NAMMO DEFENSE SYSTEMS INC

May 27, 2022

U.S. Environmental Protection Agency – Region 9
EPA Pacific Southwest San Francisco Office
75 Hawthorne Street
San Francisco, CA, 94105

NDS Current Conditions Report

To Whom It May Concern:

I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted.

Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete.

I have no personal knowledge that the information submitted is other than true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature: _____
Name: Angel Soto
Title: Health, Environment, Safety & Security (HESS) Director
Date: 05/27/2022

CURRENT CONDITIONS REPORT RESPONSE TO GENERAL COMMENTS DATED 7 APRIL 2022
NAMMO DEFENSE SYSTEMS INC.
MESA ARIZONA
27 MAY 2022

Comment Number	General Comment	Response
1	*Phasing of work.* As discussed in the RFI Workplan meeting, EPA recommends grouping the work to be completed into logical units such that they can proceed in parallel with the key work at the TTU, even if at different stages of the corrective action process. Provide a recommendation for interim submittals to improve the process to development of a sitewide RFI Workplan, such as for the site assessments discussed in Comment Nos. 3 and 4. Include a proposed schedule. EPA emphasizes prioritization of those areas that are most likely to impact human health or the environment, while ensuring that progress is made at all SWMUs and AOCs.	See new Section 7.1 General Summary of Recommendations in the revised CCR. NDS proposes to divide Plants at the Mesa Facility into separate Operable Units (OUs) as follows: OU 1 - Plant 1 OU 2 - Plant 2 OU 3 - Plant 3 (Non VRP related items) and Desert Magazine Area OU 4 - Plant 4 OU 5 - Former Plant 5 & 6 OU 6 - DFR, including the Former TTU Interim submittals consisting of RCRA Facility Assessments (RFAs) will be submitted for the proposed OUs. An assessment of SWMUs and AOCs at each OU will be completed to satisfy the requests in General Commnet #2 through #13 and SWMU/AOC specific comments to the November 2021 CCR. The RFAs will be completed based on the USEPA RFA Guidance. These submittals will include a summary of known and available information, including that relating to former TRW operations and other lessees at each Plant, and that associated with historical and current sewer/septic/cesspool connections. The RFA submittals will be prioritized in the following order: OU 2 & 6 - Plant 2 & DFR/TTU OU 3 - Plant 3 OU 4 - Plant 4 OU 1 - Plant 1 OU 5 - Plant 5/6 The RFAs will be submitted by 31 September 2022, such that recommendations resulting from the RFAs will be included as part of the scope of the proposed RFI Work Plan.
2	*Define submittals in CCR.* For comments where EPA has indicated a requirement for additional information or a summary and synthesis of information, NDS may defer the response to the RFI Workplan or other interim submittal. If the response is deferred to another submittal, indicate on the updated CCR Tables that additional information will be provided, and in which submittal.	See response to General Comment #1. The proposed submittals have been identified in CCR Tables 2 through 8.
3	*Site assessment documentation for 2019 Site Visit and 2021 Site Visit.* Submit the site assessment documentation supporting the SWMUs and AOCs identified in the Haley & Aldrich site visit from 2019 ("2019 Site Visit") and a GeoSyntec site visit in 2021 ("2021 Site Visit"). The documentation must include information equivalent to a preliminary site assessment or RCRA Facility Assessment (RFA) and include the historical and present operations, wastes managed, records review and visual documentation elements. Identify COPCs and potential releases. Include the operations and materials management of lessees Capstone, Berger, and Task. EPA will not review the recommendations for these SWMUs/AOCs prior to receipt of the documentation. Mark these SWMUs/AOCs as "preliminary" in the CCR or otherwise indicate their status. NDS may consider a supplemental submittal for this documentation as described in Comment No. 1.	See response to General Comment #1 above. A separate submittal is proposed for Plant-specific RFAs that will incorporate the information and documentation obtained during the 2019 and 2021 site visits.

Comment Number	General Comment	Response
4	*Site assessment at Plant 1.* Submit an initial site assessment for Plant 1 as described in the previous comment. As part of the site assessment, the locations of all vaults, tanks and sumps must be inventoried, with current and historical use, condition of the sumps, construction material, size, COPCs, and recommendations. Mark Plant 1 SWMUs/AOCs as preliminary in the CCR.	See response to General Comment #1 above.
5	*TRW operations.* Assess the potential releases associated with the historical operations of TRW on the facility. The required assessment must present facility information generally equivalent to a preliminary site assessment or RFA. Key information should include: a holistic presentation of the locations of all TRW leased facilities with their associated operations history, wastes and/or materials managed, COPCs, and evaluation of release potential. Include TRW facilities at Former Plant 5/6. Include Building 30 at Plant 4. Reference the February 9, 2022 EPA comments on the CSM.	See response to General Comment #1 above. The proposed RFAs will include TRW and other lessees' information related to location of their operations, operational history, wastes and/or materials managed, COPCs, and evaluation of release potential.
6	*Screening from future investigation.* To screen a SWMU/AOC from further investigation, present a justification for that SWMU/AOC that includes: a summary of historical operations, identification of wastes and COPCs, a summary of previous interim actions with sampling results as compared to COPCs and screening levels, and ultimately, a synthesis and summary of available information that shows a low risk of release, lack of a migration pathway, an incomplete exposure route, and/or analytical results below screening levels for COPCs. If samples have been collected, provide a figure that shows the nature and extent of remaining COPCs. For SWMUs/AOCs identified in the 1994 RFA, the evaluation must account for operations since 1994. For SWMUs/AOCs identified in the 2017 updated RFA, historical operations must also be documented, as noted in the comment below. If NDS is making a recommendation in the CCR to screen a SWMU/AOC from further evaluation, the justifying information must be presented in the CCR. NDS may also opt to present justification to screen out SWMUs/AOCs in the RFI Workplan or another submittal.	See response to General Comment #1 above. SWMUs and AOCs will be screened in the proposed plant-specific RFAs based on the USEPA RFA Guidance.
7	*2017 updated RFA assessment information.* Document the historical and present operations information for SWMUs/AOCs identified in the 2017 updated RFA, identify wastes managed and associated COPCs, and assess release potential. Include a records review. Review the recommendations for those SWMUs/AOCs and update the tables accordingly. See comments on specific SWMUs and AOCs included on Table 2.	See response to General Comment #1 above.
8	*Review of 1994 RFA recommendations.* Include an evaluation of the recommendations and actions completed for the SWMUs/AOCs identified in the 1994 RFA, based on current knowledge. Incorporate an assessment of operational activities in those locations since 1994. This evaluation must be presented in the CCR for SWMUs/AOCs for which NDS is recommending screening from further investigation. Update the Tables accordingly. Also see comments on specific SWMUs and AOCs included on Table 2.	See response to General Comment #1 above. Evaluation of the 1994 RFA recommendations will be included as part of the proposed plant-specific RFAs.
9	*Existing degree and extent of contamination in soils.* If NDS recommends no further investigation for a SWMU/AOC in the CCR, NDS must present the existing degree and extent of remaining contamination for SWMUs/AOCs that have undergone interim remedial action with soil removal or where sampling results are available. Include a figure with sample locations and depths, analytical methods, a table with the compiled sampling results, and a comparison to the current screening levels for the COPCs. If additional investigation is recommended in the CCR, this presentation of existing degree and extent of contamination may be deferred to the RFI Workplan, such as for the TTU (SWMU 52) or the stormwater accumulation areas (AOC BC) at the TTU.	See response to General Comment #1 above. Where applicable, SWMUs and AOCs will either be screened out of the RFI Work Plan based on data from previous investigations, or a recommendation will be provided for additional data to be collected as part of a RFI Work Plan.

Comment Number	General Comment	Response
10	*1,4-dioxane historical analysis.* For historical SWMUs/AOCs with potential VOC releases,1,4-dioxane must be evaluated as a COPC and explicitly included in the summary and synthesis of data. Review historical analytical data for the inclusion of 1,4-dioxane in the VOC analyses and present a discussion. If NDS is recommending no further investigation in the CCR for a location with potential VOC releases, that information must be presented in the CCR. Else, it may be deferred to another submittal.	Comment noted. 1,4-dioxane as a COPC will be evaluated as part of the RFAs proposed in response to General Comment #1.
11	*Plant 3 SWMUs and AOCs.* For Plant 3 SWMUs/AOCs identified as covered by the VRP Remedial Investigation (RI), specify how the planned activities under the RI address the concern at the SWMU/AOC, including the potentially impacted environmental media and COPCs. Note these locations as "Pending RI Investigation" or other acknowledgement rather than " No Recommendations." SWMUs/AOCs and COPCs not specifically covered by the VRP are covered under the Order must be assessed in the CCR for further investigation as part of the site-wide RFI. NDS must continue to include SWMUs/AOCs for Plant 3 in the CCR and RFI Workplan until a SWMU/AOC is documented as screened from further investigation.	Comment noted. The Plant 3 RFA proposed in response to General Comment #1 will include the activities and the data collected as part of the VRP Plant 3 RI that address SWMUs and AOCs.
12	*Plant 5/6 Summary:* EPA requires NDS to provide a summary of available information regarding Plants 5/6. In EPA's February 9, 2022 comments on the CSM, we included a comment that applies to the CCR, as follows: This summary must address the identified SWMUs/AOCs: AOC 1/SWMU 51: the historical surface impoundments; AOC 8 - buried layers of waste; and AOC 14: TRW Operations. Provide a detailed summary of work completed with a figure showing Plant features, sampling conducted with dates, depths, locations, sampling and analysis methods, compounds, and concentrations. Provide a summary table of sampling results. Provide a descriptive summary of existing conditions with respect to all contaminants of potential concern (COPCs). If NDS is recommending no further investigation at Plants 5/6 in the CCR, this summary must meet the criteria discussed above for screening from future investigation.	See response to General Comment #1 above.
13	*Septic tanks, sewers, and wastewater piping.* In the RFI Workplan, the site septic tanks, cesspools and municipal sewer connections must be identified and evaluated for potential releases. An inventory of septic tanks and cesspools must be presented with the historical operations of the associated building or Plant. Identify connections to the municipal sewer system with the dates established. Even when operated in accordance with the regulations of the time, liquid disposal facilities are at risk for releases. The 1994 RFA (page 6-41) notes that AP mop water was routinely disposed into the septic system. In addition, the CCR notes that neutralized water from the burn ground sump plate was disposed into the sewer. EPA agrees with the statements in the *Remedial Investigation Work Plan, Plant 3 and Former WBO Facility* regarding the need for evaluation of septic tanks and sewers in the RFI Workplan.	See response to General Comment #1. Septic tanks, sewer and wastewater piping assessment will be included as part of each plant-specific RFA.
14	Perform a thorough quality control check on the CCR table of contents, text and references. Check text citations to references to References, Sections, Tables, Figures and Appendices. EPA has provided comments on a few specific instances which impact key information, but has not attempted to be exhaustive.	Comment noted. Quality control check completed.

Comment Number	General Comment	Response
15	Adjust the CCR text to reflect comments above regarding the preliminary status of SWMUs and AOCs identified in the 2019 and 2021 site visits.	See response to General Comment #1 above. All new SWMUs and AOCs identified as part of the 2019 and 2021 site visits will be evaluated as part of the proposed RFAs. See also revised Section 7of the CCR.
16	Correct CCR text references to Section 7.	Comment noted. References in Section 8 and citations throughout text have been checked.
17	*Secondary containment description consistency.* The term "secondary containment" appears to be inconsistently used in historical documentation. In the current descriptions of liquid management areas, please identify where secondary containment exists that generally meets the criteria currently applied to containers as described in 40 CFR 264.175 or to criteria applicable to tanks. If additional research is required, this may be deferred to the RFI Workplan.	Added a general remark in Section 7.1 of the text and specific remarks in the recommendations column of Tables 2 through 8 about evaluating the need for secondary containments and assessing for conformance to 40 CFR 264.175.
18	*Former Section 7.8.* In the CCR, in lieu of the specific recommendations on SWMUs and AOCs, please provide a general summary of recommendations.	See response to General Comment #1 and new Section 7.1 summarizing general recommendations included in the revised CCR.
19	*Section 2.2.1.* Reference the required submittal of Plant 1 site assessment.	Section 2.2 was revised to state "Individual RFA Reports will be prepared by NDS for Plants 1, 2, 3, 4, 5 & 6, and the DFR to include, to the extent possible, the historical and present operations, wastes managed, records review and visual documentation elements. The RFAs will identify COPCs and potential releases and include, where applicable, the operations and materials management of lessees."
20	*Section 2.2.2.* Include a description and discussion of the operations of the x-ray process water tank (SWMU D). Include a description of the waste stream and how it is managed now, and how it has been managed in the past.	See RTC to General Comment 1 and 19. This information will be included in the proposed Plant 3 RFA Report.
21	*Section 2.5.3* Provide the referenced Table 1 that contains the TTU groundwater monitoring well network.	The requested Table 1 is included as part of the tables provided in Appendix A Conceptual Site Model (Geosyntec, 2021c). Corrected text in the section to state "Table 1 of Appendix A Conceptual Site Model (Geosyntec, 2021c)".
22	*Section 2.5.4.* Provide the referenced Table 2 of Appendix A that contains the groundwater monitoring network for Plant 3.	The requested Table 2 is included as part of the tables provided in Appendix A Conceptual Site (Geosyntec, 2021c). Corrected text reference to state "Table 2 of Appendix A Conceptual Site Model (Geosyntec, 2021c)".
23	*Section 4.1.1.* Include a section on Former Plant 1 that indicates that the location was not included in the 1994 RFA or subsequent investigations and also briefly describes AOC 2, AOC 5, and the closure of the TCA tank.	Section 4.1.1 is specific to a summary of the 1994 RFA Report, which did not include the Former Plant 1. Section 2.2.5 of the CCR (*Former Plant 1 - Current and Historical Plants, Operations and Management Practices*) was updated accordingly.

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24	*Section 4.1.3 2009 Perchlorate Source Investigation and Pre-remedial Design Activities.* Incorporate the analytical results from the 2009 Perchlorate Source Investigation into the discussion of the associated SWMUs/AOCs. Discuss perchlorate detections near SWMU 9 at Plant #2. In addition, discuss results from boring B4 at Plant #4 that show perchlorate results at 125 mg/kg at Building 25.	See response to General Comment #1 and 19. A detailed data summary of the 2009 Perchlorate Source Investigation and Pre-remedial Design Activities will be incorporated as part of the RFA Reports. Section 4.1.3.1 titled Plant 2, Sub-Section "*Waste Propellant Storage Pads #1 through #3"*, includes a description of the investigation completed in this area, associated with SWMU 9, stating "Apart from soil samples collected at depths of 0.5 ft and 2.5 ft from boring B12 (3.4 mg/kg and 1.7 mg/kg perchlorate, respectively), soil samples collected from these locations did not contain detectable concentrations of perchlorate (Table 2 of Geosyntec, 2009a; Appendix A).". No revision to the text is recommended. Section 4.1.3.4 titled Plant 4, Sub-Section "Building #25", includes a description of the investigation completed in this area, stating "With the exception of perchlorate detected in soil samples collected from a depth of 0.5 ft bgs from borings B4 (120 mg/kg) and B5 (1.0 mg/kg), soil samples collected from these locations did not contain detectable concentrations of perchlorate (Table 3 of Geosyntec, 2009a; Appendix A).". No revision to the text is recommended.
25	*Section 8 and Tables.* Do a thorough quality control check on the references included in the CCR Tables and in the Reference Section and ensure completeness and consistency. There are a number of references included in CCR Tables 2-8 which are not consistent with the documents cited in CCR Table 1. For example, in CCR Table 4, SWMU 33 cites "ADEQ Meeting Notes (ADEQ, 2000)". This document does not appear in CCR Table 1 or the References section of the text.	Comment noted. Quality control check completed.
26	*Tables 2 through 8.* Please provide context for the numbers included in the "Referenced Documents" column. EPA was unable to determine to what these referred.	The numbers included within the "Reference Documents" are associated with photographic documentation collected by H&A as part of the 2019 site visit. This documentation will be evaluated as part of the RFAs proposed in response to General Comment #1, and included in the proposed RFA if conditions have significantly changed since 2019.
27	*Table 5.* Check and correct the location of SWMU 44, the location identifications are inconsistent. In the 1994 RFA, SWMU 44 is located at the Casting Building - see 1994 RFA photos. In addition, correct the SWMU 44 description to distinguish from other locations, including SWMU J. Check and correct the location of SWMU J. The secondary SAA located at the concrete pad nearby has been lost in the various descriptions - see 1994 RFA Plant 4 figures. Include the secondary SAA in the description. See specific comments in Table 2.	Comment noted. The locations and descriptions of SWMU 44 and J will be updated, if needed, as part of the proposed Plant 4 RFA Report. See response to General Comment #1 and 19.
28	*Figure 9.* Check and correct the location of SWMU BG. It is marked on Figure 9, but does not appear to be associated with Plant 1.	SWMU BG is associated with Plant 4 and was removed from Figure 9.
29	*Figure 9.* Check and correct the location of SWMU CP, which refers to the Wastewater Treatment Plant, on Figure 9.	The area currently shown as Wastewater Treatment on Figure 9 is actually the Facility Department maintenance building. The Wastewater Treatment area is located just to the east, and associated with the location of SWMU CP, where shown on Figure 9. Figure 9 was revised accordingly.
30	*Figure 10.* Correct the location of AOC 4 on Figure 10.	AOC 4 moved approximately 100-ft east on Figure 10.
31	*Figure 10.* Mark SWMUs 5 and 6 on Figure 10.	SWMU 5 and 6 were added to Figure 10.
32	*Figure 12.* Review and correct the location of SWMU 43 on Figure 12. The marked location is inconsistent with that identified in the 1994 RFA. SWMU 43 is not at building 25, but in the cul-de-sac nearby to the east. This SWMU also appears to be mismarked in 2017 updated RFA. Google Earth historical aerials show drums at the fenced location, as well as on the open areas to the northwest of the fenced area (2016).	SWMU 43 was moved to the east side of Building 25 as described in both the 1994 and 2017 RFAs.
33	*Figure 12 and Table 5.* Check and correct the location of SWMU BJ on Figure 12. The marked location is consistent with SWMU 43, not with SWMU BJ.	SWMU BJ has been confirmed to be located within the correct location on Figure 12.

Comment Number	AOC/ SWMU	Location/ Unit	NDS Description from CCR Tables	NDS Assessment/ Recommendations from CCR Tables	EPA Specific Comment	Response
Plant 1: CCR Table 2						
34	BB	On-Site Evaporator	*"X-Ray process wastewater generated at Plants 2 and 3, plus the wastewater generated by the Plant 3 Testing department and collected in 55 gallon drums) is collected by vacuum truck and transported to the evaporator for treatment."*	*"Recommended evaluating the need for separate secondary containment units for the evaporator pans. Additionally, it is recommended the drain be emptied of fluid and visually inspected to assess the condition of the drain and sump."*	EPA requires additional information to evaluate recommendations for this SWMU/AOC. Based on the information provided to date, this SWMU/AOC is not a candidate to be screened out of the RFI process at this time. In the CCR, confirm the location of BB on Figure 9 and indicate that additional information will be provided in the RFI Workplan in the "Recommendations" column. In the RFI Workplan, provide a complete summary of current and historical operations, figure, photographs and list of associated wastes treated at the evaporator. Include a discussion of waste transfer piping. Add a holistic discussion of the generation and management of the x- ray process water across the site that is consistent with the SWMUs/AOCs.	Location BB was moved approximately 75-ft northwest on Figure 9. Table 2 Recommendation column revised to include the following additional recommendation "Additional information and recommendations will be provided as part of a Plant 1 RFA Report."
35	all other AOCs/ SWMUs	-	See CCR Table 2	various	See EPA General Comment No. 3 regarding documentation of the 2019 and 2021 Site Visits. EPA requires additional information to evaluate recommendations for these SWMUs/AOCs.	All the SWMUs on Table 2 have been marked as "Preliminary". See response to General Comment #1 regarding the proposed submittal of a Plant 1 RFA Report. The Recommendation column was revised to state for each SWMU that "Gather additional information and provide recommendations in a Plant 1 RFA Report."
Plant 2: CCR Tables 3 and 8						
36	AOC 4	Northeast of Building 1	Cooling Tower Tank and Overflow Impoundment	*"NDS staff were not aware of this AOC, so it was not observed. This AOC is considered closed."* *"No recommendations for this AOC."*	EPA does not concur with the recommendation or the evaluation that the AOC is closed. Based on available information, this SWMU/AOC is not a candidate to be screened out of the RFI process at this time. Provide the location, which is identifiable with current information. A discussion and photograph (Photo No. 55) are included in the 1994 RFA and the surface impoundment is visible on historical aerials available on Google Earth and from Maricopa County. Update the description of AOC 4 to reflect available information and correct the location on Figure 10. An unlined surface impoundment that received direct discharge of wastewater will likely require investigation and sampling as part of the RFI.	Figure 10 was revised accordingly. See response to General Comment #30. Table 8 column "Release Potential" was revised to "High-s" for potential releases to soil. The Recommendation column was revised to state "Recommended additional assessment as part of a proposed Plant 2 RFA."
37	SWMU 5	North Hold SAA Plant 2	*"5' X 15' concrete pad located to the north of the northeast corner of the main building (liquid and solid waste AA for AP and AN propellants)"*	*"Geosyntec could not locate this concrete pad. It is assumed that this concrete pad no longer exists or has been repurposed"* *"No recommendations for this SWMU."*	EPA does not concur with the recommendation or the assessment that the concrete pad no longer exists. On Figure 10, provide the location which is identifiable with current information. From EPA's review of the aerial photos, this concrete pad still exists in the location identified in the 1994 RFA. The 1994 RFA documents a release in this area and describes storage of liquid hazardous waste. In addition, the concrete pad had no curbing. In several other storage locations, the waste was stored on bare earth for many years before concrete was put in place. In the CCR or RFI Workplan, provide a synthesis of the available information. See also SWMU BW identified during the 2019 Site Visit.	Figure 10 was revised accordingly. See response to General Comment #31. The CCR Table 3 Recommendation column was revised to state "Gather additional information including details on whether secondary containments conform to the 40 CFR 264.175 standards and provide recommendations in a Plant 2 RFA Report."

Comment Number	AOC/ SWMU	Location/ Unit	NDS Description from CCR Tables	NDS Assessment/ Recommendations from CCR Tables	EPA Specific Comment	Response
38	SWMU 6	Former 1,1,1-TCA, SAA	*"SAA for waste 1,1,1-TCA (1 drum) located northeast of bays 25 and 27 on a pallet."*	*"Geosyntec could not locate this SWMU, and it is assumed to no longer exist." "Geosyntec has no recommendations for this SWMU."*	EPA does not concur with the recommendation. Review the location provided in Photo No. 8 in the 1994 RFA. The 1994 RFA also describes 1,1,1-TCA liquid waste stored on bare soil. Provide a synthesis of available information and mark SWMU 6 on Figure 10.	Figure 10 was revised accordingly. See response to General Comment #31. The CCR Table 3 Recommendation column was revised to state "Gather additional information and provide recommendations in a Plant 2 RFA Report."
39	SWMU 7	East Hold HWAA	*"Drums on 40' x 40' concrete pad located outside and to the northeast of bays 30 and 33. Hazardous waste accumulation of for propellant waste, organic solvent, 1,1,1-TCA, and products Tal 422 and Tal 113."*	*"No recommendations for this SWMU."*	EPA does not concur with the recommendation. Based on available information, this SWMU/AOC is not a candidate to be screened out of the RFI process at this time. In the CCR, indicate that additional information will be provided in the RFI Workplan in the "Recommendations" column. EPA requires a synthesis of information and an update of the operations in this location in the CCR or in the RFI Workplan. This waste storage location has been operational for over 50 years and has been used for solvent waste. Prior to 1988, the area was bare soil. The 1994 RFA notes that the historical release potential was high. EPA will likely require samples as part of the RFI.	The CCR Table 3 Recommendation column was revised to state "Gather additional information and provide recommendations in a Plant 2 RFA Report."
40	SWMU 8	HWAA Building 20	*"Concrete pad (18' x18') with sheet metal roof located outside and to the southeast of the main building for storage of drums containing 1,1,1-TCA, lubricating mineral oils, and nonhazardous waste."*	*"No recommendations for this SWMU."*	EPA does not concur with the recommendation. Based on available information, this SWMU/AOC is not a candidate to be screened out of the RFI process at this time. This waste storage area has been operational for over 50 years and was used for both waste and product such as TCA. It is unclear when the ground surface was covered in concrete. In addition, the concrete had no curb until after the 1994 RFA. Soil staining was observed. There is a 1999 report with some sampling results - provide a summary and evaluate the sampling and results relative to current COPCs and screening levels. Provide a figure with sampling results and locations. Indicate that additional information will be provided in the RFI Workplan in the "Recommendations" column.	The results of soil samples collected at SWMU 8 as part of the *Plant #2 - SWMU #8 HWAA Bldg. 20 Solvent Pad Sampling Plan and Results Report* (TDS, 1999), and the ADEQ determination of no-further action in the letter issued in 2001 will be summarized and evaluated as part of a proposed RFA Report for Plant 2. The CCR Table 2 Recommendation column was revised to state "Eevaluate existing investigation results, gather additional information including details on whether secondary containments conform to the 40 CFR 264.175 standards and provide recommendations in a Plant 2 RFA Report."
41	SWMU 9	HWAA Ignitor Bldg. Plant	*"Outdoor concrete pad (8' x12') located to the north of the ignitor building (solid waste only). Hazardous waste accumulation area consisting primarily of AN waste propellant."*	*"No recommendations for this SWMU."*	EPA does not concur with the recommendation. Extracted pages from *Perchlorate Source Investigation, June 2009,* included in Appendix A, present analytical results with detections of perchlorate associated with this SWMU. Present and discuss these results relative to this SWMU in the RFI Workplan. Indicate that additional information will be provided in the RFI Workplan in the "Recommendations" column.	As part of the 2009 *Perchlorate Source Investigation* , two soil borings (B11 and B12) were advanced next to SWMU 9. Six soil samples (three at each boring) at 0.5, 2.5 and 5 ft bgs were collected in each boring. Perchlorate was detected only at B12 at 0.5 and 2.5 ft bgs, at concentrations of 3.4 and 1.7 mg/kg, respectively, well below the Arizona SRLs. The CCR Table 2 Recommendation column was revised to state "Eevaluate existing investigation results, gather additional information and provide recommendations in a Plant 2 RFA Report."
42	SWMU 10	Water Bore-Out Operations	*"WBO Concrete pad (30' x 30'). Facility used to bore out AP propellant."*	*"Recommended identifying and labeling the storage totes, as well as sampling the area east of the WBO for potential contamination in soil."*	EPA agrees that sampling is required to evaluate potential contamination in the soil. In addition, a more extensive summary of current and historical operations with wastes handled must be presented in the RFI Workplan. Indicate that additional information will be provided in the RFI Workplan in the "Recommendations" column. More information is required for EPA to evaluate whether this recommendation is sufficient.	The following recommendation was added to the CCR Table 2 Recommendation column "Gather additional information including details on whether secondary containments conform to the 40 CFR 264.175 standards and provide recommendations in a Plant 2 RFA Report."

Comment Number	AOC/ SWMU	Location/ Unit	NDS Description from CCR Tables	NDS Assessment/ Recommendations from CCR Tables	EPA Specific Comment	Response
43	D	X-ray Process Wastewater Tank	*"Large x-ray process wastewater tank located outside of Plant 2, in covered area. Tank was situated on the concrete within a bermed area approximately 13' x 8'."*	*"No recommendations for this SWMU."*	More information is required for EPA to evaluate a recommendation. Based on available information, this SWMU/AOC is not a candidate to be screened out of the RFI process at this time. In the CCR, indicate that additional information will be provided in the RFI Workplan in the "Recommendations" column. In the RFI Workplan, provide a complete summary of current and historical operations, figure, size, construction, photos and list of associated wastes. See Table 1 general Comment No. 7 regarding historical information in the 2017 updated RFA. See also associated comments on management of x-ray process water.	The CCR Table 2 Recommendation column was revised to state "Gather additional information and provide recommendations in a Plant 2 RFA Report."
44	G	Ignitor Building 6	*"Propellant waste generated from ignitor building 6 is piped to two metal tanks (~80-gallon capacity) situated on secondary containment located outside on the north side of the building. No evidence of a spill or release was observed."*	*"No recommendations for this SWMU."*	More information is required for EPA to evaluate a recommendation. In the CCR or RFI Workplan, provide a complete summary of current and historical operations, figure, size, construction, photos and list of associated wastes. See Table 1 Comment No. 7 regarding historical information in the 2017 updated RFA.	The CCR Table 2 Recommendation column was revised to state "Gather additional information including details on whether secondary containments conform to the 40 CFR 264.175 standards and provide recommendations in a Plant 2 RFA Report."
45	H	Ignitor Building 6	*"Propellant waste generated within ignitor building 6 is piped to six metal tanks (~50-gallon capacity each) located outside on the east side of the building. Five tanks were situated on secondary containment, and one was on a pallet."*	*"No recommendations for this SWMU."*	More information is required for EPA to evaluate a recommendation. In the CCR or in the RFI Workplan, provide a complete summary of current and historical operations, figure, size, construction, photos and list of associated wastes collected. Review aerial photos. Indicate that additional information will be provided in the RFI Workplan in the "Recommendations" column, as necessary.	The CCR Table 2 Recommendation column was revised to state "Gather additional information including details on whether secondary containments conform to the 40 CFR 264.175 standards and provide recommendations in a Plant 2 RFA Report."
46	I	Building 17 Main Accumu-lation Area	*"Building 17 is a sheet metal building approximately 20' x 40' that was repurposed in late 2016 or early 2017 to be the main accumulation area for wastes generated from Plants 2, 3, and 4 that must be shipped offsite for disposal."*	*"No recommendations for this SWMU."*	More information is required for EPA to evaluate a recommendation. In the CCR or RFI Workplan, provide a complete summary of current and historical operations, figure, photos and list of associated wastes collected. Review aerial photos. See EPA Table 1 General Comment no. 7 regarding historical information in the 2017 updated RFA. Indicate that additional information will be provided in the RFI Workplan in the "Recommendations" column, as necessary.	The CCR Table 2 Recommendation column was revised to state "Gather additional information and provide recommendations in a Plant 2 RFA Report."
47	BT through BX	multiple	See CCR Table 3	*"No recommendations for this SWMU."*	See EPA Table 1, General Comment No. 3 regarding documentation of the 2019 and 2021 Site Visits.	All the SWMUs on Table 3 have been marked as "Preliminary". The CCR Table 2 Recommendation column was revised to state "Gather additional information and provide recommendations in a Plant 2 RFA Report."

Comment Number	AOC/ SWMU	Location/ Unit	NDS Description from CCR Tables	NDS Assessment/ Recommendations from CCR Tables	EPA Specific Comment	Response
Plant 3 and former WBO: CCR Tables 4 and 8						
48	SWMUs 11, 12, 17, 24, 25, 26, 27, 32, 33, 34, 41, AOCs 11, 12, 17	multiple	See CCR Table 4	Noted as part of the VOC investigation being conducted during the WBO RI under the VRP.	See EPA General Comment No. 11 regarding documentation of the Plant 3 SWMUs/AOCs. These SWMUs/AOCs are not candidates to be screened out of the RFI process at this time. Continue to incorporate information gathered during the VRP RI into the RFI documentation.	The CCR Table 4 Recommendation column was revised to state "Include a summary of SWMU specific information and data collected for perchlorate and VOCs as part of the Plant 3 RI in a proposed Plant 3 RFA Report. Assess and evaluate additional potential contaminants of concern as part of the RFA."
49	SWMU 19	HWAA Line 1	*"Extended range munitions (ERM)/research hold HWAA located southeast of bay 8. Referred to as reactive waste AA, building 35. This is a sheet metal structure open on one side with a concrete pad (20' x 12'). This unit historically accumulated liquid waste 1,1,1-TCA, 1,1,1-TCA contaminated trash, and M17M waste."*	*"No recommendations for this SWMU."*	EPA does not concur with the recommendation. Based on available information, this SWMU/AOC is not a candidate to be screened out of the RFI process at this time. Provide a synthesis of available information for this SWMU that includes a review of operations since the 1994 RFA. This waste management area has been in use since the 1960s and has historically held liquid waste and/or VOCs. Many of these locations did not have concrete installed until the 1980s. If not provided in the CCR, indicate that additional information will be provided in the RFI Workplan in the "Recommendations" column.	The CCR Table 4 Recommendation column was revised to state "Include a summary of SWMU specific information and data collected for perchlorate and VOCs as part of the Plant 3 RI in a proposed Plant 3 RFA Report. Assess and evaluate additional potential contaminants of concern as part of the RFA."
50	SWMU 20	SAA Line 1	*"SAA for more than 55 gallons of waste just south of SWMU 19 is a concrete pad (15' x 20'). This unit historically accumulated liquid waste 1,1,1-TCA, 1,1,1-TCA contaminated trash, and M17M waste."*	*"No recommendations for this SWMU."*	EPA does not concur with the recommendation. Provide a synthesis of available information for this location that includes a review of operations since the 1994 RFA. This waste management area has been in use since the 1960s and has historically held liquid waste and/or VOCs. Many of these locations did not have concrete installed until the 1980s. The currently fenced area appears smaller than it was in the past. If not provided in the CCR, indicate that additional information will be provided in the RFI Workplan in the "Recommendations" column.	The CCR Table 4 Recommendation column was revised to state "Include a summary of SWMU specific information and data collected for perchlorate and VOCs as part of the Plant 3 RI in a proposed Plant 3 RFA Report. Assess and evaluate additional potential contaminants of concern as part of the RFA."
51	SWMU 31	HWAA Line 2	*"Line 2 hold area HWAA located north and west of bays 32-35 in Line 2. Waste propellant is stored in drums on concrete pad (8' x 20')"*	*"No recommendations for this SWMU."*	Clarify the description of SWMU 31 and include historical operations information since the 1994 RFA. The location appears to exist in current aerials. Incorporate a discussion of the 2009 perchlorate sampling in the area as appropriate.	The CCR Table 4 Recommendation column was revised to state "Include a summary of SWMU specific information and data collected for perchlorate and VOCs as part of the Plant 3 RI in a proposed Plant 3 RFA Report. Assess and evaluate additional potential contaminants of concern as part of the RFA."
52	SWMU 34 and SWMU 35	HWAA Bldg. 10	*"HWAA located on a concrete floor (12' x 12') near building 10. TDS refers to this area of Plant 3 as the Roland Area and to this HWAA as the "snake pit." According to 1994 RFA, historical waste management consisted of solid propellant consisting of AP and MT."*	*"No recommendations for this SWMU."*	EPA requires additional information to evaluate this recommendation. Clarify the descriptions of SWMU 34 and 35 and ensure they are distinguished from each other. Update the discussion to describe operations and reflecting that this storage area has been in use for over 50 years and has been used to store propellants and VOCs. Discuss how the VOC investigation will address SWMU 34 as noted in EPA General Comment No. 11. Based on available information, this SWMU/AOC is not a candidate to be screened out of the RFI process at this time.	The CCR Table 4 Recommendation column was revised to state "Include a summary of SWMU specific information and data collected for perchlorate and VOCs as part of the Plant 3 RI in a proposed Plant 3 RFA Report. Assess and evaluate additional potential contaminants of concern as part of the RFA."

Comment Number	AOC/ SWMU	Location/ Unit	NDS Description from CCR Tables	NDS Assessment/ Recommendations from CCR Tables	EPA Specific Comment	Response
53	SWMUs 35 to 41	Roland Area - SAAs	Misc. SAAs	*"No recommendations for these SWMUs."*	Review and clarify the identified locations for these SWMUs. Correct or clarify all inconsistencies in the descriptions and review the recommendations. The 1994 RFA describes these SWMUs as SAAs in or near Building 10. The locations marked on Figure 11 are not consistent with that description. EPA notes that SWMUs AT to AZ identified in the 2019 Site Visit may coincide with the 1994 RFA SWMUs. EPA is not able to review a recommendation until the SWMUS are correctly located and identified.	The CCR Table 4 Recommendation column was revised to state "Potential discrepancies between SWMUs 35 to 41 and AT to AZ will be resolved as part of the proposed Plant 3 RFA. Include a summary of SWMU specific information and data collected for perchlorate and VOCs as part of the Plant 3 RI in a proposed Plant 3 RFA Report. Assess and evaluate additional potential contaminants of concern as part of the RFA."
54	AOC 6	X-Ray Film Developing Process Water	*"/n March 1991, 150 55-gallon drums containing x-ray film developing process wastewater were accumulated just east of Plant* *3. TDS stated that these drums were kept in storage northwest of building 29 at Plant 3."*	*"No recommendations for this AOC."*	Clarify and disambiguate the descriptions of the various elements of AOC 6. The 1994 RFA originally defined AOC 6 as 150 55-gallon drums containing x-ray process wastewater that were stored outside on the east side of the building for over a year. Address this specific concern in the CCR Table. In addition, identify other SWMUs/AOCs associated with the x-ray process water, such as additional storage locations, and a 900-gallon tank that batch discharged to the sewer system referenced in the 1994 RFA. Identify the sewer connection used for disposal. Present historical information associated with the storage, transport and disposal activities for the x-ray film developing process water. See comments on AOC D and AOC BB. Include the constituents of the process water. Review the AOC locations marked on Figure 6 for accuracy. EPA requires a summary before a recommendation can be evaluated.	The Concern Description column of Table 8 was revised to state "In March 1991, 150 55-gallon drums containing x-ray film developing process wastewater were accumulated directly east of Plant 3 Line 1 Building Bay 5. TDS stated that these drums were kept in storage northwest of building 29 at Plant 3 for over one year." Based on review of the 1994 RFA Section 7.6, the Plot Plan for Plant 3, and the associated photograph #57, the location of AOC 6 was presented east of the Line 1 Building, Bay 5. Figure 11 (not Figure 6), was revised accordingly. The 1994 RFA Section 7.6 also states that "..these drums were kept in storage northwest of Building 29 at Plant 3." Based on review of available Maricopa County 1998 aerial photographs what appears to be drums is visible northwest of Building 29. However, this SAA is not shown on the 1994 Plot Plan for Plant 3 and a photograph was not presented in the report. The CCR Table 4 Recommendation column was revised to state "Recommended additional assessment as part of a proposed Plant 3 RFA. As part of this assessment the x-ray processes, waste generation, transport and disposal will be documented and evaluated for consistency with existing SWMUs and AOCs. A new AOC will be evaluated in the proposed RFA for the drum storage area northwest of Building 29."
55	AOC 10	Line 2 Laboratory	*"A laboratory is located in the Plant 3 line 1 building, and it is presumed that this AOC refers to that same laboratory based on Talley personnel who stated no significant changes to the operations conducted at Plant 3 have occurred."*	*"No recommendations for this AOC."*	Correct the description of AOC 10 to refer to the laboratory at Line 2 in accordance with the 1994 RFA, unless sufficient evidence exists to determine that the location was mis-identified in 1994. If AOC 10 was located at Line 1, explicitly present that information and provide a back up justification in the form of floorplans or other documentation. If the location of the lab was moved, another AOC must be identified to disambiguate the two laboratories. EPA requires clarification before a recommendation can be evaluated.	As part of a proposed Plant 3 RFA, the location AOC10 described in the 1994 RFA will be reviewed. A new AOC will be evaluated for the existing laboratory located within Line 1 Building. The Table 8 Recommendation column was revised accordingly.

Comment Number	AOC/ SWMU	Location/ Unit	NDS Description from CCR Tables	NDS Assessment/ Recommendations from CCR Tables	EPA Specific Comment	Response
56	AOC 13	TRW Ops. At Plant 3	See CCR Table 8	*"Recommended determining if additional environmental sampling is necessary to assess potential releases of sodium azide."*	See General Comment No. 5 regarding TRW operations. EPA agrees with the recommendation for more investigation of the TRW operations with subsequent evaluation of the need for sampling. EPA requires the equivalent of facility assessment information. Indicate that additional information will be provided in the RFI Workplan in the "Recommendations" column.	Comment noted. The following recommendation was added to Table 8 "Gather additional information and provide recommendations in a Plant 4 RFA for the former TRW operations at Plant 3."
57	P	Line 1, outside of Bay 1	*"55 gallon drum of Pocal mop water stored on secondary containment outside of Bay 1. This water may contain gun powder residue."*	*Recommended identifying and labelling the unlabeled waste drums and implementing a weekly inspection of waste storage at Plant 3.*	EPA concurs. Indicate that additional information will be provided in the RFI Workplan in the "Recommendations" column.	The CCR Table 4 Recommendation column was revised to include the following additional recommendation "Gather additional information including details on whether secondary containments conform to the 40 CFR 264.175 standards and provide recommendations in a Plant 3 RFA Report."
58	V	Line 1, Bay 16	*"55 gallon drum of solvent contaminated trash situated on concrete."*	*Recommended examining the SWMU for evidence of release or spills.*	EPA concurs. Indicate that additional information will be provided in the RFI Workplan in the "Recommendations" column.	The CCR Table 4 Recommendation column was revised to include the following additional recommendation "Gather additional information and provide recommendations in a Plant 3 RFA Report."
59	W	Line 1, Bay 15	*"55 gallon drum of Tali-25 (contains barium chromate), plus 55 gallon drum of water and Tali 44 stored on concrete."*	*Recommended examining the SWMU for evidence of release or spills.*	EPA concurs. Indicate that additional information will be provided in the RFI Workplan in the "Recommendations" column.	The CCR Table 4 Recommendation column was revised to include the following additional recommendation "Gather additional information and provide recommendations in a Plant 3 RFA Report."
60	X	Line 1, End of Line 1, outside of Bays 18 and 19 Day Can	*"5-gallon day can containing solvent contaminated trash situated on a plastic pallet on concrete."*	*Recommended identifying and labeling the 5-gallon bucket, and implementing a weekly inspection for unlabeled drums and improperly stored substances.*	EPA concurs. Indicate that additional information will be provided in the RFI Workplan in the "Recommendations" column.	The CCR Table 4 Recommendation column was revised to include the following additional recommendation "Gather additional information and provide recommendations in a Plant 3 RFA Report."
61	Y	Line 1, Bays 17A and 17B	*"Wet vacuum fluid generated from saw operations are piped to an ~80-gallon metal tank situated on concrete outside of Bays 17A and 17B . Collected fluid may contain propellant residue. Tank was unlabeled." "Bay 17A contains halogenated and non halogenated solvents. Bay 17B contains vacuum waste generated from cutting/shaping propellant. An 80- gallon metal tank sits on the concrete outside of the 17 bays accumulating propellant waste and vacuum fluid generated in bay 17A and 17B. No evidence of a spill or release was observed."*	*No recommendations for this SWMU*	Provide additional description of the historical operations and details of wastes managed. Provided additional details on the age and conditions of the tank and any piping or secondary containment. Describe waste disposal procedures. Identify COPCs. More information is required for EPA to evaluate the recommendation.	The CCR Table 4 Recommendation column was revised to state "Gather additional information and provide recommendations in a Plant 3 RFA Report, including additional information related to historical operations, waste management and disposal, and conditions of this SWMU."

Comment Number	AOC/ SWMU	Location/ Unit	NDS Description from CCR Tables	NDS Assessment/ Recommendations from CCR Tables	EPA Specific Comment	Response
62	Z	Line 1, Fueling Area	*"A bermed concrete pad (8' x 50') with a sheet metal roof is located outside and to the southeast of Line 1, Bays 1-4. 3 55- gallon drums containing used oil and ethylene glycol were stored on secondary containment. An ~100 gallon above ground tank containing red diesel for fueling facility equipment was also situated on secondary containment on this concrete pad."*	*Recommended replacing the plastic secondary containment unit, repairing the concrete secondary containment unit, and implementing a weekly inspection of secondary containment systems.*	EPA concurs with initial recommendation and also requires additional description of past and present operations and materials managed. Indicate that additional information will be provided in the RFI Workplan in the "Recommendations" column.	The CCR Table 4 Recommendation column was revised to include the following additional recommendation "Gather additional information including details on whether secondary containments conform to the 40 CFR 264.175 standards and provide recommendations in a Plant 3 RFA Report, including additional information related to historical operations, waste management and disposal, and conditions of this SWMU."
63	AA	Shipping and Receiving Building	*"Shipments of waste to offsite disposal facilities are staged and palletized outside of the building, on asphalt, on the day of pickup. No evidence of a spill or release was observed."*	*No recommendations for this SWMU*	Describe the location and historical operations of the waste staging area, including: how long it was in operation, wastes managed, and condition of the storage surface at the time it was in operation. EPA requires additional information to evaluate this recommendation.	The CCR Table 4 Recommendation column was revised to state "Gather additional information and provide recommendations in a Plant 3 RFA Report., including additional information related to historical operations, waste management and disposal, and conditions of this SWMU."
64	AN	Line 2, Sinks in Bays 44 and 45 (Test De-partment)	*"Bays 44 and 45 contain sinks. Rocket motors are cleaned out in the sinks, generating corrosive wastewater, which is discharged into 55 gallon drums outside of Bay 46 situated on concrete. This water is periodically collected by a vacuum truck and transported to the on-site evaporator near Plant 1 for treatment. Some staining was observed on the concrete pad."*	*Recommended sampling the area around this SWMU for potential contamination.*	EPA concurs with initial recommendation. EPA also requires additional description of past and present operations and materials managed.	The CCR Table 4 Recommendation column was revised to include the following additional recommendation "Gather additional information and provide recommendations in a Plant 3 RFA Report, including additional information related to historical operations, waste management and disposal, and conditions of this SWMU."
65	AP	Line 2, Outside of Bay 46 (Test De-partment)	*"Fenced concrete pad (5' x 5') located near Bay 46 contains a waste propellant bin situated directly on concrete...This SWMU appears to be used to store liquid TCA, and process fluids in drums on a plastic secondary containment units."*	*No recommendations for this SWMU*	More information is required for EPA to evaluate the recommendation. Based on available information, this SWMU/AOC is not a candidate to be screened out of the RFI process at this time. EPA requires additional description of the past and present operations and wastes managed. Review the evaluation made in the 2017 Updated RFA considering historical operations.	The CCR Table 4 Recommendation column was revised to state "Gather additional information and provide recommendations in a Plant 3 RFA Report, including additional information related to historical operations, waste management and disposal, and conditions of this SWMU."

Comment Number	AOC/ SWMU	Location/ Unit	NDS Description from CCR Tables	NDS Assessment/ Recommendations from CCR Tables	EPA Specific Comment	Response
66	AR	Building 26, Bay A5	*"55 gallon drum containing solvent contaminated trash situated on concrete. Some rust-like staining on concrete observed."*	*Recommended sampling the area around this SWMU for potential contamination.*	EPA concurs with initial recommendation.	The CCR Table 4 Recommendation column was revised to include the following additional recommendation "Gather additional information and provide recommendations in a Plant 3 RFA Report, including additional information related to historical operations, waste management and disposal, and conditions of this SWMU."
67	AZ	Building 10, Outside of Bay 1	*"55 gallon drum of hazardous waste with faded, unreadable label located on secondary containment situated on a 3' x 3' concrete pad with one wall and a roof."*	*No recommendations for this SWMU*	More information is required for EPA to evaluate the recommendation. EPA requires additional description of the past and present operations and wastes managed. If this is a SAA, drums are to be appropriately labeled and managed.	The CCR Table 4 Recommendation column was revised to state "Gather additional information and provide recommendations in a Plant 3 RFA Report, including additional information related to historical operations, waste management and disposal, and conditions of this SWMU."
68	BA	Line 1 X-Ray Process and Research Wastewater Tank	*"An ~500 gallon tank located outside of the Plant 3, Line 1 research department. Lab sink water and x-ray process water are piped to the outside tank which is situated in a raised concrete containment area that is bermed on all sides. The wastewater is periodically collected by a vacuum truck and transported to the evaporator near Plant 1 for treatment. During the VSI the secondary containment was nearly full of what was presumably rain water from a recent storm event.* *Talley stated they typically empty secondary containment after storms, but had been unable to do so due to a flat tire on their vacuum truck."*	*No recommendations for this SWMU*	More information is required for EPA to evaluate the recommendation. See associated comments on x-ray process water. EPA requires additional description of the past and present operations and wastes managed. Provide additional details on the age and construction of the tank and its condition. Provide an evaluation of the secondary containment.	The CCR Table 4 Recommendation column was revised to state "Gather additional information and provide recommendations in a Plant 3 RFA Report, including additional information related to historical operations, waste management and disposal, and conditions of this SWMU."
69	BO to GS-5	multiple	See CCR Table 4	various	See EPA General Comment No. 3 regarding documentation of the 2019 and 2021 Site Visits.	All the SWMUs on Table 4 have been marked as "Preliminary". See response to General Comment #1 regarding the proposed submittal of a Plant 3 RFA Report. The Recommendation column was revised to state for each SWMU that "Gather additional information and provide recommendations in a Plant 3 RFA Report."

Comment Number	AOC/ SWMU	Location/ Unit	NDS Description from CCR Tables	NDS Assessment/ Recommendations from CCR Tables	EPA Specific Comment	Response
Plant 4: CCR Table 5						
70	SWMU 43	Plant 4 Hold Area	*"HWAA located in the cul de sac to the east of Building 25. Historically reported to contain drums of AP propellant waste, 1,1,1-TCA waste, AP vacuum and mop water, and nonhazardous Rinsolve 140 waste. TDS refers to this area as the Plant 4 Hold Area, and it is constructed on unsealed concrete pad (40' x 20') surrounded by a fence. Cargotainer and, bagged propellant waste, and drums of propellant waste present."*	*"No recommendations for this SWMU."*	Based on available information, this SWMU/AOC is not a candidate to be screened out of the RFI process at this time. This storage area has been in use for over 40 years and has been documented to have stored propellant and 1,1,1-TCA. Note that drums stored in the cul-de-sac are visible on current aerials in Google Earth. Clarify and correct the location marked on Figure 12, which is not consistent with the description. In addition, SWMU BJ from the 2019 Site Visit appears to be the same as SWMU 43 from the 1994 RFA. Disambiguate SWMU 43 from other SWMUs and identify additional SWMUs as needed. Provide additional discussion of historical operations and materials stored in the identified SWMU/AOCs. Ensure that the information presented in the RFI Workplan addresses any previous identification inconsistencies.	See response to General Comment # 32 and 33. The CCR Table 5 Recommendation column was revised to state "Gather additional information and provide recommendations in a Plant 4 RFA Report."
71	SWMU 44	Building 23 - Casting Room	*"HWAA located just east of Building 23. Historically reported to store waste propellant and waste 1,1,1-TCA. The casting room two stories tall with drums stored on concrete both upstairs and downstairs. Contaminated trash managed outside downstairs."*	*"Recommended identifying and labeling the hazardous waste drum"*	More information is required for EPA to evaluate the recommendation. Clarify and confirm the location - the location on Figure 12 is not consistent with the description in the 1994 RFA. In the 1994 RFA, SWMU 44 was identified at the Casting Building and photos are provided, but is marked at the Casting Control Building (23A). In addition, there appears to be another waste storage location at a concrete pad nearby - not currently identified on Figure 12. The 1994 RFA also contained a photograph of a stormwater run-off trench at Building 23 as associated with SWMU 44. Review historical information to define SWMU 44 and identify separate SWMUs as necessary.	Comment noted. On Figure 12 SWMU 44 was moved to the east side of Building 23, and Building 23A was labeled, located just northwest of Building 23. The CCR Table 5 Recommendation column was revised to include the following additional recommendation "Gather additional information including details on whether secondary containments conform to the 40 CFR 264.175 standards and provide recommendations in a Plant 4 RFA Report, including evaluation of other potential SWMUs at Building 23 and 23A."

Comment Number	AOC/ SWMU	Location/ Unit	NDS Description from CCR Tables	NDS Assessment/ Recommendations from CCR Tables	EPA Specific Comment	Response
72	SWMU 45	Building 22 - Mixing Room	*"Historically reported to store AP contaminated debris and AP contaminated mop water. Propellant contaminated trash stored inside the building on a concrete floor." "Two 55-gallon drums of non-RCRA related waste sit on secondary containment outside the building along with a partially full 55-gallon drum of unknown hazardous waste. Historically, the building had a drain leading out of the building into a pit. The drain and pit are now filled in."*	*"Recommended identifying and labeling the 55-gallon drum of unlabeled hazardous waste, and sampling the soil around the drain in the pit for potential releases."*	More information is required for EPA to evaluate the recommendation. Review and clarify the identification of current and historical waste management areas, potential releases and COPCs. This SWMU appears to refer to multiple locations and potential releases: a leaking compressor, a disposal pit and unlabeled waste drums. Review historical information to confirm and provide details for each element of the SWMU. Identify separate SWMUs as needed. Include a discussion of the leaking compressor described in the 1994 RFA and indicate that the "Actions Completed" are in reference to the leaking compressor rather than the waste storage area. Ensure that the information presented addresses any previous inconsistencies.	The CCR Table 5 Recommendation column was revised to include the following additional recommendation "Gather additional information including details on whether secondary containments conform to the 40 CFR 264.175 standards and provide recommendations in a Plant 4 RFA Report."
73	SWMU 46	Building 24 - Curing	*"Historically reported to store reactive waste and nonhazardous trash. Propellant contaminated trash and SA propellant contaminated debris managed in drum(s) on concrete."*	*"Recommended placing any outdoor drum storage on secondary containment units."*	EPA concurs with providing secondary containment for the drums. More information is required for EPA to evaluate the completeness of the recommendation. Provide a description of the historical waste management activities at Building 46 since the 1994 RFA and a description of the propellant storage. Include a discussion of the leaking compressor described in the 1994 RFA and indicate that the "Actions Completed" are in reference to the leaking compressor rather than the waste storage area.	The CCR Table 5 Recommendation column was revised to include the following additional recommendation "Gather additional information and provide recommendations in a Plant 4 RFA Report."
74	SWMU 47	Building 20 - Weighout Room	*"(5-bay weigh out room) 1,1,1-TCA contaminated trash maintained inside bay 3, liquid 1,1,1-TCA and later Rinsolve maintained outside near bay 1, alcohol contaminated trash accumulated in bay 2."*	*"Recommended identifying and labeling the 55- gallon drum."*	More information is required for EPA to evaluate the recommendation. Based on available information, this SWMU/AOC is not a candidate to be screened out of the RFI process at this time. Review and clarify the identification of waste management areas, potential releases and materials managed. Identify separate SWMUs as needed. This SWMU appears to refer to multiple locations: drum storage adjacent to bare soil, liquid TCA storage, a below grade sump, and drains that carried waste TCA and/or propellant wash water. Review historical information to confirm. Refer to the description and photographs in the 1994 RFA. Ensure that the information presented in the RFI Workplan addresses any previous inconsistencies.	The CCR Table 5 Recommendation column was revised to include the following additional recommendation "Gather additional information and provide recommendations in a Plant 4 RFA Report."
75	J	Building 23	Waste storage area	*"Recommended identifying and labeling the 55- gallon drums."*	EPA concurs that the drums must be identified and labeled. See also comment on SWMU 44.	The CCR Table 5 Recommendation column was revised to include the following additional recommendation "Gather additional information including details on whether secondary containments conform to the 40 CFR 264.175 standards and provide recommendations in a Plant 4 RFA Report, include evaluation of other potential SWMUs at Building 23 and 23A."

Comment Number	AOC/ SWMU	Location/ Unit	NDS Description from CCR Tables	NDS Assessment/ Recommendations from CCR Tables	EPA Specific Comment	Response
76	K	Access Road leading to Building 20	*"Seven 55-gallon drums containing waste were stored on secondary containment off to the side of the access road leading to Building 20. Drums were covered with tarps and not disturbed during the VSI."*	*"Recommended identifying and labeling the drums."*	EPA concurs that the drums must be identified and labeled. Drums appear at this location on Google Earth from at least 2009. Provide historical information. If these are hazardous waste drums, they must be removed and disposed. More information is required for EPA to evaluate the SWMU.	The CCR Table 5 Recommendation column was revised to include the following additional recommendation "Gather additional information including details on whether secondary containments conform to the 40 CFR 264.175 standards and provide recommendations in a Plant 4 RFA Report."
77	L	Waste Storage Area	*"Waste propellant was stored in a bin inside a fenced area between Buildings 18, 19, and 28. Three drums (not fenced in) contained used Rinsolve and were located nearby. Two drums were situated on secondary containment, and the third was situated on soil."*	*"No recommendations for this SWMU."*	More information is required for EPA to evaluate the recommendation. Clarify and confirm the location. On Figure 12, it is marked in the gravel wash rather than the fenced area nearby. Review historical documentation and correct description. Provide historical operations information.	Figure 12 was revised with the correct location for SWMU 12, within a fenced area. The CCR Table 5 Recommendation column was revised to include the following additional recommendation "Gather additional information including details on whether secondary containments conform to the 40 CFR 264.175 standards and provide recommendations in a Plant 4 RFA Report."
78	M	Magazine 42	*"This explosives magazine is approximately 20' x 15' and used to store solid and liquid waste propellant in drums."*	*"Recommended inspection for evidence of spills or releases."*	EPA concurs that additional investigation is needed.	The CCR Table 5 Recommendation column was revised to include the following additional recommendation "Inspect for evidence of spills or releases. Gather additional information and provide recommendations in a Plant 4 RFA Report."
79	BD through BJ	multiple	various	*"No recommendations for this SWMU."*	See EPA Table 1, General Comment No. 3 regarding documentation of the 2019 and 2021 Site Visits.	All the new SWMUs on Table 5 have been marked as "Preliminary". See response to General Comment #1 regarding the proposed submittal of a Plant 4 RFA Report. The Recommendation column was revised to state for each SWMU that "Gather additional information and provide recommendations in a Plant 4 RFA Report."
80	-	Stormwater Areas	*"The stormwater areas identified by Geosyntec's 2009 report appear to be fairly consistent with the present day configuration. Gates are in place at a number of culvert locations at this Plant which could be used to contain spills from flowing downstream. Gates are maintained in an open position."*	*"No recommendations for this SWMU."*	More information is required for EPA to evaluate the recommendation. Summarize the conditions at the identified stormwater areas and provide a figure.	The CCR Table 5 Recommendation column was revised to include the following recommendation "Gather additional information and provide recommendations in a Plant 4 RFA Report."
81	-	Building 30	TRW Operations	-	See Table 1 General Comment No. 5 regarding TRW operations. The 1994 RFA indicates that TRW leased Building 30 at Plant 4.	As part of a proposed Plant 4 RFA (See General Comment #1), former TRW operations will be evaluated at Plant 4.

Comment Number	AOC/ SWMU	Location/ Unit	NDS Description from CCR Tables	NDS Assessment/ Recommendations from CCR Tables	EPA Specific Comment	Response
TTU/DFR: CCR Table 7						
82	SWMU 52	Burn Ground	Burn Ground (or TTU)	See CCR Table	Ensure the text reflects identified data gaps for this area for all impacted environmental media. In addition, text must be revised to reflect implementation of the Order. Remove the reference to the post- closure permit. Post-closure activities will be addressed after implementation of the corrective measures under the Order. In the RFI Workplan, provide a description of the existing degree and extent of contamination at this location for all media and COPCs. Include figures and tables showing analytical results of waste or contamination remaining in the RFI Workplan.	Reference to the post-closure permit was removed from the Recommendation column. The Operational Status as of 2021 column was revised to state "A Consent Order (RCRA 3008(h)-09-2021-001) voluntarily entered into by NDS and the USEPA has been issued as of February 9, 2021." The CCR Table 7 Recommendation column was revised to include the following recommendation "Complete the vertical and lateral delineation of the TTU dissolved plume based on the data gaps identified in the 2021 CSM, which include: Additional vadose zone investigation within the former TTU burn pits to assess the presence of COCs in bedrock fractures as a potential continued source to groundwater; Delineation (vertical and lateral to the south) of the perchlorate/VOC plumes in groundwater; Collection of additional data supporting potential Southern Canal leakage and its contribution to groundwater recharge; Additional soil vapor VOC characterization south of the former TTU burn pits; and Investigation of the potential presence of PFAS due to the treatment of MT at the TTU. A comprehensive description of historical investigations, corrective action activities conducted to date, and summary of available data will be provided in the RFI Work Plan."
83	BC	Stormwater Accumu-lation Area	perchlorate impacted soils	*"No recommendations for this SWMU."*	Align the recommendations with the identified data gaps in the CSM. Indicate that investigation will be required in this area. Provide a description of the existing degree and extent of contamination at this location in the RFI Workplan. Include figures and tables showing analytical results of waste or contamination remaining.	The CCR Table 7 Recommendation column was revised to include the following recommendation "Complete the vertical and lateral delineation of perchlorate in the SWAA on SRPMIC property based on the data gaps identified in the 2021 CSM. A comprehensive description of historical investigations, corrective action activities conducted to date, and summary of available data should be provided in the RFI Work Plan."
84	BL	New Test Department Firing Area immediately south of TTU	Shoulder fired weapons containing AP and M7 propellants and HMX are tested here. Testing at this location began around 2017.	*"Recommended to establish a routine soil sampling program within the active firing range."*	EPA concurs.	Cmment noted.

Comment Number	AOC/ SWMU	Location/ Unit	NDS Description from CCR Tables	NDS Assessment/ Recommendations from CCR Tables	EPA Specific Comment	Response
85	AOC 7	Burn Ground Sump Plate Removal	Burn Ground Sump	*"No recommendations for this AOC."*	AOC 7 can be considered to be the former location of the burn ground sump at the TTU and not the location at Plant 3 where the plate was temporarily stored. Incorporate AOC 7 as the former sump location into the ongoing investigation of the TTU source area. Revise the recommendation to reflect its association with SWMU 52. EPA requires identification of the location of the former sump in the RFI Workplan and incorporation of known environmental conditions associated with the former sump.	The CCR Table 7 Recommendation column was revised to include the following recommendation "The Burn Ground Sump is associated with the location of SWMU 52. Identification of the location of the sump and associated environmental conditions will be included as part of the RFI Work Plan."
Adjacent to TTU: CCR Table 8						
86	AOC 15	Unknown or Abandoned Area/ Thermate Grenade Pit	*"An area covering approximately 50' x 100' located east of the TTU has possibly been used to dispose of building rubble, other debris, ad may be the site of a former unit associated with drains and concrete structures that appear to have been dismantled in place. The area appears to be a natural wash for surface water runoff. A pile of rubble that may have been deposited here after a structure was dismantled elsewhere is located in the wash. A yellow substance of unknown constituency or origin was scattered near the rubble piles."*	*"No recommendations for this AOC."*	More information is required for EPA to evaluate the recommendation. EPA's February 9, 2022 conditional approval letter for the CSM included a requirement to address AOC 15 in the CCR. The comment reads as follows, "Provide a detailed summary of work completed with a figure showing AOC features and sampling results with dates, depths, locations, media type, sampling and analysis methods, compounds and concentrations. Provide a summary table of sampling results for all media. Provide a descriptive summary of existing conditions with respect to all COPCs." In addition, PFAS must be discussed as a COPC in this area due to its use for thermate grenades and the presence of burned areas.	Since CSM comments were received after submittal of this CCR, the additional requested information will be provided in the proposed Plant 3 RFA. CCR Table 8 Recommendation column was revised to state "A summary of SWMU specific information and data collected during prior investigations should be included in a proposed Plant 3 RFA. Gather additional information and provide recommendations in a Plant 3 RFA for other potential contaminants of concern."

Comment Number	AOC/ SWMU	Location/ Unit	NDS Description from CCR Tables	NDS Assessment/ Recommendations from CCR Tables	EPA Specific Comment	Response
Plant 5/6: CCR Table 8						
87	AOC 1/ SWMU 51	Historical Surface Impound-ments	Historical Surface Impoundments	*"No recommendations for these SWMUs."*	Based on an initial review of available information, these SWMUs/AOCs are not candidates to be screened out of the RFI process at this time. Comment transferred from draft EPA CSM letter: "Former Plants 5/6 Summary. Provide a detailed summary of work completed with a figure showing Plant features, sampling conducted with dates, depths, locations, sampling and analysis methods, compounds and concentrations. Provide a summary table of sampling results. Provide a descriptive summary of existing conditions with respect to all contaminants of potential concern (COPCs). Present information for each of the identified SWMUs/AOCs. Reference August 4, 2021, agency comment numbers (nos.) 8 and 43 on the CSM."	Since CSM comments were received after submittal of this CCR, the additional requested information will be provided in the proposed Plant 5/6 RFA. CCR Recommendation columns in Table 6 (SWMU 51) and Table 8 AOC 1, and 8 were revised to state "Gather additional information, provide recommendations, and include a summary of SWMU specific information and data collected during prior investigations in a proposed Plant 5 & 6 RFA. "
	AOC 8	Buried Layers of Waste	Buried Layers of Waste			
	AOC 16	TRW Operations	TRW Operations			The comment refers to AOC 14, not AOC 16. As part of a proposed Plant 5 & 6 RFA (See General Comment #1), former TRW operations will be evaluated at these former Plants.
Unknown/Higley Road: CCR Table 8						
88	AOC 16	exact location unknown - "at the end of Higley Road on the north side"	Alleged TCA Dump Area	*"No recommendation for this AOC."*	More information is required for EPA to evaluate the recommendation. The 1994 RFA indicated a high potential for contamination at this AOC and recommended "...extensive review/research of activities that may have resulted in dumping. Report of preliminary findings should be submitted to agency(s). " NDS has not provided documentation to show whether review/research was done to identify this alleged dump area. CCR Table 8 notes, "No action planned by TDS. " The two documents cited in the table acknowledge the difficulty in identifying a location for the alleged dump site, but do not include documentation of efforts to evaluate this AOC. Because of the presence of VOCs and 1,4-dioxane in groundwater at the TTU, EPA considers this an undefined potential source area. Provide a complete summary of available information regarding the history and activities, and copies of historical records, including the 1985 source document and inspection report. Please revise the table column that discusses "Activities Completed..." to reflect any activities that have been completed. EPA considers this AOC unresolved rather than closed.	The CCR Table 2 Recommendation column was revised to state "Gather additional information and provide recommendations in a Plant 2 RFA."

Comment Number	AOC/ SWMU	Location/ Unit	NDS Description from CCR Tables	NDS Assessment/ Recommendations from CCR Tables	EPA Specific Comment	Response
Sitewide						
89	AOC 11 and AOC 12	Septic Tanks	see CCR Table 8	*"Recommended identifying the locations of any additional septic tanks and associated cesspools and sampling for potential contamination from facility processes. This AOC is being evaluated for investigation as part of the Plant 3 RI for potential VOC releases as part of the Plant 3 RI"*	EPA concurs with the evaluation of the septic tanks. Refer to Table 1 Comment No. 13.	Comment noted.

Notes:
1994 RFA: *RCRA Facility Assessment Report for Talley Defense Systems, Inc. Mesa, Arizona,* Science Applications International Corporation, April 1994
2017 updated RFA: *Report on Updated RCRA Facility Assessment,* Nammo Talley, Inc., Mesa Arizona, Haley & Aldrich, September 2017 2019 Site Visit: Site visit by Haley & Aldrich in 2019 - no report submitted
2021 Site Visit: Site visit by Geosyntec in 2021 - no report submitted ADEQ: Arizona Department of Environmental Quality
AOC: Area of Concern AN: Ammonium Nitrate
AP: Ammonium Perchlorate
BG: Burn Ground, or Thermal Treatment Unit
CCR: *Current Conditions Report* dated November 2021 COPC: Chemical of Potential Concern
DFR: Desert Firing Range
HWAA: Hazardous Waste Accumulation Area
NDS: Nammo Defense Systems, formerly Talley Defense Systems
Order: Administrative Order On Consent RCRA: Resource Conservation and Recovery Act
RI: Remedial Investigation RFA: RCRA Facility Assessment RFI: RCRA Facility Investigation SAA: Satellite Accumulation Area
SWMU: Solid Waste Management Unit TCA: 1,1,1-trichloroethane
TRW: TRW, Inc.
TTU: Thermal Treatment Unit, also Burn Ground WBO: Water Bore Out
VOC: Volatile Organic Compound VRP: Voluntary Remediation Program
VSI: Visual Site Inspection

Geosyntec consultants

engineers | scientists | innovators

Nammo

CURRENT CONDITIONS REPORT

NAMMO DEFENSE SYSTEMS INC. FACILITY MESA, ARIZONA

Prepared for

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Mesa, Arizona 85215

Prepared by

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November 2021 (Revised May 2022)

Geosyntec consultants

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November 2021 (Revised May 2022)

TABLE OF CONTENTS

1. INTRODUCTION 1
1.1 Purpose 1
1.2 Organization of Document 2

2. FACILITY BACKGROUND 3
2.1 Facility Layout Surroundings 3
2.2 Current and Historical Plants, Operations, and Waste Management Practices 3
2.2.1 Plant 1 4
2.2.2 Plant 2 5
2.2.3 Plant 3 6
2.2.4 Plant 4 7
2.2.5 Former Plant 1 7
2.2.6 Former Plant 5 8
2.2.7 Former Plant 6 8
2.2.8 DFR and Former TTU 9
2.3 Physical Settings 10
2.4 Topography and Hydrology 10
2.5 Geologic and Hydrogeologic Conditions 11
2.5.1 Former TTU 11
2.5.2 Plant 3 13
2.5.3 Former TTU Groundwater Well Network 15
2.5.4 Plant 3 Groundwater Well Network 15

3. AREAS OF KNOWN COPC RELEASES 16
3.1 Sources of Releases 16
3.1.1 Former TTU 16
3.1.2 Plant 3 and Former WBO 16
3.2 Delineation of Release Areas 17
3.2.1 Former TTU 17
3.2.2 Plant 3 and Former WBO 20

4. PREVIOUS INVESTIGATIONS AND RESULTS 22
4.1 Facility Wide Documents 22
4.1.1 1994 RCRA Facility Assessment Report for Talley Defense Systems, Inc., Mesa, Arizona 22
4.1.2 1999 SWMU Investigation 27
4.1.3 2009 Perchlorate Source Investigation and Pre-Remedial Design Activities 28
4.1.4 2017 Updated RCRA Facility Assessment Report 33

4.2 Plant 3 and Former WBO 34
4.2.1 1991 Soil Sampling – Metals, Nitrate 34
4.2.2 1997 Site Assessment – Metals 34
4.2.3 1999 WBO Pit Closure – Metals 35
4.2.4 2005 Soil Sampling Plan – Perchlorate 35
4.2.5 2007 Soil Investigation – Perchlorate 36
4.2.6 Pre-Design Characterization Activities in Advance of a Pilot Test of In Situ Bioremediation for Perchlorate in Soils at the Former WBO 37
4.2.7 2010 Supplemental Perchlorate Source Investigation 37
4.2.8 Revised Remedial Action Work Plan – 2013 to Present 38
4.2.9 Phase I Capture Zone Evaluation Report 39
4.2.10 2014 Aquifer Protection Permit No. P-1010370 (closed in 2019 via transition to VRP) 40
4.2.11 2021 Remedial Investigation Work Plan for Plant 3 and Former WBO Facility 40
4.3 Former TTU 45
4.3.1 1986-1991 Soil Assessment for Metals 46
4.3.2 1996 Site Assessment 47
4.3.3 1997 Site Specific Risk Assessment for Lead 47
4.3.4 2000 SRPMIC Soil Investigation 47
4.3.5 2011 SWAA Soil and Bedrock Investigation 48
4.3.6 2013-2014 Additional Perchlorate Soil Sampling in SWAA 48
4.3.7 2012-2016 Monitoring Well Drilling, Construction, and Sampling 49
4.3.8 2016 RFI Report for the Former TTU 51
4.3.9 2020 Groundwater Investigation Report 52

5. CORRECTIVE ACTIONS AND INTERIM MEASURES 55
5.1 Former TTU 55
5.1.1 2002-2004 Voluntary Cleanup Action Plan 55
5.1.2 2004-2005 Additional Soil Assessment and Removal 55
5.1.3 2005 Storm Water Retention Improvements 55
5.1.4 2008 Removal of TTU Equipment and Structures 56
5.1.5 2009 Revised Draft Closure Plan Activities 56
5.1.6 2011-2012 Storm Water Accumulation Area Soil Removal 57
5.1.7 2013 Closure Plan 57
5.1.8 2015 Contingency Plan for Exceeding Perchlorate Concentration Limits at the Primate Facility Well No. 2 58
5.1.9 2017 IRA Work Plan 59

5.1.10 Present – Interim and Remediation Measures 59
5.2 Plant 3 62
5.2.1 1999 WBO Pit Closure – Metals 62
5.2.2 2010 Perchlorate "Hot Spot" Removal Report 62
5.2.3 Revised RAP – 2013 to Present 62
5.2.4 2020 Preliminary Risk Evaluation 63

6. REGULATORY INSPECTIONS AND VIOLATIONS 66
6.1 Regulatory Inspections and RCRA Violations Prior to 1994 66

7. SOLID WASTE MANAGEMENT UNITS AND AREAS OF CONCERN 71
7.1 General Recommendations 71

8. REFERENCES 73

LIST OF TABLES

Table 1: List of Documents Referenced in Section 4
Table 2: Plant 1 SWMUs
Table 3: Plant 2 SWMUs
Table 4: Plant 3 SWMUs
Table 5: Plant 4 SWMUs
Table 6: Plant 6 SWMUs
Table 7: Desert Firing Range and Thermal Treatment Unit SWMUs
Table 8: Areas of Concern SWMUs

LIST OF FIGURES

Figure 1: Vicinity Map
Figure 2: Groundwater Elevation and Contours, May 2021
Figure 3: Groundwater Elevations and Contours in Shallow Wells, May 2021 (Plant 3)
Figure 4: Groundwater Elevations and Contours in Shallow Wells, May 2021 (Plant 3)
Figure 5: Perchlorate Detections in Groundwater, Second Quarter 2021 (Former TTU)
Figure 6: Volatile Organic Compounds (VOCs) Detections in Groundwater, Second Quarter 2021 (Former TTU)
Figure 7: Plant 3 Perchlorate Concentrations and Contours, May 2021
Figure 8: Plant 3 Trichloroethene (TCE) Concentrations and Contours, May 2021
Figure 9: Plant 1 SWMUs and AOCs
Figure 10: Plant 2 SWMUs and AOCs
Figure 11: Plant 3 SWMUs and AOCs
Figure 12: Plant 4 SWMUs and AOCs
Figure 13: DFR SWMUs and AOCs
Figure 14: Desert Magazine Area SWMU

LIST OF APPENDICES

Appendix A: Previous Investigations Figures and Data Tables

ACRONYMS AND ABBREVIATIONS

µg/L	micrograms per liter
µg/m^3	micrograms per cubic meter
ADEQ	Arizona Department of Environmental Quality
ADHS	Arizona Department of Health Services
AGI	Amplified Geotechnical Imaging
amsl	above mean sea level
AN	ammonium nitrate
AOCs	areas of concern
AP	ammonium perchlorate
APP	Aquifer Protection Permit
ASLD	Arizona State Land Department
ATC	Accuracy Test Center
AWQS	Arizona Water Quality Standard
Basin & Range	Basin and Range Hydrogeologist
bgs	below ground surface
btoc	below top of casing
CAP	Cleanup Action Plan
Capstone	Capstone Precision Group LLC
CCR	Current Conditions Report
CFR	Code of Federal Regulations
CL	concentration limit
CO	Consent Order
COC	contaminant of concern
COM	City of Mesa
COPCs	contaminants of potential concern
CRA	Conestoga-Rovers & Associates
CSM	conceptual site model
DCE	dichloroethene
DFR	desert firing range
DWEL	drinking water equivalent level

EC	electrical conductivity
EISB	enhanced in-situ bioremediation
ERMS	Environment Resource Management Services
EX	extraction
FBR	fluidized bed reactor
ft	foot, feet
ft/d	feet per day
ft/ft	feet per foot
GAC	granular activated carbon
Geomatrix	Geomatrix Consultants, Inc.
Geosyntec	Geosyntec Consultants, Inc.
GPL	Groundwater Protection Level
gpm	gallons per minute
H&A	Haley & Aldrich
HBGL	health-based guidance level
HESS	Health, Environment, Safety & Security
HMX	high melting point explosive
HPA	Historical Pond Area
HWAA	hazardous waste accumulation area
IRIS	Integrated Risk Information System
IM	interim measures
IRA	interim remedial action
ISE	ion-selective electrode
LAU	Lower (conglomerate) Alluvial Unit
MAU	Middle Alluvial Unit
MCC	maximum contaminant concentration
mg/kg	milligrams per kilogram
mg/kg-day	milligrams per kilogram per day
mg/L	milligrams per liter
mL	milliliters
mL/hr	milliliters per hour

MT	magnesium Teflon™
NDS	Nammo Defense Systems Inc.
NOC	notice of opportunity to correct
NR	non-residential
NTS	Nammo Talley, Inc.
OBI	Obtial borehole imaging
PCE	tetrachloroethene
PCRP	Partial Closure and Remediation Plan
PFAS	per- and polyfluoroalkyl substances
PF	primate facility
PR	preliminary review
PRB	perchlorate reducing bacteria
RAP	Remedial Action Plan
RCRA	Resource Conservation and Recovery Act
RDX	research and development explosive
RFA	RCRA Facility Assessment
RfD	reference dose
RFI	RCRA Facility Investigation
RI	Remedial Investigation
R-PRG	Residential Preliminary Remediation Goals
SA	sodium azide
SAIC/TSC	Science Applications International Corporation/Technology Services Company
SAP	Sampling and Analysis Plan
SDS	Safety Data Sheets
SRL	Soil Remediation Level
SRP	Salt River Project
SRPMIC	Salt River Pima-Maricopa Indian Community
SSRA	Site-Specific Risk Assessment
SVE	soil vapor extraction
SVOCs	semi-volatile organic compounds
SVP	soil vapor probe

SWAA	Storm Water Accumulation Area
SWMUs	solid waste management unit
Task	Task Aerospace, Inc.
TCA	trichloroethane
TCDD	2,3,7,8-tetrachlorodibenzo-p-dioxin
TCE	trichloroethylene
TCLP	toxicity characteristic leaching procedure
TDS	Talley Defense Systems Inc.
TestAmerica	TestAmerica Laboratory
the Site	the NDS facilities, located in Mesa, Arizona
TL	trigger limit
TRC	TRC Environmental
TRW	TRW Inc.
TTU	thermal treatment unit
UAU	Upper Alluvial Unit
UCL	upper confidence limit
USEPA	United States Environmental Protection Agency
VEMUR	Voluntary Environmental Mitigation Use Restriction
VISLs	Vapor Intrusion Screening Levels
VOCs	volatile organic compounds
VRP	Voluntary Remedial Program
VSI	visual site inspection
WBO	water bore-out

1. INTRODUCTION

Geosyntec Consultants, Inc. (Geosyntec) has prepared this Current Conditions Report (CCR) on behalf of Nammo Defense Systems Inc. (NDS) to summarize available investigation data and findings and update the status of waste management units and areas of concern (AOCs) at the NDS facility, located in Mesa, Arizona (herein collectively referred to as the "Site"). This CCR has been developed as one of the general work requirements of a Consent Order (CO) dated February 9, 2021, and voluntarily entered into by NDS and the United States Environmental Protection Agency (USEPA).

1.1 Purpose

The purpose of the CCR, as stated in the CO, is to develop a document that includes:

- Any recent sampling data from the Site;
- A summary of the historical operations;
- A summary of previous investigations and corrective actions;
- A summary of all interim measures (IM) performed to date;
- A summary of all previous compliance violations;
- All known contaminant of potential concern (COPC) releases to the environment;
- The physical setting of the Site and maps of the Site setting and layout; and
- Tables that include all solid waste management units (SWMUs) and AOCs, a brief description of the unit/concern, their current statuses, what has been done to date for the respective SWMU/AOC, recommendations for future work, and reference to document(s) that addresses the respective SWMU/AOC.

This CCR details a reasonable attempt at compiling the information outlined above in one stand-alone document to serve as the primary source of the most up to date Site conditions for each SWMU and AOC. This CCR will supplement the facility Conceptual Site Model (CSM) by providing historical context and available information, which will assist in identifying the additional data necessary to address concerns at the SWMUs/AOCs. The information provided in this CCR, together with the CSM, will provide the baseline for additional work requirements that will be included in the proposed Resource Conservation and Recovery Act (RCRA) Facility Investigation Work Plan.

Investigative work being conducted under the CO is concurrent with a Remedial Investigation (RI) being conducted under the Arizona Department of Environmental Quality (ADEQ) Voluntary Remediation Program (VRP) at Plant 3 of the Site. The VRP follows the process of the ADEQ Water Quality Assurance Revolving Fund program, which is Arizona's state equivalent to the Comprehensive Environmental Response, Compensation, and Liability Act. The CO specifies that the CCR will be completed as a Site-wide document and that investigation and interim and final

measures specifically related to Plant 3 will be documented in the CCR but will be organized and conducted under the ADEQ VRP.

1.2 Organization of Document

Elements of the CCR presented in Section 1.1 are organized into the following sections:

- Section 2 presents a summary of the facility background, including layout and surroundings, current and historical operations, physical settings, topography and hydrology, and geologic and hydrogeologic conditions;
- Section 3 summarizes the areas of known COPC releases;
- Section 4 summarizes previous investigations and results;
- Section 5 summarizes corrective actions and interim measures completed at the facility;
- Section 6 summarizes RCRA investigations and compliance violations to date;
- Section 7 provides an updated list of SWMUs and AOCs and statuses for each; and
- Section 8 provides a list of references cited within this document.

2. FACILITY BACKGROUND

2.1 Facility Layout Surroundings

The Site covers approximately 534 acres located in northeast Mesa, Maricopa County, Arizona, on land leased from the Arizona State Land Department (ASLD) (Lease #03-93792-65). The leased land includes two separate areas approximately 0.5 miles apart: a southwest portion (including the present Plant 3 facility) and a northeast portion (including the present Plant 1, Plant 2, Plant 4, and desert firing range [DFR] facilities). The surrounding area consists of open desert, with industrial facilities and sand and gravel mining operations located within approximately 0.5 miles of the Site. The Site is bordered to the north and northwest by the Salt River Project (SRP) Southern Canal, the Salt River, and the Salt River Pima-Maricopa Indian Community (SRPMIC). A suburban housing development borders the northeast portion of Plant 1.

2.2 Current and Historical Plants, Operations, and Waste Management Practices

NDS and its predecessors have classified the industrial facilities in units termed "Plants" that consist of groups of buildings and associated infrastructure (Figure 1). A test range (i.e., the DFR) and the former thermal treatment unit (TTU) operate or have operated without association with a Plant. The former TTU is presently considered part of the DFR.

The Site is an industrial complex utilized for the manufacture and testing of propellant-based products. Since the 1960s, NDS and its predecessors have operated facilities for the development, testing, and manufacturing of aircrew escape systems, automobile airbag components, submunition dispensing systems, shoulder-fired weapons, and other products. Plants 1, 2, 4, and the DFR occupy land north of the intersection of North Higley Road and Arizona State Route 202 in Sections 23 and 26, Township 2 North, Range 6 East, Gila and Salt River Base and Meridian.

An RCRA Facility Assessment (RFA) was prepared by Science Applications International Corporation/Technology Services Company (SAIC/TSC) in 1994 on behalf of the USEPA (SAIC/TSC, 1994a). At the time of the 1994 RFA, six plants were operated by Talley Defense Systems Inc. (TDS) and its lessees. In addition, two historical facilities (the former TTU and the former water bore-out [WBO]) were often associated with plants and/or as separate historical facilities. For the purposes of this document, the former TTU is treated as a separate facility and the former WBO is associated with Plant 3.

- Former Plant 1 (USEPA ID No. AZD 981 425 010) is located at 4551 East McKellips Road, approximately 3 miles south of the Site. This facility was not investigated as part of the 1994 RFA as it was not considered contiguous property. TDS ceased operations at this location subsequent to the 1994 RFA;
- Plant 2 (AZD 980 816 276) is located at 4111 North Higley Road;
- Plant 3 (AZD 980 885 362) is located at 3520 North Greenfield Road. The former WBO facility is located within the northeastern portion of Plant 3. The current monitoring well network associated with Plant 3 and the former WBO unit extends approximately

3 miles to the south and 1 mile to the east of the Site. TDS ceased operations at the former WBO facility in 1990;

- Plant 4 (AZD 982 361 347) is located at 4301 North Higley Road;
- Former Plant 5, located at 3500 North Greenfield Road, is identified as an administrative Building. TDS ceased operations at this location subsequent to the 1994 RFA;
- Former Plant 6 (AZD 982 471 096) is located at 3450 North Greenfield Road. TDS ceased operations at this location subsequent to the 1994 RFA; and
- Burn Ground (AZD 020 132 502, presently identified as the former TTU), is located northwest of Plants 2 and 4 and east of both the Salt River and the SRP Southern Canal. The footprint of the former TTU occupies approximately 3 acres of land leased by NDS; however, the current monitoring well network associated with the former TTU extends to the area between the Salt River and the Southern Canal, and southeast of the Southern Canal on land owned by the SRPMIC (Figure 2). The SRPMIC lies to the west, north, and east of the former TTU, with the northern and eastern land lying at higher elevations than the TTU, while the western land lies at a lower elevation. TDS ceased operations at this location in 2006.

The 1994 RFA Report notes that prior to 1986, all facilities operated under USEPA ID No. AZD 020 132 502, assigned to the former Plant 1 address, with the described purpose being "manufacture of solid propellant and ballistic devices". Apart from Plant 5, which only housed an administrative building, the above facilities were noted to be "involved to varying degrees in the management of solid wastes". Plants 2, 3, and 4 are still in operation as of 2021. In addition to operations by TDS, portions of the facilities are and have been leased to subsidiary or independent corporations for a variety of industrial activities:

- Talley Automotive Products, Inc. conducted research operations at Plant 6 in 1988 and 1989;
- Comdisk operated at Plant 6 from the late 1960s through the early 1970s; and
- TRW Inc. (TRW) leased portions of Plant 1, Plant 3, Plant 4, and Plant 6.
- According to the 1994 RFA Report, four solid-phase rocket propellants have been produced at the Site: ammonium perchlorate (AP), ammonium nitrate (AN), sodium azide (SA), and magnesium Teflon™ (MT).

Individual RFA Reports will be prepared by NDS for Plants 1, 2, 3, 4, 5 & 6, and the DFR to include, to the extent possible, the historical and present operations, wastes managed, records review and visual documentation elements. The RFAs will identify COPCs and potential releases and include, where applicable, the operations and materials management of lessees.

2.2.1 Plant 1

Plant 1 operations include the Site headquarters offices and small arms ammunition manufacturing. Parts of the Plant 1 facility are currently leased to Capstone Precession Group LLC (Capstone) and

Task Aerospace, Inc. (Task), independent contractors of NDS. The facility presently identified as Plant 1 was constructed at 4051 North Higley Road in the late 1980s and should not be confused with former Plant 1 at 4551 East McKellips Road, Mesa, Arizona, described in Section 2.2.5, Historical Facilities (Figure 1). At present, lessees Capstone and Task generate a waste stream that includes spent bullets and lead-contaminated wastewater and evaporator sludge (waste code D008), which are stored in a satellite accumulation area at Plant 1. Additionally, x-ray process wastewater generated at Plants 2 and 3 is collected by vacuum truck and transported to an evaporator pan at Plant 1 for treatment. Sludge that accumulates in the evaporator is transferred to 55-gallon drums (waste code D011) for short term accumulation and subsequent off-Site disposal. According to Site staff, many buildings in Plant 1 grinded, mixed, and otherwise processed ammonium azide (waste code P105) propellant under former lessee TRW. These buildings have since been vacated and some are used for the storage of maintenance equipment. Plant 1 was not included in the 1994 RFA.

2.2.2 Plant 2

Plant 2 operations include inspections, assembly, processing propellant, operation of a WBO facility that uses a high-pressure water jet to remove propellant from missile bodies, and operation of a thermal treatment unit (evaporator) to concentrate liquid waste streams. The 1994 RFA Report notes the following details pertaining to waste generation activities at Plant 2:

- Halogenated solvents (waste codes F001 and F002) used in degreasing, including 1,1,1-trichloroethane (TCA), stored at two hazardous waste accumulation areas (HWAAs);
- Central Accumulation Area for RCRA-listed waste code P105 (SA) generated as commercial chemical product hazardous waste;
- Spent aluminum oxide blast medium (waste codes D006 and D007);
- Waste flammable liquids (acetone and alcohol); and
- Solid propellant (primarily waste code D003).

A new water bore-out facility was installed at Plant 2 to replace the former WBO at Plant 3. This facility generates a waste stream of solid propellants and a solution of propellants in water, primarily AP propellant and smaller quantities of AN propellant. This facility is in current operation. The liquid waste stream is transferred across the pad to the thermal treatment unit discussed in the next paragraph. The solid propellant waste is stored in 55-gallon drums for disposal off-Site by a third party.

Additionally, a new thermal treatment unit consisting of a natural gas-fired wastewater evaporator/concentrator, granular activated carbon (GAC) for capture of volatile organic compounds (VOCs), and evaporation pans for additional concentration of wastewater was installed at Plant 2. This thermal treatment unit concentrates wastewater generated by the hydraulic containment system constructed for the former TTU. Dewatered and concentrated solid waste is accumulated at the thermal treatment unit for disposal off-Site. Waste sludge generated from the TTU is accumulated in 55-gallon drums and disposed of off-Site by a third party. GAC is disposed of and replaced by Evoqua Water Technologies, LLC.

2.2.3 Plant 3

Plant 3 occupies approximately 100 acres of land at 3659 North Greenfield Road, Mesa, Arizona (Figure 1). The facility is located northeast of the intersection of North Greenfield Road and Arizona State Route 202 in Section 27, Township 2 North, Range 6 East, Gila and Salt River Base and Meridian. The boundaries of this leased parcel constitute the boundaries of Plant 3, as described in NDS's application to the ADEQ VRP. Plant 3 consists of two main buildings that are identified as Line I and Line II and several smaller buildings located in its vicinity. Plant 3 is primarily used for the development and testing of propellant and explosive-based products. Prior to 1990, an area identified as the former WBO was used to remove propellant from missile bodies, infiltration of wastewater, and open-air burning of waste (Figure 1). The former WBO is now a recognized source of soil and groundwater impacts and is undergoing investigation and remediation under a VRP agreement (dated February 15, 2019) made between NDS and the ADEQ. According to the 1994 RFA Report, waste generation activities at Plant 3 included:

- Spent solvents (waste codes F001 and F002) including 1,1,1- TCA, trichloroethylene (TCE), and waste M17M (trade name of a chlorinated solvent; waste code F001);
- X-ray systems cleaners (chromium – waste code D007);
- Sandblast residue (waste code D006);
- Chromium contaminated wastewater (waste code D007), which is still generated and stored in drums within a secondary containment unit outside the paint booth in Line 2;
- SA liners (waste code P105);
- Waste paint filters possibly toxic for RCRA metals (waste codes D004 through D011); and
- Propellant wastes (AP – waste code D001; SA – waste code P105; and MT – waste code F006), which included disposal at the former WBO discussed in the following paragraph.

At the former WBO facility, solid propellants were removed from rocket motors by disintegration using a water jet. Process water containing large solid pieces of propellant, suspended solids, and dissolved solids flowed into a screened settling container. After screening and settling, the water (with dissolved solids and remaining suspended solids) was conveyed to one of two former unlined infiltration basins (termed "the former WBO pits"). The former WBO pits occupied a rectangular area measuring approximately 61 feet (ft) in length by 55 ft in width located approximately 210 ft southeast of the former WBO facility. In addition to receiving wastewater from the former WBO facility, the former WBO pits were used for open-air burning of solids accumulated from the WBO process. The former WBO facility operated from approximately 1970 until 1990.

A feature described as the Historical Pond Area (HPA), located east of the former WBO building, was identified from historical aerial photography, and may have served as a predecessor to the better-documented former WBO pits. Soil sampling at the HPA identified AP impacts in the soil column similar to those at the former WBO pits. For the purposes of this CCR, the HPA is considered a part of the former WBO.

Operation of the former WBO and discharge to the former WBO pits ceased in 1990 in response to a request from ADEQ. Environmental impact investigation and remediation activities associated with the former WBO facility have been in progress since the early 1990s. A fluidized bed reactor (FBR) wastewater treatment system was installed in 2014 to treat wastewater generated by a hydraulic containment system installed to provide hydraulic capture of the former WBO pits. This wastewater stream includes concentrations of nitrate and perchlorate that are removed by biological reduction in the FBR. Treated effluent from the system is directed to three infiltration basins that are operated sequentially (Geosyntec, 2013; 2016).

An area approximately 12 acres in size described as the Desert Magazine Area is located south of the right-of-way connecting Plant 2 and 3 (Figure 1). Currently five structures are found in this area. Based on review of aerial photographs, this area appears to have been in use since at least 1976. According to NDS, one of the buildings is used for storage of solid hazardous waste.

2.2.4 Plant 4

Plant 4 activities include grinding, mixing, and curing ammonium perchlorate (waste code D003) propellants. AP waste generated from Plant 4 is stored in 55-gallon drums and disposed of off-Site by a third party. Plant 4 has been documented to have manufactured propellant units for assembly in Plant 3. Hazardous wastes generated at Plant 4 consisted of waste propellants, 1,1,1-TCA, SA liners, and mop water contaminated with AP. Operations historically included the mixing and grinding of AP and SA, as well as drying operations conducted in large ovens. The 1994 RFA Report noted that Plant 4 was documented to have had two HWAAs for accumulating waste solvents and propellants.

2.2.5 Former Plant 1

Former Plant 1 was not investigated as part of the 1994 RFA. TDS ceased operations at this location subsequent to the 1994 RFA. As this property is not part of current operations, and it is not considered contiguous property to the Site, it was not investigated as part of this CCR. However, two AOCs (AOC 2 and AOC 5) were identified in the 1994 RFA associated with a former 1,1,1-TCA tank at this former Plant 1.

The former Plant 1 was located at 4551 E. McKellips Road and was first built and occupied in approximately 1960. According to the 1,1,1-TCA Tank Closure Sampling Plan and Results report (TDS, 1998a) the Former Plant 1 was utilized for the development and manufacture of aircraft escape rocket motors and rocket catapults for emergency escape and survival systems, including associated rocket propellants. A 3,000-gallong steel above ground 1,1,1-TCA tank was used to receive bulk solvents for parts degreasing. According to the report, the bulk solvent material was then distributed to Plants 1 (current), 2, 3, and 4 in 55-gallon drums. The report indicated no records were available of the former Plant 6 ever receiving solvent from the Former Plant 1. According to TDS, other solvents, such as TCE, chloroethene, acetone, isopropyl alcohol and other petroleum distillates were also used, however no records were provided of these solvents being stored in the 1,1,1-TCA tank.

The tank closure report (TDS, 1998a) indicates that in 19 March 1984 a “spill/release” was discovered when a stain was found on the concrete slab associated with the tank, resulting from a

rust hole at the bottom of the tank. As a result, TDS drained and removed the tank, turned it on its side for inspection, and notified the Arizona Department of Health Services (ADHS) on 20 March 1984. The tank and release area was later inspected by ADHS on 23 March 1984. According to the report, a release of a total of 200 gallons was estimated, and at the request of the ADHS, TDS "turned over" the soil to "assure the evaporation of any remaining TCA". The tank concrete pad and stand was demolished, and two samples were collected from the soil contained within the tank concrete stand. One sample was analyzed for VOCs, and the second sample was analyzed for Toxicity Characteristic Leaching Procedure for VOCs. According to the report, all the results were below the laboratory Practical Quantitation Limits and applicable State Soil Remediation Levels (SRLs) and Groundwater Protection Levels (GPLs).

A subsequent report titled Plant 1 – TCA Tank Closure Additional VOC Sampling Plan & Results (TDS, 2001) was completed at the request of the ADEQ to document the activities and results of additional soil sampling conducted near 1,1,1-TCA tank stand. According to the report, two soil samples were collected: one on the east side of the concrete tank stand where transferring of the bulk solvent into 55-gallon drums occurred; and on the south side of the tank stand based on the general ground slop direction away from the tank. Samples were taken approximately 1-foot off of the east and south side of the former concrete pad at a depth of 5 and 10 ft below ground surface, and analyzed for VOCs. According to the report, all the results were below the laboratory Practical Quantitation Limits and applicable SRLs and GPLs.

A no-further action letter was issued by the ADEQ in a letter dated 17 December 2001 (ADEQ, 2001).

2.2.6 Former Plant 5

Former Plant 5 was located at 3500 North Greenfield Road. According to the 1994 RFA Report, former Plant 5 was utilized as an administrative building only. Site staff did not have further information regarding former Plant 5. This property was not investigated further.

2.2.7 Former Plant 6

Former Plant 6 was located at 3450 North Greenfield Road and consisted of two buildings that housed administrative offices and research and design. Historically, assembly of inflators, ignitors, enhancer packs, and SA disks occurred. Wastes generated at Plant 6 included solvents (turpentine), x-ray systems cleaner (chromium – waste code D007), solid waste propellant (waste code D003), and wastewater generated from nickel-plating operations and were collected in surface impoundments. In addition, Plant 6 generated RCRA-listed waste code F001 at non-specific sources and spent non-halogenated solvents (waste code F003) such as xylene, acetone, and ethyl acetone.

According to TDS (TDS, 1998b), the former Plant 6 was built in 1968 and contained two lined surface impoundments for the collection of neutralized wastewaters from disk manufacturing. The impoundments were designed for wastewater evaporation. The former Plant 6 was shut down in 1973 and the solids in the impoundments were removed in 1985. According to TDS, the impoundments, which included plastic liners and asphalt, were removed in 1987 and filled with

soil. See Section 7.5 for additional details on SWMUs/AOCs at the former Plant 6 and the TDS investigation.

2.2.8 DFR and Former TTU

The former TTU is frequently associated with Plant 2 in 1994 RFA sources; however, according to NDS, it is not formally associated with any of the Site Plants and is considered part of the DFR. Wastes documented to have been burned at the former TTU include AP, AN, lead nitrate, lead styphnate, MT, SA, and others. As of 1980, the former TTU was described by TDS as treating 32,004 pounds per year of characteristic (waste code D003) hazardous waste, increased to a design capacity of 500,000 pounds per year in 1985.

The former TTU began operating in approximately 1966. Waste propellants, which consisted of reactive hazardous waste (waste code D003), were treated via open burning, which was considered one of the best and safest methods of treatment for these reactive materials at the time. The generated waste propellants can be categorized as follows (Haley & Aldrich [H&A], 2016):

- AP propellant – 70-95% of the total generated output;
- AN propellant – 5-30% of the output;
- SA propellant – 0-5% of the output;
- MT propellant – 0-5% of the output; and
- Other propellants (ignites, delays, etc.) – 1-5% of the output.

The former TTU consisted of several burn pits (Pits 1 through 6) surrounded by earthen berms 2 to 5 ft in height, which were constructed with soil and weathered bedrock from the former TTU. TDS adhered to the ADEQ Open Burning Permit for Hazardous Materials procedures for open burning operations as well as to its RCRA Part B permit application procedures for collecting and burning its waste propellants. To initiate an open burn, TDS obtained authorization from the Maricopa County Bureau of Air Pollution Control or its successor agency, as well as the Fire Prevention Section of the Mesa Fire Department, SRP, the ASLD, and SRPMIC. TDS used a propane-flashing torch to flash the entire pit/area for the burn. Afterwards, TDS wet the pit area around the box, confirmed the pits were cold, and performed continuity testing on the ignition wires leading to the area. TDS then collected waste propellant from Plants 1 through 4 and other authorized locations and transported the material to the former TTU. Upon arrival, TDS personnel unloaded the waste propellant, sorted the waste based on propellant type, and placed the respective waste in its designated pit and/or burn apparatus. Once in place, the hazardous waste was burned via remote ignition.

At present, a hydraulic containment system is being operated in the vicinity of the former TTU to mitigate potential migration of contaminants of concern (COCs) in groundwater. Impacted groundwater is collected in storage tanks at two hydraulic containment wells (TTU-1 and TTU-2) and is periodically flushed (approximately weekly) and transported to the thermal treatment unit at Plant 2. Additionally, stormwater runoff is believed to have transported COCs from the former TTU to a secondary source referred to as the SWAA detailed in subsequent sections of this CCR.

The DFR is located along the northern boundary of the Site and it is used for open-air testing of propellant and explosive-based products. The former TTU is located in the northwest corner of the DFR. The former TTU was previously (prior to 2006) used for open-air burning of waste and is now a recognized source of soil and groundwater impacts undergoing investigation and remediation under a CO voluntarily entered by the USEPA and NDS on February 9, 2021, issued under Section 3008(h) of the Solid Waste Act, commonly referred to as the RCRA.

2.3 Physical Settings

The following sections describe the geological and hydrogeological setting for the Site and its environs. A detailed discussion of the vicinities of the former TTU and former WBO is provided based on the additional and ongoing characterization conducted at those locations in support of RIs.

2.4 Topography and Hydrology

The topography of the Site generally slopes away from the northern boundary, with the highest elevation observed to be in the vicinity of the former TTU. Ground surface elevations at the former TTU range from approximately 1,330 ft above mean seal level (amsl) in the northwest corner of the fence boundary to approximately 1,370 ft amsl near the southeast corner, where the fence boundary traverses a bedrock outcrop. The former TTU area generally slopes towards the west and northwest and consists of relatively flat river terrace remnants and bedrock outcrops.

Precipitation that falls on the former TTU area primarily runs off as stormwater as the majority of the former TTU area consists of bedrock granite exposed at or near the ground surface. To control the stormwater runoff to the surrounding areas, the former TTU burn pits were graded towards the interior of the pits and surrounded by berms. Prior to 2000, stormwater runoff from areas surrounding the burn pits was predominantly carried via ephemeral channels westward into the lower lying SRPMIC land (i.e., the Storm Water Accumulation Area [SWAA]) adjacent to the SRP Southern Canal. In 2000, additional berms and stormwater retention basins were created to ensure that the stormwater did not migrate away from the NDS property. Appendix A presents runoff flow of surface water at the former TTU.

The ground surface at Plant 3 is generally flat with elevations ranging from 1,325 ft amsl to the north of Line 2 to approximately 1,330 ft amsl near Line I. Surface elevations decrease to the north-northwest of Plant 3 close to the Southern Canal and to the northeast of Plant 3 near the former WBO area, with elevations near 1,310 ft amsl. Continuing to the south of Plant 3, elevations rise significantly after crossing the Red Mountain Freeway Loop 202 with elevations near wells NT-2 and NT-3 of approximately 1,420 ft amsl. Stormwater runoff at Plant 3 mainly flows along the surface to the lower topographic areas present to the northwest and northeast end of Plant 3, close to the Southern canal and near the HPA and former WBO area. TDS constructed berms surrounding the areas of the HPA and the former WBO pits to prevent surface water runoff away from those areas (Appendix A). Outside of Plant 3, local stormwater runoff is primarily controlled through the City of Mesa stormwater retention basins and local infrastructure.

2.5 Geologic and Hydrogeologic Conditions

The Site is located in the Basin and Range Physiographic Province, which was created by tensile forces in the earth's crust. These forces created a series of alluvial valleys and northwest-southeast trending mountain ranges. Surrounding mountain ranges consist of Precambrian granite as well as more recent metamorphic and sedimentary outcrops. The valleys consist of unconsolidated to poorly consolidated basin-fill sediments up to several thousand ft thick in areas that were derived from the erosion of these rock types. The Site is located within the eastern portion of the Salt River Valley, with the former TTU located on granitic outcrops, while Plant 3 is located further southwest within the valley's Quaternary alluvial deposits.

2.5.1 Former TTU

Based on drilling data from Haley & Aldrich (H&A, 2016), the former TTU is situated on medium- to coarse-grained Precambrian granite pediment (i.e., erosional surface), which is either exposed as a weathered bedrock outcrop or covered by a thin layer of alluvial deposits. This granite also exists as outcrops in the mountains to the northeast and in the Salt River channel approximately 0.33 miles to the northwest. The granite surface slopes downstream to the north and west toward the Salt River, which has created a thickening deposit of late Tertiary and Quaternary alluvium and river terrace on the eastern section of the East Salt River Valley, southwest of the former TTU. These basin-fill deposits consist of heterogeneous sand, gravel, and cobbles, with minor amounts of clay and silt. The thickness of alluvial deposits increases towards the west from the TTU. On the west side of the Southern Canal, near the primate facility (PF), the depth to bedrock has been previously reported at approximately 25 to 30 ft below ground surface (bgs). One to 1.5 miles to the west of the TTU, boreholes for SRP wells 27CBC and 27CAB intersected bedrock at 600 to 650 ft bgs. The maximum depth to bedrock southwest of the Site has been estimated at 800 ft bgs (H&A, 2016).

Depth to groundwater, which was measured by Geosyntec in May 2021, ranged from approximately 30 ft below the top of well casing (btoc) at well TTU-9A in the northeast and 147 ft btoc at well TTU-8 in the northwest. Groundwater elevations ranged from approximately 1,314 ft amsl at well TTU-15 in the eastern section of the former TTU to 1,156 ft amsl at well PF-1 in the west (Figure 2). Based on data from Geosyntec's 2021 second quarter monitoring event, the groundwater is located entirely in the bedrock, with a relatively steep horizontal hydraulic gradient of approximately 0.013 feet per foot (ft/ft) to the west-southwest (Geosyntec, 2021a). However, as described in the sections below, groundwater flow in the subsurface is expected to be influenced by fracture-driven flow and may not directly follow the inferred hydraulic gradient. Groundwater flow direction is likely more complex and oriented in part toward the northwest (i.e., along the down-gradient component of strike of the most abundant partially open fractures).

H&A (2016) conducted geophysical logging that consisted of optical borehole imaging (OBI) and acoustic borehole imaging (ABI) surveys to evaluate the fractures at some of former TTU boreholes. The logging discovered that a maximum of 11 fractures were present per every 5-ft interval in the former TTU boreholes, with the uppermost 60 to 150 ft being more highly fractured compared to the bedrock below 150 ft, which is most likely attributed to the increased lithostatic

load with depth. They termed the more highly fractured zone the "upper bedrock" zone and the less fractured zone the "lower bedrock" zone.

The transition between the upper and lower bedrock zones is not well defined but was estimated to likely extend to a depth of 60 to 105 ft bgs east of the canal at wells TTU1, TTU-2, TTU-9A, and TTU11. To the south, the transition at well TTU- 5 was estimated to be deeper at approximately 150 ft bgs, consistent with the wells located west of the canal (TTU-3, TTU6, TTU-8, and TTU-10) where the transition was estimated at a depth range of 125 to 140 ft bgs. The transition between upper and lower bedrock zones was not observed at TTU-4 and TTU-7. Additional geophysical logging was also completed during the installation of new groundwater extraction wells TTU-EX-1 through TTU-EX-5 and the source area well TTU-16 (Geosyntec, 2020d).

Joint and fracture features identified by geophysical logging were grouped, based on orientation, aperture, continuity, and form, into three classifications: partially open fractures, near-vertical fractures, and minor fractures. Fracture classification interpretations were provided by the geophysical logging contractor (Southwest Exploration Services) and did not include quantitative estimates of fracture aperture or in-fill continuity (where present). Partially open fractures are moderately dipping (dip angles of approximately 40 to 60 degrees), strike approximately northwest-southeast, and dip either to the northeast or to the southwest. Near- vertical fractures strike approximately east-west to northwest-southeast. Minor fractures are shallowly dipping to sub-horizontal, with variable strike.

Fracture density was observed to increase from south (0.42 fractures per ft at TTU-EX-5) to north (1.48 fractures per ft at EX-1) (Geosyntec, 2020d). The lower fracture density, along with a lower water table elevation, may be responsible for the slow groundwater recharge observed between drilling and well development at TTU-EX- 4, TTU-EX-5, and TTU-16. The investigation also revealed that the groundwater flow direction may not only be controlled by the hydraulic gradient (directed toward the west-southwest), but also by preferential flow along the down-gradient component of strike of the most abundant partially open fractures (i.e., toward the northwest). Fracture classification interpretations were provided by Southwest Exploration Services and did not include quantitative estimates of fracture aperture or in-fill continuity (where present).

Rising and falling head slug tests conducted by H&A (2016) were performed at each former TTU well installed in 2016. The hydraulic conductivity estimated from the falling head tests, which were deemed more representative, ranged from 0.00127 feet per day (ft/d) (TTU-9A) to 0.475 ft/d (TTU-10). The lowest hydraulic conductivities were calculated from TTU-2 (0.00415 ft/d) and TTU-9A (0.00127 ft/d), which are screened across the inferred upper and lower granitic bedrock contact. The response at two wells (TTU-5, screened across the upper/lower bedrock contact, and TTU-7, screened in the lower bedrock) could not be analyzed due to low groundwater yield and slow groundwater recovery, implying very low hydraulic conductivities. In contrast, wells screened entirely in the upper bedrock (TTU-1, TTU- 3, TTU-4, and TTU-11) had higher hydraulic conductivities by approximately one order of magnitude, with the values ranging from approximately 0.0159 ft/d to 0.0407 ft/d. While TTU-6, TTU-8, and TTU-10 are also screened across the upper/lower bedrock contact, relatively higher hydraulic conductivity values (0.0127 ft/d, 0.157 ft/d, and 0.475ft/d, respectively) were estimated, possibly due to more open fractures

present at these locations, although geophysical data from these wells do not suggest this to be the case.

Another indication of a higher hydraulic conductivity in the shallow, more intensely fractured bedrock was provided by packer testing in the open borehole prior to well TTU-1 construction, where the groundwater recovery rate in the upper part of the borehole was approximately twice the rate observed below the packer (H&A, 2016).

Geosyntec (2020b) performed hydraulic testing at TTU-EX-1 to TTU-EX-3 using a step-drawdown test and a constant discharge rate pumping test. No drawdown was observed in the closest available wells used as observation wells during the pumping period, including the nearby TTU-EX wells. This lack of hydraulic communication between the TTU-EX wells, which are oriented along an approximate north-northeast to south-southeast line, provided further support of the hypothesis that groundwater flow is controlled by the partially open fractures that strike mostly northwest-southeast. The results of the study indicate that the hydraulic conductivity estimates ranged from 0.0005 to 0.01 ft/d, which is consistent with both the literature values for moderately fractured igneous and metamorphic rocks (e.g., Heath, 1983) and the previous findings by H&A (2016). Another indication of the facture-influenced flow is the shape of perchlorate, 1,1-DCE, and TCE plumes which extend further to the northwest than would be expected based on the hydraulic gradient direction alone. The plume is not fully delineated along its southern edge; however, the direction of hydraulic gradient and the orientation of most abundant partially open fractures suggest that the downgradient impacts would be captured by the existing wellfield.

The weathered bedrock fractures at the former TTU have allowed the groundwater to recharge in the bedrock from stormwater runoff and infiltration. Data from the boring and well development records reveal that the bedrock holds a volumetrically small amount of groundwater in its fractures and weathered areas. Additionally, the data demonstrate that the former TTU cannot yield or transmit usable quantities of water. Slug testing and packer testing by H&A (2016) provided some evidence that the upper bedrock may be characterized by higher hydraulic conductivity values, suggesting that groundwater flow and contaminant migration may be occurring mostly in the upper, fractured bedrock (uppermost 100 to 150 ft).

2.5.2 Plant 3

The regional hydrostratigraphy of the Salt River Valley consists of the Upper Alluvial Unit (UAU), the Middle Alluvial Unit (MAU), and the Lower Alluvial Unit (LAU). The Site is located within the eastern portion of the Salt River Valley. In this area, the fine-grained MAU has not been reported. The geology of the UAU consists of unconsolidated to moderately well-consolidated sand and gravel, with variable amounts of finer material or larger cobbles and boulders. The UAU serves as the main aquifer in the area; locally, it is comprised of silts, sands, and gravels and is approximately 265 to 685 ft thick near Plant 3. Lithologic observations from prior investigations at Plant 3 also identified intervals of the alluvial deposits containing calcium carbonate or caliche, encountered at the WBO at depths of less than 25 to 30 ft bgs and at an approximate depth of 80 ft bgs (Brown and Caldwell, 2007). The LAU is comprised of conglomerate. The conglomerate LAU, which also hosts groundwater, overlies the granitic basement and is approximately 100 to 125 ft thick. Based on the lithology examined at the SRP production wells (SRP-33.3E7.5N, SRP-

33.1E7.3N, and SRP-32.8E7.2N), the depth to bedrock at this location ranges between 600 to 650 ft, which is approximately 0.3 to 0.6 miles west of the WBO along the Southern Canal.

Groundwater elevations in the vicinity of Plant 3 former WBO in May 2021 ranged from approximately 1,128.28 ft amsl at well HPA-1 to 1,126.32 ft amsl at well WBO-1 located to the northeast of Plant 3 (Figures 3 and 4). Groundwater beneath the former WBO source area is present under unconfined conditions in saturated alluvial sediments. Groundwater elevations decrease away from Plant 3 toward the southeast, with a groundwater elevation of approximately 1,107 ft amsl at well NT-2 (the furthest monitoring well to the southeast, at a distance of approximately 3.4 miles from the former WBO pits). In general, groundwater flows in a southeasterly direction, with a hydraulic gradient magnitude ranging between 0.0007 and 0.005 ft/ft during second quarter 2021 (Geosyntec, 2021b). Downgradient of Plant 3, various industrial/irrigation wells extract groundwater from the alluvial aquifer (Figure 4).

Groundwater elevation trends observed in monitoring wells in the vicinity of the former WBO source area (wells WBO-1 and HPA-1) indicate increases on the order of 7 to 13 ft in 2009 and 2011, decreasing between 2011 and 2018, and then increasing again between 2018 to approximately August 2020. From August 2020 to present, groundwater elevations have been on a decreasing trend. Fluctuations in the water table at Plant 3 may be attributed to upstream releases of water into the Salt River, which is located less than 1 mile to the north-northwest, as well as to changes in regional groundwater withdrawal rates. The rising water table has in the past been attributed in part to recharge from the SRP Granite Reef Underground Storage Project, which is located approximately 2 miles northwest of Plant 3. While operating, the three SRP production wells have pumping capacities of approximately 4,500 gallons per minute (gpm). In 2012, due to elevated concentrations of perchlorate in SRP-33.E-7.5N (55 micrograms per liter [µg/L]), this well was shut down. Although perchlorate was not detected at such concentrations in SRP-33.1E-7.3N and SRP-32.8E-7.2N, these wells were also shut down in an attempt to reduce the spreading of the perchlorate plume (SRP, 2013).

In 2014, heat pulse flowmeter data were collected at wells NT-11 (a 300-ft-deep monitoring well installed approximately 900 ft west of the WBO pits) and NT-12D (a 600-ft-deep sentinel well installed between the former WBO source area and SRP wells 32.8E-7.2N and 33.1E-7.3N). The data suggested that there was no vertical flow in well NT-11 and that a very low ambient downward flow was occurring at the top of well NT-12D (no measurable vertical flow was detected below 307 ft).

Geosyntec conducted an aquifer test in 2018 that was designed to assess the aquifer parameters and evaluate the capture zone of the two extraction wells (EXT-1 and EXT-2) with SRP wells pumping at their maximum operational flow. The goal of the pumping test was to determine if the two extraction wells could provide capture of perchlorate impacted groundwater at the former WBO, for treatment of groundwater at a FBR. Pumping began on September 20, 2018 and was completed on November 5, 2018. The combined pumping rate at the extraction wells was approximately 400 gpm, while the pumping rates at the SRP wells were approximately 4,300 gpm to 4,500 gpm. The calculated horizontal hydraulic conductivity values ranged from 30 to 190 ft/d with a geometric mean of 70 ft/d. The capture zone evaluation found that the total width of hydraulic containment provided by a combined pumping rate of 400 gpm from the two extraction wells exceeds the width of the source area and that hydraulic containment can be maintained with

a substantially lower flow rate; a combined flow of 250 gpm would likely suffice (Geosyntec, 2019a).

2.5.3 Former TTU Groundwater Well Network

To monitor the groundwater impacts and remedial activities, 17 monitoring wells and eight extraction wells were installed and are monitored quarterly. Of the eight installed extraction wells, only TTU-1 and TTU-2 are operational. TTU-EX-1 through TTU-EX-5 wells have not had pumps installed. TTU-11 was converted to an injection well in October 2019 as part of an enhanced in-situ bioremediation (EISB) pilot test (Geosyntec, 2020c). A summary of the groundwater monitoring network is provided in Table 1 of Appendix A Conceptual Site Model (Geosyntec, 2021c).

2.5.4 Plant 3 Groundwater Well Network

To monitor the groundwater impacts and remedial activities, 22 monitoring wells and two extraction wells (EXT-1 and EXT-2) were installed and are monitored quarterly. Additionally, there are three non-active irrigation wells (SRP 32.8E-7.2N, SRP 33.1E-7.3N, and SRP 33.3E-7.5) upgradient of Plant 3, and seven active production and irrigation wells downgradient of Plant 3 (Alta Mesa Golf Country Club, Apache Wells Replacement Well, Drake Materials [East and West], Habeeb Ranches, Longbow Golf Club, and Painted Mountain Golf Country Club). As of the third quarter 2021, one additional monitoring well (NT-18) was also installed by NDS at Plant 3.

Additionally, two City of Mesa wells, FF-02 (an irrigation well) and FF-07 (a monitoring well) were included in the monitoring network starting in third quarter 2021. A summary of the groundwater monitoring network is provided in Table 2 of Appendix A CSM (Geosyntec, 2021c).

3. AREAS OF KNOWN COPC RELEASES

To date, remedial investigations conducted at the Site have documented releases of hazardous materials to the environment from two main areas:

- The former TTU, where TDS as the generator of hazardous wastes operated a treatment, storage, or disposal facility under interim status; and
- The former WBO facility located at Plant 3, where a water lance was utilized to remove propellant from devices and the propellant-impacted water was filtered and discharged to open pits.

3.1 Sources of Releases

The following sections provide details with respect to the mechanism of release at the two main source areas.

3.1.1 Former TTU

The former TTU area includes two potential sources:

- The impacted topsoil and fractured bedrock in the vicinity of the former burn pits and pads; and
- The impacted vadose zone at the SWAA, a satellite source area created by historical stormwater runoff from the former TTU.

COCs identified at the former TTU include perchlorate, VOCs (tetrachloroethene [PCE], TCE, 1,1-dichloroethene [DCE], 1,4-dioxane, and benzene), lead, and 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD). The main source of contamination at the TTU appears to be the treatment of propellant wastes at the six burn pits. Based on available data from a passive soil vapor survey (H&A, 2016) and groundwater monitoring (Geosyntec, 2021a), undocumented solvent releases also appear to be sourced at or near the former TTU burn pits. The potential release mechanism includes burning of these wastes within the former TTU burn pits, followed by infiltration of contaminants through bedrock fractures. Infiltration was likely driven by the accumulation of water from precipitation within the burn pits, which over time resulted in a pathway through the vadose zone to groundwater. To a lesser degree, aerial deposition of contaminants resulting from the burning of wastes and stormwater transport from the former TTU burn pits may have contributed to infiltration of contaminants in the vicinity of the former TTU, as well as at the SWAA outside of the Site boundary. A CSM dated May 7, 2021, outlining the sources of contamination, Site features, plume outline, and exposure pathways, was submitted to USEPA (Geosyntec, 2021c).

3.1.2 Plant 3 and Former WBO

The perchlorate source area at Plant 3 is understood to be comprised of two adjacent historical features, primarily the former WBO pits and secondarily the HPA, where perchlorate-impacted WBO process water was filtered and allowed to pond and infiltrate. Perchlorate subsequently

accumulated in the vadose zone, being driven horizontally and vertically by infiltration from the WBO process discharge, as well as by accumulated water from precipitation. At the former WBO pits, perchlorate in the soil column may have been mobilized by rising groundwater conditions (ca. 2009-2011). Perchlorate solids, including crystalized perchlorate salts, accumulated at ground surface over time due to water evaporation and from disposed screened propellant material generated from the WBO processes. According to the 1994 RFA Report (SAIC/TSC, 1994a), perchlorate-based propellants were also burned at the former WBO pits, which may have resulted in air emissions and potential localized aerial deposition.

Chlorinated solvent storage and hazardous waste accumulation areas have been historically documented at Plant 3 (SAIC/TSC, 1994a). After VOC impacts of unknown origin (primarily TCE and 1,1-DCE) were detected in groundwater immediately downgradient of Plant 3, the presence of VOCs was investigated at the SWMUs where solvent waste storage was documented (Geosyntec, 2021d). The results of this preliminary investigation (Soil Vapor VOC Source Areas Investigation) identified the presence of VOCs (TCE and 1,1-DCE) in shallow soil vapor, which indicated that a potential vadose zone release of chlorinated solvents may exist; however, a distinct source area has not been identified as of the date of this report. A CSM outlining the sources of contamination, Site features, plume outline, and exposure pathways for Plant 3 was submitted to USEPA (Geosyntec, 2021c).

3.2 Delineation of Release Areas

The following sections describe the delineation of the release areas, as characterized by concurrent RIs.

3.2.1 Former TTU

The treatment of hazardous waste at the former TTU has resulted in impacted soil/bedrock, groundwater, and soil vapor. A detailed chronological description of Site investigations and interim corrective actions completed at the former TTU is presented in the 2016 RCRA Facility Investigation (RFI) Report (H&A, 2016).

3.2.1.1 Soil

An evaluation of previous Site assessments completed in the 2016 RFI Report (H&A, 2016) provided rationale for elimination of multiple COCs based on either the concentrations of COCs being non-detect or detected below applicable residential SRLs. Based on the data provided in the 2016 RFI Report, barium, cadmium, chromium, high-melting point explosives (HMX), research and development explosive (RDX), SA, and nitrate were eliminated as COCs. Lead, dioxins (TCDD), and perchlorate were retained as COCs for the former TTU.

Lead has been extensively analyzed at and around the former TTU and has been the focus of soil removal efforts conducted to date. Based on the data collected during investigations completed in 2009, 2011, 2013, and 2014 (soil and bedrock data), lead, perchlorate, and 2,3,7,8-TCDD are confirmed as COCs for the former TTU closure because they have had detections that exceed their screening levels. The three COCs area designations are as follows:

- Lead as a COC only applies to the former TTU area where open burn areas were conducted;
- Perchlorate as a COC applies to the former TTU area, where open burn operations were conducted, and a small area of the SWAA that historically received runoff from the former TTU area; and
- TCDD only applies to a single sample location within the former TTU area (TTU-R5/C1).

According to data from the 2016 RFI Report (H&A, 2016), lead has been vertically and laterally delineated at the TTU, the northern (on SRPMIC land) and eastern portions of the area surrounding the TTU, and the SWAA on SRPMIC land west of the TTU; perchlorate has been vertically and laterally delineated at the TTU, the area surrounding the TTU, and the SWAA; and 2,3,7,8-TCDD has not been vertically and laterally delineated at the TTU. The method of delineation for perchlorate was the Site-specific GPL of 16 mg/kg, whereas the method of delineation for lead was the respective ADEQ residential SRL of 400 mg/kg.

3.2.1.2 Soil Vapor

COCs identified in soil vapor include VOCs (TCE and 1,1,1-TCA), and aromatic hydrocarbons (including benzene). The results of soil vapor sampling performed in 2015 within the former TTU indicate that VOCs were likely present in burned wastes at some time during historical operations. The data also suggest the presence of aromatic hydrocarbons in soil vapor. Soil vapor impacts appear to be limited to the southwest corner of the former TTU area, based on soil vapor results from soil vapor probe (SVP) 760500 (H&A, 2016). This could be a continuing VOC source in bedrock, which may not be fully delineated south of the former burn pits.

According to data from the 2016 RFI Report (H&A, 2016), the VOCs in soil vapor appear to be limited and confined to a source area near former SVP 760500 within the southwest corner of the TTU; however, soil vapor samples have not been collected to date south of this area to confirm delineation.

3.2.1.3 Groundwater

COCs identified in groundwater include:

- Perchlorate (Arizona Health-Based Guidance Level [HBGL] of 14 µg/L, [ADHS, 2000]); and
- VOCs, including:
  - TCE (Arizona Water Quality Standard [AWQS] of 5 µg/L);
  - 1,1-DCE (AWQS of 7 µg/L);
  - 1,4-dioxane (Region 9 USEPA Tap Water Screening Level of 0.78 µg/L for ingestion);
  - Benzene (AWQS of 5 µg/L);
  - PCE (AWQS of 5 µg/L);

- Chloroform (AWQS of 80 µg/L);
- Dichloromethane (AWQS of 5 µg/L);
- 1,1,2-TCA (AWQS of 5 µg/L); and
- 1,2-dichloroethane (AWQS of 5 µg/L).

These COCs have resulted in a contaminated groundwater plume measuring approximately 0.25 miles in length and extending to the west, downgradient of the former TTU source area and within SRPMIC property. Perchlorate and VOC concentrations from the second quarter 2021 monitoring event are presented in Figures 5 and 6, respectively.

Perchlorate is the main COC in groundwater at the former TTU, detected at the highest concentrations and with the largest areal extent. As of May 2021, perchlorate concentrations at the former TTU wells ranged from non-detect to 834,000 µg/L at source area well TTU-16, with 12 of the 22 sampled wells reporting above the Arizona HBGL of 14 µg/L (Geosyntec, 2021a). Perchlorate concentrations are highest in bedrock groundwater at the TTU source area (TTU-16) and immediately downgradient of the TTU source area (e.g., TTU-EX-1 to TTU-EX-4, TTU-12, and TTU-14), and decrease by several orders of magnitude to 9.01 µg/L at TTU-6. Perchlorate was detected in the furthest downgradient well (PF-2) at a concentration of 0.94 µg/L (below the HGBL) in May 2021 (Geosyntec, 2021a). This significant decrease in perchlorate concentrations in downgradient wells, especially considering the steep hydraulic gradient, suggests a low bulk hydraulic conductivity of the bedrock, resulting in the slow migration of perchlorate via groundwater movement. The perchlorate results in TTU-7 (screened in the lower bedrock) versus TTU-6 (screened shallower and partly in the upper bedrock) also confirm that perchlorate is mostly constrained to the upper bedrock unit, likely due to more fractured and permeable conditions. Although the two wells are located approximately 45 ft apart (laterally), samples collected from TTU-6 between June 2019 to May 2021 have consistently demonstrated higher perchlorate concentrations than those collected from TTU-7 (9.01 µg/L and 5.93 µg/L in May 2021, respectively) (Geosyntec, 2021a).

As of May 2021, TCE, 1,1-DCE, benzene, chloroform, and dichloromethane, exceeded their respective AWQS (Geosyntec, 2021b). PCE and 1,1,2-TCA have also historically exceeded the AWQS. The existence of 1,1-DCE and elevated concentrations of 1,4-dioxane at the TTU suggests that 1,1,1-TCA was likely present in the burned waste propellants: 1,1,1-TCA abiotically degrades to acetic acid and 1,1-DCE, while 1,4-dioxane was a common solvent stabilizer in 1,1,1-TCA (Mohr, 2001). Although all of these compounds exceed their respective regulatory standards at TTU-16, only TCE, 1,1-DCE, and 1,4-dioxane are found in other TTU-wells, extending as far west as the Southern Canal (Figure 6).

Data from the second quarter 2021 TTU report indicate that there is a lack of lateral delineation of the COCs along the southern boundary of the dissolved plume. Data from the fourth quarter 2020 and first quarter 2021 indicate that TCE also exceeds the AWQS along the northern and eastern boundaries. In addition, COCs have not yet been delineated vertically within the extent of the plume.

3.2.2 Plant 3 and Former WBO

The treatment of hazardous waste at Plant 3 has resulted in impacted soil, groundwater, and soil vapor. The perchlorate source area for Plant 3 is understood to be comprised of two adjacent historical features, the former WBO pits and the HPA, where perchlorate impacted WBO process water was filtered and allowed to pond and infiltrate. Perchlorate accumulated in the vadose zone may have been driven horizontally and vertically by subsequent infiltration from the WBO process discharge (Geosyntec, 2021d).

3.2.2.1 Soil

COCs identified in soil as exceeding screening levels to date include perchlorate. Soil in and around Plant 3 has been extensively investigated. In November 1990, eight soil samples around the former WBO pits were collected from ground surface to 3 ft bgs. Cadmium, chromium, lead, and nitrate exceeded the background levels but were below the historical draft HBGLs, and generally decreased in concentration with depth. Perchlorate concentrations ranged from 105 to 1,800 milligrams per kilogram (mg/kg) (Brown and Caldwell, 2007). In 1996, 50 soil samples were collected from and in the vicinity of the former WBO pits. Of those collected samples, 21 samples were analyzed for perchlorate, five for VOCs, three for semi-volatile organic compounds (SVOCs), and three for lead using Toxicity Characteristic Leaching Procedure (TCLP) methods; no samples exceeded the non-residential HBGLs (Basin and Range Hydrogeologist [Basin & Range], 1997a). The results did show lead concentrations in the surface soil at the former WBO exceeding the residential SRL, which led to the removal of the top 2 ft of soil. Confirmation samples indicated that lead concentrations were below the residential SRLs (Basin & Range, 1999).

In 2005, two soil borings were drilled in the approximate center of each former WBO pit. Samples were collected at 5 and 10 ft bgs, at 10-ft intervals from 10 to 100 ft bgs, and at 20-ft intervals from 100 ft bgs to 200 ft bgs. Samples were analyzed for perchlorate and the concentrations ranged from 0.27 to 1,370 mg/kg, with 25 samples exceeding the residential SRL for perchlorate (Geomatrix Consultants, Inc. [Geomatrix], 2006). In 2007, eight shallow soil samples (down to 10 ft bgs) were collected, and seven deep soil borings were advanced to 200 ft bgs, from which soil samples were also collected. Reported perchlorate concentrations exceeded the non-residential SRL but generally decreased with distance away from the former WBO pits (Brown and Caldwell, 2007). In 2008, 343 soil samples were collected from 120 borings ranging in depth from 5 to 25 ft bgs to assess the extent of perchlorate impacts to surface soils in and around Plant 2, Plant 3, and Plant 4 (Geosyntec, 2009a). Perchlorate concentrations exceeded the residential SRL near Plant 3, Line II. In 2009, this soil was excavated from 5 to 10 ft bgs. Samples collected after the excavation confirmed that concentrations of perchlorate in soil were below the residential SRL (NTD, 2010).

Perchlorate remaining in the soil column has diminished in mobility as the WBO pits are no longer used to pond and infiltrate perchlorate impacted process water. If the water table were to rise to higher elevations at the former WBO, perchlorate in the vadose zone could be mobilized.

3.2.2.2 Soil Vapor

COCs identified in soil vapor include TCE, 1,1,1-TCA, and 1,1-DCE. As documented in the 1994 RFA (SAIC/TSC, 1994a), chlorinated solvent storage and hazardous waste accumulation areas

were historically documented at Plant 3. The RFA documents that Plant 3 has historically generated waste with concentrations of 1,1,1-TCA and TCE. 1,1-DCE is known to be a common byproduct of 1,1,1-TCA degradation in the environment.

From April 20 to 23, 2020, a total of 22 dual-nested SVPs were installed near the SWMUs at Plant 3 (SVP-01 through SVP-22) (Geosyntec, 2020b). SVPs were installed at depths of 5 and 15 ft bgs. Concentrations of TCE ranged from 62.7 to 8,140 micrograms per cubic meter (µg/m3). Concentrations of 1,1-DCE ranged from 27.8 to 15,700 µg/m3. VOCs were detected at generally greater concentrations along the south side of Plant 3, with higher concentrations in the 15-ft bgs SVPs relative to the shallower 5-ft bgs SVPs (Geosyntec, 2020b). Due to the NDS commercial settings, soil vapor data is currently being evaluated against the target indoor air level for TCE, which is 3.0 ug/m3. When an attenuation factor of 0.03 is applied, the resulting target for TCE in sub-slab soil gas is 100 ug/m3. Similarly, for 1,1-DCE, when an attenuation factor of 0.03 is applied to the target indoor air level of 880 ug/m3, the resulting target sub-slab soil-gas concentration is 29,333 ug/m3. Additional soil vapor investigations, including sub-slab sampling, indoor air, and vertical delineation of VOC concentrations at Plant 3 are planned under the regulatory oversight of the ADEQ VRP.

3.2.2.3 Groundwater

COCs identified in groundwater include perchlorate, TCE, and 1,1-DCE. These COCs are associated with a contaminated groundwater plume measuring approximately 2.75 miles in length and extending to the south, downgradient of the former WBO source area. Perchlorate and TCE concentrations from the May 2021 monitoring event are presented in Figures 7 and 8, respectively.

During the second quarter of 2021, perchlorate was detected in 21 wells at concentrations exceeding the HBGL, with the highest detected concentration of 2,000 µg/L in the NT-5 (Figure 7).

VOCs of unknown origin (primarily TCE and 1,1-DCE) have been detected in groundwater in the vicinity of Plant 3. The highest detections were detected in samples collected from ADEQ-MW-5 and ADEQ-MW-8, which are located directly south of Plant 3 (Geosyntec, 2021b). During the second quarter 2021 monitoring event, concentrations of TCE exceeded the AWQS in four wells (NT-5, ADEQ-MW-5, ADEQ-MW-8, and the Drake Materials West Well). Concentrations of 1,1-DCE were detected above the AWQS in NT-5, ADEQ-MW-5, and ADEQ-MW-8.

Perchlorate, TCE, and 1,1-DCE appear to be laterally delineated immediately north east and west of the former WBO; however, the lateral extent of these COCs in the off-Site dissolved plume has not been delineated. Additionally, these COCs have not been delineated vertically.

4. PREVIOUS INVESTIGATIONS AND RESULTS

Investigations at the Plant 3 and TTU areas of the facility have been ongoing since the early 1990s. The following sections describe the investigations and closure activities (where relevant) that have been conducted to-date. The documents referenced in the following sections are listed in Table 1. Figures and data tables associated with each report referenced in this section are provided in Appendix A.

4.1 Facility Wide Documents

4.1.1 1994 RCRA Facility Assessment Report for Talley Defense Systems, Inc., Mesa, Arizona

An RFA report prepared by SAIC/TSC in 1994 was completed at Plant 2, Plant 3, Plant 4, Plant 6, and the former TTU in Mesa. The 1994 RFA Report was completed for TDS, the predecessor to NDS. The goals of the 1994 RFA included: gathering information on releases at TDS; the evaluation of hazardous waste releases and/or potential releases at documented SWMUs and the resulting potential environmental impacts to soil, groundwater, surface water, and air; determination of significance of releases and the need for further corrective action; and the exclusion of SWMUs that do not pose a threat to human health and the environment. The summary of the 1994 RFA Report provided in this section is provided for each plant. In total, the 1994 RFA Report identifies 52 SWMUs and 16 AOCs. Figures from the 1994 RFA Report are presented in Appendix A.

4.1.1.1 Plant 2

A total of ten SWMUs (SWMUs 1-10) were identified at Plant 2. Plant 2 consisted of a main building, an ignitor building, a lunchroom building, “Building 20,” and four smaller structures. The 1994 RFA Reports three satellite accumulation areas and one historical satellite accumulation area in and in the vicinity of the main building (SWMUs 1-4). The SWMUs were observed as follows:

1. SWMU-1 consisted of a waterfall paint booth measuring approximately 10 ft tall by 18 ft wide. Coagulant from the paint booth was collected in a trough at the bottom of the wall and accumulated as hazardous waste containing chromium in drums stored adjacent to the paint booth bay on the concrete floor surface outside of the building. Additionally, up to one drum of Teflon™ rinse water generated from a tefloning process operation at the booth was also stored in this location. It is noted that tefloning processes at NDS are utilized to seal and waterproof rocket casings used at NDS facilities. There have not been investigations into potential per- and polyfluoroalkyl substances (PFAS) contamination at NDS facilities to date.
2. SWMU-2 consisted of blast residue waste solids including materials such as glass beads, Teflon™ beads, and aluminum oxide. Glass and Teflon™ beads were accumulated as nonhazardous waste, while aluminum oxide was accumulated as hazardous waste and contained in a drum stored between Bays 44 and 45.

3. At SWMU-3, AN propellant was accumulated in 5-gallon buckets stored along a hallway in front of Bays 25, 27, and 29. Solvent contaminated trash was also stored in a 55-gallon poly drum.
4. SWMU-4, located north of Bay 47, was utilized as a historical satellite hazardous waste accumulation area for AP propellant. A 55-gallon storage drum was located in the southwest corner of the open production area. According to the 1994 RFA Report, the glue table listed in SWMU-4 was removed in 1990.
5. SWMU-5, located north of the main building, historically consisted of AN and AP propellants. During the 1994 RFA Site visit, one drum of Rinsolve and one drum of acetone and alcohol were observed.
6. SWMU-6, located northeast of Bays 25 and 27, contained one drum consisting of accumulated waste 1,1,1-TCA.
7. SWMU-7, located northeast of Bays 30 and 33, was utilized as a hazardous waste accumulation area for propellant waste, organic solvent, 1,1,1-TCA, and products Tal 422 and Tal 113.
8. SWMU-8, located southeast of the main building, was utilized as a hazardous waste accumulation area for drums of 1,1,1-TCA, lubricating mineral oils, and nonhazardous waste.
9. SWMU-9, located north of the ignitor building, was utilized as a hazardous waste accumulation area consisting primarily of AN waste propellant.
10. SWMU-10 is the location of the current WBO. The system continuously recycles water that is directed through used rocket motors to bore out AP. Approximately two 5-gallon buckets of propellant were collected for each motor bored and accumulated at a hazardous waste storage area along the eastern edge of the pad on which the WBO operations accrue. According to the 1994 RFA Report, the pad was surrounded by concrete berms and sloped into a sump.
11. AOC 4 was identified as the cooling tower wastewater holding tank and overflow impoundment. The impoundment receives overflow from the 10,000-gallon holding tank located adjacent to the impoundment. The holding tank receives cooling tower wastewater as part of an air temperature control system for the Building 2 bays. The facility voluntarily sampled wastewater for analysis of total boron, silver, lead, and pH, conducted in its uncertified laboratory. Additionally, following the acquisition of industrial wastewater discharge permit No. 188, the facility conducts monthly sampling to analyze for total boron, silver, pH, and oil and grease. Prior to the installation of the tank in April 1991, the condensation water was discharged directly to the ground.
12. AOC 15 was identified as an unknown disposal or abandoned area with dimensions of approximately 50 ft by 100 ft located east of the TTU. AOC 15 was potentially used for the disposal of building rubble and other debris associated with drains and concrete structures that appeared to have been dismantled in place. A pile of rubble may have been deposited in the wash after dismantling a structure elsewhere at the Site. An unknown yellow substance was observed scattered around the rubble piles at this

location. The origin of the yellow substance was not known. Rubble piles observed around AOC 15 included pieces of terracotta, concrete, bricks, and a crushed drum. Burned ashes, debris, and rubble were observed in the wash nearby.

13. AOC 16 was identified as an alleged historical dumping area located at the north end of Higley Road on the north side of Plant 2. According to an unidentified agency's record of a complaint, AOC 16 was the location of both 1,1,1-TCA and TCE dumping "over the hill in back." The aforementioned hill drained into a ravine into the desert towards a center for breeding laboratory primates.

4.1.1.2 Plant 3

A total of 32 SWMUs (SWMUs 11 through 42) and five AOCs (AOCs 6, 10, 11, 12, and 13) were identified at Plant 3. The 1994 RFA Report states that at Plant 3, AP propellent was assembled into finished products. Additionally, SA propellent, along with magnesium Teflon™ propellant, were manufactured at Plant 3 (SAIC/TSC, 1994a). The 1994 RFA Report also identifies spray painting operations within two paint booths. Waste paint filters originating from paint booths and potentially containing RCRA-regulated metals are documented in the 1994 RFA Report. The 1994 RFA Report documents that Plant 3 has historically generated waste 1,1,1-TCA (waste codes F001 and F002); M17M (a trade name of an unknown chlorinated solvent mixture waste code F001); and TCE. 1,1-DCE is known to be a common byproduct of 1,1,1-TCA degradation in the environment. According to the 1994 RFA Report, the solvents used at Plant 3 were associated with metal working. Historical chlorinated solvent storage and HWAA are documented in the 1994 RFA Report. SWMUs where solvent waste storage reportedly occurred were targeted as part of a soil vapor investigation conducted by Geosyntec (Section 4.2.11.3).

For Plant 3, SAIC recommended interim measures and/or an investigation at two SWMUs and two AOCs:

1. SWMU 33 (HWAA located near Building 28) – the 1994 RFA Report indicates that various non-propellent hazardous waste was accumulated, including TCA, TCA contaminated material, M17M waste, SA liners, and "other hazardous waste" such as chromium wastewater and solvent contaminated trash. At the time of the 1994 RFA inspection, it was noted that waste was accumulated on a concrete pad; however, this SWMU was utilized for hazardous waste storage prior to the construction of the concrete pad in 1990. SAIC recommended the construction of curbs if liquid hazardous waste or constituents of hazardous waste were to continue to be managed at SWMU 33.
2. SWMU 42 (former WBO) – SAIC recommended the removal of drums from a concrete pad located on the northeast corner of the bore-out building. The drums contained waste propellent collected during the WBO process. SAIC recommended discontinuing use of the pad; the collection of soil samples; and completing remediation as necessary.
3. AOC 11 (septic tanks) – The 1994 RFA Report indicates that all bathrooms at every Plant were tied to septic tanks. At Plant 3, casings were reportedly washed in sinks that drained into the septic tanks. The 1994 RFA Report also indicates that, according to TDS, the products of combustion that were washed out consisted of copper and sodium

hydroxide. SAIC recommended to determine the locations of all septic tanks and leach fields and completing sampling to assess potential hazardous waste impacts (see Sections 4.1.3.1 and 4.1.3.2 for a summary of sampling results associated with the septic tanks).

4. AOC 12 (cesspool) – The 1994 RFA Report documents the presence of a cesspool, which was used by TDS to receive wastewater from a photograph laboratory and two sinks utilized for metal parts washing and hand washing. The 1994 RFA Report noted that the chemical nature of these waste streams could not be confirmed. SAIC recommended that TDS sample the cesspool as well as the surrounding soil to assess whether hazardous constituents were present. SAIC further recommended the discontinued use and removal of the cesspool. According to the 2017 Updated RFA Report (H&A, 2017), AOCs 11 and 12 were synonymous (Section 4.1.2.2).

Section 4.1.2 summarizes a follow-up investigation of the above SWMUs and AOCs completed by TDS, which is documented in a January 12, 1999 letter to the ADEQ (TDS, 1999b). A copy of the 1994 RFA Report presenting the details of the Plant 3 SWMUs, AOCs, and figures depicting the Plant 3 layout and locations of the SWMUs are presented in Appendix A. As mentioned above, an updated RFA report was completed in 2017 (H&A, 2017), which documents the status of the SWMUs and AOCs where SAIC recommended the implementation of interim measures and/or the completion of an RCRA Facility Investigation. A summary of the 2017 Updated RFA Report is presented in Section 4.1.4 of this CCR, and a summary of the condition of the SWMUs as of August 2017 is presented in Appendix A.

4.1.1.3 Plant 4

A total of six SWMUs (SWMUs 43-48) were identified. The SWMUs were described as follows:

1. SWMU-43, located in a cul-de-sac east of Building 25, consisted of a hazardous waste accumulation area and was observed to have 51 drums of waste AP propellant, one drum of 1,1,1-TCA, additional bags of AP propellant, drums of AP, drums of mop water generated at a grinding building, and a drum of Rinsolve 140. Historically, waste 1,1,1-TCA was accumulated at this location. TCA was phased out of operations beginning in April 1992. Historically, AP impacted mop water was routinely disposed of into a septic tank.
2. SWMU-44, located east of Building 23, was utilized as a hazardous waste accumulation area intended to store waste from the casting building (i.e., Building 23). Historically, this location housed a TCA parts washer that generated waste 1,1,1-TCA, which was removed off-Site by a waste disposal contractor. Additionally, SA liners were accumulated at this location prior to disposal by a contractor. Rinsolve contaminated trash was observed on the second floor and outside of the building. At the time of the 1994 RFA Site visit, AP impacted debris and mop water were accumulated at this location.
3. SWMU-45, located in Building 22, was utilized as a mixing room for SA and cupric oxide powders. This unit was a satellite waste accumulation area for AP contaminated debris and mop water as well as SA contaminated liners.

4. SWMU-46, located in Building 24, was utilized as a satellite hazardous waste accumulation area where propellant was air-dried in ovens. AP contaminated trash was maintained in a drum outside of the middle oven, along with SA contaminated debris.
5. SWMU-47, located in Building 20, was utilized as a satellite hazardous waste accumulation area that stored solvent contaminated trash, waste liquid TCA, alcohol contaminated trash, and waste Rinsolve. Historically, this location housed a series of drains used for carrying propellant wash water to a sump located at a former TCA satellite accumulation area.
6. SWMU-48, located at Building 18, functioned as a mixing room where SA was grinded and mixed into propellants. Historically, SA liners were accumulated in a metal cabinet outside of the building, alongside AP mop water contained in drums.

4.1.1.4 Plant 6

At Plant 6, a total of three SWMUs (SWMUs 49-51) and three AOCs (AOCs 1, 8, and 14) were identified. The SWMUs and AOCs are described as follows:

1. SWMUSWMU-49, located east of Bay 27 in Building 1, was utilized as a satellite hazardous waste accumulation area. The SWMU stored 5-gallon buckets of solvent contaminated trash and chromium cleaners.
2. SWMUSWMU-50 was utilized as a historical satellite hazardous waste accumulation area west of Building 2. The location was not visited during the 1994 RFA, but it was reported that at that time, solid waste propellant was stored in a 55-gallon drum.
3. SWMUSWMU-51, located west of the parking lot between Plants 5 and 6, consisted of heavily deteriorated drums that previously held waste particulates from surface impoundment ponds. Plastic liners were historically present and disposed of as nonhazardous waste.
4. AOC 1 was identified as a historical surface impoundment located west of Plants 5 and 6. Unidentified sludge was observed in the impoundments.
5. AOC 8 was identified in a source document as a landfill containing buried waste propellant near Plant 6. Talley Defense Systems stated that it was unaware of any buried propellant near Plant 6.
6. AOC 14 was identified as the operations occurring across the entire Plant 6 under TRW. TRW operations included the weigh out and assembly of SA propellant and air bag products. Waste manifest forms indicated that propellant waste from TDS and TRW was stored at Plant 6.

Plant 6 is no longer operated by NDS. It is currently vacant ASLD property.

4.1.1.5 The Former TTU

At the former TTU, one SWMU (SWMU-52) and three AOCs (AOCs 3, 7, and 9) were identified. The SWMUs and AOCs are described as follows

1. SWMUSWMU-52 is the former TTU, located approximately 1.25 miles northeast of East Thomas and Higley Roads. The former TTU consisted of six burn pits and auxiliary equipment. Waste propellants containing RCRA-regulated metal were burned in burn boxes at the former TTU. Ash from the burn boxes was accumulated in a satellite hazardous waste accumulation area (location not specified). Prior to the construction of the burn boxes in 1983, materials containing RCRA-regulated metals were burned on bare ground. For an undetermined period following the construction of the burn boxes, ashes were washed out of the burn boxes onto the soil. Historically, burn pit 6 was used for burning wase SA propellant. At the time of the 1994 RFA, waste SA propellant was burned in pit 1 instead of pit 6. After the prescribed burn events, the burn pits were inspected for potentially reactive material, which was collected and containerized as hazardous waste and stored at an unspecified location for burning at the next burn event. Site personnel indicated that prior to construction of the burn pits in 1967, burn events occurred on bare ground to the north of the current burn pits. At the time of the 1994 RFA, a maximum of 10,000 pounds of waste was burned in a day during a burn event. Waste propellants burned at the former TTU contained lead, barium, lead phosphate, lead nitrate, AN, AP, and barium chromate.
2. AOC 3 was identified as burial pits located at the former TTU. At the time of the 1994 RFA, the burial pits had been abandoned. Lead styphnate-containing propellent was historically detonated at the burial pits. After the burial pits were abandoned, analytical soil testing identified the presence of lead contamination. Lead contaminated soil was shipped from the burial pits to a facility in Beatty, Nevada.
3. AOC 7 was identified as a burn plate sump that was removed from the former TTU in 1992. No documentation of the design, procedure, sampling plan, or possible soil removal associated with the sump removal was identified. Waste SA burned in the burn pits was washed into the sump and subsequently pumped into poly drums, neutralized, and sent to the sewer. No spills were reportedly observed during the sump pump process.
4. AOC 9 refers to lead and chromium contaminated soil discovered after the ADHS conducted soil sampling at the burn pits and identified elevated concentrations of lead and chromium in the soil.

4.1.2 1999 SWMU Investigation

In a letter dated January 12, 1999 (TDS, 1999b; the "1999 TDS Letter"), TDS documents activities related to the SWMUs and AOCs identified by SAIC in the 1994 RFA Report as requiring interim measures and/or additional investigation (SAIC/TSC, 1994a). The 1999 TDS Letter documents the undertaking of five recommended investigations and ten interim measures for the 52 SWMUs and 16 AOCs identified at TDS Plants 2, 3, 4, and 6. The 1999 TDS Letter is summarized in the below sections, and a copy of this document is included in Appendix A.

4.1.2.1 Plant 2

Per the 1999 TDS Letter, the following activities were carried out by TDS at Plant 2:

- SWMU 5 – Drums were removed from the collection area identified in the 1994 RFA Report and moved to Building 20 equipped with secondary containment.
- SWMU 8 – TDS constructed a secondary containment berm around the unit and completed soil sampling around the concrete pad. Four 0.5 to 1.0 ft soil samples were collected and analyzed for total and TCLP RCRA metals, VOCs, and total petroleum hydrocarbons. Reported concentrations in the analyzed soil samples were below state and federal screening levels.

4.1.2.2 Plant 3

Per the 1999 TDS Letter, the following activities were carried out by TDS at Plant 3:

- SWMU 33 – In accordance with the recommendations of the 1994 RFA Report, secondary containment berms were constructed around the HWAA. According to the 2017 RFA report (H&A, 2017), an interoffice memorandum prepared by Mr. Jeff Bryan of the ADEQ, dated February 6, 1998, stated that TDS had implemented this interim measure.
- SWMU 42 – TDS removed containers previously stored at the WBO building pad, discontinued its use, and removed the pad; however, the 1999 TDS Letter did not document the collection of any soil samples as part of the SWMU investigation. Soil samples were later collected at "Storage Pad #4" located near the former WBO building as part of the Perchlorate Source Area Investigation (Geosyntec, 2009a; see Section 4.2 of this CCR for a summary of follow-on work completed at the Plant 3 former WBO).
- AOCs 11 and 12 – TDS further investigated the septic tank and cesspool at Plant 3 and determined that AOCs 11 and 12 were referring to the same units and were therefore synonymous. According to the 1999 TDS Letter, this unit was referred to as "cesspool/septic tank/injection well located north of Plant 3 Line II". According to the 1999 TDS Letter, the unit was filed for closure with the ADEQ Aquifer Protection Permit (APP) unit; the unit was permanently removed; and sampling results were submitted to the ADEQ. According to the 2017 RFA report (H&A, 2017), an attempt was made to obtain copies of relevant documentation related to these AOCs, but no documents were received.

4.1.3 2009 Perchlorate Source Investigation and Pre-Remedial Design Activities

In October 2008, December 2008, and February 2009, Geosyntec conducted a Perchlorate Source Investigation to identify various locations at the Site where current or historical operations had the potential to have releases of perchlorate capable of impacting soil or groundwater (Geosyntec, 2009a). Following the initial soil screening activities performed in October 2008, supplemental soil screening activities were conducted in December 2008 to further characterize and delineate the lateral and vertical extent of identified perchlorate impacts. A field extraction method was employed during the October 2008 field activities to extract perchlorate from soil samples for liquid screening analysis using an ion-selective electrode (ISE) (Geosyntec, 2009a). Using lateral delineation data collected at Plant 3 in December 2008, the center of an HPA was identified. This data was utilized to drill and install a monitoring well (HPA-1) at the former HPA in February

2009. A total of 120 borings were advanced and 343 soil samples collected for perchlorate screening analysis using an ISE. A total of 48 soil samples were submitted to TestAmerica Laboratory (TestAmerica) for confirmatory analysis of the field screening ISE method and analyzed by USEPA Method 314.0. Based on the results, it was determined that ISE method demonstrated reliable results (Geosyntec, 2009a). The following sections summarize the investigation and the data collected at each NDS Plant. Figures and tables associated with this investigation are saved in Appendix A.

4.1.3.1 Plant 2

Lower Building #6 Area

Three soil borings (B8, B10, and B13) were advanced to the north, south, and east of the Lower Building #6 area, and two to three soil samples per boring (eight soil samples total) from 0.5 ft to 5.0 ft bgs were collected for field screening analysis (Figure 2 of Geosyntec, 2009a; Appendix A). The soil samples collected from these locations did not contain detectable concentrations of perchlorate (Table 2 of Geosyntec, 2009a; Appendix A).

Western Storm Water Retention Basin

Two soil borings (B1 and B2) were advanced in the Western Storm Water Retention Basin and one sample was collected at an approximate depth of 0.5 ft from each boring for field screening analysis (Figure 2 of Geosyntec, 2009a; Appendix A). A third boring (B3) was attempted west of the known septic system in this location, but refusal at the surface prohibited soil samples from being collected. The soil samples collected from these locations did not contain detectable concentrations of perchlorate (Table 2 of Geosyntec, 2009a; Appendix A).

Eastern Storm Water Drainage Area

Three soil borings (B9, B14, and B15) were advanced in the Eastern Storm Water Drainage Area, and one to three soil samples per boring (seven soil samples total) from 0.5 ft to 5.0 ft bgs were collected for field screening analysis (Figure 2 of Geosyntec, 2009a; Appendix A). The soil samples collected from these locations did not contain detectable concentrations of perchlorate (Table 2 of Geosyntec, 2009a; Appendix A).

Waste Propellant Storage Pads #1 through #3

Six soil borings (B4 to B7, B11, and B12) were advanced at the perimeter of waste propellant storage pads #1 through #3, and three soil samples per boring (18 soil samples total) from 0.5 ft to 5.0 ft bgs were collected for field screening analysis (Figure 2 of Geosyntec, 2009a; Appendix A). Apart from soil samples collected at depths of 0.5 ft and 2.5 ft from boring B12 (3.4 mg/kg and 1.7 mg/kg perchlorate, respectively), soil samples collected from these locations did not contain detectable concentrations of perchlorate (Table 2 of Geosyntec, 2009a; Appendix A).

4.1.3.2 Plant 3

Former Grinding Facility and Storm Water Retention Pond

Five soil borings (B36 to B38, B41, and B42) were advanced in the vicinity of the former grinding facility, and three soil samples per boring (15 samples total) from 0.5 ft to 5.0 ft bgs were collected for field screening analysis (Figure 3 of Geosyntec, 2009a; Appendix A). The soil samples collected from these locations did not contain detectable concentrations of perchlorate (Table 2 of Geosyntec, 2009a; Appendix A).

Former WBO Building

Four soil borings (B24 to B26, and B33) were advanced adjacent to the northwest, northeast, southwest, and southeast sides of the former WBO building, and three soil samples per boring (12 samples total) from 0.5 ft to 5.0 ft bgs were collected for field screening analysis (Figure 3 and Figures 6 through 9 of Geosyntec, 2009a; Appendix A). The soil samples collected from these locations did not contain detectable concentrations of perchlorate (Table 2 of Geosyntec, 2009a; Appendix A).

Plant 3 HPA

Forty-two soil borings (B29 to B32, B43 to B77, and B83 to B85) were advanced in the HPA. One to four soil samples were collected from each boring (119 samples total) from 0.5 ft to 11 ft bgs for field screening analysis (Table 2 of Geosyntec, 2009a; Appendix A). Concentrations of perchlorate detected in the soil samples analyzed ranged from 1.0 mg/kg to 3,000 mg/kg, with the highest concentrations (55 mg/kg or greater) generally coinciding with the limits of the historical ponds as seen in historical aerial photographs of the Site (Figures 6 through 9 of Geosyntec, 2009a; Appendix A).

In addition to the perchlorate field screening, surficial soil samples were collected from seven borings (P3-B71, -B72, -B73, -B74, -B75, -B76, and -B77) and analyzed for metal COCs (cadmium, chromium, hexavalent chromium, and lead) (Table 2 of Geosyntec, 2009a; Appendix A). Laboratory analytical results indicated that hexavalent chromium was not detected in the seven soil samples. Detected concentrations of cadmium (0.56 mg/kg to 6.7 mg/kg in three samples), total chromium (7.7 mg/kg to 14 mg/kg in seven samples), and lead (6.2 mg/kg to 23 mg/kg in five samples) in soil were less than 20 times the respective RCRA TCLP limits.

Laundry Room Septic System

Four soil borings (B1 through B4) were advanced near the former laundry room septic system between Manufacturing Lines #1 and #2, and five soil samples per boring (20 samples total) from

ft to 25 ft bgs were collected for field screening analysis (Figure 3 of Geosyntec, 2009a; Appendix A). Apart from perchlorate concentration of 1.8 mg/kg and 1.4 mg/kg detected in soil samples collected from boring B2 at depths of 5.0 ft and 10.0 ft, respectively, soil samples collected from these locations did not contain detectable concentrations of perchlorate (Table 2 of Geosyntec, 2009a; Appendix A).

Waste Propellant Storage Pads #1 through #6

Seventeen soil borings were advanced around the perimeters of concrete waste propellant storage pads #1 through #6, and two to four soil samples per boring (50 soil samples total) from 0.5 ft to 10 ft bgs were collected for field screening analysis (Figure 3 and Figures 6 through 9 of Geosyntec, 2009a; Appendix A). Soil samples collected from ten of the 17 borings did not contain detectable concentrations of perchlorate (Table 2 of Geosyntec, 2009a; Appendix A). Concentrations of perchlorate above the detection limit were observed in following soil samples:

- B27-2.5 (2.1 mg/kg) and -5.0 (28 mg/kg);
- B28-0.5 (6.5 mg/kg);
- B39-0.5 (2.7 mg/kg) and -2.5 (2.8 mg/kg);

- B78-0.5 (1.7 mg/kg), -5.0 (25 mg/kg), and -10.0 (96 mg/kg);
- B79-10.0 (1.2 mg/kg);
- B80-5.0 (7.7 mg/kg); and
- B81-5.0 (2.2 mg/kg) and -10.0 (20 mg/kg).

Manufacturing Line #2 Storm Water Area

Ten soil borings (B13 to B15, B19, B20, and B86 through B90) were advanced in the storm water area immediately northwest of Manufacturing Line #2, and three to four soil samples per boring (34 soil samples total) from 0.5 ft to 10.0 ft bgs were collected for field screening analysis (Figure 3). Soil samples collected from 6 of the 10 borings did not contain detectable concentrations of perchlorate (Table 2 of Geosyntec, 2009a; Appendix A). Concentrations of perchlorate above the detection limit were observed in the following soil samples:

- B19-2.5 (140 mg/kg), -3.5 (17 mg/kg), and -5.0 (1.2 mg/kg);
- B86-1.5 (3.9 mg/kg) and -10.0 (1.2 mg/kg);
- B87-3.5 (42 mg/kg), -5.0 (4.8 mg/kg), and -10.0 (9.5 mg/kg); and
- B90-10.0 (1.2 mg/kg).

Northwest Storm Water Pond Area

Four soil borings (B91 to B94) were advanced in the storm water pond area northwest of Plant 3 along the westernmost property line, and two to three soil samples per boring (11 soil samples total) from 0.5 ft to 10.0 ft bgs were collected for field screening analysis (Figures 3 and 4 of Geosyntec, 2009a; Appendix A). Apart from a perchlorate concentration of 1.2 mg/kg detected in a soil sample collected from 0.5 ft from boring B94, soil samples collected from these locations did not contain detectable concentrations of perchlorate (Table 2 of Geosyntec, 2009a; Appendix A).

Test Department Firing Area

Eight soil borings (B5 through B11, and B18) were advanced in the test department firing area, and two to three soil samples per boring (23 soil samples total) from 0.5 ft to 20 ft bgs were collected for field screening analysis (Figure 3 of Geosyntec, 2009a; Appendix A). Soil samples collected from borings B6 and B8 did not contain detectable concentrations of perchlorate (Table 2 of Geosyntec, 2009a; Appendix A). Concentrations of perchlorate above the detection limit were observed in the following soil samples:

- B5-0.5 (1.1 mg/kg), -2.5 (1.6 mg/kg), and -5.0 (1.8 mg/kg);
- B7-0.5 (1.0 mg/kg);
- B9-0.5 (1.0 mg/kg);
- B10-5.0 (4.7 mg/kg); and
- B11-2.5 (1.0 mg/kg) and -20 (1.3 mg/kg).

4.1.3.3 Plant 3 HPA Vertical Delineation Vertical Delineation

Geosyntec conducted field activities from February 2 to 6, 2009 to characterize the vertical limits of perchlorate throughout the vadose zone and extending to a depth approximately 20 ft below groundwater. A total of 21 soil samples collected from the ground surface to 197 ft bgs were submitted to TestAmerica for perchlorate and nitrate analysis. Eleven of these samples were also analyzed for ammonia. Of the 21 analyzed samples collected from boring HPA-1, 20 contained perchlorate at concentrations ranging from 0.039 mg/kg to 1,200 mg/kg. The highest concentrations of perchlorate were detected in soil samples collected from depths of 40 ft bgs (1,200 mg/kg) to 50 ft (1,100 mg/kg) (Figure 10 of Geosyntec, 2009a; Appendix A). Perchlorate concentrations below 50 ft attenuated to concentrations less than 1 mg/kg at 100 ft bgs.

Seven of the 21 soil samples analyzed did not contain detectable concentrations of nitrate. Nitrate concentrations in the remaining 14 soil samples ranged from 1.0 to 110 mg/kg, with the highest concentrations observed in the interval from 10 to 25.5 ft bgs. Of the 11 soil samples analyzed for ammonia, only one soil sample collected from a depth of 19.5 ft bgs contained a detectable concentration (110 mg/kg). The remaining ten samples did not contain detectable concentrations of ammonia.

Groundwater Sampling

Groundwater samples were collected on February 16, 2009, using no-purge Hydrasleeve™ samplers and analyzed for the following parameters:

- Anions (bromide, chloride, nitrate, nitrite, and sulfate) by EPA 300.0;
- Perchlorate by EPA 314.0; chlorate by EPA 300.1;
- Dissolved metals (arsenic, barium, beryllium, cadmium, chromium, copper, iron, lead, manganese, nickel, silver, and thallium) by EPA 6010;
- Sulfide by SM 4500-S,C,D;
- Methane by RSK-175;
- Ammonia by EPA 350.3; and
- Dissolved organic carbon by SM 5310B.

Of the 24 analytes, the analyzed groundwater samples only contained detectable concentrations of the following six constituents (Table 5 of Geosyntec, 2009a; Appendix A):

- Methane (1.1 µg/L);
- Perchlorate (39 µg/L);
- Chloride (160 milligrams per liter [mg/L]);
- Nitrate (1.9 mg/L);
- Sulfate (56 mg/L); and
- Manganese (0.031 mg/L).

4.1.3.4 Plant 4

Building #25

Three soil borings (B3, B4, and B5) were advanced in the vicinity of Building #25, and three soil samples per boring (nine soil samples total) from 0.5 ft to 5.0 ft bgs were collected for field screening analysis (Figure 5 of Geosyntec, 2009a; Appendix A). With the exception of perchlorate detected in soil samples collected from a depth of 0.5 ft bgs from borings B4 (120 mg/kg) and B5 (1.0 mg/kg), soil samples collected from these locations did not contain detectable concentrations of perchlorate (Table 3 of Geosyntec, 2009a; Appendix A).

Waste Propellant Storage Pads #1 – #2

Four soil borings (B1, B2, B9, and B10) were advanced adjacent to waste propellant storage pads #1 and #2 at Plant 4, and two to three soil samples per boring (11 soil samples total) from 0.5 ft to 5.0 ft bgs were collected for field screening analysis (Figure 5 of Geosyntec, 2009a; Appendix A). Soil samples collected from these locations did not contain detectable concentrations of perchlorate (Table 3 of Geosyntec, 2009a; Appendix A).

Plant 4 Storm Water Areas

Five soil borings (B6 to B8, B11, and B12) were advanced in the storm water areas throughout Plant 4, and one to three soil samples per boring (11 soil samples total) from 0.5 ft to 5.0 ft bgs were collected for field screening analysis (Figure 5 of Geosyntec, 2009a; Appendix A). The soil samples collected from these locations did not contain detectable concentrations of perchlorate (Table 3 of Geosyntec, 2009a; Appendix A).

4.1.4 2017 Updated RCRA Facility Assessment Report

The 2017 Updated RFA Report (H&A, 2017a) was completed as a component to a RCRA post-closure application for closure and post-closure of the TTU. The goal of the 2017 Updated RFA Report was to:

- Document if SWMUs and AOCs previously identified in the 1994 RFA Report (SAIC/TSC, 1994a) were resolved;
- Document the findings of a preliminary review (PR) and visual site inspection (VSI) conducted to identify the status of SWMUs and AOC identified during the 1994 RFA; and
- Document the findings of a PR and VSI, evaluate potential releases of hazardous substances or hazardous wastes from the SWMUs and provide recommendations on the 2017 status of those SWMUs.

Of the 52 SWMUs identified in the 1994 RFA Report (SAIC/TSC, 1994a) at all the Plants, a total of 17 SWMUs existed as of 2017. At Plant 3, SWMUs 11, 18 through 20, 34, and 39 were located.

As part of the 2017 Updated RFA VSI, 55 new SWMUs were identified beyond those identified in 1994. Forty new SWMUs were identified at Plant 3 (N through BA). The 2017 Updated RFA recommends investigation of new SWMU BA. According to the Updated RFA, a large tank located on the west side of the Line I building is utilized to collect non-hazardous X-ray process and laboratory wastewater generated at Line I. A secondary containment unit for this tank was

observed to be nearly full of water during the VSI. Although no evidence of spills was noted, the 2017 Updated RFA Report recommended a review of Safety Data Sheets (SDSs) to evaluate chemicals associated with the wastewater accumulated at BA. Surficial soil sampling was also recommended if, based on the findings of the SDSs review, chemical constituents were identified that could potentially result in exceedances of SRLs.

An updated list of SWMUs, AOCs, and new SWMUs/AOCs identified as part of this CCR is presented in Tables 2 through 8 and discussed in Section 7.

4.2 Plant 3 and Former WBO

The perchlorate source area at the former WBO has been under investigation since the early 1990s. The following sections describe the investigations and closure activities that have been conducted to date. Figures and tables from each of the documents referenced below are presented in Appendix A.

4.2.1 1991 Soil Sampling – Metals, Nitrate

In November 1990, TDS conducted an initial soil investigation at the former WBO pits to evaluate the possible impacts of historical operations at Plant 3 (Basin & Range, 1991). For this investigation, TDS collected eight soil samples from the former WBO pits and two background soil samples at depths ranging from ground surface to approximately 3 ft bgs. The samples were submitted to a laboratory for analysis of selected total metals (cadmium, chromium, and lead), nitrate, and perchlorate. Cadmium, chromium, lead, and nitrate were detected in the former WBO pit soil samples at concentrations exceeding the detected concentrations in the background samples. However, the reported concentrations were less than the historical draft HBGLs established for these analytes by the ADEQ. In general, the highest metal and nitrate concentrations were detected from surface to approximately 1 ft bgs and decreased with depth. Reported perchlorate concentrations ranged from 105 to 18,000 mg/kg. No draft HBGL had been established for perchlorate at that time (Basin & Range, 1991).

4.2.2 1997 Site Assessment – Metals

In 1996, Basin & Range conducted a Site assessment under which they collected a total of 50 soil samples (including composite samples and duplicates) from the former WBO pits, adjacent berms, along the trough between the former WBO building and the former WBO pits, and from surrounding areas (Basin & Range, 1997a). Twenty-one of the samples were analyzed for selected total recoverable metals (cadmium, chromium, and lead); 11 samples for perchlorate; five samples for VOCs; and three samples for SVOCs. Three samples were also analyzed for soluble lead following extraction using USEPA's TCLP.

The laboratory analytical results for 21 out of the 50 analyzed soil samples indicated that none of the analytes were reported at concentrations exceeding their respective non-residential SRLs (if applicable) and in the case of lead, they were below the RCRA regulatory level for the hazardous waste characteristic of toxicity. The vertical extent of soils containing lead (i.e., the analyte with the highest detected concentrations) was less than 5 ft bgs. VOCs and SVOCs were reported at concentrations less than their respective laboratory reporting limits.

Basin & Range concluded that corrective actions at the former WBO pits were not required to comply with interim soil remediation standards, provided that TDS recorded a Voluntary Environmental Mitigation Use Restriction (VEMUR) with the Maricopa County Recorder (Basin & Range, 1997a).

4.2.3 1999 WBO Pit Closure – Metals

In accordance with a closure plan submitted to the ADEQ, TDS proceeded with surficial soil removal and soil sampling at the former WBO pits in 1999 (H&A, 2016). Soil removal and sampling was intended to facilitate expedited closure by the ADEQ. The results of previous soil sampling activities indicated that lead concentrations in surficial soil at the former WBO pit exceeded the residential SRL later established by the ADEQ in 2007 (55 mg/kg) but were less than the non-residential SRL (720 mg/kg). Based on the previous soil sampling results, the top 2 ft of soil in the former WBO pits was removed with the expectation that this removal would allow closure without the need for a VEMUR. Post-excavation confirmation soil samples were collected and analyzed for total and TCLP cadmium and lead. The laboratory analytical results of the analyzed post-excavation soil samples indicated that concentrations of cadmium and lead in the former WBO pits soil were less than RCRA thresholds for the hazardous waste characteristic of toxicity, ADEQ residential SRLs, and ADEQ minimum groundwater protection levels (GPLs). The WBO pit locations were marked and leveled following the excavation activities. The concrete trough between the former WBO building and the pits was removed (Geosyntec, 2013).

4.2.4 2005 Soil Sampling Plan – Perchlorate

Additional soil investigation activities were conducted by Geomatrix in July 2006 (Geomatrix, 2006) to assess the presence of perchlorate in soil beneath the former WBO pits. For this investigation, two soil borings were drilled and sampled to a depth of approximately 200 ft bgs. One soil boring was drilled at the approximate center point of each former WBO pit (Figure 1 of Geomatrix, 2005; Appendix A). The borings were designated WBO-SB1 (east basin) and WBO-SB2 (west basin). At each soil boring, soil samples were collected at depths of approximately 5 and 10 ft bgs, at approximate 10-ft intervals between approximately 10 ft and 100 ft bgs, and at approximate 20-ft intervals between approximately 100 and 200 ft bgs. Results from this investigation are summarized in the 2007 Soil Investigation Report (Brown and Caldwell, 2007).

Soil sample analytical results indicated that perchlorate was present in the soil samples at concentrations ranging from 0.27 to 1,370 mg/kg (Figures 3 to 5 of Brown and Caldwell, 2007; Appendix A). The highest concentration was reported for the 5 ft bgs soil sample from boring WBO-SB-2 in the west pit. Apart from the 5 ft bgs soil sample, the highest remaining perchlorate concentrations were detected in the 60 ft bgs soil sample in WBO-SB-1 (846 mg/kg) and the 80 ft bgs soil sample in WBO-SB-2 (820 mg/kg). The perchlorate concentrations detected in these three samples exceeded the non-residential SRL of 720 mg/kg. In addition, 13 soil samples collected from depths between approximately 20 ft and 180 ft bgs in boring WBO-SB-1, and 12 samples collected from depths of approximately 5 ft and 20 ft to 140 ft bgs in boring WBO-SB-2, exceeded the residential SRL of 55 mg/kg for perchlorate. Groundwater was not encountered in either boring.

4.2.5 2007 Soil Investigation – Perchlorate

Between February and July 2007, Brown and Caldwell performed an investigation to characterize the lateral extent of perchlorate in soil around the former WBO pits and provide additional data concerning the vertical distribution of perchlorate in the vadose zone beneath the former WBO pits. These objectives were accomplished through sampling and analysis of shallow soil at eight locations and through drilling and sampling of subsurface soil to depths of up to approximately 200 ft bgs at seven boring locations around the former WBO pits. A human health risk assessment was also completed to evaluate the likelihood that exposure to perchlorate in soil at the former WBO pits would pose a concern to human health for current industrial or potential future residential use of the Site (Brown and Caldwell, 2007).

The Brown and Caldwell Draft Soil Investigation Report indicates that the concentration of perchlorate in the vadose zone generally decreases with increased distance from the former WBO pits (Figures 3 to 5 of Brown and Caldwell, 2007; Appendix A). Perchlorate was not detected at concentrations exceeding the residential SRL in soil samples from the four outermost soil borings. Perchlorate was detected above the non-residential SRL of 720 mg/kg at depths of 5, 60, and 80 ft bgs directly beneath the former WBO pits. Perchlorate was not detected above the non-residential SRL in any of the soil samples collected from the lateral extent soil borings or potholes. Except for one sample collected at 5 ft bgs, the highest concentrations were between approximately 60 ft and 120 ft bgs. Perchlorate was detected above the residential SRL of 55 mg/kg at depths ranging from 5 to 160 ft bgs in the two vertical extent soil borings and the three lateral extent soil borings located closest to the former WBO pits. The lateral extent of perchlorate in the vadose zone above the residential SRL was within a 50-ft radius of the former WBO pits to the north, east and west, and within a 70-ft radius to the south.

Perchlorate was present in the vadose zone in the area encompassing the former WBO pits from the surface to greater than 200 ft bgs. Groundwater was encountered at a depth of approximately 190 ft bgs in one lateral extent soil boring. Laboratory analytical results for groundwater samples collected by the ADEQ and NDS indicated that perchlorate was present in groundwater downgradient of the former WBO pits. At the time of this investigation, USEPA identified a drinking water equivalent level (DWEL) of 24.5 µg/L for perchlorate. Using the DWEL as the tentative water quality standard for perchlorate, Brown and Caldwell calculated a minimum GPL of 143 mg/kg in accordance with ADEQ guidance. Evaluation of Site characterization data for the former WBO pits indicated that perchlorate was present above the minimum GPL at depths ranging from 5 to 160 ft bgs. Based on these data, engineering controls and/or remediation would be necessary to minimize the potential for further leaching of perchlorate from the vadose zone into groundwater.

The results of the human health risk assessment indicated that under then-current conditions, exposure concentrations were below the non-residential SRL for perchlorate, and the Site could be used for industrial and other non-residential uses without further remedial action. According to the human health risk assessment, excavation and removal of near-surface soil in the west pit of the former WBO pits, where perchlorate concentrations up to 1,370 mg/kg were reported, would result in a reduction in the exposure concentration to a level that is acceptable for future residential use.

4.2.6 Pre-Design Characterization Activities in Advance of a Pilot Test of In Situ Bioremediation for Perchlorate in Soils at the Former WBO

Following the Perchlorate Source Investigation, Geosyntec performed additional pre-remedial design Site characterization activities at the former WBO pits (Geosyntec, 2009b). This included a boring advanced at the approximate center of the WBO pits to provide vertical delineation of the perchlorate, nitrate, and ammonium concentrations in the soil column; this boring was completed as a groundwater monitoring well (WBO-1). Laboratory analytical results indicated that perchlorate was present in concentrations exceeding the residential SRL from approximately 30 to 180 ft bgs and in concentrations exceeding the non-residential SRL from approximately 50 to 90 ft bgs (Figure 2 of Geosyntec, 2009b; Appendix A).

4.2.7 2010 Supplemental Perchlorate Source Investigation

The Supplemental Perchlorate Source Investigation (Geosyntec, 2010) was completed to identify if untested areas exceeded and/or to further delineate the vertical extent of perchlorate in soil at Plant 3 that exceeded the Site-specific GPL of 143 mg/kg (Brown and Caldwell, 2007), ADEQ residential (55 mg/kg) or non-residential (720 mg/kg) SRLs for perchlorate (ADEQ, 2009). Additional borings were advanced at Plant 3 (Figure 14) near the:

1. Former grinding facility (boring B95);
2. Historical storm water retention pond (boring B96) - note this is not the same as the HPA; and
3. Adjacent to Waste Propellant Storage Pad #4 (boring B97) near the former WBO building.

These areas were targeted because previous activities did not address and/or fully delineate the vertical extent of elevated concentrations of perchlorate in soil. All soil samples were extracted by the ISE method and screened on-Site to provide rapid turnaround on results to assist in the delineation effort. Soil sample extracts from each 10-ft interval were submitted by Nammo Talley, Inc. (NTS) to TestAmerica for confirmatory perchlorate analysis by USEPA Method 314.0 (Table 5). The findings of this investigation vertically delineated perchlorate concentrations and did not identify additional sources that could substantially impact groundwater with perchlorate.

Boring B95 was advanced adjacent to an abandoned dry well located in the southern portion of the former grinding facility. Seven samples were collected from ground surface to 80 ft bgs. Samples contained detectable concentrations of perchlorate ranging from 0.067 mg/kg to 0.38 mg/kg. The highest concentration of 0.38 mg/kg was detected at 60 ft bgs; however, perchlorate concentrations attenuate over a short distance to 0.067 mg/kg and 0.068 mg/kg at 70 and 80 ft bgs, respectively.

Boring B96 was advanced in the approximate center of a historical storm water retention pond (note this is not the same as the HPA), located at the northern end of the former grinding facility (Figure 14). Six soil samples were collected from ground surface to 60 ft bgs. Analyzed soil samples contained detectable concentrations of perchlorate ranging from 0.043 mg/kg to 0.30 mg/kg. Perchlorate was not detected at 40 and 50 ft bgs. The highest concentration of 0.30 mg/kg

was detected at 20 ft bgs; however, perchlorate concentrations attenuate over a short distance to 0.043 mg/kg at 60 ft bgs.

Boring B97 was advanced in the approximate location of Waste Propellant Storage Pad #4 adjacent to the former WBO building. Excluding the soil sample collected at 45 ft bgs, laboratory analysis indicated that concentrations of perchlorate detected in soil samples from this boring (from 0.32 mg/kg to 49 mg/kg) were below the Site-specific GPL and residential SRL for perchlorate in soil. The soil sample collected at 45 ft bgs contained perchlorate at 170 mg/kg, exceeding the Site-specific GPL and residential SRL, but was below the nonresidential SRL. Concentrations of perchlorate in soil samples generally increase until 45 ft bgs, where the maximum concentration was observed. Below that depth, concentrations of perchlorate in soil decreased by three orders of magnitude over the next 40 ft, where the boring was terminated at 85 ft bgs. The sample collected from 85 ft bgs contained the lowest concentration of perchlorate (0.32 mg/kg) in this boring.

Based on these data, the report concluded that impacts to soil near Storage Pad #4 were likely attributed to intermittent spills of perchlorate-laden water from containers placed at the storage pad, as opposed to thousands of gallons discharged annually to the former WBO pits. Boring B97 perchlorate concentrations were several orders of magnitude lower than soil samples collected from WBO-1 and HPA-1. It was likely that these concentrations further attenuate laterally with distance away from boring B97, as seen in surface soil sample locations collected during the prior investigation (Geosyntec, 2009a). Based on these data, further vertical or lateral delineation of perchlorate impacts at this location was not recommended. However, remediation of this source was recommended to be incorporated into future remedial actions in the WBO/HPA area.

4.2.8 Revised Remedial Action Work Plan – 2013 to Present

Geosyntec prepared a Revised Remedial Action Plan (RAP) in August of 2013 (Geosyntec, 2013). The RAP was accepted by the ADEQ and subsequently formed the basis for an Aquifer Protection Permit (Permit No. P-101370), which governed the remediation of the perchlorate source area prior to the ADEQ's acceptance of the Site into VRP.

The first phase of the RAP was to design, install, operate, and monitor a groundwater extraction and treatment system to establish hydraulic containment of the perchlorate source area. Hydraulic containment is necessary both to mitigate further migration of perchlorate off-site with groundwater and to provide a capture zone for the potential in-situ treatment of the perchlorate-impacted soil column.

To establish hydraulic containment, two 12-inch-diameter extraction wells (EXT-1 and EXT-2) each capable of approximately 400 gpm extraction were drilled to approximately 350 ft bgs in the UAU to the east and southeast of the perchlorate source area (Figure 3). Groundwater extracted from these wells is conveyed to a treatment facility that lies north of the former WBO building. The treatment facility, rated for treatment of groundwater with concentrations of up to 100 mg/L of perchlorate at flow rates of up to 800 gpm, uses two FBRs to remove perchlorate from the groundwater using an anaerobic biological process. The treated groundwater is conveyed to three infiltration basins located to the west of the treatment facility, where it is allowed to infiltrate and recharge the aquifer. Treated effluent is tested on a monthly basis and monitoring results have consistently been non-detect for perchlorate, nitrate, and nitrate for approximately four years. On

August 30, 2021, there was a detection of perchlorate at 0.0042 mg/L3, which was below the alert level of 0.011 mg/L3 and discharge limit of 0.014 mg/L3. In the same monitoring event, both FBR units monitoring results were non-detect.

Construction of the groundwater extraction and treatment system was completed in 2014, with start-up of the treatment system beginning in 2015 and full operation commencing in 2016 (Geosyntec, 2016).

4.2.9 Phase I Capture Zone Evaluation Report

An aquifer test was designed for: (1) calculating aquifer parameters; (2) evaluating the capture zone of the two extraction wells with SRP wells pumping at their maximum operational flow; and verification of the existing groundwater model. A Phase I Capture Zone Evaluation Report (Geosyntec, 2019a) summarized the procedures and findings of the test. Analysis of the aquifer testing data indicates that horizontal hydraulic conductivity in the vicinity of the Site in the shallow aquifer zone, where the Site extraction wells are screened, is similar to values estimated from previous aquifer tests and boring logs and values that were used for previous modeling. Moreover, based on the new aquifer testing data and analyses, the hydraulic conductivity for the shallow aquifer zone is likely lower than previously estimated, which means a lower extraction rate than estimated for the design will achieve the necessary hydraulic containment of the water table beneath the source area.

The results of the path line simulations show that particles from all portions of the WBO source area are anticipated to be captured by a combined pumping rate of 400 gpm from the two Site extraction wells while the two SRP wells located to the northwest of the perchlorate source area (SRP 33.1E-7.3N and SRP 32.8E-7.2N, Figure 4) operate at high capacity, under conservative assumptions. The SRP well located to the north of the perchlorate source area (SRP 33.3E-7.5N) is intended to indefinitely remain off until the perchlorate source area is remediated. Based on the modeling, the total width of hydraulic containment provided by a combined pumping rate of 400 gpm from the two Site extraction wells greatly exceeds the width of the source area (~300 ft). Modeling also indicates that the requisite extent of hydraulic containment can be maintained with a substantially lower flow rate; a combined flow of 250 gpm would likely suffice.

Several lines of evidence (Geosyntec, 2019a) indicate that the perchlorate detected in the SRP wells during this aquifer test was not caused by migration of perchlorate from the source during the test, but instead is associated with the SRP wells drawing in groundwater with residual perchlorate in the deep portion of the aquifer in the vicinity of the SRP wells, which were not in operation prior to this test:

1. Perchlorate was detected in the SRP wells after pumping commenced at the SRP wells.
2. Perchlorate concentrations were stable over the course of the aquifer test.
3. Groundwater modeling indicates that groundwater 120 ft below the water table and just beyond the horizontal extent of hydraulic containment of the source area, which is provided by extraction at 400 gpm, would take more than ten years to reach an SRP well pumping continuously at 4,800 gpm.

4. Perchlorate was not detected, or detected below 1.3 µg/L, at NT-12D and other observation wells during the aquifer test.

Thus, the low detections of perchlorate in the SRP wells are associated with pre-existing residual perchlorate near the SRP wells. Moreover, the results and analysis of the aquifer testing support that groundwater down to at least 100 ft beneath the water table, which could be impacted by infiltration to enhance remediation of the WBO source area, will be captured by the extraction wells.

4.2.10 2014 Aquifer Protection Permit No. P-1010370 (closed in 2019 via transition to VRP)

NDS submitted an Aquifer Protection Permit for closure of the WBO pits to the ADEQ in 1996, and the permit was formally issued by the ADEQ on August 28, 2000. NDS submitted an application request for the former WBO facility to participate in the ADEQ VRP on June 14, 2018. The ADEQ terminated APP Permit No. P-101370 in a letter dated May 15, 2019, and accepted NDS's application to the VRP in a letter dated May 16, 2019. The Site was assigned VRP Site Code 520005-01. Preparation of a Remedial Investigation Work Plan, including a Sampling and Analysis Plan (SAP) and Quality Assurance Project Plan, was initiated upon NDS's acceptance into the VRP. The VRP Application identified soil and groundwater as the target media for the NDS Plant 3. The contaminants of concern identified in the application were listed as VOCs (including TCE and 1,1-DCE) and perchlorate.

4.2.11 2021 Remedial Investigation Work Plan for Plant 3 and Former WBO Facility

In an effort to initiate collection of data that could supplement the conceptual development of the RI Work Plan for Plant 3 and the former WBO (Geosyntec, 2021d) and a future Risk Evaluation, NDS collected water samples from the facilities downgradient of Plant 3 that currently pump groundwater as part of their operations. The locations sampled included:

- Drake Materials;
- Longbow Golf Course;
- Alta Mesa Golf Course;
- Apache Wells Golf Course;
- Painted Mountain Golf Course; and
- City of Mesa (COM).

NDS also completed vertical delineation and video logging of existing monitoring wells currently used as part of the Plant 3 and former WBO monitoring well network. Additionally, because of the proximity of Plant 3 directly upgradient to monitoring well ADEQ-MW-8, where groundwater concentrations of TCE and 1,1-DCE exceed the AWQS, a preliminary investigation was commenced by NDS to characterize a potential source area of VOCs at Plant 3. This data was summarized in the RI Work Plan and in the following sections. Figures and tables from the RI Work Plan summarizing the data are provided in Appendix A.

4.2.11.1 2019-2020 Drake Materials, Golf Courses, and COM Wells

NDS collected water samples from the facilities downgradient of Plant 3 that currently pump groundwater as part of their operations. The locations sampled included:

- Drake Materials;
- Longbow Golf Course;
- Alta Mesa Golf Course;
- Apache Wells Golf Course;
- Painted Mountain Golf Course; and
- COM.

These sampling locations and results are presented in Table 6 and Figures 4 and 16 of the RI Work Plan (Appendix A). Details from the Site visits and sampling activities are provided in the subsequent sections.

Drake Materials Water Uses and Sampling

Drake Materials currently operates a gravel and sand quarry at 3410 North Higley Road, Mesa, Arizona (Figure 16 of the RI Work Plan; Appendix A). Materials produced at this facility are utilized for a variety of uses primarily with respect to concrete/cement and construction supplies. Other lessees operating at the property, include:

- CalPortland – Operates a Ready-Mix cement mixing facility utilizing materials produced by Drake Materials;
- Southwest Rock Products – Conducts rock crushing at the facility; and
- Rango – Seasonal mining company that quarries rock and gravel at the facility.

The Drake Materials facility process water is pumped from two on-site production wells: The East Well (ADWR #55-624382); and the West Well (ADWR #55-624381). Figure 16 of the RI Work Plan (Appendix A) presents the location of these wells within the property, along with the main property features and sampling locations discussed below.

The East Well is approximately 645 ft bgs deep. ADWR records indicate the well was re-sleeved in approximately 2014, with a screened interval between 460 and 560 ft bgs. The West Well is 1,151 ft bgs deep. Records provided by Drake indicate that the screen interval is first encountered at 493 ft bgs and that the screens are partially open to at least 937 ft bgs where "top of fill" is encountered.

The wells are activated via a float system in the South Pond, where water from both wells is blended. However, according to Drake Materials, most of the groundwater produced for the property is pumped from the West Well. The water from the South Pond is then pumped via a piping system throughout the property for on-site industrial uses by Drake Materials and the other leases on-site, including:

De-silting of quarried material – Water is pumped to a 30,000-gallon tank at the wash plant and utilized for removal of silt from the quarried material. Material is transported from the rock crushing area to a system of conveyor belts for further processing, and silt is removed. Excess water generated during the de-silting process is recycled by storing it in a 70,000-gallon "thickener" tank, where flocculant is added to remove sediments. Once sediments have settled, the water is reused at the wash plant, and the sediments that settled out of solution are pumped into sediment settling ponds north of the Drake Materials facility.

Roads and stockpiles are routinely sprayed for dust control with water utilizing a water truck. Also, stockpiles are watered utilizing a sprinkler system.

Water is utilized by Cal-Portland (a tenant at the Drake facility) for concrete mixing, and at the slump rack for washing concrete trucks after concrete deliveries.

A total of five samples were collected from this facility, as follows:

- Two samples, one from each of the on-site production well's effluent pipes into the South Pond;
- One sample from the South Pond at a spigot located on an effluent pipe that distributes water to the Drake Materials facility;
- One sample from the slump rack; and
- One additional sample was collected from the ready-mix shop because during the November 15, 2020, meeting, Drake Materials indicated that the ready-mix shop may have been connected to the East Well. However, during the subsequent meeting on January 13, 2020, Drake Materials confirmed that their on-site buildings are connected to a COM potable service line.

The sample analytical results indicated a detection of perchlorate in the East Well at a concentration of 1,280 µg/L, and in the West Well at a concentration of 373 µg/L. Perchlorate was detected in the sample collected from the South Pond at a concentration of 452 µg/L, which is to be expected, considering the information provided by Drake Materials indicating that the water from both the East and West Wells is blended in the South Pond, with a greater ratio of water originating from the West Well. A sample from the slump rack was collected to confirm that the South Pond water is distributed across other facility operations. A perchlorate concentration of 461 µg/L was detected at the slump rack, which is almost identical to the concentration detected in the South Pond.

Trichloroethene was also detected in samples from both the East and West Wells at concentrations of 3.98 µg/L and 6.29 µg/L, respectively. Furthermore, TCE was detected in the South Pond at a concentration of 5.73 µg/L and at the slump rack at a concentration of 4.06 µg/L. The AWQS for TCE is 5 µg/L. Chloroform and 1,1-DCE were also detected at concentrations below their respective AWQS.

No detections of either perchlorate or VOCs were reported in the Ready-Mix shop sample, confirming that the source of water at this location is from the COM main, as stated by Drake Materials representatives.

Golf Courses Water Uses and Pond Sampling

The golf courses operate their production wells as needed by pumping water from irrigation wells into the corresponding ponds at each golf course. The ponds act as temporary reservoirs from which water is pumped through an irrigation system to irrigate the golf courses. According to the golf courses, irrigation is mostly automated, with occasional hand watering conducted as-needed to irrigate new sod or areas of the golf course that may not receive enough water during summer months. Groundwater production at the golf courses ranges between 300 and 620 acre-feet of water per year. The golf courses confirmed that groundwater is strictly utilized for irrigation purposes and that domestic water supplies are obtained through a COM potable service connection.

Samples analytical results from the ponds were reported to be below the HBGL, except for the samples collected at Longbow Golf Course (72.7 µg/L) and Apache Wells Pond 15 (14 µg/L). These results are similar in concentrations to those detected from the respective wells during the quarterly sampling event.

COM Groundwater Samples

Groundwater samples were collected from the following two COM wells:

- Falcon Field Well No. 2 (FF-02, ADWR No. 55-629609) – Based on communications with COM representatives, the well is screened between 550 and 914 ft bgs. The well is pumped intermittently (approximately three days a week in the summer months and 10 days a month in the winter months) to supply water for irrigation to nearby orchards located west of the FF-02. The total depth of the well is 976 ft, with a 20-inch-diameter casing and a pump capacity of approximately 2,000 gpm.
- Falcon Field Well No. 7 (FF-07, Department of Water Resources No. 55-500994) – The total depth of the well is 1,202 ft, with an 18-inch-diameter casing and perforated screen at three intervals (698 to 912.5, 1057.5 to 1097.8, and 1,157.8 to 1,198.1 ft bgs). This well is currently not used by COM for water production, and it is used by the ADWR as a groundwater monitoring station.

The groundwater samples from each well were analyzed for perchlorate by USEPA Method 314.0 and VOCs by USEPA Method 8260B. At FF-02, a groundwater sample was collected from a discharge pipe at the well pump. Groundwater sample results obtained from FF-02 indicated that VOCs were not detected, except for a low chloroform detection of 0.331 µg/L. Perchlorate was detected at a concentration of 2.80 µg/L, below the HBGL of 14 µg/L.

At FF-07, samples were collected at three depths using Hydrasleeves™ within the shallowest screened interval: 700, 800, and 900 ft bgs. Perchlorate was not detected in the 800 and 900 ft bgs samples and was detected at 1.33 µg/L in the 700 ft bgs sample, well below the HBGL. VOCs were not detected in any of the three screened intervals.

4.2.11.2 2019 Existing Monitoring Well Vertical Delineation and Video Logs

Concurrent with the fourth quarter 2019 groundwater monitoring event, a set of vertical delineation samples was collected from existing groundwater monitoring wells to provide information on the vertical distribution of perchlorate and VOCs in the groundwater column. The sampling results

and depth intervals of the depth-specific samples are presented in Tables 7 and 8 of the RI Work Plan (Appendix A).

Video logging of monitoring wells ADEQ-MW-2, ADEQ-MW-3, ADEQ-MW-4, and ADEQ-MW-5 was completed as part of the fourth quarter 2019 groundwater monitoring event to determine the integrity of these wells. Results of the video logs indicate significant scaling on the screened intervals of wells ADEQ-MW-2, ADEQ-MW-3, and ADEQ-MW-4. The screened interval was not visible at ADEQ-MW-2 and ADEQ-MW-4. At ADEQ-MW-3, the screened interval is partially visible; however, a significant amount of scaling and possibly mineralization is present, which appears to completely fill the screen slots. At ADEQ-MW-5, the polyvinyl chloride (PVC) screened interval is visible starting at about 230 ft bgs. The screen slots are open and in good condition up to approximately 260 ft bgs. Below 260 ft bgs, biofouling growth is visible, resulting in partial slot clogging.

Based on the results of the video logs, the monitoring report (Geosyntec, 2019b) made the following recommendations:

- The deteriorated conditions of ADEQ-MW-2, ADEQ-MW-3, and ADEQ-MW-4 observed during video logging suggest that these wells may not provide monitoring results that are representative of actual groundwater conditions. The report recommended continued gauging and sampling of these wells until the wells can be replaced by a new monitoring well, at which point monitoring of these locations can be discontinued;
- Future sampling of ADEQ-MW-5 is recommended. However, redevelopment of this well is recommended due to the fouling observed in the screen; and
- Sampling of Drake Material's extraction wells, located east of ADEQ-MW-2, ADEQ-MW-3, and ADEQ-MW-4, was recommended as part of the quarterly monitoring program.

4.2.11.3 2020 Soil Vapor VOC Source Area Investigation, NDS Plant 3

Because of the proximity of Plant 3 directly upgradient to monitoring well ADEQ-MW-8, where groundwater concentrations of TCE and 1,1-DCE exceed the AWQS, a preliminary investigation was completed by NDS to characterize a potential source area of VOCs at Plant 3. A letter dated June 30, 2020 was prepared to document the results of a preliminary VOC source area investigation (Geosyntec, 2020b). As documented in the 1994 RFA Report (SAIC/TSC, 1994a) and 2017 Updated RFA Report (H&A, 2017), chlorinated solvent storage and hazardous waste accumulation areas were historically documented at Plant 3. SWMUs where solvent waste storage was documented were targeted as part of this investigation. The RFA documents that Plant 3 has historically generated waste 1,1,1-TCA (waste code F001 and F002), M17M (a trade name of chlorinated solvent of unknown mixture – waste code F001), and TCE. 1,1-DCE is known to be a common byproduct of 1,1,1-TCA degradation in the environment.

A total of 22 dual-nested SVPs were installed near the SWMUs at Plant 3 (SVP-01 through SVP-22). All the samples were analyzed for the presence of VOCs by USEPA Method TO-15. The primary contaminants of COPCs, TCE and 1,1-DCE, were detected in soil vapor collected from

the SVPs. Concentrations of TCE ranged from 62.7 to 8,140 µg/m3. Concentrations of 1,1-DCE concentrations ranged from 27.8 to 15,700 µg/m3. Figures 17 and 18 of the RI Work Plan (Appendix A) show TCE concentrations at the depths 5 and 15 ft bgs, respectively. Figures 19 and 20 of the RI Work Plan (Appendix A) show 1,1-DCE concentrations at the depths 5 and 15 ft bgs, respectively. VOCs were detected at generally greater concentrations along the south side of the Plant 3, with higher detections in the 15 ft bgs SVPs, when compared to the shallower 5-ft SVPs.

The generally observed increase in VOC concentrations from 5 to 15 ft bgs may be indicative of historical releases. The coarse nature of the soil encountered beneath the Site suggests that releases of liquid products and their vapors could have migrated vertically. The results of the investigation were compared to Vapor Intrusion Screening Levels (VISLs), calculated by applying a conservative attenuation factor (0.03) to indoor air screening levels. For comparison, generic VISLs calculated for TCE and 1,1-DCE in sub-slab samples (USEPA, 2012; 2018) are approximately 100 and 29,300 µg/m3, respectively. While the VISLs are considered conservative for sub-slab samples, and more conservative for samples in unconfined soils, they are considered useful for preliminary screening. Considering that the locations sampled as part of this investigation were in unpaved areas, and therefore, potentially lower concentrations compared to what would be expected below a slab where a potential release may have occurred, the results of the soil vapor analysis suggested that additional characterization may be necessary.

The VOC source area investigation letter report (Geosyntec, 2020b) recommends that future Site characterization work include the following:

- Indoor air and sub-slab sampling;
- Deep soil vapor VOCs characterizations;
- Completion of soil vapor extraction (SVE) wells and an SVE pilot test, if warranted; and
- Groundwater sampling and installation of a source area groundwater monitoring well if VOCs in groundwater are detected above AWQS.

Details related to the proposed scope of work are presented in the RI Work Plan (Geosyntec, 2021c). The additional work proposed is being completed by NDS concurrent with the submittal of this CCR. The data generated as part of the additional VOC investigation will be documented in the proposed Plant 3 and former WBO RI Report.

4.3 Former TTU

Sections 4.3.1 through 4.3.9 below are a summary of previous investigations provided from the RFI Report dated November 13, 2016 (H&A, 2016). The 2016 RFI Report provides a detailed summary of investigations conducted at the TTU between 1986 and 2016. Pertinent information regarding these investigations has been summarized, and associated figures and tables are provided in Appendix A.

4.3.1 1986-1991 Soil Assessment for Metals

From December 1986 to September 1991, NTS completed soil assessments to identify the levels of leachable metals in the soils in the former TTU (Basin & Range, 1991; H&A, 2016). These assessments were conducted via TRC Environmental (TRC), Sunshine Environmental Services, and Basin & Range.

TRC performed soil sampling at the TTU from December 1986 to February 1987 during the remediation of lead soil (TRC, 1986/1987). Samples from pits #1-5 and graded and undisturbed areas in the TTU were analyzed for arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver, with only lead detected above the extraction procedure – toxicity (EP-TOX) maximum contaminant concentration (MCC) of 5 mg/L at pits #1, #2, #4, and #5 and the graded area S-25. The soils at these locations were excavated, with additional samples confirming that lead had been reduced below the MCC. Sample locations are shown in Figure 4-1 of the 2016 RFI Report (H&A, 2016), provided in Appendix A.

In 1989, Sunshine Environmental Services collected 13 samples from visibly discolored soils in the eastern graded area of the TTU, located northeast of the burn pits (Sunshine Environmental Services, 1989; Figure 4-1 of the RFI report, provided in Appendix A). The soil samples were analyzed for cadmium, chromium, and lead using EP-TOX. Two soil samples indicated detectable concentrations of lead (0.85 and 1.6 mg/L, respectively), while one soil sample indicated a detectable concentration of chromium (0.43 mg/L). These concentrations, along with the other measured samples, were significantly below their respective MCCs (Table 4-2 of the 2016 RFI Report; Appendix A).

In 1990, TRC collected additional soil samples from the drummed soil; composite soil samples from pits #1 to #6 and the old burn box area; and two background soil samples (LJ-1 and LJ-2) in areas away from the burn activities (TRC, 1990a; 1990b). The soil samples were analyzed for TCLP chromium and total chromium. Total chromium concentrations were detected at 14 mg/kg and 17 mg/kg in background soil samples LJ-1 and LJ-2, respectively. TCLP was not detected in any of the soil samples, while total chromium was detected in all the samples from 32 mg/kg to 266 mg/kg, with these concentrations were below ADEQ's HBGLs of 2,000 mg/kg (Figure 4-1 and Table 4-2 of the 2016 RFI Report; Appendix A).

In 1991, NTS removed the interior berms that separated pits #2 to #5 and stored the soil on the west side of pit #6, and NTS also removed steel boxes from the old burn box area to pits #2 to #5. Basin & Range collected seven soil samples from the soil pile and six samples from the base of the old burn box area for analysis of barium, cadmium, chromium, and lead using the TCLP sample preparation method. Barium was detected in soil samples collected from the old burn box area, and cadmium and chromium were detected in soil samples collected from both the soil pile and old burn box area, with identified concentrations below their respective Toxicity (TC) MCCs. Lead was detected in all soil samples above the TC MCC of 5.0 mg/L (Figure 4-1 and Table 4-2 of the 2016 RFI Report; Appendix A). Soil from the old burn box area was subsequently removed and shipped with berm soils to U.S. Ecology's permitted disposal facility in Beatty, Nevada.

4.3.2 1996 Site Assessment

In September 1991, a SAP (Basin & Range, 1991 and 1997a) was submitted to the ADEQ for the TTU as part of a Consent Judgment between TDS and the State of Arizona. The SAP was intended to aid in the determination of the presence and extent of contamination from hazardous waste due to prior operations. In December 1996, Basin & Range collected and analyzed 107 soil samples from 64 locations in the TTU, determining that barium, cadmium, and chromium concentrations were all below the non-residential health-based guidance levels (NR-HBGLs). Lead concentrations ranged from 25.3 to 8,210 mg/kg, with nine locations in the graded area, four locations in the burn pit area, and four locations in the old burn box area exceeding the NR-HBGL. Eight subsurface soil samples were collected at these locations and analyzed for lead, with concentrations ranging from 88.2 to 3,130 mg/kg and exceeding the NR-HBGLs at one location in the burn pit area and three locations in the old burn box area. Total chromium in 19 soil samples and total lead in all but four soil samples exhibited concentrations that were 20 times greater than their respective TC MCC values (100 mg/kg). Perchlorate results from the three burn pit locations ranged from 239.5 to 9,530 mg/kg at the surface and from 1.54 to 69.2 mg/kg at 6-12 inches deep, which are less than the >200,000 mg/kg level needed to classify the soil as hazardous based on ignitability or reactivity.

4.3.3 1997 Site Specific Risk Assessment for Lead

A Site-Specific Risk Assessment (SSRA) was completed for lead in the TTU soils, following recommendations from Basin & Range (1997a). The SSRA found that when using Site-specific and actual exposure levels to the default levels used in the NR-SRL calculation, acceptable lead exposure levels increased to 9,600 mg/kg, and so the proposed Site-specific SRL for lead in soils at the TTU was changed to 9,600 mg/kg. This information was submitted to the ADEQ by Basin & Range (Basin & Range, 1997b, as reported by H&A, 2016) in a Partial Closure and Remediation Plan (PCRP) to partially close sections of the TTU no longer utilized for scrap propellant treatment. The 1997 SSRA Report also noted that metals in the soil had a low potential to affect and contaminate the surrounding groundwater. Thus, the PCRP did not recommend excavating or remediating the lead-contaminated soils at the TTU.

4.3.4 2000 SRPMIC Soil Investigation

In 2000, a soil investigation led by Smith Consultants (as reported by H&A, 2016) was conducted on SRPMIC land adjacent to the TTU (to the west, north, and east) to determine the possibility of soil contamination on SRPMIC land from TTU operations. SRPMIC land to the north and east are situated at higher elevations than the TTU, while SRPMIC land to the west is situated at a lower elevation. As such, SRPMIC land to the west, north, and east could be impacted by airborne combustion product migration, whereas land to the west could also be impacted by storm water runoff. Soil samples were collected at 80 locations within 300 ft of the SRPMIC and NDS property boundary (with an additional 12 background samples collected from remote locations 0.3 to 0.5 miles from the TTU). Soil sample locations are shown in Figure 4-2 of the 2016 RFI Report (Appendix A). Analytical results indicate that nine chromium (2 to 67 mg/kg) and 12 lead (<5 to 950 mg/kg) soil samples exceeded the background threshold; however, only seven lead results exceeded the residential Preliminary Remediation Goals (R-PRG) of 400 mg/kg, which were

located in the low-lying western SRPMIC land where storm water runoff accumulated. Higher chromium results were also found in this area. Smith Consultants concluded that the metals in the TTU soils were transported onto SRPMIC land in the storm water runoff, with the metals likely not impacting the underlying groundwater (Smith Consultants, 2000). In response, TDS created a Clean-up Action Plan (Talley, 2003) to address the metals found on SRPMIC land west of the TTU and submitted the plan to SRPMIC. TDS, however, never received a response form SRPMIC, yet the impacted soils were excavated in 2011 for off-Site disposal.

4.3.5 2011 SWAA Soil and Bedrock Investigation

In 2011, Arcadis performed soil sampling and bedrock coring in the SWAA west of the TTU, based on previous recommendations to determine: (1) the vertical characterization of perchlorate; (2) the delineation of the alluvium-bedrock contact depth; and (3) the degree of bedrock fracturing, fracture orientation, and the possibility of contaminant conduits. Eight soil borings (1 through 5, A, B, and C) were collected and are shown in Figure 4-11 of the 2016 RFI Report (Appendix A). Borings 1 to 5, which were drilled to refusal at the alluvium-bedrock contact, measured the depth to bedrock at 10, 12 to 13, 20, 26.5, and 16 ft bgs, respectively. Borings A, B, and C were advanced through the alluvium-bedrock contact to varying depths in the bedrock. Arcadis measured the alluvium-bedrock contact at 14, 23, and 27 ft bgs, respectively; boreholes were drilled to total depths of 28, 42, and 47 ft bgs, respectively. Forty-one primary and duplicate soil samples were collected from the eight borings and analyzed for perchlorate (USEPA Test Method 314). Results are presented in Table 4-8 of the 2016 RFI Report (Appendix A). The bedrock cores were placed in wax-coated boxes and stored at NDS. Additional permeation tests of the cored bedrock intervals were performed at Borings B and C. A single upper pack was lowered to a specific depth and inflated to seal the borehole, with water injected under pressure (14 to 20 pounds per square inch). The injection rate was monitored to determine the fracture flow rate.

The bedrock investigation revealed that shallow bedrock is present beneath the SWAA, with the observed depth to bedrock ranging from 10 to 26.5 ft bgs and increasing from east to west. The bedrock is primarily granite and showcased heavy weathering and fractures at different intervals; however, the permeation tests reported that the bedrock held no observable water volume. Given these results, the geophysical surveys to determine the fracture orientation were deemed to no longer be necessary. The surficial alluvium was determined to be a mixture of silt, sand, and gravel, consisting dominantly of gravelly silt.

Perchlorate concentrations identified in the 41 soil samples ranged from non-detect (<0.020 mg/kg) to 29 mg/kg, with 28 samples containing concentrations <1.0 mg/kg and one sample (SRA-B2-5 at 5 ft) containing a concentration above the 16 mg/kg screening level for perchlorate applied at the time of the investigation. Perchlorate concentrations in the soils collected immediately above the bedrock contact were below 16 mg/kg.

4.3.6 2013-2014 Additional Perchlorate Soil Sampling in SWAA

Further perchlorate soil sampling was conducted in 2013 and 2014 (H&A, 2015a) to characterize the lateral extent around sample location SRA-R4/C3 (i.e., SRA-B2). Three sets of soil samples taken at depths of 3, 5, and 10 inches were collected using direct-push methods at the SWAA in 2013. Additional characterization was conducted in 2014 to complete the delineation, with 12 soil

sample sets (i.e., one at 5 ft bgs and one at greater depth depending on the refusal depth) adding up to a total of 24 soil samples. Two soil samples collected in 2013 (indicating perchlorate concentrations of 19 and 31 mg/kg) were above the ADEQ Site-specific GPL for perchlorate at the TTU of 16 mg/kg, while eight samples collected in 2014 (26 to 83 mg/kg) indicating perchlorate concentrations above the GPL.

4.3.7 2012-2016 Monitoring Well Drilling, Construction, and Sampling

From 2012 to 2015, H&A (2016) oversaw the construction of seven bedrock monitoring wells downgradient of the TTU area (TTU-1 through TTU-7) and one well within the source area (TTU-11). Additional bedrock monitoring wells (TTU-8, TTU-9a, and TTU-10) were installed in 2016 to the north and west of the TTU to determine the extent of COPCs and define the groundwater flow paths.

A perchlorate concentration of 53,000 µg/L was identified in TTU-1 at 50 ft bgs. Packer testing also determined the relative proportion of flow into the borehole from the upper and lower bedrock zones. The results indicated that the largest density of open fractures lie within the upper saturated zone, from the static water level at approximately 38 ft to 68 ft bgs. Additionally, packer testing and pumping the well dry revealed that the recovery rate above the packer was approximately twice the rate below the packer, also confirming that the primary source of groundwater is in the upper portion of the borehole.

The construction of the monitoring wells TTU-2 through TTU-7 occurred during 2013 to 2015, with sampling at TTU-2 to TTU-4 revealing that perchlorate concentrations did not significantly change with depth. Additional depth-specific sampling at TTU-7, drilled to 485 ft bgs, revealed that the collected grab samples from the drilling rig discharge exhibited an overall decrease in perchlorate with depth.

TTU-8 through TTU-11 were constructed in 2015 to 2016. TTU-9 was drilled but abandoned due to perchlorate concentrations exceeding 14 µg/L, and thus, a step-out well was constructed (TTU-9A). H&A (2016) conducted subsurface gas sampling using Amplified Geochemical Imaging (AGI) sampler modules at TTU-11 to constrain the TTU source area. The results revealed that (1) VOCs were detected in 11 of the 19 deployed modules, with total sorbed mass of 0.02 to 82.06 µg; (2) benzene, toluene, ethylbenzene, and xylenes (BTEX) was detected as a combined mass in 10 of the 19 modules, with total sorbed mass of 0.03 to 4.19 µg; (3) total petroleum hydrocarbons were detected in all modules at 1.47 to 70.42 µg; (4) 1,4-dioxane was not detected; and (5) the total detected sorbed mass of VOCs highlight the source area as the location of module 760500, given each compound had the highest concentrations in module 760500.

4.3.7.1 Fracture Evaluation

H&A (2016) conducted geophysical logging that consisted of optical borehole imaging and acoustic borehole imaging surveys to evaluate the fractures at some of former TTU boreholes (see Section 2.5.1 for a summary of this investigation). For the surveys, H&A noted several different features: (1) the fracture dip; (2) the fracture dip direction; (3) whether the fractures were filled or unfilled with mineral precipitation; (4) the color of the precipitation; and (5) whether the fractures were open, partially open, or closed. The downhole logging began at depth at some of the TTU

wells due to borehole instability, requiring the casing be driven down during drilling. This instability indicates that the upper granitic bedrock is more highly fractured.

The optical borehole imaging (OBI) survey creates an optical image of the borehole, which is then georeferenced to determine the location and orientation of the fractures. The survey also gathers a high-density 144-arm caliper log of the hole, which is georeferenced to determine the size and orientation of voids or cavings, which could affect the ABI survey. The ABI survey generates an acoustic and georeferenced image of the borehole by transmitting sound waves and measuring the interval and speed of their return. Higher density media return the sound waves quicker than lower density (softer) media, and the differences in density can showcases lithologic boundaries, voids, and fractures. By using the OBI and ABI surveys in tandem, it is easier to see fractures in the OBI survey that are confirmed due to their lower density in the ABI survey.

H&A present the geophysical logging that shows the fracture network in the boreholes per 5-ft interval in Figure 4-20 of H&A's 2016 RFI Report (Appendix A). Generally, the filled and stained fractures were determined to be the top of the lower granite bedrock, potentially indicating low effective porosity and fracture connectivity due to secondary mineralization.

The logging discovered that up to 11 fractures were present per every 5-ft interval in the former TTU boreholes, with the uppermost 60 to 150 ft more highly fractured compared to the lower bedrock (below 150 ft), which is most likely attributed to the increased lithostatic load with depth. The fractures were oriented in all directions at the TTU boreholes throughout the Site. The dominant dip directions in the northern (TTU-1, TTU-4, TTU-8, and TTU-9A) and western (TTU-11) sections of the Site were north and northeast. The dominant dip directions for the wells in the center of the Site (TTU-2, TTU-3, and TTU-5) were south and southwest.

The contact between the upper and lower bedrock is not well defined but was estimated to likely extend to a depth of 60 to 105 ft bgs east of the canal at wells TTU-1, TTU-2, TTU-9A, and TTU11. To the south, the contact at well TTU-5 was estimated deeper at approximately 150 ft bgs, consistent with the wells located west of the canal (TTU-3, TTU6, TTU-8, and TTU-10) where the contact was estimated at a depth range of 125 to 140 ft bgs. The contact was not observed at TTU-4 and TTU-7.

4.3.7.2 2014 Aquifer Testing

H&A (2016) performed slug tests in the TTU wells to determine the granite bedrock hydraulic conductivity (Section 2.5.1) and used pulse testing at select TTU wells and pumping at PF-2 to determine the hydraulic response of the TTU wells.

In December 2014, H&A performed pulse tests at TTU-4 and TTU-2. Pulse testing was utilized at the TTU wells because a constant rate for pump testing could not be sustained. These pulse tests pumped the selected wells dry each day for three days and the groundwater levels were monitored in TTU-1 through TTU-4. The groundwater levels were monitored for one week before testing and around two weeks after the TTU-2 pulse test (Figure 4-21 of H&A's 2016 RFI Report; Appendix A). Recovery of the groundwater levels following the pulse tests was rapid and more complete in TTU-4 than TTU-2, with both wells reporting full recovery after two weeks of the pulse testing.

Afterwards, H&A placed an electric current meter on the PF supply well PF-2 to examine its pumping schedule, as the pumping schedule is controlled by the water level in the storage tanks that supply water to the facility. As such, H&A could determine whether the TTU monitoring wells respond to pumping at PF-2. PF-2 was pumped for around one to two hours each day in the mid-morning, with surrounding TTU-1, TTU-2, TTU-3, TTU-6, and TTU-7 monitored during the pumping test (Figure 4-22 of H&A's 2016 RFI Report; Appendix A).

However, according to H&A, the results of both the pulse and pumping tests were inconclusive, as the lack of response in groundwater levels was indistinguishable from natural diurnal water level fluctuations. H&A concluded that the pulse and pumping tests may have required longer durations to account for a measurable response at monitoring wells.

4.3.8 2016 RFI Report for the Former TTU

H&A submitted the 2016 RFI Report to the ADEQ, which discussed the historical operations and past Site investigations and corrective actions and included an explanation of the COPCs and COCs in soil and groundwater at and around the former TTU. H&A proposed an Interim Remedial Action (IRA) for the TTU Site groundwater to initiate source removal and hydraulic control via groundwater extraction and ex-situ treatment by using the existing monitoring wells at and downgradient of the TTU, with these activities completed prior to the initiation of a final remedial action. H&A also provided a CSM that indicated potential exposure pathways and transport mechanisms of the on-Site COCs.

H&A concluded that only three COCs existed in the TTU soil (lead, perchlorate, and 2,3,7,8-TCDD), with only perchlorate existing outside the former TTU in the SWAA. H&A intended to evaluate potential remediation techniques for perchlorate during the soil Corrective Measure Study and for lead and 2,3,7,8-TCDD during RCRA closure of the TTU. The 2016 RFI Report determined that authorized TTU personnel were the only potential human exposure to contaminated soil. H&A also determined that several COPCs existed in the TTU groundwater (perchlorate, TCE, 1,1-DCE, 1,4-dioxane, benzene, and PCE), with the Site's fractured upper granite bedrock acting as an effective porous medium for contaminant transport. The 2016 RFI Report also stated that the perchlorate and VOC plumes from the TTU were of relatively short plume lengths due to slow contaminant migration from the relatively low bulk hydraulic conductivity of the granite bedrock. Additionally, H&A reported that the perchlorate, TCE, and 1,4-dioxane plumes appeared to be either stable or in decline since the commencement of monitoring in 2014 and there were no unacceptable human exposures to contaminated groundwater, with the groundwater only used to wash down cages and for other non-potable uses at the PF located off-Site and downgradient of NDS (wells PF-1 and PF-2).

Following the submittal of the 2016 RFI Report, the ADEQ provided comments in a letter dated January 3, 2017 (ADEQ, 2017). Based on the letter, the 2016 RFI Report was not approved as final until suggested changes were made. Some of main areas of revision included the following:

- A statement regarding the known volume and disposal practices of waste propellants and VOCs at the TTU to determine the exact impacted locations at and around the TTU;
- A determination of the surrounding migration routes through the discussion of (1) the known domestic and production wells within 1 mile of the TTU; (2) the primate well

pumping rates; (3) whether the Southern Canal is lined; (4) information regarding the SRPMIC property that contains the groundwater plume; and (5) future plume movement and impacts;

- A clarification on the differences between the 2016 RFI Report and 2012 Closure Plan, with the RFI stating that no further characterization was needed for lead, perchlorate, and 2,3,7,8-TCDD, which contradicts the 2012 Closure Plan;
- An explanation of the large differences in groundwater elevations that appear inconsistent with the CSM of a homogeneous, low hydraulic conductivity unit;
- Completing both vertical and lateral delineation of all COCs;
- Improvements to the CSM that provide more detail regarding (1) the contaminant sources, releases, and transport mechanisms; (2) the potential for bedrock to act as a source of perchlorate and VOC contamination; and (3) revisions explaining that the perchlorate plume, which has migrated approximately 1,400 ft from the TTU, does not meet the requirements as being under control.

A response-to-comments letter was submitted by H&A on behalf of NDS (H&A, 2018), which only pertained to soil characterization affecting review of a Closure Plan submitted on March 2, 2018.

4.3.9 2020 Groundwater Investigation Report

Eight wells were installed at the TTU: five extraction (EX) wells (TTU-EX-1, -EX-2, EX-3, EX-4, and EX-5) were advanced to approximately 110 ft bgs to expand the existing interim remediation measure (Section 5.1.9) while TTU-16, TTU-17, and TTU-18 were installed to further delineate the plume boundaries and drilled to depths of approximately 95, 100, and 140 ft bgs, respectively (Geosyntec, 2020d).

After well development, Southwest Exploration Services was subcontracted by Geosyntec to complete geophysical logging at the five EX wells as well as TTU-16, which was installed in the source area of the former TTU. ABI, OBI, and three-arm caliper geophysical logging was utilized to determine the intervals with a higher density of fractures, which could affect the groundwater flow direction and rate (Appendix F of Geosyntec's TTU Groundwater Investigation Report, [Geosyntec, 2020a]; Appendix A).

Additional geophysical logging was also completed during the installation of new groundwater extraction wells TTU-EX-1 through TTU-EX-5 and the source area well TTU-16 (Geosyntec, 2020d). Joint and fracture features identified by geophysical logging were grouped, based on orientation, aperture, continuity, and form, into three classifications: partially open fractures, near-vertical fractures, and minor fractures. Fracture classification interpretations were provided by the geophysical logging contractor (Southwest Exploration Services) and did not include quantitative estimates of fracture aperture or in-fill continuity (where present). Partially open fractures are moderately dipping (dip angles of approximately 40 to 60 degrees), strike approximately northwest-southeast, and dip either to the northeast or to the southwest. Near-vertical fractures strike approximately east-west to northwest-southeast. Minor fractures are shallowly dipping to

sub-horizontal, with variable strike. Fracture density was observed to increase from south (0.42 fractures per ft at TTU-EX-5) to north (1.48 fractures per ft at EX-1) (Geosyntec, 2020d). The lower fracture density, along with a lower water table elevation, may be responsible for the slow groundwater recharge observed between drilling and well development at TTU-EX-4, TTU-EX-5, and TTU-16. The investigation also revealed that the groundwater flow direction may not only be controlled by the hydraulic gradient (directed toward the west-southwest), but also by preferential flow along the down-gradient component of strike of the most abundant partially open fractures (i.e., toward the northwest).

Geosyntec also performed hydraulic testing at TTU-EX-1 to TTU-EX-3 using step-drawdown tests and constant discharge rate pumping tests. The step-drawdown test was conducted to determine a sustainable pumping rate for the constant rate hydraulic testing and to avoid excessive drawdown or dewatering of the well. The step-drawdown test was terminated during the third step at 1 gpm at EX-1 and EX-3 as the drawdown exceeded half of the initial water column, with further drawdown not recommended to avoid causing irreversible reduction in fracture saturation and connectivity. During the step test at TTU-EX-2, pumps failed, and thus the test was stopped at the end of the second step. Because the pumping rates during the step-tests were above the equilibrium recharge rates, the tests suggested that a lower pumping rate would be best for the constant discharge rate test.

After recovery from the step-tests, a constant discharge rate pumping test was performed at each well for approximately eight hours. Pumping rates of 0.2 to 0.3 gpm were chosen as the pump could not pump at a lower rate. No drawdown was observed in the observation wells during the pumping period, including the nearby EX wells. Considering this lack of hydraulic communication between the EX wells, which are oriented along an approximate north-northeast to south-southeast line across the plume axis, there is further support that the partially open fractures strike mostly northwest-southeast.

After the pumping phase of each constant discharge rate test, the recovery data were used to estimate transmissivity (T), storativity (S), and hydraulic conductivity (K). The results of the investigations show that the hydraulic conductivity ranges from 0.0005 to 0.01 ft/d, which is consistent with both literature for moderately fractured igneous and metamorphic rocks (e.g., Heath, 1983) and previous findings by H&A (2016).

In March 2020, Hydrasleeve™ groundwater samples were collected in the middle of the saturated zone in the newly installed wells, excluding the dry TTU-18. The groundwater samples were analyzed for perchlorate (USEPA Method 314), VOCs (USEPA Method 8260B), and 1,4-dioxane (USEPA Method 8270 SIM). The results are provided in Figures 6 and 7 and Tables 1 to 3 of the 2020 Groundwater Investigation Report (Appendix A). The results show that perchlorate was detected in all wells, except TTU-17, above the HBGL of 14 µg/L. The highest perchlorate concentration in the EX wells was measured at 468,000 µg/L. Benzene, 1,2-DCE, 1,1-DCE, methylene chloride, PCE, 1,1,2-TCA, and TCE were also detected above the AWQS. TTU-16 exhibited the highest detections of these compounds at concentrations of 169 µg/L of benzene,

28.7 µg/L of 1,2-DCE, 2,220 µg/L of 1,1-DCE, 92,900 µg/L of methylene chloride, 39.1 µg/L of PCE, 65.9 µg/L of 1,1,2-TCA, and 51,500 µg/L of TCE. TTU-16 also showed the highest detection of 1,4-dioxane at 2,470 µg/L.

5. CORRECTIVE ACTIONS AND INTERIM MEASURES

The following sections describe the risks identified for the Site and the corrective actions and interim measures implemented to date.

5.1 Former TTU

Treatment of hazardous waste at the former TTU ceased in 2006 (H&A, 2016). Activities currently performed by NDS at the former TTU are limited to the operation of a hydraulic capture system and monitoring of impacts. Implementation of risk management actions at the former TTU has been ongoing since the early 2000s. The following is a summary of the actions taken to date.

5.1.1 2002-2004 Voluntary Cleanup Action Plan

In 2002, TDS submitted a Cleanup Action Plan (CAP) and Quality Assurance Project Plan to the ADEQ to conduct voluntary lead remediation at the former TTU (H&A, 2016). A revised CAP was approved by the ADEQ in 2003, which was carried out in four subsequent phases:

- Phase I included a "hot-spot removal," excavating soil from the vicinity of the TTU that had been previously identified as having the highest lead concentrations;
- Phase II was implemented in 2003 by Environment Resource Management Services (ERMS), who were retained to complete soil sampling to support the planned remedial activities by delineating the impacted soils;
- Phase III was implemented in 2003 by Conestoga-Rovers & Associates (CRA), who were retained to perform in situ stabilization by applying a proprietary phosphate-based stabilizer to soils and bedrock to bind lead and reduce the amount of lead that could be recovered using the TCLP; and
- Phase IV was implemented in 2003 and 2004, which included the excavation and disposal of additional post-treatment soil and completion of confirmation sampling, which indicated that the CAP activities had produced the desired results. The confirmation sampling also indicated that perchlorate (in concentrations ranging from 0.543 to 453 mg/kg) and nitrate (in concentrations ranging from 7.7 to 718 mg/kg) were ubiquitous in all samples (H&A, 2016).

5.1.2 2004-2005 Additional Soil Assessment and Removal

From late 2004 through mid-2005, TDS performed an additional soil assessment at the TTU for two explosives, RDX and HMX; neither was detected. Concurrently, TDS conducted additional soil excavation and disposal in areas with elevated lead concentrations (H&A, 2016).

5.1.3 2005 Storm Water Retention Improvements

In August 2005, Brown and Caldwell evaluated the storm water control efforts for the berms and retention areas at the TTU for the ADEQ, in response to an inquiry by the ADEQ on the run-on and run-off management for the TTU's active area (H&A, 2016). Clarification for the ADEQ

included the run-off limits for the watershed boundary; proper design storm volume calculation methodology; and determining how the storm water management system functions.

Due to topography, the active area of the TTU is hydraulically separated from any run-on that could occur outside its boundaries. Existing channels divert storm water run-off north and south of the area, while the prevailing grades divert run-off to the west. According to H&A (2016), these diversions demonstrate that the TTU's active area will not experience any run-on from off-Site sources during a 25-year, 24-hour storm event. In the active area itself, the grade slopes to the south to a containment berm that prevents run-off of the on-Site storm water.

An additional hydrologic model was created and, according to H&A (2016), indicated that a containment volume of 0.039 acre-feet or 1,699 cubic-feet is required to contain a 25-year, 24-hour storm. According to H&A (2016), Brown and Caldwell then visited the Site and determined the run-off patterns and on-Site berm locations and conditions. Brown and Caldwell discovered that certain areas of the berms needed to be slightly higher and/or longer to meet the model's containment requirements. In December 2005, the berms were modified to meet these retention requirements for a 25-year, 24-hour storm event.

5.1.4 2008 Removal of TTU Equipment and Structures

In early 2008, TDS sampled soil from the berms around the burn pits (H&A, 2016). Analysis indicated that the soil contained total lead in concentrations exceeding the applicable residential SRL of 400 mg/kg, while perchlorate exceeded the applicable residential SRL of 55 mg/kg. All remaining equipment associated with TTU activities was decontaminated and removed, as well as approximately 582 tons of soil and concrete, comprising the former burn pit berms and burn pads (Table 4-3 of H&A, 2016; Appendix A).

5.1.5 2009 Revised Draft Closure Plan Activities

The ADEQ reviewed the closure plan included in the Part B Application dated March 25, 2008 and determined that it was incomplete; the AFEQ indicated that the plan needed significant revisions. As a result, in 2008 NTS requested in a letter to the ADEQ to withdraw the Part B Permit Application submitted to begin closure of the TTU (H&A, 2016). Following the withdrawal request, the ADEQ requested a document of all relevant Site characterization, decontamination, and soil removal activities at the TTU to approve closure activities.

As a response, NTS submitted a Draft Closure Plan in March 2009, which provided a full summary of the closure activities that were completed up until that point. The plan also proposed an in-depth sampling scheme to confirm the presence or absence of certain COPCs in the TTU and determine the extent of these contaminants in soils in and around the TTU.

The plan defined three investigation units based on the history and off-Site contaminant transport:

1. Area within the TTU ("TTU Area");
2. Area immediately around the TTU on NTS and SRPMIC property were airborne transport of COPCs could have impacted soil ("Area Surrounding the TTU"); and

3. Area on NTS and SRPMIC property west of the TTU where storm water runoff may have transported COPCs ("SWAA").

The 2009 sampling strategy was revised based on ADEQ comments and on the findings of the sampling program established since the 2009 Draft Closure Plan (Section 5.1.5). The sampling strategy used a phased approach that initiated with the Initial Characterization Sampling Program (described in NTS's letter to ADEQ dated June 10, 2009, which received ADEQ agreeance in a letter to NTS dated June 24, 2009), and based on these results, soil was removed from SRPMIC land within the SWAA (Section 5.1.5). Additional characterization sampling was completed within the SWAA, which included a determination of the competence of the bedrock in this area (Section 4.3.5; H&A, 2016), as well as soil evaluation to delineate perchlorate in the SWAA soil (Section 4.3.6; H&A, 2016), both of which helped address data gaps from the Initial Characterization Sampling Program.

5.1.6 2011-2012 Storm Water Accumulation Area Soil Removal

According to H&A (2016), Arcadis completed a soil removal action at the SWAA in 2011 to address lead impacts. Soil was removed in 3- and 6-inch intervals, with confirmation sampling between intervals, over four phases. The removal action confirmation sampling indicated that lead concentrations were below the residential SRL.

Arcadis subsequently completed a soil and bedrock investigation to vertically characterize perchlorate impacts at the SWAA. The investigation confirmed that perchlorate was not detected in the soil column from ground surface to bedrock at concentrations above the screening level of 16 mg/kg, which corresponds to the GPL approved by the ADEQ (H&A, 2016).

H&A subsequently installed groundwater monitoring well TTU-1 to approximately 200 ft bgs in the SWAA. The static water level was reported to be approximately 40 ft bgs, and perchlorate was reported in a sample from 50 ft bgs at a concentration of 53 mg/L (H&A, 2016).

5.1.7 2013 Closure Plan

H&A prepared a closure plan for the ADEQ of the former TTU on March 11, 2013 (H&A, 2013). The following steps to closure are described by the closure plan:

1. Treat by open burning all reactive hazardous waste (i.e., waste propellants) and residue present at the former TTU at the time of closure.
2. Decontaminate former TTU equipment, structures, and containment system components that are contaminated with potentially reactive residues or other hazardous waste.
3. Ship all hazardous decontamination wastes off-Site for treatment and disposal at an authorized treatment, storage, and disposal facility.
4. Demolish former TTU structures and remove demolition residues, equipment, and containment system components from the Site including recycling of steel items.
5. Collect and analyze representative samples from the soils within the former TTU and the immediate surrounding area to evaluate contaminant concentrations in the soil

relative to the closure evaluation criteria. Conduct off-Site sampling to assess areas that may have been impacted by migration of on-Site contaminants via surface water and/or air dispersion.

6. If the soil sampling program identifies the presence of hazardous waste constituents (contaminants) above the closure evaluation criteria, excavate and dispose of the contaminated soil at an authorized disposal facility and collect additional verification samples for analysis of the appropriate contaminants to confirm that the Site meets closure criteria.
7. Obtain proper certification that the former TTU has been closed in accordance with the procedures outlined in the closure plan.

According to H&A, steps 1 through 5 had been completed as of the date of the closure plan.

5.1.8 2015 Contingency Plan for Exceeding Perchlorate Concentration Limits at the Primate Facility Well No. 2

H&A developed a Contingency Plan for the PF located on SRPMIC land (H&A, 2015b). The PF is owned by SRPMIC and operated by the Washington National Primate Research Center. The facility has two on-Site groundwater supply wells (PF-1 and PF-2). PF-2 is the only well being operated at the PF due to low yields from PF-1. The Contingency Plan was developed to establish proposed trigger and concentration limits (TL and CL) and implement a response plan in the event the CLs and TLs are exceeded at PF-2.

H&A collected six groundwater samples, one from the PF-2 tank and five from the PF-2 well, between 2014 and 2015. The highest perchlorate concentration was 2.7 µg/L. As part of the document, H&A also estimated then-current and future demand at the PF, which were estimated to be 4,300 gallons per day and 9,052 gallons per day, respectively.

The Contingency Plan proposed the following measures:

- A CL of 6.4 µg/L, which according to H&A (H&A, 2015b) was supported by a study of Safe Perchlorate Levels in Drinking Water for Non-Human Primates dated March 11, 2015.
- A TL of 3.2 µg/L (50% of the CL).
- Quarterly monitoring of PF-2 for perchlorate, VOCs, and 1,4-dioxane.
- Protocols for notifying SRPMIC in the event of a TL exceedance, which includes notification within 24-hours to SRPMIC, WANPRC, and the ADEQ, and monthly sampling.
- A conceptual design for an ion-exchange wellhead treatment system that meets future PF demands.
- Installation of a wellhead treatment, if warranted based on exceeding CL.

As PF-2 is still operational for groundwater production, NDS continues to sample and monitor this well as part of the quarterly groundwater monitoring events. NDS is committed to implementation of the contingency plan if TLs or CLs are exceeded at PF-2.

5.1.9 2017 IRA Work Plan

In January 2017, H&A prepared an IRA Work Plan on behalf of NDS (H&A, 2017b). The objectives of the IRA Work Plan were to begin source removal and control for the groundwater plumes originating at the former TTU, and to obtain information necessary to evaluate the need for further corrective actions.

The 2017 IRA Work Plan describes four tasks:

1. Data collection and a pilot scale test of a planned groundwater treatment system;
2. Preparation of an IRA Work Plan that finalizes the design of the groundwater treatment system;
3. Groundwater treatment system permitting and construction; and
4. Groundwater treatment system startup, operation, maintenance, and monitoring.

The planned treatment system is to include groundwater extraction and treatment using existing monitoring wells TTU-1, TTU-2, and TTU-11. Extraction at these three wells and treatment of the extracted is ongoing. Additional extractions wells TTU-EX-1 through TTU-EX-5 (Figure 3 of Geosyntec's 2020 TTU Groundwater Investigation Report; Appendix A) were installed in 2020 but have not yet been tied into the extraction system as of the date of this CCR. Extracted groundwater from TTU-1, TTU-2, and TTU-11 is collected in storage tanks at the former TTU area and periodically transported wastewater evaporation system at Plant 2, which is fitted with GAC for control of VOCs.

5.1.10 Present – Interim and Remediation Measures

5.1.10.1 Source Removal and Hydraulic Control

Interim measures, including the installation of a groundwater pump and treat system, have been implemented to date. These measures align with NDS's IRA for the TTU Site groundwater (H&A, 2016). The two main objectives of the IRA are to (1) initiate source removal as well as hydraulic control using existing monitoring wells at and downgradient of the TTU before final remedial action is implemented, and (2) acquire the required information to determine the need for further remedial action. The IRA suggested extracting groundwater from wells TTU-1, TTU-2, and TTU-11, and treating the water with an evaporator kettle followed by GAC. Further geophysical and hydraulic investigations have been conducted by Geosyntec to determine aquifer fracturing and its effect on groundwater flow direction and rate, the aquifer's hydraulic conductivity, and the delineation of COPCs (e.g., perchlorate) (Section 4.3.8). In 2020, five extraction wells (TTU-EX-1 to TTU-EX-5) were advanced to approximately 110 ft bgs, and three additional bed rock monitoring wells (TTU-16, TTU-17, and TTU-18) were advanced to approximately 95, 100, and 140 ft bgs, respectively (refer to Section 4.3.8 for additional details). Wells TTU-EX-1 through EX-5 were installed to expand the capture zone at the Site. Although the wells have been installed,

the installation of the infrastructure (e.g., solar powered submersible pumps) was temporarily placed on hold to implement an EISB study.

5.1.10.2 EISB Pilot Test

From July to October 2020, an evaluation of EISB for chlorinated solvents and perchlorate was completed for the TTU (Matrix New World, 2020). The evaluation consisted of electrical conductivity (EC) and temperature profiling of eight wells, groundwater sampling of two wells for geochemical and microbial parameters, and deployment and retrieval of Bio-Traps® in three wells to test bioremediation using a variety of microbial cultures and carbon substrates. Results of the EC profiling indicated increased values at depth, which correlated to increased perchlorate concentrations at depth. Results of groundwater sampling indicated that perchlorate reducing bacteria (PRB) were not present in the aquifer; however, significant degradation of perchlorate was observed in the BioTrap® that did not introduce any PRB to the aquifer, suggesting that there are PRB in the aquifer that are not quantifiable with the traditional analyses that look for PRB. Finally, results of the BioTraps® indicated that the best amendments for bioremediation of the Site are a combination of a slow release carbon substrate and a quick release carbon substrate (these amendments constitute the biostimulation component), and a microbial consortium (which constitutes the bioaugmentation component).

In September 2020, an EISB pilot test was implemented at the former TTU. The EISB pilot test design was described in the EISB Pilot Test Work Plan (Geosyntec, 2020c), which was approved by the ADEQ in August 2020. The EISB pilot test included the installation of monitoring wells; the injection of amendments, a tracer, and bioaugmentation cultures; and groundwater monitoring.

The EISB pilot test is ongoing, and a summary is provided below of what has been completed as of the date of this CCR.

Two groundwater monitoring wells (TTU-19 and TTU-20) were installed in September 2020 at depths of approximately 10 and 20 ft bgs, respectively, downgradient of well TTU-11. After the groundwater monitoring wells were installed and developed, baseline groundwater sampling was conducted in October 2020.

Injection of amendments and tracer began in October 2020. The amendments consisted of a diluted solution of Newman Zone QR™ (a blend of food grade electron donors, nutrients, cofactors, and vitamins that stimulates rapid microbial growth) and Newman Zone 55™ (a blend of food grade fast and slow release electron donors that provides a longer-term source of electron donor for biodegradation). Bromide was mixed into the amendment solution to serve as a tracer. The solution was initially gravity injected into well TTU-11. In addition, four liters of KB-1 Plus® bioaugmentation culture and five liters of water from the on-Site FBR were injected into well TTU-11 to introduce dechlorinating and perchlorate degrading bacteria to the aquifer. Over the first week of gravity injections, the injection rates into the formation were much slower than anticipated, so injections using pumps were attempted. Various solar power and pump configurations were tested in November and December 2020, which indicated that the maximum achievable long-term injection rate into well TTU-11 via injection with a pump was approximately 40 gallons per day.

To evaluate whether the slow injection rate into well TTU-11 was due to the lithology or the well (potentially due to biofouling or clogging of the fractures, sand pack, or well screen), on February 9, 2021, injections into well TTU-11 ceased and amendments were instead injected into well TTU-19. Injections into well TTU-19 followed the same trend as injections into well TTU-11, with injection rates slowing over time to an average of approximately 40 gallons per day. Due to the slow injection rates and length of time that would be necessary to inject the remaining amendments, injections ceased in March 2021. Approximately 50 gallons of potable water were injected into well TTU-11 and well TTU-19 to flush any amendments out of the well and into the formation and prevent biofouling of the wells. The remaining amendment/water solution (approximately 3,000 gallons) was characterized and disposed of off-Site.

To date, only baseline monitoring results have been reported and validated. Additional performance monitoring results will be available three and six months following the completion of injections (anticipate June and September 2021). Preliminarily results are presented below, and a detailed analysis of the performance monitoring results from the EISB pilot test will be provided in the Corrective Measures Study report.

Baseline EISB monitoring results indicated that in general, COC concentrations at wells TTU-11 and TTU-20 were similar, and COC concentrations at well TTU-19 were approximately twice the concentrations observed in wells TTU-11 and TTU-20. In addition, at all three locations, COC concentrations were generally higher in the deeper interval (73 ft bgs) compared to the shallower interval (59 ft bgs). Total organic carbon concentrations were less than 20 mg/L, which is the minimum concentration considered favorable for microbial reductive dechlorination (USEPA, 1998). Ethene was detected in samples collected from both wells TTU-19 and TTU-20 (at concentrations of approximately 11 µg/L), which suggests that minimal complete microbial reductive dechlorination was occurring.

Bromide sampling was performed in February 2021 (four months after the start of injections) to evaluate the distance the amendments traveled from well TTU-11. Bromide was detected in the sample collected from well TTU-19, but not detected in the sample collected from TTU-20. These results indicated that injections of amendments into well TTU-11 migrated downgradient at least 10 ft to well TTU-19.

Three-month post-injection monitoring (June 2021) was only completed at well TTU-20 at the 73 ft bgs depth. Well TTU-20 is located approximately 20 ft downgradient of well TTU-11, where approximately two thirds of the EISB amendments were injected, and approximately 10 ft downgradient of well TTU-19, where approximately one third of the EISB amendments were injected. An initial evaluation of the data was performed, using preliminary data provided by the laboratory and prior to completing the data validation. In general, COC concentrations at well TTU-20 increased from baseline concentrations, with concentrations observed at well TTU-20 in June 2021 similar to those observed at well TTU-19 in October 2020. Further evaluation of the data will be conducted after the six-month post injection samples are collected.

5.2 Plant 3

Risk mitigation activities at Plant 3 include the operation of a hydraulic capture system and monitoring of impacts. Implementation of risk management actions at Plant 3 has been ongoing since the late 1990s. A summary of the actions completed to date is provided below.

5.2.1 1999 WBO Pit Closure – Metals

In accordance with a closure plan submitted to the ADEQ, TDS proceeded with surface soil removal and sampling at the former WBO pits in 1999. The soil removal and sampling activities were intended to facilitate expedited closure by the ADEQ. The results of previous soil sampling activities had indicated that lead concentrations in surficial soil at the former WBO pits exceeded the residential SRL established by the ADEQ in 2007 (55 mg/kg), but were less than the NR-SRL (720 mg/kg). Based on the previous soil sampling analytical results, the top 2 ft of soil in the former WBO pits was removed with the expectation that the removal would allow closure without the need for a VEMUR. Post-excavation confirmation soil samples were collected and analyzed for total and TCLP cadmium and lead. The laboratory analytical results of the post-excavation soil samples indicated that concentrations of cadmium and lead in the former WBO pits soil were less than RCRA thresholds for the hazardous waste characteristic of toxicity, ADEQ residential SRLs, and ADEQ minimum GPLs. The former WBO pit locations were marked and leveled following the excavation activities. The concrete trough between the former WBO Building and the pits was removed (Geosyntec, 2013).

5.2.2 2010 Perchlorate "Hot Spot" Removal Report

The perchlorate source investigations (Geosyntec, 2009a and 2010) identified two locations at Plant 3 where excavation of contaminated soil was recommended because perchlorate concentrations in soil exceeded the 55 mg/kg SRL. The two areas at Plant 3 included the WBO pits area and a stormwater retention pond area at Plant 3 north of the Line II building. As remediation of the WBO was to be completed separately, only the stormwater retention pond area north of the Line II building was excavated as part of a "hot spot" removal (NTD, 2010).

The excavation area measured approximately 40 by 15 ft in size and varied between 5 to 10 ft in depth. Two confirmation soil samples were collected from the bottom of the excavation and analyzed for perchlorate by USEAP Method 314.0. Perchlorate results were below the residential RSL of 55 mg/kg (NTD, 2010).

5.2.3 Revised RAP – 2013 to Present

Geosyntec prepared a RAP in August of 2013 (Geosyntec, 2013). The RAP was accepted by the ADEQ and subsequently formed the basis for an APP (Permit No. P-101370, subsequently canceled upon acceptance into the VRP), which governed the remediation of the perchlorate source area. The RAP prescribed a two-phased approach to remediation, the first phase of which was to design, install, operate, and monitor a groundwater extraction and treatment system to establish hydraulic containment of the perchlorate source area. Hydraulic containment was determined to be necessary both to mitigate further migration of perchlorate off-Site with groundwater and to

provide a capture zone for future source area remediation actions. The second phase, source area remediation, has not been implemented to date.

To establish hydraulic containment, two 12-inch-diameter extraction wells, each capable of approximately 400 gpm extraction, were drilled to a depth of approximately 350 ft bgs in the UAU to the east and southeast of the perchlorate source area. Groundwater extracted from these wells is conducted to a treatment facility that lies north of the former WBO building. The treatment facility, rated for treatment of groundwater with concentrations of up to 100 mg/L perchlorate at flow rates of up to 800 gpm, uses two FBRs to remove perchlorate from the groundwater using an anaerobic biological process. The treated groundwater is conveyed to one of three infiltration basins located to the west of the treatment facility, where it is allowed to infiltrate and recharge the aquifer.

The groundwater extraction and treatment system was completed in 2014, with start-up beginning in 2015 and full operation commencing in 2016 (Geosyntec, 2016). A revised hydraulic capture study conducted by Geosyntec in 2019 with the system in operation indicated that the hydraulic containment system would capture groundwater at the source area and prevent further migration of impacted groundwater from the former WBO pits both downgradient with the regional groundwater flow and upgradient under the influence of SRP production wells serving the Southern Canal.

Additionally, berms have been constructed around the former WBO to mitigate transport of COCs in stormwater runoff.

5.2.4 2020 Preliminary Risk Evaluation

Utilizing the groundwater sampling results collected at the downgradient, off-Site Drake Materials facility and nearby golf courses (Section 4.2.11), and information provided by Drake Materials and the golf courses related to groundwater uses and potential exposure scenarios, Geosyntec developed a preliminary risk evaluation. Results of this preliminary risk evaluation is being substantiated by additional ongoing sampling and risk evaluation efforts which will be reviewed by the ADEQ and will be re-evaluated, if needed, in collaboration with the ADEQ as part of the upcoming RI Report for NDS.

5.2.4.1 Golf Courses

Facility managers of the Longbow, Alta Mesa, Apache Wells and Painted Mountain Golf Courses were contacted to request information on the off-Site water uses. The golf courses confirmed that groundwater is strictly utilized for irrigation purposes and that domestic water supplies are obtained through a City of Mesa potable service connection. The golf courses operate their production wells as needed by pumping water into the corresponding ponds at each golf course. The ponds act as temporary reservoirs from which water is pumped through an irrigation system to irrigate the golf courses. According to the golf courses, irrigation is mostly automated, with occasional hand watering conducted on an as-needed basis to irrigate new sod or areas of the golf course that may not receive enough water during summer months. Groundwater production at the golf courses ranges between 300 and 620 acre-feet of water per year.

Based on the information provided by the golf courses, the risk evaluation assumed that watering occurs two times a week for four months per year during the summer. In addition, it assumed that

watering occurs for four hours per day. Additional assumptions include the potential for golf course workers to wear short sleeves and long pants. An incidental ingestion rate of 11.2 milliliters per hour (mL/hr) was assumed based on splashing and wading during recreational water use. This incidental ingestion rate reflects the upper confidence limit (UCL) of the USEPA-recommended incidental ingestion rate of a "wading/splashing" during recreational water use scenario (USEPA, 2019). Data on incidental ingestion while watering grass is limited, therefore assuming a "wading/splashing" scenario would be a conservative estimate for incidental ingestion while watering lawns.

For the risk evaluation, chronic toxicity criteria were selected from the USEPA Integrated Risk Information System (IRIS). An oral reference dose (RfD) value of 0.0007 milligrams per kilogram per day (mg/kg-day) is used based on radioactive iodide uptake inhibition in the thyroid (USEPA, 2005). Consistent with USEPA guidance, potential dermal exposures are evaluated using the oral RfD as USEPA has not developed toxicity criteria for the dermal route of exposure for most chemicals (USEPA, 2004).

To evaluate potential noncancer hazards, a perchlorate health-based screening level was derived using the results of the exposure assessment and toxicity assessment. An outdoor worker screening level of 10,205 µg/L was determined using the maximum detect concentration of 73 µg/L, and a hazard quotient of 0.007.

Based on the results of this risk evaluation, chemicals detected in golf course pond samples do not pose an unacceptable risk based on the scenarios evaluated.

5.2.4.2 Drake Materials

The first step in the risk evaluation involved identifying the relevant data for use in quantifying exposure. The facility pumps water from the two wells and blends them prior to entering the South Pond. Water from the pond is then used for a variety of purposes such as dust control and truck washing at the slump rack. The reported perchlorate concentration in the East Well sample was 1,280 µg/L and the perchlorate concentration in the West Well was 373 µg/L in 2020. The South Pond perchlorate concentration was 452 µg/L (blended water), whereas the slump rack concentration was 461 µg/L. The VOCs (chloroform, 1,1-DCE, and TCE) were also detected at relatively low concentrations and are not considered a concern for the non-potable use scenarios evaluated.

The exposure assessment identified outdoor workers which may be exposed to groundwater while engaged in various direct contact activities such as truck washing or indirectly as spray while passing through areas where the groundwater is used, such as the wash plant. Based on discussions with Drake Materials, workers may be exposed to groundwater for up to 6 hours per day as a conservative estimate. For this scenario, an incidental ingestion rate of 11.2 mL/hr is assumed based on splashing and wading during recreational water use. Similar to a golf course worker, this incidental ingestion rate reflects the UCL of the USEPA-recommended incidental ingestion rate of a "wading/splashing" during recreational water use scenario (USEPA, 2019). Data on incidental ingestion while washing trucks is limited, therefore assuming a "wading/splashing" scenario

would be a conservative estimate for incidental ingestion while washing trucks.[1] Additionally, it was assumed the outdoor workers wear short sleeved shirts and long pants.

For the risk evaluation, chronic toxicity criteria were selected from the USEPA Integrated Risk Information System. An oral RfD value of 0.0007 mg/kg-day is used based on radioactive iodide uptake inhibition in the thyroid (USEPA, 2005). Consistent with USEPA guidance, potential dermal exposures are evaluated using the oral RfD as USEPA has not developed toxicity criteria for the dermal route of exposure for most chemicals (USEPA, 2004).

To evaluate potential noncancer hazards a perchlorate health-based screening level was derived using the results of the exposure assessment and toxicity assessment. An outdoor worker screening level of 925 µg/L was determined using the maximum detect concentration of 461 µg/L from the slump rack, and a hazard quotient of 0.5. A Technical Memorandum dated October 6, 2020 (Geosyntec, 2020e), summarized the Drake Materials Risk Evaluation.

Based on the results of the preliminary risk evaluation, chemicals detected in Drake Materials South Pond and Slump Rack were determine not to pose an unacceptable risk based on the scenarios evaluated. Noncancer hazard estimate for potential exposures to perchlorate was below 1, the value deemed to be acceptable by regulatory agencies.

[1] The Exposure Factors Handbook (USEPA, 2019) does discuss one study measuring water ingestion from spray exposures based on 26 study participants engaged in a 10-minute simulated car wash activity using a high-pressure spray device. The 95th percentile of water ingestion was 1.93 mL, which corresponds to 11.58 mL/hr, which is not significantly different from the 11.2 mL/hr that was assumed for truck washers. However, due to the uncertainty associated with a small sample size, the USEPA-recommended value for “wading/splashing” was used. Additionally, the data behind the “wading/splashing” scenario includes ages 6 years and older; the truck washers workers are adults and are expected to have less incidental ingestion than a study that includes children.

6. REGULATORY INSPECTIONS AND VIOLATIONS

A list of regulatory inspections and RCRA compliance violations associated with the Site was compiled based on information provided in the 1994 RFA Report (SAIC/TSC, 1994a); the 2017 Updated RFA Report (H&A, 2017); and information available through the USEPA Enforcement and Compliance History Online (ECHO) database.

6.1 Regulatory Inspections and RCRA Violations Prior to 1994

According to the 1994 RFA Report, regulatory inspections at the TDS Plants have occurred since 1981, with these inspections yielding repeated violations by TDS of the Arizona Administrative Code. Most of the violations documented prior to 1994 were issued as a result of inaccurate or inadequate paperwork requirements (e.g., closure plans, manifests, inaccurate or nonexistent job descriptions, and inaccurate Part A and B Permit Applications). Additional violations have revolved around inadequate employee training and handling of hazardous wastes. A list of the general violations and dates are as follows:

- August 11, 1981:
  - An inspection of Plants 1 through 3 was conducted by the ADHS, although source documents for this inspection were not discovered during the 1994 RFA file review.
- April 26, 1985:
  - An inspection of Plants 2 and 3 and the former TTU was conducted by ADHS. Plant 1 was the only Plant address submitted on the Part A application in December 1980. There were also notes of pre-RCRA, partially lined surface impoundments west of the Plant 5 parking lot.
  - Violations: 18 probable violations, including paperwork violations, lack of waste determination, and improper hazardous waste management. Paperwork violations include deficiencies in closure plans, operating records, and training documents. Improper hazardous waste management could have potentially resulted in release of hazardous waste to the environment. It is unknown if a release occurred due to these violations and where the potential release would have occurred.
- February 5, 1986:
  - An inspection was conducted by ADHS, although source documents for this inspection were not discovered during the 1994 RFA file review, and the specific Plants inspected are unknown.
- October 29, 1986, and November 5, 1986:
  - Two inspections of Plants 1 through 3 and the former TTU were conducted by ADHS. Lead contaminated soil was in the process of being removed from the 1979 burning of lead styphnate containing propellant at the former TTU but had not yet been completed. Burning of lead nitrate containing propellant at the former TTU occurred before or during 1980. Seven violations ranging from inadequate documentation to improper handling of hazardous wastes.

- Violations: Seven violations, including improper handling of hazardous waste and inadequate documentation. Improper handling of hazardous waste could have potentially resulted in release of hazardous waste to the environment. It is unknown if a release occurred due to these violations and where the potential release would have occurred.

- September 20-21, 1988:
  - An inspection was conducted by the ADEQ, although source documents for this inspection were not discovered during the 1994 RFA file review, and the specific plants inspected are unknown.
  - Violations: Unspecified probable violations were reported as part of the site visit, but no details were provided.
- May 11, 1989:
  - A limited investigation of the former TTU was conducted by ADEQ to determine the causes of a May 10, 1989 fire/explosion.
  - Violations: 12 probable violations, including failure to control and maintain fire and spill equipment and inadequate training of personnel. Eight repeat violations were also noted, but no details were provided.
- May 18, 1989:
  - An inspection of Plants 2 and 4 and the former TTU was conducted by the ADEQ.
  - Violations: Four general categories of violations were reported, including improper hazardous waste management and paperwork violations, and a total of 12 repeat violations. An additional 53 probable violations and 39 repeat violations were also reported. Improper hazardous waste management could have potentially resulted in release of hazardous waste to the environment. It is unknown if a release occurred due to these violations and where the potential release would have occurred.
- May 24, 1989, and June 13, 1989:
  - Follow-up inspections of Plant 2 and the former TTU were conducted by the ADEQ.
  - TDS did not yet compile all the correction actions required by the ADEQ's May 24, 1989 letter (which resulted from the May 18, 1989 inspection).
- April 26, 1990:
  - An inspection of Plants 1 through 4 and the former TTU was conducted by the ADEQ.
  - Violations: 30 probable violations were reported, including improper hazardous waste management and paperwork violations, with 21 repeat violations. Improper hazardous waste management could have potentially resulted in release of hazardous waste to the environment. It is unknown if a release occurred due to these violations and where the potential release would have occurred.

- May 24, 1990:
  - An inspection of the facility boundaries and security at Plant 3 and the former TTU was conducted by the ADEQ.
  - Violations: Four probable violations were reported for inadequate security and warning signs. No indication of a probable release was provided.
- March 18, 1991:
  - An inspection of Plants 2 through 4 and the former TTU was conducted by the USEPA.
  - Violations: 14 probable violations were reported, including paperwork violations and failure to manage entry in the former TTU. No indication of a probable release was provided.
- December 4, 1991:
  - An inspection of Plants 2 through 4 and the former TTU was conducted by the ADEQ.
  - Violations: The ADEQ listed 16 items as "instructions to responsible parties" for TDS to follow up within 40 calendar days.
- August 18, 1992:
  - An inspection of Plants 2 through 4 and the BG was conducted by the USEPA.
  - Violations: Three probable violations were reported, including paperwork and construction violations.
- October 19-20, 1993:
  - An inspection of Plants 2 through 4 and 6, the BG, and the WBOs was conducted by the USEPA.
  - Field inspection to evaluate the facility as part of the RFA process pursuant to the completion and submissions of the 1992 Part B Application.

The 1994 RFA Report documents that as a part of a Consent Judgment between the ADEQ and TDS dated August 30, 1991, TDS was required to:

- Pay a penalty of $500,000 to the state of Arizona.
- Submit a revised Part B Permit Application for the former TTU within 120 days.
- Meet with the ADEQ to discuss the requirements of 40 Code of Federal Regulations (CFR), Pat 264, Subpart X within 30 days.
- Limit ammonium perchlorate and AN Class 1.3 propellant waste to 1,000 pounds per burn event and one burn event per day. SA propellant and other Class 1.3 propellant waste was limited to 100 pounds per burn event and three burn events per day.

Magnesium Teflon™ and other Class 1.1 propellant waste was limited to 25 pounds per burn event and one burn event per day.

- Notify the Salt River Project, the State Land Department, the SRPMIC, and the COM Fire Department of the time and location of each burn event, and the identity and quantity of the material being burned during each event.
- Install a 6-ft-tall chain-link fence with out-turned three-strand barbed wire that displays warning signs along its property lines north and west of the former TTU.
- Post at least two trained sentries with access to two-way communication or reliable signaling for all burn events to limit access.
- Create a written inspection schedule of the former TTU.
- Maintain a written operating record, as approved by the ADEQ.
- Submit an SAP for the former TTU within 60 days to determine and delineate the lateral and vertical extent of contamination at the former TTU.
- Implement the SAP only as approved by the ADEQ.
- Submit a plan to the ADEQ for hazardous waste removal within 30 days of the discovery of new hazardous waste at the TTU.
- Remove debris on the ground from the operation of the TTU within 90 days.
- Either remediate or remove all waste from the former TTU.
- Stop the operation of the bore-out pits and submit an SAP within 90 days.
- Submit a master document to the ADEQ to show the training of employees operating the former TTU.

Records provided by the ADEQ on July 20, 2021 indicate that a total of eight notice of violations have been issued by the ADEQ between 2004 and 2010. A description of the notice of violations and case closures dates are provided below:

- November 5, 2003 (five violations; Inspection ID #42312; Case #27696; Case closure date January 15, 2004):
  - Two violations pertaining to storage of hazardous waste without a permit exceeding the 90 days accumulation period without a permit exception;
  - Inadequate contingency plan;
  - Failure to provide a contingency plan to emergency response authorities;
  - Storage of a hazardous waste without a permit by failing to comply with accumulation exemption that required containers to be at or near the point of generation and under control of the process generating the waste.
- January 20, 2010 (three violations; Inspection ID #149800; Case #114305; Case Closure date January 20, 2010):

- Inadequate contingency plan;
- TDS, transporter, or generator failure to pay annual registration;
- Interim status failure to submit an Annual Report to the ADEQ.

The ADEQ also reported 22 notices of opportunity to correct (NOCs) dated between 2008 and 2021. The NOCs included minor requests for corrections, such as amendments to the contingency plan, open waste storage containers, discrepancies on hazardous waste records, etc. All NOC cases were closed according to ADEQ records.

7. SOLID WASTE MANAGEMENT UNITS AND AREAS OF CONCERN

Site visits were completed in 2021 as part of this CCR at Plants 1 through 4 to update the conditions of SWMUs and AOCs identified in the 1994 RFA and the updated 2017 RFA. Additional SWMUs were identified during a 2019 site visit, and the 2021 site visits completed as part of this CCR. A new AOC (AOC 17) was also identified in 2021. A summary of the information from the 1994 and 2017 RFAs, along with the observations and preliminary status of new SWMUs and AOC 17 identified in 2019 and 2021, is provided in Tables 2 through 8. These tables summarize: unit name, concern description, actions completed on SWMUs/AOCs to date, reference documents, operational status, and recommendations. The location of each SWMU and AOC is presented in Figures 8 through 14.

7.1 General Recommendations

In addition to SWMU and AOC-specific recommendations provided in Tables 2 through 8, identifying each Plant as a unique Operable Unit (OU) is recommended. Separating the Site into OUs will facilitate prioritization of Plants where information is readily available, that are at an advanced stage in the assessment process (e.g., the former TTU), and/or that may pose a higher risk to human health and the environment, while simultaneous research, data gathering, and investigation is conducted at OUs where the history of the Plant may be more ambiguous (e.g. Plant 1, and the former Plant 5/6). Designation of OUs is proposed as follows:

- OU1 – Plant 1;
- OU2 – Plant 2;
- OU3 – Plant 3 (Non-VRP related items) and the Desert Magazine Area;
- OU4 – Plant 4;
- OU5 – Plant 5/6; and,
- OU6 – DFR including the former TTU.

Submittal of a separate RFA report for each OU completed based on USEPA RFA Guidance is recommended. Each RFA report will include the following:

- The preliminary SWMU and AOC information obtained during VSIs conducted in 2019, and in 2021 as part of this CCR;
- A holistic description of operations of former and current lessees (e.g., TRW, Capstone, etc.) that includes current and historical locations, operational history, wastes and materials managed, an evaluation of COPCs and release potential;
- A review of the 1994 RFA recommendations based on current site knowledge;
- A succinct summary of available data, historical records, a summary of operations and previous interim actions that will support screening of SWMUs and AOCs from future

investigation, including those currently being completed at Plant 3 under the ADEQ VRP RI;

- An evaluation of potential releases of COPCs from historical and current SWMUs and AOCs, including 1,4,-dioxane where 1,1,1-TCA was utilized, PFAS, and sodium azide; and,
- An evaluation of septic tanks, cesspools and municipal sewer connections as potential release areas for each plant.

The RCRA Corrective Action process would then play out for each OU, as appropriate.

An additional general recommendation is to assure all hazardous waste containers are stored on secondary containment in accordance with 40 CFR 264.175.

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TABLES

Table 1: List of Documents Referenced in Section 4
Current Conditions Report
Nammo Defense Systems Inc., Mesa, Arizona

	Year	Document Title	Author	Internal Citation
Facility-Wide Documents				
Facility Wide	1994	RCRA Facility Assessment Report for Talley Defense Systems, Inc. Mesa, Arizona. (Plant 4); AZD982471096 (Plant 6); AZD020132502 (Burn Ground).	Science Applications International Corporation/Technology Services Company (SAIC/TSC)	SAIC/TSC, 1994
	1999	Solid Waste Management Unit (SWMU) Investigations	TDS	TDS, 1999
	2009	Perchlorate Source Investigation, Prepared for Nammo Talley, Inc., Mesa, Arizona.	Geosyntec Consultants, Inc.	Geosyntec, 2009a
	2017	RCRA Facility Investigation Report, Nammo Talley Thermal Treatment Unit, Mesa, Arizona.	Haley & Aldrich	H&A, 2017
Plant 3 and Former WBO Documents				
Plant 3/WBO	1991	Site Assessment Plan, Talley Defense Systems' Thermal Treatment Unit	Basin & Range	Basin & Range, 1991
	1997	Site Assessment Report, Talley Defense Systems' Water Bore-Out Pits.	Basin & Range	Basin & Range, 1997a
	2005	Soil Sampling Plan, Perchlorate Soil Sampling Activities, Prepared for Talley Defense Systems, Inc., Mesa, Arizona	Geomatrix Consultants, Inc.	Geomatrix, 2005
	2007	Draft Soil Investigation Report, Talley Defense System Plant #3, Former Water Bore-Out Pits, Mesa, Arizona	Brown and Caldwell	Brown and Caldwell, 2007
	2009	Status Update for Pre-Design Characterization Activities in Advance of a Pilot Test of In Situ Bioremediation for Perchlorate in Soils at the Former Water Bore-Out (WBO) Facility at Plant #3 at the Nammo Talley Site in Mesa, Arizona, Letter to Robert Blomberg, Environmental Quality Specialist, Nammo Talley, Inc., Mesa, Arizona	Geosyntec Consultants, Inc.	Geosyntec, 2009b
	2009	Title 18. Environmental Quality. Chapter 7 Department of Environmental Quality Remedial Action	ADEQ	ADEQ, 2009
	2010	Supplemental Perchlorate Source Investigation Plant #3, Nammo Talley Defense, Inc. Mesa Arizona	Geosyntec Consultants, Inc.	Geosyntec, 2010
	2012	EPA's Vapor Intrusion Database: Evaluation and Characterization of Attenuation Factors for Chlorinated Volatile Organic Compounds and Residential Buildings	United States Environmental Protection Agency (USEPA)	USEPA, 2012
	2013	Revised Perchlorate Source Area Remedial Action Work Plan, Plant No. 3, Nammo Talley, Inc. Mesa, Arizona	Geosyntec Consultants, Inc.	Geosyntec, 2013
	2016	Fluidized Bed Reactor Initial Performance Report, Nammo Talley, Inc., Plant No. 3, Mesa, Arizona	Geosyntec Consultants, Inc.	Geosyntec, 2016
	2018	Regional Screen Level Summary Table (TR=1E-06, HQ=1)	United States Environmental Protection Agency (USEPA)	USEPA, 2018
	2019	Phase I Capture Zone Evaluation Report, Nammo Talley, Inc. Plant No. 3, Mesa, Arizona	Geosyntec Consultants, Inc.	Geosyntec, 2019a
	2020	Soil Vapor VOC Source Area Investigation, Nammo Defense Systems, Inc., Plant No. 3, Mesa, Arizona	Geosyntec Consultants, Inc.	Geosyntec, 2020b
	2021	Conceptual Site Model, Nammo Defense Systems Inc. Facility, Mesa, Arizona	Geosyntec Consultants, Inc.	Geosyntec, 2021c
	2021	Remedial Investigation Work Plan Plant 3 and Former WBO Facility, Nammo Defense Systems Inc., Mesa, Arizona	Geosyntec Consultants, Inc.	Geosyntec, 2021d
Former TTU Documents				
	1987	Investigation of Metals in Soils, Talley Defense Systems, Inc.	TRC Environmental Consultants	TRC Environmental Consultants, 1986/1987
	1989	Collection of Soil Samples at Talley Defense Systems, Inc.	Sunshine Environmental Services	Sunshine Environmental Services, 1989
	1990	Results of Soil Sampling Conducted in the Burn Area on August 28, 1990, correspondence to Mr. Donovan Jones, Talley Defense Systems, Inc.	TRC Environmental Consultants, 1990a	TRC Environmental Consultants, 1990a
	1990	Results of Soil Sampling Conducted in the Vicinity of the Burn Boxes on August 28, 1990, correspondence to Mr. Donovan Jones, Talley Defense Systems, Inc.	TRC Environmental Consultants, 1990b	TRC Environmental Consultants, 1990a
	1991	Draft Site Assessment Plan, Talley Defense Systems' Water Bore-Out Pits, Prepared for Kimball & Curry, P.C., Phoenix, Arizona. December.	Basin & Range	Basin & Range, 1991
	1997	Site Assessment Report, Talley Defense Systems' Water Bore-Out Pits. December.	Basin & Range	Basin & Range, 1997a
	1997	Thermal Treatment Unit Assessment of Risks Associated with Adult Exposure to Lead in TTU Soils.	Basin & Range	Basin & Range, 1997b
	2000	Soil Investigation on Salt River Pima-Maricopa Indian Community lands Near Talley Defense Systems Burn Pits	Smith Consultants	Smith Consultants, 2000
	2003	Clean-up Action Plan for SRPMIC Land Near the Thermal Treatment Facility in Northeast Mesa	Talley	Talley, 2003
	2015	Site Characterization Interim Data Summary Report, Thermal Treatment Unit, Mesa, Arizona	Haley & Aldrich	Haley and Aldrich, 2015a
	2015	Contingency Plan for Exceeding Perchlorate Concentration Limits at the Primate Facility Well No. 2	Haley & Aldrich	Haley and Aldrich, 2015b
	2016	RCRA Facility Investigation Report, Nammo Talley Thermal Treatment Unit, Mesa, Arizona	Haley & Aldrich	Haley and Aldrich, 2016
	2020	Groundwater Investigation Report, Former Thermal Treatment Unit, Nammo Defense Systems, Inc.	Geosyntec Consultants, Inc.	Geosyntec, 2020d

Table 2: Plant 1 SWMUs
Current Conditions Report
Nammo Defense Systems Inc., Mesa, Arizona

SWMU/AOC	Unit Name	Concern Description	Actions Completed On SWMU/AOC to Date	Reference Documentation	Operational Status as of August 2017	Operational Status as of 2019	Operational Status as of 2021	Recommendation for Future Work
2017 Updated RCRA Facility Assessment								
BB	On-Site Evaporator	X-Ray process wastewater generated at Plants 2 and 3, plus the wastewater generated by the Plant 3 Testing department (and collected in 55 gallon drums) is collected by vacuum truck and transported to the evaporator for treatment. Sludge that accumulates in the evaporator is transferred to 55 gallon drums and sent to the main SAA building (Plant 2, Building 17) for storage and subsequent offsite disposal. The evaporator was not in operations at the time of the VSI. No evidence of a spill or release was observed.	None	NA	This evaporator (~1,400 gallons) has been moved to the southern side of the former WWT plant. It's now located in a graded concrete depression, which is not enclosed on two sides. An additional evaporator pan was added in April 2018 (~800 gallons) which processes AP propellant mop water generated at the various plants. No evidence of leaks or spills were present.	Note from Brad Anderer stating "Talk to Stuart on possible failure of original pan"	According to site personnel, the evaporator is no longer in service. However, two evaporator pans are in use in a graded concrete depression, which is only enclosed on two sides. One evaporator pan adjacent to the evaporator was observed to be full of ammonium perchlorate, ammonium nitrate, and pocal mop water. The other evaporation pan contained residue from x-ray wastewater generated at Plants 2 and 3. A drain was observed starting from a golf cart maintenance area and runs under the evaporator pans and into the adjacent former wastewater treatment plant, and appeared to be full of water. Approximately eight 275-gallon totes of mop and x-ray water were observed to be stored in the graded depression.	Evaluate the need for separate secondary containment units for the evaporator pans. Additionally, drain the fluid and visually inspect the pans to assess the condition of the drain and sump. Additional information and recommendations will be provided as part of a Plant 1 RFA Report.
New Preliminary SMUWs (2019 Site Visit by H&A)								
CA (Preliminary)	Blackstone and Rotofinish Wastewater Collection System	Three ~300 gallon poly toes are located on mezzanine and collect wastewater from the Blackstone jacket wash and rotofinish. Wastewater is piped to the evaporator below on the ground level. Wastes managed here include spent degreaser, lubricant, copper, bullet wash soap and lead.	None	1316		Brad Anderer response: Not Talley space. Leased by third party.	There were no observed changes to this SWMU. No evidence of spills or releases were observed.	Gather additional information and provide recommendations in a Plant 1 RFA Report.
CC (Preliminary)	Capstone Evaporator	Effluent from Blackstone and rotofinish wastewater collection system (SWMU CA) is piped to the evaporator located in an ~10' x 12' 3-walled room for processing. Sludge is collected into a nearby 55-gallon drum. The evaporator room has an ~4" concrete berm along the open wall for containment. Unit is located on concrete and there was no evidence of leaks or spills.	None	NA		Brad Anderer response: Not Talley space. Leased by third party.	There were no observed changes to this SWMU.	Gather additional information and provide recommendations in a Plant 1 RFA Report.
CD (Preliminary)	Lead Wastewater Recycling System	Lead wastewater recycling system consists of 2 225-gallon tanks and a filtration unit, each located on secondary containment inside a 3-walled ~10' x 12' room. System receives, filters, and recycles liquids used by the Lean Jet parts washers (SWMU CB). Filters are replaced periodically, and when lead concentrations exceed a set point, the entire volume is drained and shipped offsite as hazardous waste. No signs of leaks or spills were present.	None	NA		Brad Anderer response: Not Talley space. Leased by third party.	There were no observed changes to this SWMU. Lead-containing wastewater is shipped off-site as hazardous waste.	Gather additional information including details on whether secondary containments conform to the 40 CFR 264.175 standards and provide recommendations in a Plant 1 RFA Report.
CE (Preliminary)	Capstone Hazardous Waste SAA	Fenced-in, covered area (~20' x 25') with incomplete secondary containment houses the following: 1 55- gallon drum of spent Lean Jet lead filters 1 55-gallon drum of spent rotojet filters 1 55-gallon drum of spent aerosol cans 1 55-gallon drum of spent blackstone filters 1 carboard drum of universal waste	None	1317 - 1319		Brad Anderer response: Not Talley space. Leased by third party.	There were no observed changes to this SWMU. No evidence of spills or releases were observed.	Store drums on secondary containment pallets. Also, gather additional information and provide recommendations in a Plant 1 RFA Report.
CG (Preliminary)	Evaporator Effluent Overflow Staging Area	Three ~300 gallon totes staged outside of Capstone hazardous waste SAA and on secondary containment. (Totes were empty at time of VSI.) Staff stated that less than 1 gallon of liquid leaked onto asphalt below around late 2018 or early 2019. Some staining present, but no free liquid as time of discovery. Staff stated that a vacuum truck collecting evaporator effluent released approximately 50-gallons of fluid onto asphalt in September of 2018. No fluid entered any drainages, or contacted soil.	No action was taken as a result of the leak that occurred in late 2018 or early 2019. A sweeper truck was called out to clean the area the day following the September 2018 release.	None		Brad Anderer response: Not Talley space. Leased by third party.	There were no observed changes to this SWMU.	Sample the area around the reported spills to characterize the potential release of fluid. Also, gather additional information including details on whether secondary containments conform to the 40 CFR 264.175 standards and provide recommendations in a Plant 1 RFA Report.
CH (Preliminary)	Capstone Machine Shop	1 5-gallon oil/grease contaminated trash located on sealed concrete. No signs of spills or leaks were present.	None	1321		Brad Anderer response: Not Talley space. Leased by third party.	There were no observed changes to this SWMU. No evidence of spills or releases were observed.	Gather additional information and provide recommendations in a Plant 1 RFA Report.
CJ (Preliminary)	Building 50 (Nammo Tactical)	Building could not be accessed, but staff stated that one 5-gallon day can is used to store waste gunpowder.	None	NA		Brad Anderer response: Not Talley space. Leased by third party.	Building 50 contained one 5-gallon day can for waste gunpowder, one 55-gallon drum for solvent contaminated trash, one 55-gallon drum for solvent contaminated trash, one 55-gallon drum for waste gun powder, and one 55-gallon drum of compressor blowdown oily water. No evidence of spills or release were observed.	Additional information and recommendations will be provided as part of a Plant 1 RFA Report.
CK (Preliminary)	Building 50 (Nammo Tactical)	Building could not be accessed, but staff stated that one 55-gallon drum is used to store solvent contaminated trash.	None	NA		Brad Anderer response: Not Talley space. Leased by third party.	No observed changes to this SWMU. No signs of staining or spills were observed.	Gather additional information and provide recommendations in a Plant 1 RFA Report.
CL (Preliminary)	Building 50 (Nammo Tactical)	Building could not be accessed, but staff stated that one 55-gallon drum is used as a SAA for waste gunpowder.	None	NA		Brad Anderer response: Not Talley space. Leased by third party.	No observed changes to this SWMU. No signs of staining or spills were observed.	Gather additional information and provide recommendations in a Plant 1 RFA Report.
CM (Preliminary)	Building 50	1 55-gallon drum of compressor blowdown oily water was situated on concrete on north side of Building 50. No signs of spills or leaks were present	None	1323		Brad Anderer response: Not Talley space. Leased by third party.	SWMU is no longer present. No signs of staining were observed.	Gather additional information and provide recommendations in a Plant 1 RFA Report.
CN (Preliminary)	Lapua Rimfire Test Center (RTC)	Completely enclosed .22 rifle firing range. Spent bullets are periodically collected from this facility. Did not access for visual inspection.	None	NA		Brad Anderer response: Not Talley space. Leased by third party.	The Lapua Rimfire Test Center is an enclosed 0.22 rifle firing range. Spent bullets are periodically collected from this facility. No signs of staining or spilling were observed.	Gather additional information and provide recommendations in a Plant 1 RFA Report.

Table 2: Plant 1 SWMUs
Current Conditions Report
Nammo Defense Systems Inc., Mesa, Arizona

SWMU/AOC	Unit Name	Concern Description	Actions Completed On SWMU/AOC to Date	Reference Documentation	Operational Status as of August 2017	Operational Status as of 2019	Operational Status as of 2021	Recommendation for Future Work
CO (Preliminary)	Building 20 Maintenance Repair Shop	Formerly used by TRW to maintain fleet vehicles and equipment. Visible staining present within bays on concrete floors, and asphalt outside of overhead bay doors. No floor drains present. Building currently used for maintenance of golf carts. TRW operations historically involved sodium azide.	None	NA			Staining was observed from outside the building. Additionally, a drum of unknown fluid was observed outside the building.	Recommended identifying and labeling the drum, and sampling the SMWU for potential sodium azide contamination. Gather additional information and provide recommendations in a Plant 1 RFA Report.
CP (Preliminary)	Former TRW Wastewater Treatment Plant	This plant treated all process water, stormwater, and emergency plant discharges from all of the Plant 1 facilities, according to staff. Some of the influent was piped to the plant, while some was transported by vacuum truck. This plant is no longer operational, with process lines and tanks being plugged, capped, and/or disconnected. Entire plant is located in secondary containment and appeared to be in generally good condition. Standing water observed in several areas.	This SWMU ceased being used and piping in the SWMU was disconnected.	1330 - 1333		Brad Anderer response: Where was processed water discharged to? How were sludges and solids handled? In operation during TRW and have no idea how they ran the system. There is also no documentation showing that.	Observed a large pan of ammonium perchlorate, ammonium nitrate, and pocal mop water adjacent to the former TRW Wastewater Treatment Plant. An additional pan was observed to be full of residue from x-ray wastewater from plants 2 and 3. The pan sits above a drain which connects into the former TRW Wastewater Treatment Plant. The process piping still appears to be disconnected. The plant's secondary containment appeared to be in good condition. Standing water was observed in drains near the adjacent pan.	Identify the process which discharged water into the drains in the southwest corner of the SWMU and implement an alternative secondary containment, as the current containment collects water in a concrete vault located in the former wastewater treatment plant. Also, gather additional information including details on whether secondary containments conform to the 40 CFR 264.175 standards and provide recommendations in a Plant 1 RFA Report.
CQ (Preliminary)	Nammo Tactical Accuracy Test Center (ATC)	Completely enclosed up to .338 caliber rifle firing range. Spent bullets are periodically collected from this facility. Did not access for visual inspection.	None	None		Brad Anderer response: Not Talley space. Leased by third party.	No bullet storage was observed outside of the facility. Spent bullets are collected from this facility. Breaches in containment were not observed.	Gather additional information and provide recommendations in a Plant 1 RFA Report.
CR (Preliminary)	Building 2 Vault (V-2-C)	Former TRW below grade concrete vault. This was used until about April 2018 as an evaporation pan for AP propellant mop water generated at the various plants. Standing water present in vault at time of VSI.	Ceased being used.	1336			No standing water was observed in the below grade vault. Residue from historical operations appears to be present along the bottom of the vault. No evidence of a breach of containment was observed.	Recommended removing the residue and inspecting the vault integrity for a potential breach in containment. Gather additional information and provide recommendations in a Plant 1 RFA Report.
CS (Preliminary)	Building 2 Vault/Tank (Tank T-2-B)	Covered below grade vault with possible tank. This has been inactive since TRW left the site. It's not known if the vault/tank is empty of full or what kind of condition it's in. Potential contents could include sodium azide.	None	NA		Brad Anderer response: What did TRW use this vault for? Is there a tank? What kind of decommissioning was done? Water and Lead/Sodium Azide. No documentation or knowledge of fires or emergencies where the delug systems were used and water ran into the vaults. Brad has the decon procedures but is not sure of the decon of the outdoor vaults.	Attempted to, but did not observe, the covered below grade vault with possible tank.	Recommended uncovering and inspecting the below grade vault. Soil sampling may be warranted based on vault integrity and conditions. Gather additional information and provide recommendations in a Plant 1 RFA Report.
CT (Preliminary)	Building 2 Vault (Vault V-2-E)	Below grade concrete vault divided into two bays. Inactive since TRW left. Some standing water observed during VSI. Vault equipped with solar powered pump which discharges pumped fluid onto asphalt road adjacent to vault. Potential contents could include sodium azide.	None	NA			The vault did not appear to be active. Staff informed Geosyntec that after rainfalls, standing water can be observed for some time until it eventually evaporates. The solar powered pump did not appear to be connected.	Recommended confirming the pump is no longer connected and conducting sampling around the discharge location of the pump for potential release. Gather additional information and provide recommendations in a Plant 1 RFA Report.
CU (Preliminary)	Building 21 Vault/Tank 9(V-21-B, T-21-B)	Below grade vault with tank (~8'L x 5' diameter). This has been inactive since TRW left the site. Tank was likely used to contain emergency process fluids discharges according to NT staff, while vault was likely for retention of stormwater. Significant volume of standing water in vault as time of inspection. Potential contents could include sodium azide, ammonium nitrate, or ammonium perchlorate.	None	NA			The below grade vault with tank is still on-Site and inactive according to NDS staff. Process fluids likely were discharged into the tank, while the vault retained stormwater. A significant volume of standing water was visible in the vault during the inspection.	Recommended sampling the tank's contents, if any, and evaluating the vault for potential breaches in containment. Gather additional information and provide recommendations in a Plant 1 RFA Report.
CX (Preliminary)	Building 25 Vault (V-25-C)	Former TRW below grade concrete vault. Standing water present in vault at time of VSI. A storm drain running along Building 25 leads to the vault. Vault was backfilled in the months following the VSI. Potential contents could include sodium azide.	Vault was backfilled after the 1994 RFA	1341		Brad Anderer response: What did TRW use this vault for? What kind of decommissioning was done? Has been back filled and closed.	Vault is no longer visible from the surface. NDS staff were unsure of the vault's exact location.	Recommended locating closure documents, or sampling the location of the vault for potential releases if no documentation is available. Gather additional information and provide recommendations in a Plant 1 RFA Report.
CY (Preliminary)	Building 25 Vault	Covered below grade vault. This has been inactive since TRW left the site. It's not known if the vault is empty of full, its condition, or if it contains a tank or not. Potential contents could include sodium azide.	Ceased being used.	1342			The vault is still covered. NDS staff were unsure of the vault's condition, whether liquid is stored inside, and whether a storage tank is present in the vault.	Recommended uncovering and inspecting the vault. Soil sampling may be warranted based on vault integrity and conditions. Gather additional information and provide recommendations in a Plant 1 RFA Report.
DA (Preliminary)	Building 56 Vault V-56-A	Vault is below grade and covered with metal sheeting. It appears to receive process upset fluids piped from Building 56. Vault is approximately 5' x 40'. Concrete berms (approximately 6" tall) are present on 3 sides, though one edge of the vault is in close proximity to exposed soils. It's unknown what type or how much fluid may be present in the vault.	None	NA			No changes were observed to this SMWU.	Recommended uncovering and inspecting the vault. Soil sampling may be warranted based on vault integrity and conditions. Gather additional information and provide recommendations in a Plant 1 RFA Report.
DB (Preliminary)	Process fluid drainage line for Buildings 10, 11, 8, and 7	An approximately 3" steel pipe likely collected process upset fluids which ultimately drain to the containment basin at Building 7 (SWMU DR). The drainage line originates near Building 10. Pipe appears to have a concrete or metal channel beneath it which would serve to contain small leaks from the line. the channels appeared to be in good condition, though some stretched could not be inspected due to access or vegetation.	Ceased being used and was disconnected.	1582		Brad Anderer response: What types of wastes were handled in this line? Any known leaks or releases? Not process fluid drainage, collection system for storm water run off and deluge/sprinkler system if an emergency occurred.	This SMWU also connects to buildings 8 and 11 and is disconnected prior to reaching building 7. No evidence of a breach of containment was observed.	Gather additional information and provide recommendations in a Plant 1 RFA Report.
DC (Preliminary)	Magazine 10A	Used for storage of explosive products and AP and nitro-cellulose based propellants. Waste was reported to be stored in drums, boxes, crate, and/or DOT packaging. The inside of the magazine could not be inspected during the site visit. There were no signs of exterior spills or leaks.	No longer used to store waste	None		Brad Anderer response: No liquids stored in this magazine.	This SMWU continues to store explosive products and propellants. No evidence of spills or releases were observed.	Gather additional information and provide recommendations in a Plant 1 RFA Report.

Table 2: Plant 1 SWMUs
Current Conditions Report
Nammo Defense Systems Inc., Mesa, Arizona

SWMU/AOC	Unit Name	Concern Description	Actions Completed On SWMU/AOC to Date	Reference Documentation	Operational Status as of August 2017	Operational Status as of 2019	Operational Status as of 2021	Recommendation for Future Work
DD (Preliminary)	Building 2 Bay 0, Control Room	55-gallon cardboard drum of solvent contaminated trash located on linoleum floor on upper level of building. Removed at time to site visit.	Removed during 1994 RFA	None		Brad Anderer response: Not a typical storage area nor is this a process area for anything to do with solvent.	This SMWU was removed in 2017. No evidence of spills or releases were observed.	Gather additional information and provide recommendations in a Plant 1 RFA Report.
DE (Preliminary)	Building 2 Process Fluid Line	Piping located on the western side of Building 2 likely collected process upset fluids from Building 2 and stormwater. Lines were generally disconnected and located on soil. Some portions of the lines could not be inspected due to vegetation.	None	NA		Brad Anderer response: What types of wastes were handled in this line? Any known leaks or releases? Not process fluid drainage, collection system for storm water run off and deluge/sprinkler system if an emergency occurred.	No observed changes.	Gather additional information and provide recommendations in a Plant 1 RFA Report.
DF (Preliminary)	Mag 4 Drainage Vault	Below grade vault (~8'x 9') for collection of piped fluids from immediately in front of Magazine 4 and direct rainfall only. Standing water was present at the time of the site visit. Depth is unknown. No cracks in exposed concrete were observed. Potential contents could include stormwater runoff.	No apparent actions taken.	1593, 1594		Brad Anderer response: Why was a drainage line from magazine 4 necessary? Were there any known leaks or spills from Mag 4? This magazine was not used for waste. It was used for in process materials. The collection vaults for the buildings were not waste. All liquids were suspected to be processed through the waste water treatment plant at the time of operation.	No changes were observed to this SMWU. No evidence of containment breach was observed.	Gather additional information and provide recommendations in a Plant 1 RFA Report.
DG (Preliminary)	Magazine 5	Currently contains shipping cases only. Sign indicates it was formerly used for 1.4S explosive storage.	None	NA			Magazine 5 did not appear to be used for waste storage.	Gather additional information and provide recommendations in a Plant 1 RFA Report.
DH (Preliminary)	Building 9 Vault and Tank T-9A V-9A	Open top concrete vault (~11' x 11') and tank, predominantly below grade. The vault was dry with debris in the bottom at the time of the site visit. Vault appeared to be in good condition. No staining on the surrounding soil was observed. Potential contents could include sodium azide, ammonium nitrate, or ammonium perchlorate.	None	1595, 1596			No observed changes to this SMWU.	Recommended sampling the contents of the tank, if any. Soil sampling may be warranted based on tank integrity and conditions.
DJ (Preliminary)	Building 11	Could not access building. Stormwater and process fluid drainage channels present which drain to Building 7 vault via the Building 10 pipeline.	Ceased operation.	1598, 1600 - 1604			Stormwater and process fluid drainage channels present which drain to Building 7 vault via the Building 10 pipeline. The building itself has not been in use since TRW ceased operations at Plant 1. Some equipment was still present at the site from historic operations.	Recommended evaluating whether building material is impacted with sodium azide prior to any demolition work, if any were to be planned in the future. Gather additional information and provide recommendations in a Plant 1 RFA Report.
DK (Preliminary)	Magazine 11A	Pyrotechnic explosive waste stored in this magazine which contain aluminum, zinc, and magnesium. Inside of magazine could not be inspected during the site visit, but staff reported that waste is stored in boxes, 5-gallon buckets, or in 55-gallon drums. Some wastes must be stored in mineral oil for stability. No evidence of spills or leaks were observed from the exterior of the magazine.	Ceased being used for waste storage.	1605		Brad Anderer response: Ask Stuart about leaks/spills.	This SWMU could not be accessed during the site reconnaissance.	Recommended inspecting the magazine for waste storage and potential spills or releases. Gather additional information and provide recommendations in a Plant 1 RFA Report.
DL (Preliminary)	Building 6 Tank T-6-A	This tank may have formerly collected process fluids from the Building 6 laboratory area, where drain pipes were sticking up out of the center of the floor. No signs of staining was observed. Potential contents could include sodium azide.	Building 6 was shutdown, lab equipment removed, and piping capped	1608 - 1610			No observed changes to this SMWU.	Recommended sampling the contents of the tank, if any. Soil sampling may be warranted based on tank integrity and conditions. Gather additional information and provide recommendations in a Plant 1 RFA Report.
DN (Preliminary)	Former Building 6 Equipment Wash Area	TRW drawings identified an equipment wash area. The wash area was likely on concrete, but there are nearby soils and there is currently no drainage in the area. TRW operations historically involved sodium azide.	No apparent actions taken.	1612-1611		Brad Anderer Responses: What types of wastes might have been on the washed equipment? How was wash water handled? No way of knowing this information.	No signs of stained soil or concrete was observed around this SMWU.	Recommended conducting additional evaluation of the equipment wash area processes and to determine if environmental sampling is necessary. Gather additional information and provide recommendations in a Plant 1 RFA Report.
DO (Preliminary)	Building 8 Fume Scrubber Discharge Line	Discharge line from outdoor fume scrubber unit which supported sodium nitrite propellant grinding operations in Building 8 leads to drainage channel which ultimately drains to the Building 7 vault. Scrubber unit is fully contained by a combination of a concrete basin and a drainage channel.	Scrubber appears to have been removed.	1614-1618		Brad Anderer Responses: What types of propellants would have been used in Building 8? Sodium Nitrite How was contaminated water disposed of? Possible drained to the containment vaults and taken to waste water treatment.	Discharge line was still present at time of site visit.	Gather additional information and provide recommendations in a Plant 1 RFA Report.
DP (Preliminary)	Building 41 Former TRW Waste Management Building	Entire building is surrounded by drainage channels to capture stormwater and any spills or leaks. Building contains two large open bays with orange staining on walls and floors.	Building ceased being used when TRW left the site.	1628		Brad Anderer Responses: Any known spills or releases? None How was water managed when the vault and tank were full? Transported to WWT plant for treatment? Likely	No observed changes to this SMWU.	Recommended sampling building material for potential sodium azide contamination prior to conducting any demolition operations, if any are planned. Gather additional information and provide recommendations in a Plant 1 RFA Report.

Table 2: Plant 1 SWMUs
Current Conditions Report
Nammo Defense Systems Inc., Mesa, Arizona

SWMU/AOC	Unit Name	Concern Description	Actions Completed On SWMU/AOC to Date	Reference Documentation	Operational Status as of August 2017	Operational Status as of 2019	Operational Status as of 2021	Recommendation for Future Work
DR (Preliminary)	Building 7 Vault and Tank V-7-B T-7-B	Two vault units (~6'x12' and 20'x 30'), both with metal covers. The first smaller unit did not have signs, but its likely they are V-7-A and T-7-A. These are the most downgradient vaults that collect fluids from Buildings 10, 11, 8 and 7, with the larger of the two vaults being the final collection point. Both are partially above grade. Depth and both current and former contents are unknown. The larger vault and tank signs (V-7-B and T-7-B) indicated they are "sensitive" though its unclear what that means. Potential contents could include sodium azide from the buildings connected to the vaults.	No apparent actions taken.	1627		Brad Anderer response: Any known spills or releases? None How was water managed when the vault and tank were full? Transported to WWT plant for treatment? Likely	No observed changes to this SMWU.	Recommended uncovering the vaults, inspecting them, and sampling the contents of the storage tank, if any. Gather additional information and provide recommendations in a Plant 1 RFA Report.
DS (Preliminary)	Building 52 Vault V-52-A	Open top concrete vault (~10' x 15'). Some standing water present at time of site visit and some possible cracking observed on floor. This vault was installed after 1995 it appears as it's not on TRW's 1995 design drawings. Collects discharged from Building 52 and direct rainfall. It's unknown what Building 52 was used for. Potential contents could include sodium azide, ammonium nitrate, or ammonium perchlorate.	No apparent actions taken.	1628		Brad Anderer response: What was Building 52 used for? What types of wastes would have been discharged to the vault? Processing area. Any known spills or releases? None	No standing water was observed at the time of the site visit as the vault was covered. Otherwise, no changes were observed for this SMWU.	Recommended uncovering and inspecting the vault and sampling the contents, if any exist. Soil sampling may be warranted based on vault integrity and conditions. Additional information and recommendations will be provided as part of a Plant 1 RFA Report.
DT (Preliminary)	Building 24 Vault and Tank V-24-A T-24-A	Large predominantly below grade vault and tank. Vault was very full with standing water at the time of the inspection. Tank was disconnected and not in service, but designed to collected process fluids from Building 24 which is entirely surrounded by drainage channels for stormwater and process fluids. It's unknown if this building was ever brought online. No visible cracks or signs of staining in vicinity.	Piping to the tank appears to have been disconnected.	1630, 1631			No water was observed in the vault. Otherwise, no changes were observed for this SMWU.	Recommended sampling the contents of the tank, if any. Soil sampling may be warranted based on tank integrity and conditions. Gather additional information and provide recommendations in a Plant 1 RFA Report.
DU (Preliminary)	Building 24	3 scrubber units observed on concrete. It's unknown if these were ever in use and what they were used for.	Scrubber units appear to have been removed.	1629, 1632, 1633			These scrubber units were not observed during site visit.	Gather additional information and provide recommendations in a Plant 1 RFA Report.
DV (Preliminary)	Building 24 Vault and Tank V-24-B T-24-B	Large predominantly below grade vault and tank. Vault was very full with standing water at the time of the inspection. Tank was disconnected and not in service, but designed to collected process fluids from Building 24 which is entirely surrounded by drainage channels for stormwater and process fluids. It's unknown if this building was ever brought online. No visible cracks or signs of staining in vicinity. Adjacent soils.	Piping to the tank appears to have been disconnected.	1634		Brad Anderer response: Any known spills or releases? None How was water managed when the vault and tank were filled? Transported to WWT plant for treatment?	No water was observed in the vault. Otherwise, no changes were observed for this SMWU.	Recommended sampling the contents of the tank, if any. Soil sampling may be warranted based on tank integrity and conditions. Gather additional information and provide recommendations in a Plant 1 RFA Report.
New Preliminary SMUWs (2021 Site Visit by Geosyntec)								
GS1 (Preliminary)	Building 57 Tank	A mostly below grade tank was observed west of building 57. Its contents and intended use are unknown.	None	NA				Recommended sampling the tanks contents, if any. Soil sampling may be warranted based on vault integrity and conditions. Gather additional information and provide recommendations in a Plant 1 RFA Report.

Notes:

[1] Documented Releases: Records are available documenting release, or release can be assumed based on the presence of soil or groundwater contamination.

[2] Suspected Releases: This category includes facilities for which no quantitative samples are available, but release is suspected based on the nature and frequency of hazardous material operations and presence of staining or other indicators of possible release.

[3] Release Potential: Release potential from hazardous material operations to each media.

[4] Recommendations for RCRA Facility Investigation (RFI): In the RFI the facility responsible for establishing the extent of on-site and off-site contamination. This category attempts to prioritize the need for further action and presents recommendations for further action to be conducted in the RFI.

[5] Current in 1994

A - release to air

GW - release to groundwater

S - release to soil

Sources:

H&A. 2017a. Report on Updated RCRA Facility Assessment, Nammo Talley, Inc. Mesa Arizona. September.

SAIC/TSC. 1994. RCRA Facility Assessment Report for Talley Defense Systems, Inc. Mesa, Arizona. EPA I.D. NOS.: AZD980816276 (Plant 2); AZD980885362 (Plant 3); ASD982361347 (Plant 4); AZD982471096 (Plant 6); AZD020132502 (Burn Ground). April.

Table 3: Plant 2 SWMUs
Current Conditions Report
Nammo Defense Systems Inc., Mesa, Arizona

SWMU/AOC	Unit Name	Concern Description	Actions Completed On SWMU/AOC to Date	Reference Documentation	Operational Status as of August 2017	Operational Status as of 2019	Operational Status as of 2021	Recommendation for Future Work
1994 RCRA Facility Assessment								
SWMU 1-4	Plant 2 - SAAs/HWAA - Main Bldg.	SWMU 1: Paint Booth SAA SWMU2: Blast Residue SAA (drum between bays 44 and 45) SWMU 3: Area 29 SAA (waste AN propellant in concrete hallway in front of bays 25,27, and 29) SWMU 4: Former Glue Table SAA (north of bay 47)	None	SAIC's Summary and Recommendations for RCRA Facility Assessment Report did not recommend a RFI or any interim measures for this SWMU (SAIC, 1994).	SWMU's 1-3 appear to be active. A 55 gallon drum situated on the concrete floor and containing paint contaminated trash (SWMU #1) appeared to have moisture and rust around its base. No indication of spills or releases from SWMU 2 or 3. SWMU 4 could not be located and was listed as a former SWMU at the time of the 1994 RFA report.		SMWU 1: Still active. A 55-gallon drum of chromium contaminated trash was observed in the paint room. SMWU 2: The blast residue drum between bays 44 and 45 was no longer present. However, drums of waste propellant, ammonium perchlorate contaminated trash, and solvent contaminated trash were observed throughout building 1. Day cans for solvent contaminated trash were observed in the main assembly and packing room. SMWU 3: The waste ammonium nitrate propellant drum was not observed during Geosyntec's site visit. SMWU 4: The former glue table was reported as a former SWMU at the time of the 1994 RFA report, and was not located during the site reconnaissance. No evidence of spills or release was observed for these SWMUs.	No recommendations for these SWMUs.
SWMU 5	North Hold SAA Plant 2	5' X 15' concrete pad located to the north of the northeast corner of the main building (liquid and solid waste AA)	Drums were removed from this collection area and placed in Bldg. 20 which now has secondary containment. (See photos.)	TDS SWMU Letter to ADEQ (TDS, 1999c); ADEQ Meeting Notes (ADEQ, 2000)	Could not be located, and presumably no longer exists.		Geosyntec could not locate this concrete pad. It is assumed that this concrete pad no longer exists or has been repurposed.	Gather additional information including details on whether secondary containments conform to the 40 CFR 264.175 standards and provide recommendations in a Plant 2 RFA Report.
SWMU 6	Former 1,1,1-TCA SAA Plant 2	SAA for waste 1,1,1-TCA (1 drum) located northeast of bays 25 and 27 on a pallet	Appears to have been removed.	SAIC's Summary and Recommendations for RCRA Facility Assessment Report did not recommend a RFI or any interim measures for this SWMU (SAIC, 1994).	Could not be located, and presumably no longer exists.		Geosyntec could not locate this SMWU, and it is assumed to no longer exist.	Gather additional information and provide recommendations in a Plant 2 RFA Report.
SWMU 7	East Hold HWAA Plant 2	Drums on 40' x 40' concrete pad located outside and to the northeast of bays 30 and 33.	None	SAIC's Summary and Recommendations for RCRA Facility Assessment Report did not recommend a RFI or any interim measures for this SWMU (SAIC, 1994).	Appears to be active, with 4 bins containing explosive waste, flammable solids, and propellant waste. No signs of spills or leaks.		This SWMU is still active. It contained 5 bins of waste ammonium nitrate propellant, miscellaneous explosive items, waste igniters, and M7 propellant. No observed signs of spills or staining.	Gather additional information and provide recommendations in a Plant 2 RFA Report.
SWMU 8	HWAA Bldg. 20 Plant 2	Concrete pad (18' x18') with sheet metal roof located outside and to the southeast of the main building for storage of drums	TDS had secondary containment berms constructed around the unit and hired a consultant to take soil samples around the units' concrete pad. A sampling report was provided.	TDS SWMU Letter to ADEQ (TDS, 1999c); ADEQ NFA Letter (ADEQ, 2001).	Appears to be active with several drums containing flammable liquids situated on concrete. No signs of spills or leaks.		This SWMU is still active. It contains many drums and buckets of flammable liquids, primarily used oil and alcohols. There appeared to be a few small stains in the secondary containment. No cracks were observed in the secondary containment.	Eevaluate existing investigation results, gather additional information including details on whether secondary containments conform to the 40 CFR 264.175 standards and provide recommendations in a Plant 2 RFA Report.

Table 3: Plant 2 SWMUs
Current Conditions Report
Nammo Defense Systems Inc., Mesa, Arizona

SWMU/AOC	Unit Name	Concern Description	Actions Completed On SWMU/AOC to Date	Reference Documentation	Operational Status as of August 2017	Operational Status as of 2019	Operational Status as of 2021	Recommendation for Future Work
SWMU 9	HWAA Ignitor Bldg. Plant	Outdoor concrete pad (8' x12') located to the north of the ignitor building (solid waste only)	None	SAIC's Summary and Recommendations for RCRA Facility Assessment Report did not recommend a RFI or any interim measures for this SWMU (SAIC, 1994).	Appears to be active with 3 bins containing solid propellant waste. No signs of spills or leaks.		This SWMU appeared to be active with 1 bin containing solid propellant waste. No evidence of spills or releases were observed.	Eevaluate existing investigation results, gather additional information and provide recommendations in a Plant 2 RFA Report.
SWMU 10	Water Bore-Out Ops. At Plant 2	WBO Concrete pad (30' x 30')	None	SAIC's Summary and Recommendations for RCRA Facility Assessment Report did not recommend a RFI or any interim measures for this SWMU (SAIC, 1994).	Active. Bore out operations are conducted on a bermed concrete pad with a sheet metal roof. Wastewater is collected in an above ground tank near the bore out operations. Approximately 1/2 inch of standing water was observed on an unoccupied portion of the concrete pad. Talley stated that the portion of the pad with standing water had recently been cleared so that new equipment could be installed there. Additionally, three drums of propellant water were stored outside Water Bore out Building 13 on concrete. No signs of spills or leaks were observed.		This SWMU is still active. No standing water was observed on the pad. Unlabeled 275-gallon totes are stored next to the WBO within the secondary containment pad. Staff stated that the water boreout process has caused chunks of solid ammonium perchlorate to shoot out of the secondary containment.	Iidentify and labele the storage totes, as well as sample the area east of the WBO for potential contamination in soil. Gather additional information including details on whether secondary containments conform to the 40 CFR 264.175 standards and provide recommendations in a Plant 2 RFA Report.
2017 Updated RCRA Facility Assessment								
A	Plant 2, Building 1, Bay 45	Approximately (16) 55-gallon drums of various types of primarily liquid wastes (waste paint, waste solvent, bomb rack and rotary wash water, irridite acid water) were stored in Bay 45 on the concrete floor near the paint booth. No evidence of a spill or release was observed.	Drums appear to have been removed and the SWMU inactive.	None			Did not observe the 16 drums observed in bay 45 during the 2017 RFA. This SWMU does not appear active. No evidence of spills or releases were observed.	No recommendations for this SWMU.
B	Plant 2, Building 1	Cardboard drum of solid propellant waste located inside Plant 2 in the hallway near Bays 25, 27, and 29, situated on concrete. No evidence of a spill or release was observed.	None	NA			There was no longer cardboard drums of solid propellant waste. The drums appeared to be replaced with metal drums storing propellant waste, ammonium perchlorate contaminated trash, ammonium nitrate contaminated trash, and solvent contaminated trash throughout the hallways in building 1. No evidence of spills or releases were observed.	No recommendations for this SWMU.
C	Plant 2, Building 1	Solvent contaminated trash stored in a 55-gallon drum on concrete within the main working area of Plant 2. Drum approximately equilateral to bays 31 and 41. No evidence of a spill or release was observed.	None	None			This SWMU appears to still be active, as the 55-gallon drum, along with a few 5-gallon day cans, was observed in the main working area storing solvent contaminated waste. No evidence of spills or releases were observed.	No recommendations for this SWMU.
D	Plant 2 , Building 1 X-Ray Process Wastewater Tank	Large x-ray process wastewater tank located outside of Plant 2, in covered area. Tank was situated on the concrete within a bermed area approximately 13' x 8'. No evidence of a spill or release was observed.	None	NA			This SWMU appears to still be active, and no evidence of a spill or release was observed.	Gather additional information and provide recommendations in a Plant 2 RFA Report.
E	Plant 2, Building 1 Compressor Blowdown Oily Water	A 55-gallon drum located on the east side of building 1 in the covered area contained compressor blowdown oily water. The drum was situated on concrete. No evidence of a spill or release was observed.	None	NA			This SWMU appears to still be active and no evidence of a spill or release was observed.	No recommendations for this SWMU.

SWMU/AOC	Unit Name	Concern Description	Actions Completed On SWMU/AOC to Date	Reference Documentation	Operational Status as of August 2017	Operational Status as of 2019	Operational Status as of 2021	Recommendation for Future Work
F	Plant 2 Ignitor Building 6	Solvent contaminated trash and propellant trash stored in two 55-gallon drums on concrete on the west side of Ignitor Building 6. No evidence of a spill or release was observed.	Ceased being used.	None			This SMWU no longer appears to be active. No evidence of spills or releases were observed.	No recommendations for this SWMU.
G	Plant 2 Ignitor Building 6	Propellant waste generated from ignitor building 6 is piped to two metal tanks (~80-gallon capacity) situated on secondary containment located outside on the north side of the building. No evidence of a spill or release was observed.	Ceased being used.	None			This SMWU no longer appears to be active. No evidence of spills or releases were observed.	Gather additional information including details on whether secondary containments conform to the 40 CFR 264.175 standards and provide recommendations in a Plant 2 RFA Report.
H	Plant 2 Ignitor Building 6	Propellant waste generated within ignitor building 6 is piped to six metal tanks (~50-gallon capacity each) located outside on the east side of the building. Five tanks were situated on secondary containment, and one was on a pallet. It is unclear how tank levels are monitored. No evidence of a spill or release was observed.	None	NA			This SMWU is still active. All six metal tanks are on secondary containment. Building 6 generates explosive product and propellant waste. No evidence of spills or releases were observed.	Gather additional information including details on whether secondary containments conform to the 40 CFR 264.175 standards and provide recommendations in a Plant 2 RFA Report.
I	Plant 2 Building 17 Main Accumulation Area	Building 17 is a sheet metal building approximately 20' x 40' that was repurposed in late 2016 or early 2017 to be the main accumulation area for wastes generated from Plants 2, 3, and 4 that must be shipped offsite for disposal. A concrete berm runs across the center of the concrete floor, separating the two halves of the building. Drums of waste were stored on one side, and empty drums, buckets etc. were on the other side. At the time of the VSI, less than a dozen drums of waste were stored within the building. No evidence of a spill or release was observed.	None	NA			This SMWU is still active. Over two dozen drums and buckets of waste were stored within the building on one side. On the other side, empty drums, buckets, and storage containers were stored. No evidence of spills or releases were observed.	Gather additional information and provide recommendations in a Plant 2 RFA Report.
New Preliminary SMUWs (2019 Site Visit by H&A)								
BT (Preliminary)	IRA Treatment System	The IRA treatment system is used to remove perchlorate and VOCs from groundwater extracted from the TTU wells. Extracted groundwater is transported by vacuum truck to the treatment system which is located within a concrete containment area. The containment area appeared to be in good condition and no evidence of leaks or spills beyond the containment are were observed at the time of the VSI.	None	1305, 1306		Brad Anderer response: Any releases beyond the concrete containment? None, must confirm with Haley and Aldrich who constructed and maintained initially.	This SMWU is still in use. There is potential for, but no evidence observed of, leaks or spills beyond the containment area.	Gather additional information and provide recommendations in a Plant 2 RFA Report.
BU (Preliminary)	Eastern Stormwater Drainage	This drainage area begins immediately northwest of the IRA treatment system and WBO operations area and was well vegetated at the time of the VSI. The area is graded such that a release from either the IRA treatment system or WBO operations which breeches the secondary containment of the process areas would likely be directed to the eastern stormwater drainage identified by Geosyntec's 2009 report. However, site staff indicated that they were not aware of any releases which have breached the secondary containment in which the IRA treatment system and WBO operations are situated in.	None	1307, 1308		Brad Anderer response: Has waste been managed outside the eastern or southern sides of Building 1 historically? If so, what types, and during what time period? Never	Observations indicated no changes in this SMWU from Geosyntec's 2009 report.	Gather additional information including details on whether secondary containments conform to the 40 CFR 264.175 standards and provide recommendations in a Plant 2 RFA Report.
BV (Preliminary)	Lower Building #6	The SWMUs present in this area were previously captured in the 1994 RFA and 2017 RFA update (SWMUs 9, F, G, and H). No additional SWMUs were identified.	See above	See above			These SMWUs are addressed above.	Gather additional information and provide recommendations in a Plant 2 RFA Report.

Table 3: Plant 2 SWMUs
Current Conditions Report
Nammo Defense Systems Inc., Mesa, Arizona

SWMU/AOC	Unit Name	Concern Description	Actions Completed On SWMU/AOC to Date	Reference Documentation	Operational Status as of August 2017	Operational Status as of 2019	Operational Status as of 2021	Recommendation for Future Work
BW (Preliminary)	Waste propellant storage pad #1	This waste storage propellant pad does not currently exist. A small, vacant concrete pad was identified adjacent to the Building 1 pavement which was presumed to be the former site of the waste storage pad.	None	1311		Brad Anderer response: When was this waste storage pad operational? When was is removed? There is only one fenced area in which we stored waste propellant in grey totes. Still exists. Concrete pad east of the south half of Bldg. 1.	This SMWU does not appear to be active. No evidence of spills or releases were observed.	Gather additional information and provide recommendations in a Plant 2 RFA Report.
BX (Preliminary)	Western Stormwater Retention Basin	This stormwater retention basin identified by Geosyntec's 2009 report still exists and was well vegetated at the time of the VSI. A gradient exists from Building 1 towards the retention basin, but no wastes were observed to be managed outside of the building which could potentially impact stormwater runoff directed towards the basin.	None	1313, 1314		Brad Anderer response: Have any known spills or releases occurred in this area? None	Observations indicated no changes in this SMWU from Geosyntec's 2009 report.	Gather additional information and provide recommendations in a Plant 2 RFA Report.

Notes:

[1] Documented Releases: Records are available documenting release, or release can be assumed based on the presence of soil or groundwater contamination.

[2] Suspected Releases: This category includes facilities for which no quantitative samples are available, but release is suspected based on the nature and frequency of hazardous material operations and presence of staining or other indicators of possible release.

[3] Release Potential: Release potential from hazardous material operations to each media.

[4] Recommendations for RCRA Facility Investigation (RFI): In the RFI the facility responsible for establishing the extent of on-site and off-site contamination. This category attempts to prioritize the need for further action and presents recommendations for further action to be conducted in the RFI.

[5] Current in 1994

A - release to air

GW - release to groundwater

S - release to soil

Sources:

ADEQ. 2000. July 5, 2000 Meeting Agenda for TDS & ADEQ. July 5.

ADEQ. 2001. Talley Defense Systems (Talley), Inc., EPA ID No AZD980814479. (1) Plant #1 – TCA Tank Closure – Sampling Plan and Results – December 18. 1998. (2) Plant #3 – Abandon Area/TTU/Smoke Tunnel Closure – Sampling Plan and Results Report – January 6, 1999. (3) Plant #3 – Thermal Grenade Pit Closure – Sampling Plan and Results Report – December 21, 1998. (4) Plant #2 – SWMU#8 – HWAA Bldg. 20. Solvent Pad – Sampling and Results Report – January 8, 1999. December 17.

Geosyntec. 2009a. Perchlorate Source Investigation, Prepared for Nammo Talley, Inc., Mesa, Arizona. June.

H&A. 2017a. Report on Updated RCRA Facility Assessment, Nammo Talley, Inc. Mesa Arizona. September.

SAIC/TSC. 1994. RCRA Facility Assessment Report for Talley Defense Systems, Inc. Mesa, Arizona. EPA I.D. NOS.: AZD980816276 (Plant 2); AZD980885362 (Plant 3); ASD982361347 (Plant 4); AZD982471096 (Plant 6); AZD020132502 (Burn Ground). April.

TDS. 1999c. Solid Waste Management Unit (SWMU) Investigations, January 12.

Table 4: Plant 3 SWMUs
Current Conditions Report
Nammo Defense Systems Inc., Mesa, Arizona

SWMU/AOC	Unit Name	Concern Description	Actions Completed On SWMU/AOC to Date	Reference Documentation	Operational Status as of August 2017	Operational Status as of 2019	Operational Status as of 2021	Recommendation for Future Work
1994 RCRA Facility Assessment								
SWMU 11 - 18	SAAs Line 1- Plant 3	SWMU 11: Maintenance bay, indoor (Solvents, TCA, TCE) SWMU 12: Bay 2, outdoor on concrete (Solvent contaminated trash) SWMU 13: Bay 5 hallway, indoor (x-ray systems cleaner) SWMU 14: Hallway between bays 8 &9, indoor SWMU 15: Bay 13, outdoor on concrete (nonhalogenated solvent) SWMU 16: Hallway EE, northeast end, indoor (solvent contaminated trash) SWMU 17: Bay 16, outdoor on concrete (halogenated and non-halogenated solvents) SWMU 18: North end of line 1, outdoor on concrete (sand blast residue)	SWMUs 11-15 appear to have ceased being used.	SAIC's Summary and Recommendations for RCRA Facility Assessment Report did not recommend a RFI or any interim measures for this SWMU (SAIC, 1994b).	SWMUs 11 and 18 appear to be active. No signs of leaks or spills were observed. Other listed SWMUs could not be located and presumably no longer exist. SWMU 11: Two 55-gallon drums containing solvent contaminated trash were situated on concrete in maintenance bay BB, along with approximately 7 5-gallon solvent contaminated trash day cans situated on concrete, and a 1-gallon solvent waste container located on a bench. Two flammable cabinets are also located in the maintenance bay and contain a variety of alcohols, solvents, epoxies, and primers. SWMU 18: A 55 gallon-drum of sand blaster waste was located outside of Bay 18A (on the northern end of the Line 1 building) and situated on concrete.		SWMU 11: Geosyntec did not observe solvents, TCA, or TCE stored in the maintenance bay. This SWMU is currently being investigated for potential VOC releases as part of the Plant 3 RI (Geosyntec, 2021d) described in Section 4.2.11 of this CCR. SWMU 12: This SWMU was not observed in 2017 nor in this site reconnaissance. This SWMU is currently being investigated for potential VOC releases as part of the Plant 3 RI (Geosyntec, 2021d) described in Section 4.2.11 of this CCR. SWMU 13: Geosyntec observed SWMU 13 in hallway CE. SWMU 14: Geosyntec did not locate SWMU 14, and notes that it was not found in the 2017 RFA. SWMU 15: At the time of the site reconnaissance, a drum of nonhalogenated solvent outside bay 13 was not observed, nor was it observed in the 2017 RFA. SWMU 16: This SWMU is still active, and contains one drum of propellant trash. SWMU 17: Geosyntec could not access bay 16 waste drums due to an active mixing process during the site reconnaissance. Site personnel informed Geosyntec that drums located in bay 16 contained solvent contaminated trash. This SWMU is currently being investigated for potential VOC releases as part of the Plant 3 RI (Geosyntec, 2021d) described in Section 4.2.11 of this CCR. SWMU 18: The 55-gallon drum of sand blaster waste was no longer located outside Bay 18A.	Include a summary of SWMU specific information and data collected for perchlorate and VOCs as part of the Plant 3 RI in a proposed Plant 3 RFA Report. Assess and evaluate additional potential contaminants of concern as part of the RFA.
SWMU 19	HWAA Line 1 - Plant 3 (ERM)	Extended range munitions (ERM)/research hold HWAA located southeast of bay 8. Referred to as reactive waste AA, building 35. This is a sheet metal structure open on one side with a concrete pad (20' x 12')	None	SAIC's Summary and Recommendations for RCRA Facility Assessment Report did not recommend a RFI or any interim measures for this SWMU (SAIC, 1994b).	Appears to be active with 3 bins and 3 55-gallon drums containing propellant waste and M-7 waste. Talley personnel stated that this area accumulates waste generated from the Line 1 building. No details could be provided regarding the nature or composition of the M-7 waste. This pad is located outside of Bay 8A. No signs of leaks or spills were observed.		This SWMU is still active and contained three bins and one 55-gallon drum of explosive waste. The SWMU consists of a fenced concrete pad with a small structure. No secondary containment was observed. The structure is labelled as building 35.	Include a summary of SWMU specific information and data collected for perchlorate and VOCs as part of the Plant 3 RI in a proposed Plant 3 RFA Report. Assess and evaluate additional potential contaminants of concern and issues such as the need for secondary containment as part of the RFA.

Table 4: Plant 3 SWMUs
Current Conditions Report
Nammo Defense Systems Inc., Mesa, Arizona

SWMU/AOC	Unit Name	Concern Description	Actions Completed On SWMU/AOC to Date	Reference Documentation	Operational Status as of August 2017	Operational Status as of 2019	Operational Status as of 2021	Recommendation for Future Work
SWMU 20	SAA Line 1 - Plant 3 (ERM)	SAA for more than 55 gallons of waste just south of SWMU 19 is a concrete pad (15' x 20')	None	SAIC's Summary and Recommendations for RCRA Facility Assessment Report did not recommend a RFI or any interim measures for this SWMU (SAIC, 1994b).	Appears to be active with 3 empty 55-gallon drums stored within a smaller fenced in area (4' x 6') situated on the concrete pad. No signs of leaks or spills were observed.	This SWMU should be expanded to include one 55-gallon drum of solvent waste within an enclosed metal unit located adjacent to the fenced in area. It does not appear to be used often, and no signs of spills or leaks were observed.	This SWMU is still active, containing a 55-gallon drum of solvent waste within the enclosed metal unit. No waste drums were observed on the concrete pad adjacent to the metal unit. No signs of spills or leaks were observed.	Include a summary of SWMU specific information and data collected for perchlorate and VOCs as part of the Plant 3 RI in a proposed Plant 3 RFA Report. Assess and evaluate additional potential contaminants of concern as part of the RFA.
SWMU 21 - 30	SAAs Line 2 - Plant 3	SWMU 21: North of bay 47, indoor (waste propellant and solvent) SWMU 22: Bay 45, indoor (Solvent contaminated trash) SWMU 23: VE, paint booth, indoor (paint contaminated trash) SWMU 24: Northwest of bay 36, indoor (solvent contaminated trash) SWMU 25: Northwest of bay 36, indoor (waste solvent) SWMU 26: Bay 25, outdoor (solvent contaminated trash) SWMU 27: Bay 16, outdoor (halogenated and non-halogenated solvents) SWMU 28: Bay 22, outdoor (waste propellant) SWMU 29: South end Line 2, indoor (waste NaN3, propellant and liners) SWMU 30: South of Model T press, outdoor (Cr contaminated wastewater)	SWMUs 21-22, 24-25, and 27-30 appear to have ceased being used.	SAIC's Summary and Recommendations for RCRA Facility Assessment Report did not recommend a RFI or any interim measures for this SWMU (SAIC, 1994b).	SWMUs 21 - 22 and 24 - 30 could not be located and presumably no longer exist. The indoor paint booth bay (SWMU 23) could not be accessed for inspection due to active painting operations requiring the use of a respirator.		SWMU 21: This SWMU was not located during the site reconnaissance. SWMU 22: This SWMU was not located during the site reconnaissance. SWMU 23: The paint booth is still active. Paint contaminated trash and ammonium perchlorate impacted mop water were located in 55-gallon drums on secondary containment outside the paint booth. No signs of spills or releases were observed. SWMU 24: This SWMU was not located during the site reconnaissance. SWMU 25: This SWMU was not located during the site reconnaissance. SWMU 26: This SWMU is no longer located outside bay 25. However, a 55-gallon drum of propellant trash was observed inside bay 25. No signs of spills or releases were observed. SWMU 27: This SWMU was not located during the site reconnaissance. SWMU 28: Geosyntec did not locate this SWMU during the site reconnaissance. SWMU 29: Geosyntec did observe waste ammonium nitrate propellent waste at this location. No signs of spills or releases were observed. SWMU 30: Geosyntec was unable to locate this SWMU during the site reconnaissance.	SWMUs 24, 25, 26, and 27 are currently being investigated for potential VOCs releases as part of the Plant 3 RI (Geosyntec, 2021d) described in Section 4.2.11 of this CCR. Include a summary of SWMU specific information and data collected for perchlorate and VOCs as part of the Plant 3 RI in a proposed Plant 3 RFA Report. Assess and evaluate additional potential contaminants of concern and the need for secondary containment as part of the RFA.
SWMU 31	HWAA Line 2	Line 2 hold area HWAA located north and west of bays 32-35 in Line 2. Waste propellant is stored in drums on concrete pad (8' x 20')		SAIC's Summary and Recommendations for RCRA Facility Assessment Report did not recommend a RFI or any interim measures for this SWMU (SAIC, 1994b).	No longer exists. No waste is managed or stored here. No signs of spills or leaks observed. Rolling metal carts are present within fenced area.		This SWMU is no longer in use. Waste is no longer managed or stored at this location. No signs of spills or releases were observed.	Include a summary of SWMU specific information and data collected for perchlorate and VOCs as part of the Plant 3 RI in a proposed Plant 3 RFA Report. Assess and evaluate additional potential contaminants of concern as part of the RFA.
SWMU 32	SAA Test Office	SAA on patio of Test Department located between Lines 1 and 2, at the northern end. Solvent contaminated trash managed here on a concrete floor.		SAIC's Summary and Recommendations for RCRA Facility Assessment Report did not recommend a RFI or any interim measures for this SWMU (SAIC, 1994b).	No longer exists. No waste is managed or stored here. No signs of spills or leaks observed.		This SWMU is no longer in use. Waste is no longer managed or stored at this location. No signs of spills or releases were observed. This SWMU is currently being investigated for potential VOCs releases as part of the Plant 3 RI (Geosyntec, 2021d) described in Section 4.2.11 of this CCR.	Include a summary of SWMU specific information and data collected for perchlorate and VOCs as part of the Plant 3 RI in a proposed Plant 3 RFA Report. Assess and evaluate additional potential contaminants of concern as part of the RFA.
SWMU 33	HWAA Bldg. 28	Drums on a concrete pad (15' x 25') located near building 28. Wastes are generated from Plant 3.	TDS had secondary containment berms constructed around the unit.	TDS SWMU Letter to ADEQ (TDS, 1999c); ADEQ Meeting Notes (ADEQ, 2000)	No longer exists. No waste is managed or stored here. No signs of spills or leaks observed.		Waste is no longer stored or managed at this location. No signs of spills or leaks were observed at this location. This SWMU is currently being investigated for potential VOCs releases as part of the Plant 3 RI (Geosyntec, 2021d) described in Section 4.2.11 of this CCR.	Include a summary of SWMU specific information and data collected for perchlorate and VOCs as part of the Plant 3 RI in a proposed Plant 3 RFA Report. Assess and evaluate additional potential contaminants of concern and the need for secondary containment as part of the RFA.
SWMU 34	HWAA Bldg. 10	HWAA located on a concrete floor (12' x 12') near building 10. TDS refers to this area of Plant 3 as the Roland Area and to this HWAA as the "snake pit."	None	SAIC's Summary and Recommendations for RCRA Facility Assessment Report did not recommend a RFI or any interim measures for this SWMU (SAIC, 1994b).	Appears to be active with one bin for hazardous waste stored in the fenced in concrete pad. The specific type of hazardous waste could not be identified from the bin markings. No signs of spills or leaks observed.		A fenced area on a concrete pad was devoid of waste. Posted signage indicates the area is used for storing hazardous waste. Site personnel indicated the location is used for storing explosive or propellent waste when the BDM department generates it. No signs of spills or releases were observed. This SWMU is currently being investigated for potential VOCs releases as part of the Plant 3 RI (Geosyntec, 2021d) described in Section 4.2.11 of this CCR.	Include a summary of SWMU specific information and data collected for perchlorate and VOCs as part of the Plant 3 RI in a proposed Plant 3 RFA Report. Assess and evaluate additional potential contaminants of concern as part of the RFA.

SWMU/AOC	Unit Name	Concern Description	Actions Completed On SWMU/AOC to Date	Reference Documentation	Operational Status as of August 2017	Operational Status as of 2019	Operational Status as of 2021	Recommendation for Future Work
SWMU 35 - 41	SAAs Bldg. 10	SWMU 35: Adjacent to SWMU 34, outdoor (solvent contaminated trash, Cr water) SWMU 36: Bay 31, indoor SWMU 37: Bay 10, outdoor SWMU 38: Bay 7, outdoor SWMU 39: Bay 4, outdoor (waste propellant) SWMU 40: Bay 1, indoor (NaN3, liners) SWMU 41: South of Bay 4, outdoor (solvent contaminated trash)	None	SAIC's Summary and Recommendations for RCRA Facility Assessment Report did not recommend a RFI or any interim measures for this SWMU (SAIC, 1994b).	SWMU 39 appears to be active with a 55-gallon drum containing solvent contaminated trash situated on concrete. No signs of leaks or spills were observed. SWMUs 35 - 38 and 40 -41 could not be located and presumably no longer exist.		SWMU 35: This SWMU does not appear to be active. SWMU 36: This SWMU could not be located during this site reconnaissance. SWMU 37: This SWMU consisted of a 55-gallon drum of solvent contaminated trash and a 55-gallon drum of compressor water & oil. SWMU 38: This SWMU is no longer outside bay 7. However, a 5-gallon day can for solvent trash and a 5-gallon can of isopropyl alcohol are located inside bay 7. SWMU 39: This SWMU is active and consists of one 55-gallon drum of solvent contaminated trash. SWMU 40: This SWMU could not be located. The 1994 RFA report indicated this area outside of bay 1 was historically used for sodium azide and liner storage. SWMU 41: This SWMU is still active. A 55-gallon drum of solvent trash is located in bay 4. This SWMU is currently being investigated for potential VOCs releases as part of the Plant 3 RI (Geosyntec, 2021d) described in Section 4.2.11 of this CCR. No signs of spills or releases were observed. Geosyntec.	Potential discrepancies between SWMUs 35 to 41 and AT to AZ will be resolved as part of the proposed Plant 3 RFA. Include a summary of SWMU specific information and data collected for perchlorate and VOCs as part of the Plant 3 RI in a proposed Plant 3 RFA Report. Assess and evaluate additional potential contaminants of concern as part of the RFA.
SWMU 42	Former Water Bore-Out Ops. Area	The former water bore out operations area was historically used for the cleaning of rocket motors resulting in releases of AP to groundwater. Waste containers were observed on a former operations pad.	TDS removed the containers from the pad, discontinued its use, and removed the concrete pad. (See attached photographs.) No soil samples have been taken.	Not reviewed for this updated RFA. This unit has been characterized and is currently being remediated by Nammo Talley under to APP No. P-101370.			This SWMU is currently under remediation by Nammo Defense Systems under the voluntary remediation program.	Include a summary of SWMU specific information and data collected for perchlorate and VOCs as part of the Plant 3 RI in a proposed Plant 3 RFA Report. Assess and evaluate additional potential contaminants of concern as part of the RFA.
2017 Updated RCRA Facility Assessment								
N	Plant 3, Line 1, Bay DM	~30 gallon drum of Tali 61 in mineral oil (hazardous waste) situated on a roller cart over concrete. A partial ring of rust-like staining was observed nearby on concrete.	None	NA			This SWMU no longer contains Tali 1 in mineral oil. Four 55-gallon drums and three 275-gallon totes containing varying levels of cesium/potassium solution are located in this area. No signs of spills or releases were observed.	No recommendation for this SWMU.
O	Plant 3, Line 1, Bay 2 Day Can	~3-gallon metal container of alcohol waste stored in flammable cabinet on concrete. No evidence of a spill or release was observed.	None	NA			This SWMU is still active. A 3-gallon metal container of alcohol waste is stored in a flammable cabinet, along with a day can for solvent contaminated trash and a day can for alcohol waste. No evidence of spills or release was observed.	No recommendation for this SWMU.
P	Plant 3, Line 1, outside of Bay 1	55 gallon drum of Pocal mop water stored on secondary containment outside of Bay 1. This water may contain gun powder residue. No evidence of a spill or release was observed.	None	NA			This SMWU is still active, and contains ammonium perchlorate impacted bag filters in a 55-gallon drum on secondary containment, along with three unlabeled drums. No evidence of spills or releases were observed.	Identify and label the unlabeled waste drums and implement a weekly inspection of waste storage at Plant 3. Gather additional information including details on whether secondary containments conform to the 40 CFR 264.175 standards and provide recommendations in a Plant 3 RFA Report.
Q	Plant 3, Line 1, Bay A4	55-gallon drum of solvent contaminated trash stored on concrete. No evidence of a spill or release was observed.	None	NA			This SWMU is still active with a 55-gallon drum of solvent contaminated trash stored at Bay A4. No evidence of a spill or release was observed.	No recommendations for this SWMU.
R	Plant 3, Line 1, Bay A3	2 5-gallon day cans containing empty cartridges, one ~40 gallon drum, and one 5-gallon bucket of Tali 61 in mineral oil (hazardous waste) were stored on concrete. No evidence of a spill or release was observed.	None	NA			This SWMU does not appear to be active, the day cans and Tali 61 bucket were not observed at this location.	No recommendations for this SWMU.
S	Plant 3, Line 1, Bay A2 Day Can	One 5-gallon day can containing solvent contaminated trash was stored on a shelf. No evidence of a spill or release was observed.	None	NA			This SWMU does not appear to be active, the day can was not observed to be at this location.	No recommendations for this SWMU.
T	Plant 3, Line 1, Bay 9 Day Can	5-gallon metal container containing waste propellant and oxidizer stored on shelf. No evidence of a spill or release was observed.	None	NA			This SWMU appears to be active and still contains a 5-gallon container with waste propellant and oxidizer. No evidence of a spill or release was observed.	No recommendations for this SWMU.

SWMU/AOC	Unit Name	Concern Description	Actions Completed On SWMU/AOC to Date	Reference Documentation	Operational Status as of August 2017	Operational Status as of 2019	Operational Status as of 2021	Recommendation for Future Work
U	Plant 3, Line 1, Hallway FE	2 ~30-gallon plastic drums of halogenated waste stored in flammable cabinet (2' x4'). Discoloration and material deposits were observed on the bottom of the flammable cabinet. Signs of minor spills present on one drum and flammable cabinet door. Flammable cabinet was situated on concrete which appeared to have been sealed recently. No evidence of spills or leaks outside of the cabinet were observed.	Ceased being used.	None			This SWMU no longer appears to be in use. The floors were refinished within the last year, and no signs of spills were observed during this reconnaissance.	No recommendations for this SWMU.
V	Plant 3, Line 1, Bay 16	55 gallon drum of solvent contaminated trash situated on concrete. No evidence of a spill or release was observed.	None	NA			Due to ongoing mixing operations, unable to access bay 16 due to safety concerns. Site staff stated a 55-gallon drum of solvent contaminated trash is still in bay 16.	Recommended examining the SWMU for evidence of release or spills. Gather additional information and provide recommendations in a Plant 3 RFA Report.
W	Plant 3, Line 1, Bay 15	55 gallon drum of Tali-25 (contains barium chromate), plus 55 gallon drum of water and Tali 44 stored on concrete. No evidence of a spill or release was observed.	None	NA			Due to ongoing mixing operations, unable to access bay 15 due to safety concerns. Site staff stated a 55-gallon drum of Tali-25 and a 55-gallon drum of Tali 44 were stored in bay 15.	Recommended examining the SWMU for evidence of release or spills. Gather additional information and provide recommendations in a Plant 3 RFA Report.
X	Plant 3, Line 1, End of Line 1, outside of Bays 18 and 19 Day Can	5-gallon day can containing solvent contaminated trash situated on a plastic pallet on concrete. No evidence of a spill or release was observed.	None	NA			A flammables cabinet located outside bays 18 and 19 contains a variety of solvents and alcohol based chemicals inside. Additionally, some explosive material was observed in the cabinet, and promptly relocated by site staff. No day can was observed at this location, but an unlabeled 5-gallon bucket from the research department was observed north of the cabinet.	Recommended identifying and labeling the 5-gallon bucket, and implementing a weekly inspection for unlabeled drums and improperly stored substances. Gather additional information and provide recommendations in a Plant 3 RFA Report.
Y	Plant 3, Line 1, Bays 17A and 17B	Wet vacuum fluid generated from saw operations are piped to an ~80-gallon metal tank situated on concrete outside of Bays 17A and 17B. Collected fluid may contain propellant residue. Tank was unlabeled. No evidence of a spill or release was observed.	None	NA			Bay 17A contains halogenated and non halogenated solvents. Bay 17B contains vacuum waste generated from cutting/shaping propellant. An 80-gallon metal tank sits on the concrete outside of the 17 bays accumulating propellant waste and vacuum fluid generated in bay 17A and 17B. No evidence of a spill or release was observed.	Gather additional information and provide recommendations in a Plant 3 RFA Report, including additional information related to historical operations, waste management and disposal, and conditions of this SWMU.
Z	Plant 3, Line 1, Fueling Area	A bermed concrete pad (8' x 50') with a sheet metal roof is located outside and to the southeast of Line 1, Bays 1-4. Three 55-gallon drums containing used oil and ethylene glycol were stored on secondary containment. An ~100 gallon above ground tank containing red diesel for fueling facility equipment was also situated on secondary containment on this concrete pad. No evidence of a spill or release was observed.	None	NA			Some spilling/staining was observed outside of plastic secondary containment units. However, the staining remained within the concrete secondary containment. Cracks were observed within the concrete secondary containment unit approximately 15 feet east of the observed staining.	Recommended replacing the plastic secondary containment unit, repairing the concrete secondary containment unit, and implementing a weekly inspection of secondary containment systems. Gather additional information including details on whether secondary containments conform to the 40 CFR 264.175 standards and provide recommendations in a Plant 3 RFA Report, including additional information related to historical operations, waste management and disposal, and conditions of this SWMU.
AA	Plant 3, Shipping and Receiving Building	A 5 gallon bucket of discarded live ammunition was stored in a flammable cabinet. Talley personnel stated that waste is not stored in this building. Shipments of waste to offsite disposal facilities are staged and palletized outside of the building, on asphalt, on the day of pickup. No evidence of a spill or release was observed.	Ceased being used.	NA		This SWMU is inactive and no longer exists. The building has been renovated and waste is no longer assimilated or staged here. Previously, expired hazardous wastes (no energetic wastes) were transported to this building from the various Plants. Then the HESS department would pick up and transport to the CAA. Now, the HESS department collects these wastes directly from the Plants at which they were generated.	This SWMU remains inactive.	Gather additional information and provide recommendations in a Plant 3 RFA Report., including additional information related to historical operations, waste management and disposal, and conditions of this SWMU.
AB	Plant 3, Line 2, Bay 22 Day Can	5-gallon metal container for solvent contaminated trash located on shelf. No evidence of a spill or release was observed.	None	NA			This SWMU remains active with a 5-gallon metal day can for solvent contaminated trash. No evidence of a spill or release was observed.	No recommendations for this SWMU.

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AC	Plant 3, Line 2, Bay 23	55-gallon drum of propellant trash situated on concrete, plus 3 5-gallon containers of waste acetone were situated on a bench. No evidence of a spill or release was observed.	Ceased being used.	NA			This SWMU was inactive at the time of the site reconnaissance due to it being used to store tables while other bays in line 2 were being cleared out in advance of being painted over. No evidence of a spill or release was observed. This SWMU will be active again after painting is complete.	No recommendations for this SWMU.
AD	Plant 3, Line 2, Bay 24	55 gallon drum of solvent contaminated trash and a 3-gallon solvent contaminated trash container situated on concrete. No evidence of a spill or release was observed.	Ceased being used.	NA			This SWMU was inactive at the time of the site reconnaissance due to it being used to store tables while other bays in line 2 were being cleared out in advance of being painted over. No evidence of a spill or release was observed. This SWMU will be active again after painting is complete.	No recommendations for this SWMU.
AE	Plant 3, Line 2, Outside of Bays HE and 28	Spent solvent cans managed in a 55 gallon drum outside of the Line 2 building entrance leading to Bays HE and 28. Drum is situated on soil. No evidence of a spill or release was observed.	Ceased being used.	NA			This SWMU appears to no longer be active. There did not appear to be waste drums stored outside the entrance of line 2. Two 5-gallon day cans of solvent trash are present in bay 28. No evidence of a spill or release was observed.	No recommendations for this SWMU.
AF	Plant 3, Line 2, Bay 27 Day Can	5 gallon solvent contaminated trash day can situated on floor mat. No evidence of a spill or release was observed.	None	NA			A 55-gallon drum of solvent contaminated trash, and three 5-gallon day cans for solvent trash and acetone are present in bay 27. No evidence of a spill or release was observed.	No recommendations for this SWMU.
AG	Plant 3, Line 2, Bay 25	55-gallon drum of solvent contaminated trash situated on concrete. Some minor rust-like staining observed on concrete.	None	NA			A 55-gallon drum of propellant waste is situated on the floor. The floor was refinished since the last RFA, so no signs of rust or staining were observed.	No recommendations for this SWMU.
AH	Plant 3, Line 2, Bay HE Day Can	3 5-gallon day cans for solvent contaminated trash located on benches. No evidence of a spill or release was observed.	None	NA			Bay HE was being painted, and did not have anything stored in it. No evidence of a spill or release was observed.	No recommendations for this SWMU.
AI	Plant 3, Line 2, Bay 30 Day Can	5 gallon solvent contaminated trash day can situated on concrete. No evidence of a spill or release was observed.	None	NA			Bay 30 was being painted, and did not have anything stored in it. No evidence of a spill or release was observed.	No recommendations for this SWMU.
AJ	Plant 3, Line 2, Bay 33	55 gallon drum containing solvent contaminated trash situated on concrete. No evidence of a spill or release was observed.	None	NA			This SWMU appears to no longer be active. Unable to locate the 55-gallon solvent contaminated trash drum previously present in this bay. No evidence of a spill or release was observed.	No recommendations for this SWMU.
AK	Plant 3, Line 2, Bay 38	55-gallon drum containing solvent contaminated trash situated on concrete. No evidence of a spill or release was observed.	None	NA			This SWMU appears to no longer be active. Unable to locate the 55-gallon solvent contaminated trash drum previously present in this bay. No evidence of a spill or release was observed.	No recommendations for this SWMU.
AL	Plant 3, Line 2, Outside of Bay 38	55-gallon drum containing waste paint is managed alongside unused acetone, and isopropanol in the covered carport-like area outside of Bay 38. Drums were situated on secondary containment. No evidence of a spill or release was observed.	None	NA			This SWMU appears to no longer be active. Unable to locate the 55-gallon solvent contaminated trash drum previously present in this bay. No evidence of a spill or release was observed.	No recommendations for this SWMU.
AM	Plant 3, Line 2, Bay 43	55 gallon drum of solvent contaminated trash situated on concrete, plus a 5-gallon container for aerosol cans in cabinet. No evidence of a spill or release was observed.	Ceased being used.	None			This SWMU appears to no longer be active. Unable to locate the 55-gallon solvent contaminated trash drum previously present in this bay. No evidence of a spill or release was observed.	No recommendations for this SWMU.

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AN	Plant 3, Line 2, Sinks in Bays 44 and 45 (Test Department)	Bays 44 and 45 contain sinks. Rocket motors are cleaned out in the sinks, generating corrosive wastewater, which is discharged into 55 gallon drums outside of Bay 46 situated on concrete. This water is periodically collected by a vacuum truck and transported to the on-site evaporator near Plant 1 for treatment. Some staining was observed on the concrete pad.	Ceased being used.	None			This SWMU is no longer in use. Rocket motors are cleaned out at the water bore out at Plant 2. Some staining was observed on the concrete pad.	Sample the area around this SWMU for potential contamination. Gather additional information and provide recommendations in a Plant 3 RFA Report, including additional information related to historical operations, waste management and disposal, and conditions of this SWMU.
AO	Plant 3, Line 2, Bay 45 (Test Department)	5 gallon metal container for waste isopropanol located on bench. No evidence of a spill or release was observed.	Ceased being used.	None			This SWMU is no longer in use. This bay contains some operating computers, but no day cans. No evidence of a spill or release was observed.	No recommendations for this SWMU.
AP	Plant 3, Line 2, Outside of Bay 46 (Test Department)	Fenced concrete pad (5' x 5') located near Bay 46 contains a waste propellant bin situated directly on concrete. This area is used very rarely according to Site personnel. No evidence of a spill or release was observed.	None	NA		This SWMU is inactive and is no longer used to store waste. This SWMU was eliminated around quarter 3 of 2018.	This SWMU appears to be used to store liquid TCA, and process fluids in drums on plastic secondary containment units. No evidence of a spill or release was observed.	Gather additional information and provide recommendations in a Plant 3 RFA Report, including additional information related to historical operations, waste management and disposal, and conditions of this SWMU.
AQ	Plant 3, Building 26, Bay A6	55 gallon drum containing spent aerosol cans located outside of Bay A6 situated on concrete. Minor rust-like staining observed on concrete.	None	NA			This SWMU is no longer active. No evidence of a spill or release was observed.	No recommendations for this SWMU.
AR	Plant 3, Building 26, Bay A5	55 gallon drum containing solvent contaminated trash situated on concrete. Some rust-like staining on concrete observed.	None	NA			A 55-gallon drum containing TALI contaminated trash and a 5-gallon day can for oily waste are now present at this SWMU instead. There are signs of staining behind the day can.	Sample the area around this SWMU for potential contamination. Gather additional information and provide recommendations in a Plant 3 RFA Report, including additional information related to historical operations, waste management and disposal, and conditions of this SWMU.
AS	Plant 3, Building 26, Bay A4	Two 55 gallon drums situated on concrete containing solvent contaminated trash and propellant contaminated trash, plus a 5 gallon-day can for scrap propellant located on a shelf. Rust-like staining present on concrete near solvent contaminated trash drum.	None	NA			Two 5-gallon oily waste day cans are present in this bay. No evidence of a spill or release was observed.	No recommendations for this SWMU.
AT	Plant 3, Building 10, Bay 10 Day Can	One 5-gallon day can for solvent contaminated trash located on a shelf. No evidence of a spill or release was observed.	None	NA			A 55-gallon drum of Tali-25, Tali-26, and Tali-27 is located in this bay in addition to a 5-gallon day can for Tali-26. No evidence of a spill or release was observed.	No recommendations for this SWMU.
AU	Plant 3, Building 10, Bay 9 Day Can	One 5-gallon day can for solvent contaminated trash can situated on concrete. No evidence of a spill or release was observed.	None	NA			This SWMU is still active and unchanged from the previous observation. No evidence of a spill or release was observed.	No recommendations for this SWMU.
AV	Plant 3, Building 10, Bay 7 HWAA	55 gallon cardboard drum containing solvent contaminated trash situated on concrete. No evidence of a spill or release was observed.	None	NA			This SWMU is still active and unchanged from the previous observation. No evidence of a spill or release was observed.	No recommendations for this SWMU.
AW	Plant 3, Building 10, Bay 4 Day Can	5-gallon day can for solvent contaminated trash day can located on bench. No evidence of a spill or release was observed.	None	NA			This SWMU is still active and unchanged from the previous observation. No evidence of a spill or release was observed.	No recommendations for this SWMU.

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AX	Plant 3, Building 10, Bay 6 Day Can	5-gallon day can for unspecified hazardous waste situated on concrete. No evidence of a spill or release was observed.	None	NA			This SWMU is still active and unchanged from the previous observation. No evidence of a spill or release was observed.	No recommendations for this SWMU.
AY	Plant 3, Building 10, Bay 3 Day Cans	2 5-gallon days cans for solvent contaminated trash located on benchtops, plus a 1-gallon container for waste isopropanol. No evidence of a spill or release was observed.	None	NA			This SWMU is still active and unchanged from the previous observation. No evidence of a spill or release was observed.	No recommendations for this SWMU.
AZ	Plant 3, Building 10, Outside of Bay 1	55 gallon drum of hazardous waste with faded, unreadable label located on secondary containment situated on a 3' x 3' concrete pad with one wall and a roof. No evidence of a spill or release was observed.	Plastic secondary containment units were brought in for drum storage.	None			Two 55-gallon drums are now on a plastic secondary containment unit within the structure. One is for acetone, the other is for isopropyl alcohol. No evidence of a spill or release was observed.	Gather additional information and provide recommendations in a Plant 3 RFA Report, including additional information related to historical operations, waste management and disposal, and conditions of this SWMU.
BA	Line 1 X-Ray Process and Research Wastewater Tank	An ~500 gallon tank located outside of the Plant 3, Line 1 research department. Lab sink water and x-ray process water are piped to the outside tank which is situated in a raised concrete containment area that is bermed on all sides. The wastewater is periodically collected by a vacuum truck and transported to the evaporator near Plant 1 for treatment. During the VSI the secondary containment was nearly full of what was presumably rain water from a recent storm event. Talley stated they typically empty secondary containment after storms, but had been unable to do so due to a flat tire on their vacuum truck. No evidence of a spill or release was observed.	None	NA			This SWMU is still active, with no observed changes to the condition of the unit. No evidence of a spill or release was observed.	Gather additional information and provide recommendations in a Plant 3 RFA Report, including additional information related to historical operations, waste management and disposal, and conditions of this SWMU.

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New Preliminary SMUWs (2019 Site Visit by H&A)								
BO (Preliminary)	Former Grinding Facility and Stormwater Retention Pond	The stormwater retention pond identified in Geosyntec's 2009 report is still present. Some vegetation was observed in the retention area and there were no active operations in the vicinity at the time of the VSI. Site staff were not aware of historical grinding operations taking pace outside of the Plant 3 buildings.	None	NA		Brad Anderer response: Has grinding historically occurred outside of the Plant 3 buildings? If so, over what time period? What was being ground, and how was waste managed? Need more detail on "grinding facility" to understand what was being ground but no operations like that existed outdoors.	This does not appear to be an active SWMU. Staff was not aware of any grinding activities that may have taken place in this area outside the bays. No evidence of a spill or release was observed.	Gather additional information and provide recommendations in a Plant 3 RFA Report.
BP (Preliminary)	Laundry Room Septic System	Site staff indicated that a septic system may exist in the location identified in Geosyntec's 2009 report, but did not have any further information available at the time of VSI.	None	NA		Brad Anderer Response: Does a septic system still exist in this area? What drains to it? Any sinks where parts are cleaned or rinsed? No only the former laundry room and current bathrooms are plumbed to the septic system. We have a collection system for Xray and laboratory sinks.	Staff indicated there still may be some septic tanks in this area, but was unsure as to the exact locations. This SWMU is currently being investigated for potential VOCs releases as part of the Plant 3 RI (Geosyntec, 2021d) described in Section 4.2.11 of this CCR.	Recommended identifying the locations of and sampling the septic tanks and associated cesspools to determine to determine potential releases of VOCs. Gather additional information and provide recommendations in a Plant 3 RFA Report.
BQ (Preliminary)	Fluidized Bed Reactor (FBR)	The FBR receives and treats groundwater extracted from APP wells. The system is located within a concrete containment basin. Minor ponding was observed in some areas of the containment. Cracks in the containment basin exist which were previously sealed, but in some places, but some seals may no longer be water tight. Site staff were not aware of any releases outside of the containment area.	None	NA			The Fluidized Bed Reactor (FBR) pump and treat system is no longer under the Aquifer Protection Permit (APP). An APP is an ADEQ regulatory program of which the site was previously registered under. Additionally, the wells described by previous consultants as "APP wells" are extraction wells installed to provide water to the FBRs for remediation. Cracks in the treatment pad secondary containment have been sealed to restore water tightness. Otherwise, no significant changes were observed. Ammonium perchlorate contaminated bag filters are stored in 55-gallon drums on plastic secondary containment units within the larger concrete secondary containment.	Gather additional information and provide recommendations in a Plant 3 RFA Report.
BR (Preliminary)	Plant 3 Waste Propellant Pad #4	This waste propellant pad has been demolished and no longer exists. The area is vacant land with exposed soils. A paved walkway towards the presumed location of the former waste storage pad was identified during the VSI. Geosyntec sampling results reported a detection above the rSRL (and a handful of those are above the GPL of 16 mg/kg). Brad Anderer replied "No this pad was demolished a couple years ago and held 65 gallons totes which held propellants wrapped in conductive bags. No liquids, spillage or leakage possible."	None	NA		Brad Anderer replied "No this pad was demolished a couple years ago and held 65 gallons totes which held propellants wrapped in conductive bags. No liquids, spillage or leakage possible."	This SWMU is no longer active. Waste is not stored at this location anymore. No evidence of a spill or release was observed.	Characterize the extent of the release for the chemicals detected above screening levels. Gather additional information and provide recommendations in a Plant 3 RFA Report.

SWMU/AOC	Unit Name	Concern Description	Actions Completed On SWMU/AOC to Date	Reference Documentation	Operational Status as of August 2017	Operational Status as of 2019	Operational Status as of 2021	Recommendation for Future Work
BS (Preliminary)	Test Department Firing Area	The Test Department Firing Areas is a largely unpaved area which is used almost daily to test nearly every product manufactured at the site. Wastes associated with this area include AP and AN propellants. Geosyntec sampling results reported a detection below the rSRL (all below the GPL).	None	NA			There are no updates for SWMU-BS. It is still undergoing the same operations. As sampling has been performed with results below the GPL,	Gather additional information and provide recommendations in a Plant 3 RFA Report.
BT (Preliminary)	Desert Magazine	This area, approximately 12 acres in size, has been in use since at least 1976 and include 5 structures. According to Nammo, one of the structures is used for storage of solid hazardous waste. This area was not visited during the CCR site visits.	None	NA				Gather additional information and provide recommendations in a Plant 3 RFA Report.
GS-5 (Preliminary)	Line 2 Compressor and Dryer Pad	The Line 2 compressor and dryer equipment is located outside on a covered concrete pad between Lines 1 and 2. Compressor blowdown oily water generated by the equipment was routed to drip mat (~3' x 3' x 2") located directly on soil. The drip mat was completely full, and the standing water had a visible sheen. Staining was visible on the soil in the immediate vicinity of the drip mat.	None	NA			This area does not have secondary containment, and staining and spilling of oil from various equipment on the pad was observed. Staining and spills appeared to not only be recent but ongoing.	Determine if the release is only from compressor oil, or if there is a release of a RCRA regulated waste, and assess if environmental sampling is required. Gather additional information including the need for secondary containments and provide recommendations in a Plant 3 RFA Report.

Notes:

[1] *Documented Releases: Records are available documenting release, or release can be assumed based on the presence of soil or groundwater contamination.*

[2] *Suspected Releases: This category includes facilities for which no quantitative samples are available, but release is suspected based on the nature and frequency of hazardous material operations and presence of staining or other indicators of possible release.*

[3] *Release Potential: Release potential from hazardous material operations to each media.*

[4] *Recommendations for RCRA Facility Investigation (RFI): In the RFI the facility responsible for establishing the extent of on-site and off-site contamination. This category attempts to prioritize the need for further action and presents recommendations for further action to be conducted in the RFI.*

[5] *Current in 1994*

A - release to air

GW - release to groundwater

S - release to soil

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ADEQ. 2000. July 5, 2000 Meeting Agenda for TDS & ADEQ. July 5.
Geosyntec. 2009a. Perchlorate Source Investigation, Prepared for Nammo Talley, Inc., Mesa, Arizona. June.
Geosyntec. 2021d. Remedial Investigation Work Plan Plant 3 and Former WBO Facility, Nammo Defense Systems Inc., Mesa, Arizona. 20 May.
H&A. 2017a. Report on Updated RCRA Facility Assessment, Nammo Talley, Inc. Mesa Arizona. September.
SAIC/TSC. 1994a. RCRA Facility Assessment Report for Talley Defense Systems, Inc. Mesa, Arizona. EPA I.D. NOS.: AZD980816276 (Plant 2); AZD980885362 (Plant 3); ASD982361347 (Plant 4); AZD982471096 (Plant 6); AZD020132502 (Burn Ground). April.
SAIC/TSC. 1994b. Summary and Recommendations, RCRA Facility Assessment Report For Talley Defense Systems, Talley Industries, Inc., Mesa, Arizona. April.
TDS. 1999c. Solid Waste Management Unit (SWMU) Investigations, January 12.

Table 5: Plant 4 SWMUs
Current Conditions Report
Nammo Defense Systems Inc., Mesa, Arizona

SWMU/AOC	Unit Name	Concern Description	Actions Completed On SWMU/AOC to Date	Reference Documentation	Operational Status as of August 2017	Operational Status as of 2019	Operational Status as of 2021	Recommendation for Future Work
1994 RCRA Facility Assessment								
SWMU 43	Plant 4 HWAA	HWAA located in the cul de sac to the east of Building 25. TDS refers to this area as the Plant 4 Hold Area, and it is constructed on unsealed concrete pad (40' x 20') surrounded by a fence. Cargotainer and, bagged propellant waste, and drums of propellant waste present.	Ceased being active	SAIC's Summary and Recommendations for RCRA Facility Assessment Report did not recommend a RFI or any interim measures for this SWMU (SAIC, 1994b).	Appears to be active with 2 drums of ammonium propellant mop water situated on concrete, No signs of spills or leaks observed.		This SWMU is no longer active, and just contains empty drums and unused equipment. No evidence of spills or releases were observed.	Gather additional information and provide recommendations in a Plant 4 RFA Report.
SWMU 44	Bldg. 23 - Plant 4 Casting	HWAA located just east of Building 23. The casting room two stories tall with drums stored on concrete both upstairs and downstairs. Contaminated trash managed outside downstairs.	None	SAIC's Summary and Recommendations for RCRA Facility Assessment Report did not recommend a RFI or any interim measures for this SWMU (SAIC, 1994b).	Appears to be active, with one bin containing hazardous waste located on soil within a 3' x3' fenced area. No signs of spills or leaks.		This SWMU is still active, and has an unlabeled 55-gallon drum of hazardous waste on secondary containment, a drum of aerosol cans, and two solvent based cleaning stations. No evidence of spills or releases were observed. .	Identify and label the hazardous waste drum. Gather additional information including details on whether secondary containments conform to the 40 CFR 264.175 standards and provide recommendations in a Plant 4 RFA Report, including evaluation of other potential SWMUs at Building 23 and 23A.
SWMU 45	Bldg. 22 - Plant 4 Mixing	Propellant contaminated trash stored inside the building on a concrete floor.	TDS has implemented a Quality Policy (company wide) whereby each department strives to improve response time and quality. The process includes semi-annual surveys which monitors improvement. This policy has helped to shorten response times for equipment repair.	TDS SWMU Letter to ADEQ (TDS, 1999c); ADEQ 2000 Meeting Notes (ADEQ, 2000)	This building could not be visually inspected during the site visit due to ongoing mixing operations which presented a safety hazard.		Two 55-gallon drums of non-RCRA related waste sit on secondary containment outside the building along with a partially full 55-gallon drum of unknown hazardous waste. Historically, the building had a drain leading out of the building into a pit. The drain and pit are now filled in. No evidence of spills or releases were observed.	Identify and label the 55-gallon drum of unlabeled hazardous waste, and sample the soil around the drain in the pit for potential releases. Gather additional information including details on whether secondary containments conform to the 40 CFR 264.175 standards and provide recommendations in a Plant 4 RFA Report.
SWMU 46	Bldg. 24 - Plant 4 Curing	Propellant contaminated trash and NaN3 propellant contaminated debris managed in drum(s) on concrete.		TDS SWMU Letter to ADEQ (TDS, 1999c); ADEQ Meeting Notes (ADEQ, 2000)	This building could not be visually inspected during the site visit, but Talley stated no waste accumulation areas in building. No waste observed outside of building; presumed to no longer exist.		This building stores ammonium perchlorate, ethylene glycol, and clay desiccants in 5-gallon buckets inside and outside of the building. No evidence of spills or releases were observed.	Place any outdoor drum storage on secondary containment units. Gather additional information and provide recommendations in a Plant 4 RFA Report.
SWMU 47	SAAs Bldg. 20 Plant 4	(5-bay weigh out room) TCA contaminated trash maintained inside bay 3, liquid TCA and later Rinsolve maintained outside near bay 1, alcohol contaminated trash accumulated in bay 2.	None	SAIC's Summary and Recommendations for RCRA Facility Assessment Report did not recommend a RFI or any interim measures for this SWMU (SAIC, 1994b).	Appears to be active, with 3 drums outside of Bay 1 situated on pallets, one drum outside of bay 5 on concrete, and 2 - 5 gallon pots containing hazardous waste situated on a stand in bay 4. No signs of spills or leaks observed.		Three 55-gallon drums of non-RCRA regulated waste are located around the outside of building 20. One unlabeled 55-gallon drum was also observed. No evidence of spills or releases were observed.	Identify and label the 55-gallon drum. Gather additional information and provide recommendations in a Plant 4 RFA Report.
SWMU 48	SAA Bldg. 18 Plant 4	(Mixer building) Waste liners containing NaN3 were accumulated in a metal cabinet outside the building located on a concrete base. AP mop water is accumulated in a drum outside the northwest corner of the building.	None	SAIC's Summary and Recommendations for RCRA Facility Assessment Report did not recommend a RFI or any interim measures for this SWMU (SAIC, 1994b).	Appears to be active with a drum of solvent contaminated trash located on concrete outside of the building. No metal cabinet were present. No signs of spills or leaks observed.		The drum of solvent contaminated trash is still located on the concrete outside the building. No metal cabinets were present, and no signs of spills or leaks were observed.	No recommendations for this SWMU.
2017 Updated RCRA Facility Assessment								
J	Plant 4 Building 23	Two drums of HMX contaminated trash, 1 55-gallon drum of HMX contaminated mop water, and a 55-gallon drum of compressor oil water were stored outside in the downstairs covered area of casting building 23. Three drums were situated on concrete, and one was on a metal stand. This areas is relatively new. No evidence of a spill or release was observed.	None	NA			One 55-gallon drum of propellant contaminated trash and one 55-gallon drum of solvent contaminated trash are located on a secondary containment unit outside the building. A cardboard drum is in place to collect propellant waste generated from a mixing process. A cardboard drum of AP contaminated waste sits in the southwest corner of the building. No evidence of spills or releases were observed.	Identify and label the 55-gallon drum. Gather additional information including details on whether secondary containments conform to the 40 CFR 264.175 standards and provide recommendations in a Plant 4 RFA Report, include evaluation of other potential SWMUs at Building 23 and 23A.
K	Plant 4, Access Road Leading to Building 20	Seven 55-gallon drums containing waste were stored on secondary containment off to the side of the access road leading to Building 20. Drums were covered with tarps and not disturbed during the VSI. No evidence of a spill or release was observed.	None	NA			SWMU-K has remained unchanged. NDS staff lifted the tarp, and discovered the drums were not labelled. No evidence of spills or releases was observed.	Identify and label the drums. Gather additional information including details on whether secondary containments conform to the 40 CFR 264.175 standards and provide recommendations in a Plant 4 RFA Report.
L	Plant 4	Waste propellant was stored in a bin inside a fenced area between Buildings 18, 19, and 28. Three drums (not fenced in) contained used Rinsolve and were located nearby. Two drums were situated on secondary containment, and the third was situated on soil. No evidence of a spill or release was observed.	None	NA			No drums were observed in the vicinity of the fenced area. Waste propellant is still stored in a bin within the fenced area. No evidence of spills or releases were observed.	Gather additional information including details on whether secondary containments conform to the 40 CFR 264.175 standards and provide recommendations in a Plant 4 RFA Report.
M	Plant 4 Magazine 42	This explosives magazine is approximately 20' x 15' and used to store solid and liquid waste propellant in drums. The magazine was locked, therefore the inside was not inspected. Site personnel stated that the magazine was empty at the time of the VSI. No evidence of a spill or release was observed around the structure.	None	NA			NDS staff were unable to grant access to the magazine. NDS staff stated that only explosive product was stored in the magazines.	Inspect for evidence of spills or releases. Gather additional information and provide recommendations in a Plant 4 RFA Report.

Table 5: Plant 4 SWMUs
Current Conditions Report
Nammo Defense Systems Inc., Mesa, Arizona

SWMU/AOC	Unit Name	Concern Description	Actions Completed On SWMU/AOC to Date	Reference Documentation	Operational Status as of August 2017	Operational Status as of 2019	Operational Status as of 2021	Recommendation for Future Work
New Preliminary SMUWs (2019 Site Visit by H&A)								
BD (Preliminary)	Building 22, outside	Two 55-gallon drums of unspecified waste located on a spill pallet and covered by a tarp. One drum was labelled as non-RCRA regulated waste, and the other was labelled as hazardous waste. Staff indicated the non-RCRA waste was mop water from Building 22, while the hazardous waste was AP propellant waste. No signs of spills or leaks were observed.	None	1255 - 1256		Brad Anderer Response: Non-RCRA waste is mop water. Hazardous wastes collected there will include AP-based propellant and clean up materials.	This SWMU is still active and consists of a 55-gallon drum of non-RCRA regulated waste and an unlabeled 55-gallon drum both on a secondary containment unit. Another 55-gallon drum is located on a spill pallet and is labelled as hazardous waste. No evidence of spills or releases were observed.	Identify and label the 55-gallon drums, including the drum labelled "Non-RCRA Regulated Waste," as the label does not specify the contents of the drum. Gather additional information including details on whether secondary containments conform to the 40 CFR 264.175 standards and provide recommendations in a Plant 4 RFA Report.
BE (Preliminary)	Building 22, inside	One 55-gallon cardboard drum of solvent contaminated trash. No signs of spills or leaks observed.	Ceased being used	1258			This SWMU appears to be inactive, as the solvent contaminated trash drum could not be located.	Gather additional information and provide recommendations in a Plant 4 RFA Report.
BF (Preliminary)	Building 22, compressor blowdown	One 55-gallon drum of compressor blowdown oil water located on stand on north side of Building 22 without secondary containment. Stand located on concrete, with exposed soils nearby.	None	1259			This SWMU is active and unchanged from the 2017 RFA. No evidence of spills or releases were observed.	Gather additional information including details on whether secondary containments conform to the 40 CFR 264.175 standards and provide recommendations in a Plant 4 RFA Report.
BG (Preliminary)	Building 19	Solvent cleaning station located outside of building on concrete which has been active for some time. Parts are rinsed in this unit with Rinsolve (~55 gallon capacity). Also one 55-gallon drum of AP solid waste, and one 55-gallon drum of acetone and water located nearby on pavement. No signs of leaks or spills were observed. Nearest soil upgradient approximately 50 ft away.	None	1262 - 1264			This SWMU still has the solvent cleaning station, a 55-gallon drum of ammonium perchlorate contaminated trash, and a 55-gallon drum of compressor blow down water. No evidence of spills or releases were observed.	Gather additional information and provide recommendations in a Plant 4 RFA Report.
BH (Preliminary)	Building 27	Solvent cleaning station (~55 gallon capacity) located inside building on concrete and has been active since late 2018. Parts such as newly manufactured casings, rocket motors, and liner materials are rinsed in this unit using DMSO. No signs of spills or leaks observed.	None	1267			In addition to the solvent cleaning station, a 55-gallon drum of hazardous waste and a 55-gallon of ammonium perchlorate impacted mop water, a 55-gallon drum of oil water from an air compressor, and an approximately 100-gallon tank of rinsolve on secondary containment, are located outside the building. No evidence of spills or releases were observed.	Gather additional information including details on whether secondary containments conform to the 40 CFR 264.175 standards and provide recommendations in a Plant 4 RFA Report.
BH-2 (Preliminary)	Building 27, outside	Casing cleaning operation location, which is scheduled to be decommissioned and replaced by SWMU BH. Parts were formerly cleaned outside using isopropyl alcohol (IPA) and Rinsolve. Two 40-gallon drums of IPA were located on rolling secondary containment and one 55-gallon drum of solvent contaminated waste was present. Cleaning was done outside on concrete, (sometimes under covered area). Exposed soils are adjacent to work area. No spills, leaks or staining of nearby soils was observed.	Ceased being used.	1268, 1269			This SWMU is no longer active as the building transitioned to the solvent cleaning station in place of the casing cleaning operation which made this SWMU. No evidence of spills or releases were observed.	Gather additional information including details on whether secondary containments conform to the 40 CFR 264.175 standards and provide recommendations in a Plant 4 RFA Report.
BI (Preliminary)	Building 20, Bay 3	Two ~30 gall solvent cleaning station units on concrete and not yet in use. Units will be used to clean tooling using DMSO solvent.	Solvent cleaning stations were removed.	1270			The solvent cleaning stations are no longer present at this location. No evidence of spills or releases were observed.	Gather additional information and provide recommendations in a Plant 4 RFA Report.
BJ (Preliminary)	Waste Propellant Storage Pad #1	This SWMU is inactive and is no longer used to manage waste. Various items such as rolling carts, empty tanks and drums, and shelving units are currently stored within a fenced area which presumably was the former location for waste propellant storage.	None	1271, 1272			This SWMU is still inactive and no longer used to manage waste. It also still is a storage location for miscellaneous equipment, empty tanks, drums, etc. No evidence of spills or releases were observed.	Additional information and recommendations will be provided as part of a Plant 4 RFA Report.
(Preliminary)	Stormwater areas	The stormwater areas identified by Geosyntec's 2009 report appear to be fairly consistent with the present day configuration. Gates are in place at a number of culvert locations at this Plant which could be used to contain spills from flowing downstream. Gates are maintained in an open position.	None	NA			Stormwater areas appear to be unchanged from Geosyntec's 2009 report.	Gather additional information and provide recommendations in a Plant 4 RFA Report.

Table 5: Plant 4 SWMUs
Current Conditions Report
Nammo Defense Systems Inc., Mesa, Arizona

SWMU/AOC	Unit Name	Concern Description	Actions Completed On SWMU/AOC to Date	Reference Documentation	Operational Status as of August 2017	Operational Status as of 2019	Operational Status as of 2021	Recommendation for Future Work

Notes:

[1] Documented Releases: Records are available documenting release, or release can be assumed based on the presence of soil or groundwater contamination.

[2] Suspected Releases: This category includes facilities for which no quantitative samples are available, but release is suspected based on the nature and frequency of hazardous material operations and presence of staining or other indicators of possible release.

[3] Release Potential: Release potential from hazardous material operations to each media.

[4] Recommendations for RCRA Facility Investigation (RFI): In the RFI the facility responsible for establishing the extent of on-site and off-site contamination. This category attempts to prioritize the need for further action and presents recommendations for further action to be conducted in the RFI.

[5] Current in 1994

A - release to air

GW - release to groundwater

S - release to soil

Sources:

ADEQ. 2000. July 5, 2000 Meeting Agenda for TDS & ADEQ. July 5.
Geosyntec. 2009a. Perchlorate Source Investigation, Prepared for Nammo Talley, Inc., Mesa, Arizona. June.
H&A. 2017a. Report on Updated RCRA Facility Assessment, Nammo Talley, Inc. Mesa Arizona. September.
SAIC/TSC. 1994a. RCRA Facility Assessment Report for Talley Defense Systems, Inc. Mesa, Arizona. EPA I.D. NOS.: AZD980816276 (Plant 2); AZD980885362 (Plant 3); ASD982361347 (Plant 4); AZD982471096 (Plant 6); AZD020132502 (Burn Ground). April.
SAIC/TSC. 1994b. Summary and Recommendations, RCRA Facility Assessment Report For Talley Defense Systems, Talley Industries, Inc., Mesa, Arizona. April.
TDS. 1999c. Solid Waste Management Unit (SWMU) Investigations, January 12.

Table 6: Plant 6 SWMUs
Current Conditions Report
Nammo Defense Systems Inc., Mesa, Arizona

SWMU/AOC	Unit Name	Concern Description	Actions Completed On SWMU/AOC to Date	Reference Documentation	Operational Status as of August 2017	Operational Status as of 2019	Operational Status as of 2021	Recommendation for Future Work
SWMU 49	SAA Bldg. 1 Plant 6	SAA with 5 gallon buckets containing solvent contaminated trash and developer tray cleaner (Cr) located east of bay 27, outside on the patio.	None	SAIC's Summary and Recommendations for RCRA Facility Assessment Report did not recommend a RFI or any interim measures for this SWMU (SAIC, 1994b).	Nammo Talley no longer operates at this location.	Nammo Talley no longer operates at this location.	Nammo Defense Systems no longer operates at this location.	No recommendations for these SWMUs.
SWMU 50	Historical SAA Bldg. 2	Solid waste propellant stored in drum(s) on concrete and under a roof at the western end of the Load building.	None	SAIC's Summary and Recommendations for RCRA Facility Assessment Report did not recommend a RFI or any interim measures for this SWMU (SAIC, 1994b).				No recommendations for these SWMUs.
SWMU 51	Historical SIs	Two surface impoundments located to the west of the parking lot between Plant 5 and Plant 6. Comdisk operated and discharged pretreated industrial wastewater through underground pipes to SIs. Each SI was approximately 100' x 200' x 5'. The bottom of the SIs were covered with asphalt. (More details in 1994 report.)	TDS has completed site investigations for both VOCs and metals. ADEQ has provided TDS with a no further action letter to give closure to this issue.	TDS SWMU Letter to ADEQ (TDS, 1999c); Former DISCOM Surface Impoundments Plant 6- VOC Investigation Report (TDS, 1998b); ADEQ NFA letter (ADEQ, 1998a)				Gather additional information, provide recommendations, and include a summary of SWMU specific information and data collected during prior investigations in a proposed Plant 5 & 6 RFA.

Notes:

[1] Documented Releases: Records are available documenting release, or release can be assumed based on the presence of soil or groundwater contamination.

[2] Suspected Releases: This category includes facilities for which no quantitative samples are available, but release is suspected based on the nature and frequency of hazardous material operations and presence of staining or other indicators of possible release.

[3] Release Potential: Release potential from hazardous material operations to each media.

[4] Recommendations for RCRA Facility Investigation (RFI): In the RFI the facility responsible for establishing the extent of on-site and off-site contamination. This category attempts to prioritize the need for further action and presents recommendations for further action to be conducted in the RFI.

[5] Current in 1994

A - release to air

GW - release to groundwater

S - release to soil

Sources:

ADEQ. 1998a. Arizona Department of Environmental Quality, Inter-Office Memorandum, To: Talley Defense Systems, From: Jeff Bryan, HWPU, RE: Meeting of February 4, 1998; Talley Defense Systems. February 6.

SAIC/TSC. 1994. RCRA Facility Assessment Report for Talley Defense Systems, Inc. Mesa, Arizona. EPA I.D. NOS.: AZD980816276 (Plant 2); AZD980885362 (Plant 3); ASD982361347 (Plant 4); AZD982471096 (Plant 6); AZD020132502 (Burn Ground). April.

TDS. 1998b. Former DISCOM Surface Impoundments Plant 6 – VOC Investigation Report. Talley Defense Systems, Inc. Environmental Department 3450 North Greenfield Road, Mesa, Arizona 85215. 30 September.

TDS. 1999c. Solid Waste Management Unit (SWMU) Investigations, January 12.

Table 7: DFR and TTU SWMUs
Current Conditions Report
Nammo Defense Systems Inc., Mesa, Arizona

SWMU/AOC	Unit Name	Concern Description	Actions Completed On SWMU/AOC to Date	Reference Documentation	Status	Location	Operational Status as of August 2017	Operational Status as of 2021	Recommendation for Future Work
1994 RCRA Facility Assessment									
SWMU 52	Burn Ground		Undergone characterization and partial closure activities.	Not reviewed for this updated RFA. This unit has undergone characterization and partial closure activities, is subject to final closure and post-closure upon issuance of a RCRA post-closure permit by ADEQ.				SWMU did not appear to have underwent change. A Consent Order (RCRA 3008(h)-09-2021-001) voluntarily entered into by NDS and the USEPA has been issued as of February 9, 2021.	Complete the vertical and lateral delineation of the TTU dissolved plume based on the data gaps identified in the 2021 CSM, which include: Additional vadose zone investigation within the former TTU burn pits to assess the presence of COCs in bedrock fractures as a potential continued source to groundwater; Delineation (vertical and lateral to the south) of the perchlorate/VOC plumes in groundwater; Collection of additional data supporting potential Southern Canal leakage and its contribution to groundwater recharge; Additional soil vapor VOC characterization south of the former TTU burn pits; and Investigation of the potential presence of PFAS due to the treatment of MT at the TTU. A comprehensive description of historical investigations, corrective action activities conducted to date, and summary of available data will be provided in the RFI Work Plan.
2017 Updated RCRA Facility Assessment									
BC	Stormwater Accumulation Area	Prior to implementation of current storm water controls, previous storm water runoff from the TTU collected in this area. Underlying soil may be impacted by low levels of perchlorate.	Nammo Talley has characterized this unit and excavated perchlorate impacted soils for off-site disposal.					No changes were observed to stormwater controls since soil remediation was performed. According to the 2017 RFA, perchlorate impacted soils were excavated and disposed of off site.	Complete the vertical and lateral delineation of perchlorate in the SWAA on SRPMIC property based on the data gaps identified in the 2021 CSM. A comprehensive description of historical investigations, corrective action activities conducted to date, and summary of available data should be provided in the RFI Work Plan.
BK	TTU-11 Tank	Approximately 1,000-gallon double-walled tank stores extracted perchlorate contaminated groundwater .Tank is located on concrete pad (~10' x 10'). No signs of spills or leaks were observed. Site staff stated that no known releases have occurred.	None	1273, 1274		33.49871 N -111.71429 W		This SWMU appears to be unchanged. Water from the tank is transferred to the evaporator/water boreout via vacuum truck. No evidence of spills or releases were observed.	No recommendations for this SWMU.
BL	New Test Department Firing Area immediately south of TTU	Should fired weapons containing AP and M7 propellants and HMX are tested here. Testing at this location began around 2017. Generally this area is used for testing approximately 1 day per month. Staff reported that after every test, any inert pieces of the fired articles will be picked up and disposed of. No soil sampling program was implemented for this area at the time of the VSI.	None	1275 - 1278		33.49817 N -111.71337 W	Brad Anderer Response: When did this area begin being used for testing? Approximately two years ago. What does the routine cleaning entail, and how often is that done? After every test, any inert pieces of the fired articles will be picked up and disposed. All propellants and explosive are consumed during the testing. Has any sampling been done here? No	This SWMU appears to be unchanged in both operation and contents. Groundwater monitoring is conducted in the vicinity of the firing range, and that remediation efforts are in their pilot testing phase.	Establish as part of the RFI Work Plan a routine soil sampling program within the active firing range.
BM	TTU-2 Tank	Approximately 1,000-gallon double-walled tank stores extracted perchlorate contaminated groundwater. Tank is located on concrete pad (~10' x 10'). Tank could not be accessed at time of VSI. Site staff stated that no known releases have occurred.	None	NA				This SWMU appears to be unchanged. Water from the tank is transferred to the evaporator/water boreout via vacuum truck. No evidence of spills or releases were observed.	No recommendations for this SWMU.
BN	TTU-1 Tank	Approximately 1,000-gallon double-walled tank stores extracted perchlorate contaminated groundwater. Tank is located on concrete pad (~10' x 10'). Tank could not be accessed at time of VSI. Site staff stated that no known releases have occurred.	None	1279				This SWMU appears to be unchanged. Water from the tank is transferred to the evaporator/water boreout via vacuum truck. No evidence of spills or releases were observed.	No recommendations for this SWMU.

Notes:

[1] *Documented Releases: Records are available documenting release, or release can be assumed based on the presence of soil or groundwater contamination.*

[2] *Suspected Releases: This category includes facilities for which no quantitative samples are available, but release is suspected based on the nature and frequency of hazardous material operations and presence of staining or other indicators of possible release.*

[3] *Release Potential: Release potential from hazardous material operations to each media.*

[4] *Recommendations for RCRA Facility Investigation (RFI): In the RFI the facility responsible for establishing the extent of on-site and off-site contamination. This category attempts to prioritize the need for further action and presents recommendations for further action to be conducted in the RFI.*

[5] *Current in 1994*

A - release to air

GW - release to groundwater

S - release to soil

Sources:

Geosyntec. 2021c. Conceptual Site Model, Nammo Defense Systems Inc. Facility, Mesa, Arizona. May.

H&A. 2017a. Report on Updated RCRA Facility Assessment, Nammo Talley, Inc. Mesa Arizona. September.

SAIC/TSC. 1994. RCRA Facility Assessment Report for Talley Defense Systems, Inc. Mesa, Arizona. EPA I.D. NOS.: AZD980816276 (Plant 2); AZD980885362 (Plant 3); ASD982361347 (Plant 4); AZD982471096 (Plant 6); AZD020132502 (Burn Ground). April.

SWMU/AOC	Unit Name	Concern Description	Documented Releases[1]	Suspected Releases[2]	Release Potential[3]	Recommendation for RCRA Facility Investigation/ Level of Priority[4]	Recommendation for Interim Measures	Actions Completed On SWMU/AOC to Date	Reference Documentation	Operational Status as of August 2017	Operational Status as of 2019	Operational Status as of 2021	Recommendation for Future Work
AOC 1	See SWMU No. 51	This AOC is SWMU 51.	NA	NA	NA	NA	NA	See SWMU 51	SAIC's Summary and Recommendations for RCRA Facility Assessment Report did not recommend a RFI or any interim measures for this SWMU (SAIC, 1994b).	Talley no longer operates at this location.		Nammo Defense no longer operates at this location. This AOC is considered closed.	Gather additional information, provide recommendations, and include a summary of SWMU specific information and data collected during prior investigations in a proposed Plant 5 & 6 RFA.
AOC 2	March 1984 Incident	Incident report indicated a spill of 1,1,1-TCA occurred on March 20, 1984. TDS indicated that the spill occurred at Plant 1 on March 19, 1984. A vertically mounted cylindrical product tank of TCA was turned on its side to stop the flow of product from a hole in the bottom of the tank caused by rust. An estimated maximum of 200 gallons was spilled, and ADHS oversaw remediation, which utilized a tractor to aerate contaminated soil on March 23, 1984.	NA	NA	NA	NA	NA	Underwent remediation.	SAIC's Summary and Recommendations for RCRA Facility Assessment Report did not recommend a RFI or any interim measures for this SWMU (SAIC, 1994b). However, the following documentation relates to this AOC because the release that it addresses was from the TCA product storage tank identified as AOC 5. Plant #1-TCA Tank Closure, Sampling Plan & Results (TDS, 1998b) Plant 1 – TCA Tank Closure Additional VOC Sampling Plan & Results (TDS, 2001) ADEQ NFA Letter (ADEQ, 2001)	Talley no longer operates at this location. A Walmart is now located at the former Plant 1 location.		Nammo Defense no longer operates at this location. This AOC is considered closed.	No recommendations for this AOC.
AOC 3	BG Burial Pits	TDS stated that the BG burial pits refer to 18 soil sampling locations located in the area that lead styphenate-containing propellant was detonated in 1979. Soils were tested for lead, and found to be contaminated. Soils were excavated and shipped to a facility in NV in 1986 and 1987. (More details in 1994 report.)	Yes	Yes	NA - Soil is removed	No	No	Undergone characterization and partial closure activities.	Not reviewed for this updated RFA. This is part of the TTU (SWMU 52). This unit has undergone characterization and partial closure activities, is subject to final closure and post-closure upon issuance of a RCRA post-closure permit by ADEQ.			See Table 7 SWMU 52.	Recommended completing the vertical and lateral delineation of COCs in the dissolved groundwater plume, and in soil vapor along the southern portion of the TTU.
AOC 4	Plant 2 Cooling Tower Tank and Overflow Impoundment	Unlined surface impoundment at the bottom of the hill on which the Plant 2 main HWAA was located in 1991. The impoundment received cooling tower wastewater generated at Plant 2 when discharge was great than the capacity of a holding tank adjacent to the impoundment. (More details in '94 report.)	No	No	High-S	NDS should assess potential releases from wastewater discharges to the unlined surface impoundment.	No	None	SAIC's Summary and Recommendations for RCRA Facility Assessment Report did not recommend a RFI or any interim measures for this SWMU (SAIC, 1994b).	Talley personnel was not aware of the referenced cooling tower tank and overflow impoundment. This AOC was not observed.		NDS staff were not aware of this AOC, so it was not observed.	Recommended additional assessment as part of a proposed Plant 2 RFA.
AOC 5	TCA Product Storage Tank (at Plant 1)	In March 1991 TDS utilized an above ground storage tank of virgin TCA. Documented releases of TCA have occurred during transfers.	Yes	Yes	Low-S	No	TDS should and obtain information to agency(s).	This comment is incomplete but the tank and stand were removed and soil sampled. A report was provided.	Plant #1-TCA Tank Closure, Sampling Plan & Results (TDS, 1998b); Plant 1 – TCA Tank Closure Additional VOC Sampling Plan & Results (TDS, 2001) TDS SWMU Letter to ADEQ (TDS, 1999c); ADEQ NFA Letter (ADEQ, 2001)	Talley no longer owns this property. A Walmart is now located at the Former Plant 1 location.		NDS no longer owns this property. This AOC is considered closed.	No recommendations for this AOC.
AOC 6	X-Ray Film Developing Process Water	In March 1991, 150 55-gallon drums containing x-ray film developing process wastewater were accumulated directly east of Plant 3 Line 1 Building Bay 5. TDS stated that these drums were kept in storage northwest of building 29 at Plant 3 for over one year.	No	No	Low	No	No	None	SAIC's Summary and Recommendations for RCRA Facility Assessment Report did not recommend a RFI or any interim measures for this SWMU (SAIC, 1994b).	X-ray process and wastewater generated from Line 1 at Plant 3 is no longer accumulated in 55 gallon drums and stored east of Plant 3 or in Plant 3 Building 29. Instead, it is now discharged to a large (~500 gallon) tank on the western side of the Line 1 building. (See new SWMU table for details.) No signs of spills or leaks were observed on the eastern side of the Line 1 building. Plant 3 building 29 was not visually inspected during the site visit due to time limitations. Talley personnel stated that Building 29 is used as overflow for shipping and receiving, and that no waste is generated or stored there.		Approximately once a month, X-ray film developing process water is transferred to the evaporator at Plant 2 via vacuum truck. The tank and secondary containment appeared to be in good condition. No signs of spills or releases were observed.	Recommended additional assessment as part of a proposed Plant 3 RFA. As part of this assessment the x-ray processes, waste generation, transport and disposal will be documented and evaluated for consistency with existing SWMUs and AOCs. A new AOC will be evaluated in the proposed RFA for the drum storage area northwest of Building 29.
AOC 7	BG Burn Plate Sump Removal	On the BG Security and Safety Equipment Inspection Log Sheet for March 6, 1992, it is noted that the burn plate sump was removed from the BG. No indication of the design, procedure, sampling plan, or possible soil removal associated with the sump removal was found. This is possibly a remedial action or redesign of the BG performed without notification of the ADEQ.	No	No	Med-S, A	No	No	Burn plate sump was removed.	None			Could not identify any new information regarding the BG Burn Plate Sump Removal.	The Burn Ground Sump is associated with the location of SWMU 52. Identification of the location of the sump and associated environmental conditions will be included as part of the RFI Work Plan.

SWMU/AOC	Unit Name	Concern Description	Documented Releases[1]	Suspected Releases[2]	Release Potential[3]	Recommendation for RCRA Facility Investigation/ Level of Priority[4]	Recommendation for Interim Measures	Actions Completed On SWMU/AOC to Date	Reference Documentation	Operational Status as of August 2017	Operational Status as of 2019	Operational Status as of 2021	Recommendation for Future Work
AOC 8	Buried Layers of Waste - Plant 6	One source document identified a landfill of layers of buried waste propellant near Plant 6. TDS stated that it is unaware of a buried propellant near Plant 6.	No	No	NA	NA	NA	None	SAIC's Summary and Recommendations for RCRA Facility Assessment Report did not recommend a RFI or any interim measures for this SWMU (SAIC, 1994b).	Nammo Talley no longer operates at this location.		NDS no longer operates at this location. This AOC is considered closed.	A summary of SWMU specific information and data collected during prior investigations will be included in a proposed Plant 5 & 6 RFA. Assessment of other contaminants of concern will be evaluated as part of the RFA.
AOC 9	Pb/Cr Contaminated Soil at BG	See SWMU 52 for details.	See SWMU 52	NA	NA	NA	NA	See SWMU 52	Not reviewed for this updated RFA. This is part of the TTU (SWMU 52). This unit has undergone characterization and partial closure activities, is subject to final closure and post-closure upon issuance of a RCRA post-closure permit by ADEQ.			See Table 7 SWMU 52.	See Table 7 SWMU 52.
AOC 10	Laboratory at Plant 3	Laboratory at Plant 3, Line 2 practicing good housekeeping measures, with proper manifesting for offsite disposal. Sink water is not discharged, but piped to 55 gallon drums.	No	No	Low	No	No	None	SAIC's Summary and Recommendations for RCRA Facility Assessment Report did not recommend a RFI or any interim measures for this SWMU (SAIC, 1994b).	A laboratory is located in the Plant 3 line 1 building, and it is presumed that this AOC refers to that same laboratory based on Talley personnel who stated no significant changes to the operations conducted at Plant 3 have occurred. Therefore, this AOC is active. A 5 gallon-container for solvent contaminated trash was situated on concrete within the lab. Sink water is piped to the x-ray process and research wastewater tank located outside of the Line 1 building, and treated by an onsite evaporator located near Plant 1. No signs of spills or leaks were observed.		Line 2 no longer has a laboratory. However, line 1 has a laboratory. No evidence of spills or releases were observed from the laboratory.	As part of a proposed Plant 3 RFA, the location AOC10 described in the 1994 RFA should be reviewed. Evaluate a new AOC for the existing laboratory located within Line 1 Building.
AOC 11	Septic Tanks	TDS stated that wherever there is a bathroom, there is a septic tank. Two septic tanks are used at Plant 2. Historically TDS dismantled and washed out fired metal casings. Casings were washed out in sinks located in Plants 3 and 6. TDS stated that the products of combustions that were washed out consisted of copper and sodium hydroxide. These sinks drain to septic tanks. TDS has disposed of nonhazardous bathroom mop water to the septic system at Plant 4. TDS could not identify the locations of all septic tanks on site plans of each plant.	Unknown	Yes	Med-S	NDS should determine locations of all septic tanks and leach fields, and sample area to determine if hazardous constituents are present.	No	Based on the text of the SAIC RFA report, AOC #11 and #12 are referring to the same area which is the cesspool/septic tank/injection well located north of Plant #3 Line II. TDS has filed for closure under the ADEQ APP permit unit, removed the unit, and submitted sampling results. TDS was awaiting approval for closure as of January 1999. A second (similar) unit was located at Plant and TDS had already received clean closure on it as of January 1999. Two more (similar) units were also undergoing closure at Plant #1 and were waiting for final ADEQ approval at that time. No other "regulated units" require closure per APP regulations. Septic tanks which receive bathroom waste are exempt.	TDS SWMU Letter to ADEQ (TDS, 1999c); ADEQ 5 July 2000 Meeting Notes (ADEQ, 2000)	Based on the text of the SAIC RFA report, AOC 11 a nd 12 are referring to the same area which is the ce sspool/septic tank/injection well located north of Pl ant 3 Line II. TDS has filed for closure under the AD EQ APP permit unit, removed the unit, and submitt ed sampling results. TDS was awaiting approval for closure as of January 1999. A second (similar) unit was located at Plant and TDS had already received clean closure on it as of January 1999. Two more (s imilar) units were also undergoing closure at Plant 1 and were waiting for final ADEQ approval at that time. No other "regulated units" require closure per APP regulations. Septic tanks which receive bathro om waste are exempt.		Could not identify any new information regarding the septic tanks at Nammo Defense Systems.	Identify the locations of any additional septic tanks and associated cesspools and sampling for potential contamination from facility processes. This AOC is being evaluated for investigation as part of the Plant 3 RI for potential VOC releases as part of the Plant 3 RI (Geosyntec, 2021d) described in Section 4.2.11 of the CCR. A summary of SWMU specific information and data collected for perchlorate and VOCs as part of the Plant 3 RI should be included in a proposed Plant 3 RFA. Gather additional information and provide recommendations in a Plant 4 RFA for other contaminants of concern.
AOC 12	Cesspool at Plant 3	In their notification of disposal forms submitted to the state, TDS identified a cesspool at Plant 3 used to receive photo lab wastewater and two sinks for metal parts washing and hand washing. The chemical nature of these waste streams was not determined at the visual site inspection (VSI).	No	No	Low-S	TDS should sample surrounding soil (and through cesspool) to determine if hazardous constituents are present.	Discontinue use/remove.	The use of the cesspool was discontinued, removed, and was undergoing closure through the ADEQ APP process in January 1999. Marnie Greenbie was the contact person identified in the APP Unit department.	TDS SWMU Letter to ADEQ (TDS, 1999c); ADEQ 5 July 2000 Meeting Notes (ADEQ, 2000)	The use of the cesspool was discontinued, removed , and is was undergoing closure through the ADEQ APP process in January 1999. Marnie Greenbie was the contact person identified in the APP Unit depar tment.		Discovered that discharge from industrial clothes washing machines was discharged into the cesspools at Plant 3. A 15-foot vertical pipe was observed leading into the location of one cesspool. According to site staff, a degreaser was historically connected to this pipe.	Locate and sample the cesspools for potential contamination. This AOC is being evaluated for investigation as part of the Plant 3 RI for potential VOC releases as part of the Plant 3 RI (Geosyntec, 2021d) described in Section 4.2.11 of this CCR. A summary of SWMU specific information and data collected for perchlorate and VOCs as part of the Plant 3 RI should be included in a proposed Plant 3 RFA. Gather additional information and provide recommendations in a Plant 3 RFA for other contaminants of concern.

SWMU/AOC	Unit Name	Concern Description	Documented Releases[1]	Suspected Releases[2]	Release Potential[3]	Recommendation for RCRA Facility Investigation/ Level of Priority[4]	Recommendation for Interim Measures	Actions Completed On SWMU/AOC to Date	Reference Documentation	Operational Status as of August 2017	Operational Status as of 2019	Operational Status as of 2021	Recommendation for Future Work
AOC 13	TRW Ops. at Plant 3	TRW leased bays 21-23 and 36 at Line 2 building 29 and one additional unidentified building beginning on May 31, 1990. TDS states that TRW operations in bay 21-23 consisted of assembly of "enhancer packs" for airbag inflators and that no waste was generated in these bays. Bay 36 was a holding area for NaN3; no waste was generated. Bay 13 was also used for storage of boron potassium nitrate. Building 29 was also leased for storage of cupric oxide. During the file review at the VSI manifests reflecting the shipment of TRW waste propellant from Plant 3 to the TDS BG were discovered. These forms indicate that both TDS and TRW generates propellant waste at both Plants 3 and 6.	No	No	Low	No	No	None	SAIC's Summary and Recommendations for RCRA Facility Assessment Report did not recommend a RFI or any interim measures for this SWMU (SAIC, 1994b).	Plant 3 building 29 was not visually inspected during the site visit due to time limitations. Talley personnel stated that Building 29 is used as overflow for shipping and receiving, and that no waste is generated or stored there.		Did not observe waste storage in building 29.	Determine if additional environmental sampling is necessary to assess potential releases of sodium azide. Gather additional information and provide recommendations in a Plant 4 RFA for the former TRW operations at Plant 3.
AOC 14	TRW Ops at Plant 6	TDS stated that TRW operations in Plant 6 consisted of weighing out and assembly operations. NaN3 propellant was put into tubes, ignitors were wire, and enhancer packs were assembled. Experimental work on air bag construction was also conducted. TDS stated that no waste was generated from TRW operations at Plant 6. During the file review at the VSI manifests reflecting the shipment of TRW waste propellant from Plant 3 to the TDS BG were discovered. These forms indicate that both TDS and TRW generates propellant waste at both Plants 3 and 6.	No	No	Low	No	No	None	SAIC's Summary and Recommendations for RCRA Facility Assessment Report did not recommend a RFI or any interim measures for this SWMU (SAIC, 1994b).	Nammo Talley no longer operates at this location.		NDS no longer operates at this location. This AOC is considered closed.	No recommendations for this AOC.
AOC 15	Unknown or Abandoned Area	An area covering approximately 50' x 100' located east of the TTU has possibly been used to dispose of building rubble, other debris, ad may be the site of a former unit associated with drains and concrete structures that appear to have been dismantled in place. The area appears to be a natural wash for surface water runoff. A pile of rubble that may have been deposited here after a structure was dismantled elsewhere is located in the wash. A yellow substance of unknown constituency or origin was scattered near the rubble piles. (More details in 1994 report.)	Unknown	Yes	High-S	TDS should conduct extensive review/research of activities that resulted in this debris, burn area(s and yellow substances. Sampling would determine extent of possible contamination. Report of findings should be presented to agency(s).	Remove debris, discontinue practice of dumping.	TDS removed the debris and discontinued the practice of stockpiling debris in the area. Clean-up reports provided. TDS has conducted extensive review/research, investigation, sampling, and remediation to both the debris and burn areas. The results of the work were provided in reports.	Plant #3- Thermate Grenade Pit Closure, Sampling Plan and Results (TDS, 1998c) Plant #3- Abandon Area/TTU/Smoke Tunnel Closure Sampling Plan & Results (TDS, 1999a); TDS SWMU Letter to ADEQ (TDS, 1999c); Thermate Grenade Pit Final Sampling Results (TDS, 2001); ADEQ NFA Letter (ADEQ, 2001)	This AOC was not observed during the site visit due to time limitations.		Did not observe debris in the wash east of the TTU. This AOC is considered closed.	A summary of SWMU specific information and data collected during prior investigations should be included in a proposed Plant 3 RFA. Gather additional information and provide recommendations in a Plant 3 RFA for other potential contaminants of concern.
AOC 16	Alleged TCA Dump Area	A complaint was lodged around 1/3/85 which alleged TDS was dumping 1,1,1-TCA "at the end of Higley Rd on the north side - plant 2(?)." ADHS inspected the site and did not find any evidence of spillage. No photos were taken. TDS stated they were unaware of any dumping and that employee are not directed to dispose of TCA by dumping.	Unknown	Yes	High-S	TDS should conduct extensive review/research of activities that may have resulted in TCA dumping. Report of preliminary findings should be submitted to agency(s). If a location is determined, sampling would determine extent of possible contamination. Report of findings should be presented to agency(s).	No	TDS has no knowledge of such dumping and the allegation was from an unknown anonymous source. An ADHS inspection occurred as a result of the complaint and no evidence was found to substantiate the complaint. Exact area where complainant said dumping occurred is unknown. As discussed and agreed upon by ADEQ during a meeting on 2/4/98, no further investigation can be done if location or source is unknown. TDS has no knowledge of TCA or TCE dumping. Employees have never been directed to dispose of TCA or TCE by dumping on-site. This alleged AOC should not be a Part B or WQARF issue. No action planned by TDS.	ADEQ Inter-office Memorandum (ADEQ, 1998a); TDS SWMU Letter to ADEQ (TDS, 1999c);	Not observed due to lack of detailed location information.		Did not locate this alleged TCA dump area. This AOC is considered closed.	Gather additional information and provide recommendations in a Plant 2 RFA.
AOC 17 (Preliminary)	Former Plant 3 Line 1 Storage Area	According to staff, when propellant grains could not be removed from rocket motors processed at the former Plant 1, they were transported to Plant 3 and soaked in solvent drums. According to staff, releases from the solvent drums were observed in this area.						Currently being evaluated for potential VOC releases.	Geosyntec, 2021d			According to staff, when propellant grains could not be removed from rocket motors processed at the former Plant 1, they were transported from to Plant 3 and soaked in solvent drums. According to staff, releases from the solvent drums were observed in this area.	This AOC is currently being evaluated for potential VOCs releases as part of the Plant 3 RI (Geosyntec, 2021d) described in Section 4.2.11 of this CCR. A summary of SWMU specific information and data collected for perchlorate and VOCs as part of the Plant 3 RI should be included in a proposed Plant 3 RFA. Gather additional information and provide recommendations in a Plant 3 RFA.

Table 8: AOCs SWMUs
Current Conditions Report
Nammo Defense Systems Inc., Mesa, Arizona

SWMU/AOC	Unit Name	Concern Description	Documented Releases[1]	Suspected Releases[2]	Release Potential[3]	Recommendation for RCRA Facility Investigation/ Level of Priority[4]	Recommendation for Interim Measures	Actions Completed On SWMU/AOC to Date	Reference Documentation	Operational Status as of August 2017	Operational Status as of 2019	Operational Status as of 2021	Recommendation for Future Work

Notes:

[1] Documented Releases: Records are available documenting release, or release can be assumed based on the presence of soil or groundwater contamination.

[2] Suspected Releases: This category includes facilities for which no quantitative samples are available, but release is suspected based on the nature and frequency of hazardous material operations and presence of staining or other indicators of possible release.

[3] Release Potential: Release potential from hazardous material operations to each media.

[4] Recommendations for RCRA Facility Investigation (RFI): In the RFI the facility responsible for establishing the extent of on-site and off-site contamination. This category attempts to prioritize the need for further action and presents recommendations for further action to be conducted in the RFI.

[5] Current in 1994

A - release to air

GW - release to groundwater

S - release to soil

Sources:

ADEQ. 1998a. Arizona Department of Environmental Quality, Inter-Office Memorandum, To: Talley Defense Systems, From: Jeff Bryan, HWPU, RE: Meeting of February 4, 1998; Talley Defense Systems. February 6.

ADEQ. 2000. July 5, 2000 Meeting Agenda for TDS & ADEQ. July 5.

ADEQ. 2001. Talley Defense Systems (Talley), Inc., EPA ID No AZD980814479. (1) Plant #1 – TCA Tank Closure – Sampling Plan and Results – December 18. 1998. (2) Plant #3 – Abandon Area/TTU/Smoke Tunnel Closure – Sampling Plan and Results Report – January 6, 1999. (3) Plant #3 – Thermal Grenade Pit Closure – Sampling Plan and Results Report – December 21, 1998. (4) Plant #2 – SWMU#8 – HWAA Bldg. 20. Solvent Pad – Sampling and Results Report – January 8, 1999. December 17.

Geosyntec. 2021d. Remedial Investigation Work Plan Plant 3 and Former WBO Facility, Nammo Defense Systems Inc., Mesa, Arizona. 20 May.

SAIC/TSC. 1994a. RCRA Facility Assessment Report for Talley Defense Systems, Inc. Mesa, Arizona. EPA I.D. NOS.: AZD980816276 (Plant 2); AZD980885362 (Plant 3); ASD982361347 (Plant 4); AZD982471096 (Plant 6); AZD020132502 (Burn Ground). April.

SAIC/TSC. 1994b. Summary and Recommendations, RCRA Facility Assessment Report For Talley Defense Systems, Talley Industries, Inc., Mesa, Arizona. April.

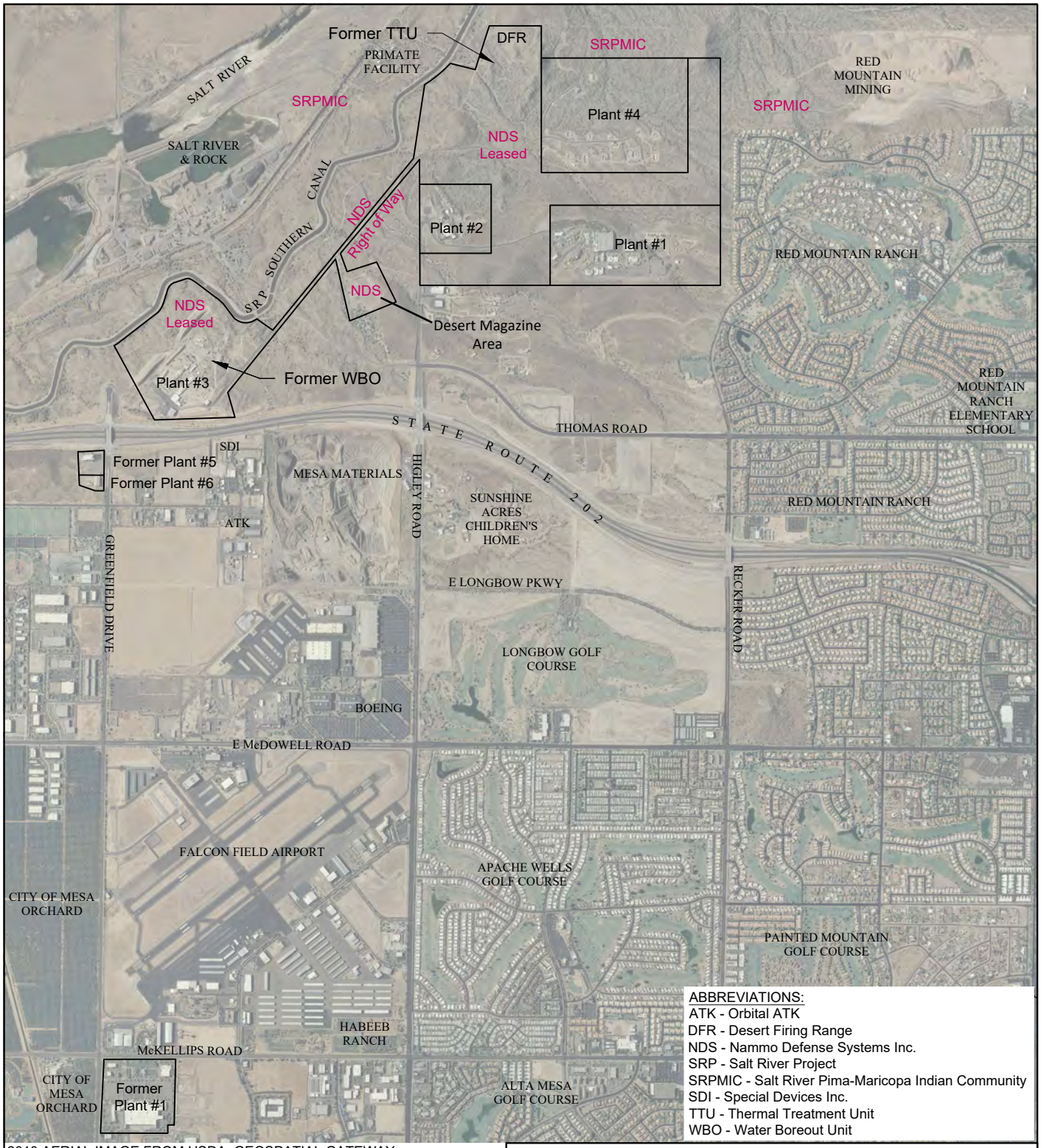
TDS. 1998b. Former DISCOM Surface Impoundments Plant 6 – VOC Investigation Report. Talley Defense Systems, Inc. Environmental Department 3450 North Greenfield Road, Mesa, Arizona 85215. 30 September.

TDS. 1999a. Plant #3 – Abandon Area/TTU/Smoke Tunnel Closure Sampling Plan & Results Report. January 6.

TDS. 1999c. Solid Waste Management Unit (SWMU) Investigations, January 12.

TDS. 2001. Plant 1 – TCA Tank Closure Additional VOC Sampling Plan & Results. Talley Defense Systems, Inc. Environmental Department 3450 North Greenfield Road, Mesa, Arizona 85215. July 26.

FIGURES

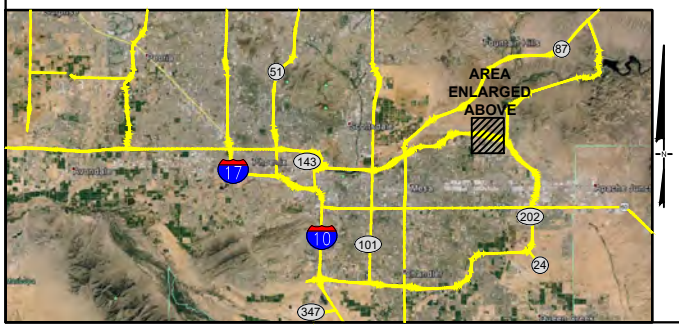


ABBREVIATIONS:
ATK - Orbital ATK
DFR - Desert Firing Range
NDS - Nammo Defense Systems Inc.
SRP - Salt River Project
SRPMIC - Salt River Pima-Maricopa Indian Community
SDI - Special Devices Inc.
TTU - Thermal Treatment Unit
WBO - Water Boreout Unit

2010 AERIAL IMAGE FROM USDA: GEOSPATIAL GATEWAY

EXPLANATION:

APPROXIMATE PROPERTY BOUNDARY



2,400' 1,200' 0 2,400 Feet

VICINITY MAP

Nammo Talley Defense Systems Inc.
Mesa, Arizona

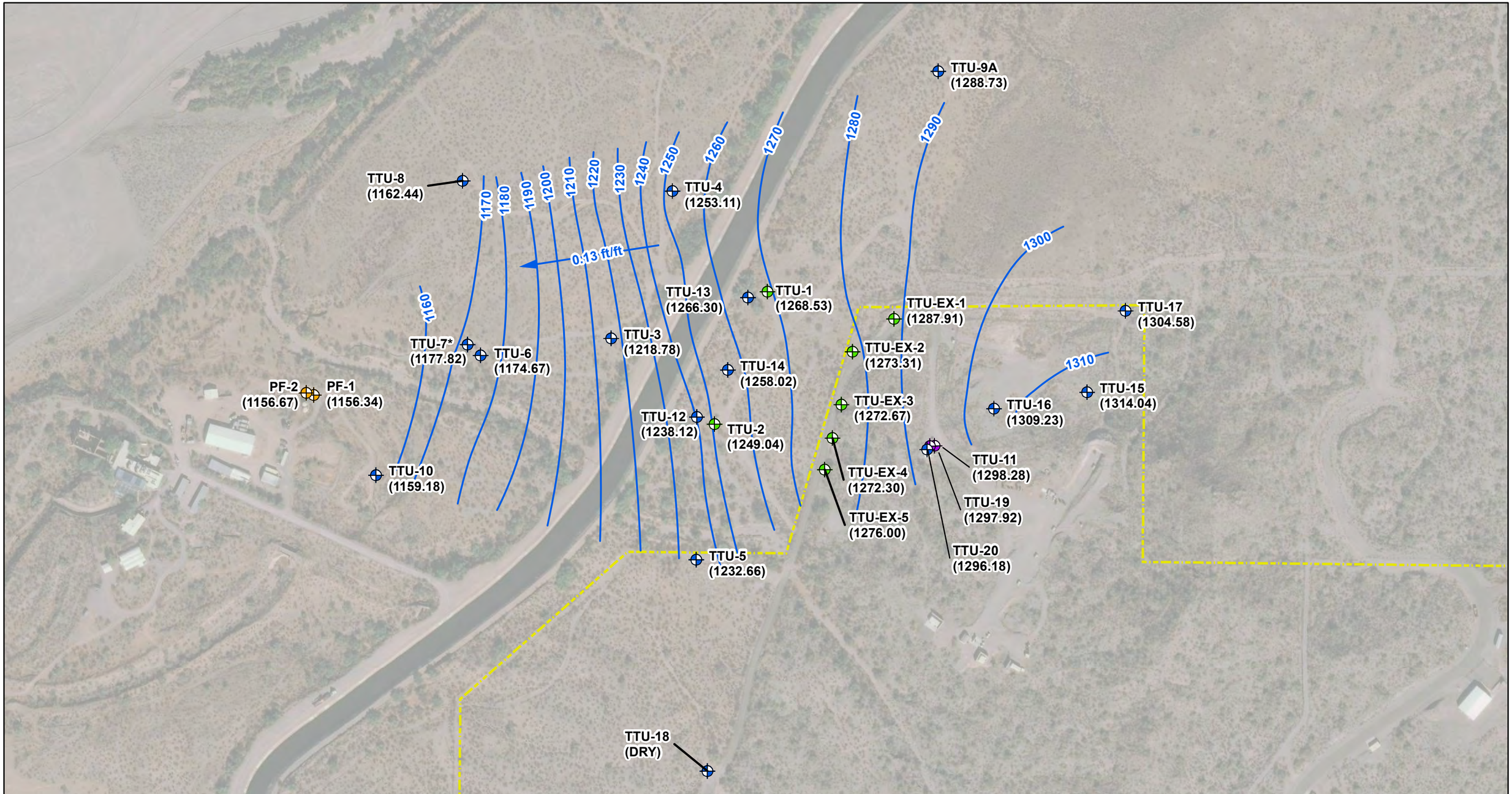
Geosyntec consultants

Phoenix, AZ | September 2021

Figure

1

N:\GEOSYNTEC\NAMMO DEFENSE\VICINITY MAP\SP0101N NT P6 VICINITY MAP EXHIBIT



Legend

- Primate Well
- Extraction Well
- Injection Well
- Monitoring Well
- Groundwater Elevation Contour (ft amsl)
- Hydraulic Gradient Direction and Magnitude (ft/ft)
- NDS Leased Property Boundary with SRP-MIC

Notes

NM: Not Measured
All locations are approximate.
ft amsl: feet above mean sea level
*: not used to generate contours.
TTU-7 is a deep well.
During the 1st quarter of 2021, TTU-11, TTU-19, and TTU-20 were used for an In-Situ Treatment Pilot test with TTU-11 and TTU-19 as injection points.

TTU-1 = Monitoring Well Location
1268.53 = Groundwater Elevation (ft. amsl)

N

0 400 Feet

2021 Q2 Groundwater Contours

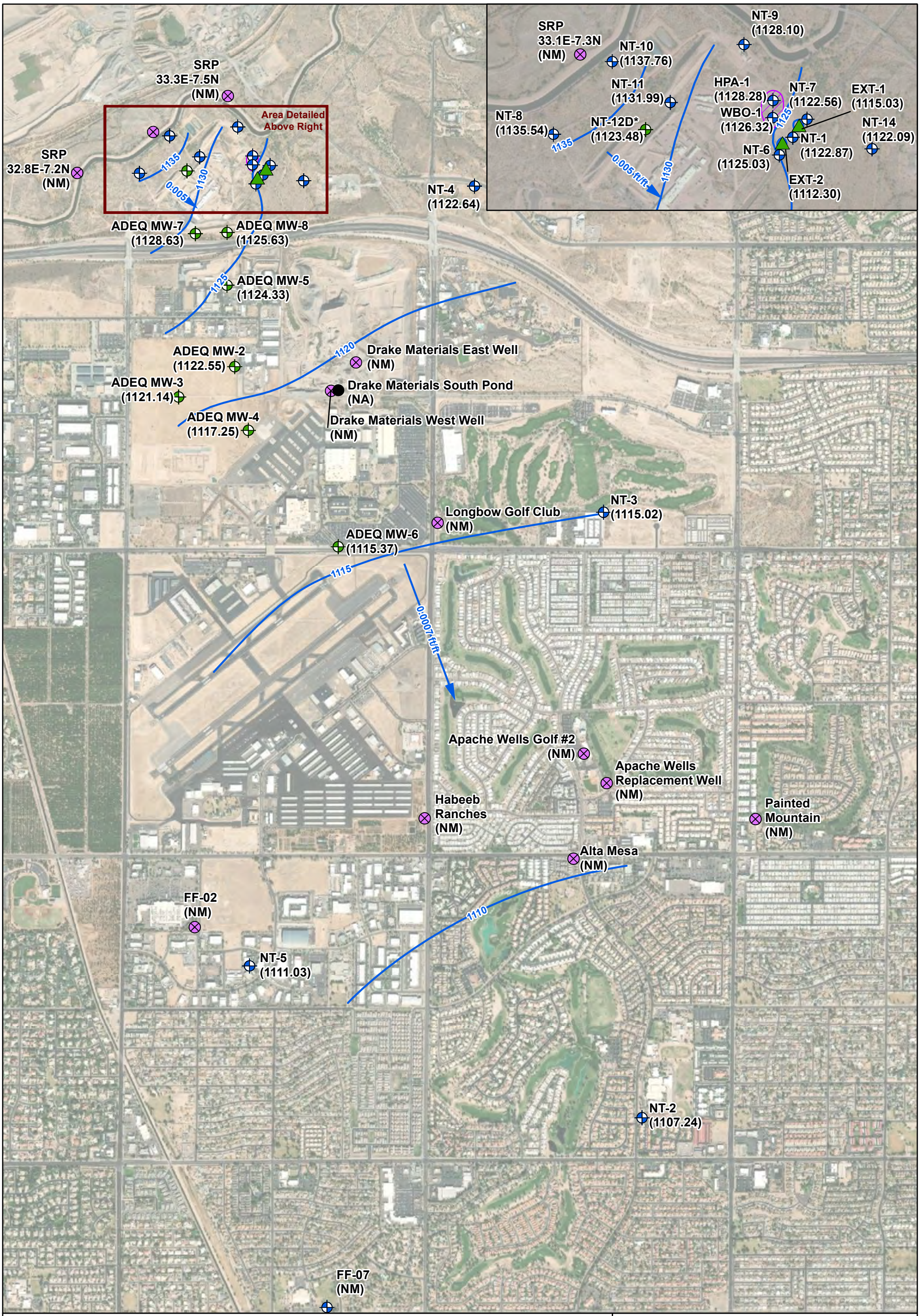
Nammo Defense Systems Inc.
Former Thermal Treatment Unit (TTU)
Mesa, Arizona

Geosyntec consultants

Phoenix, AZ | November 2021

Figure 2

\\SANDIEGO-01\Data\GIS_SanDiego01\SP0101_Nammo\MXD\TTU\TTU_GWM_ANNUAL_2021\Fig02_2021Q2_Groundwater_Contour_Maps.mxd 11/11/2021 (Author: MBradford) 3:24:36 PM



Extraction Well
Industrial/Irrigation Well
Monitoring Well
Monitoring Well with Submerged Screen Interval
Drake Materials South Pond
Groundwater Elevation Contour (ft amsl)
Flow Direction and Hydraulic Gradient (ft/ft)
Approximate Perchlorate Source Area

NT-2 = Monitoring Well Location
1107.24 = Groundwater Elevation (ft amsl)

ft amsl: feet above mean sea level
NDS: Nammo Defense Systems Inc.
NM: Not Measured
NA: Not applicable, Drake Materials South Pond is a man-made surface body of water.
* : Not used for contouring
NT-12D is a deep well.
Approximate perchlorate source area is within the vicinity of WBO-1 and HPA-1.

N

0 1,500 Feet

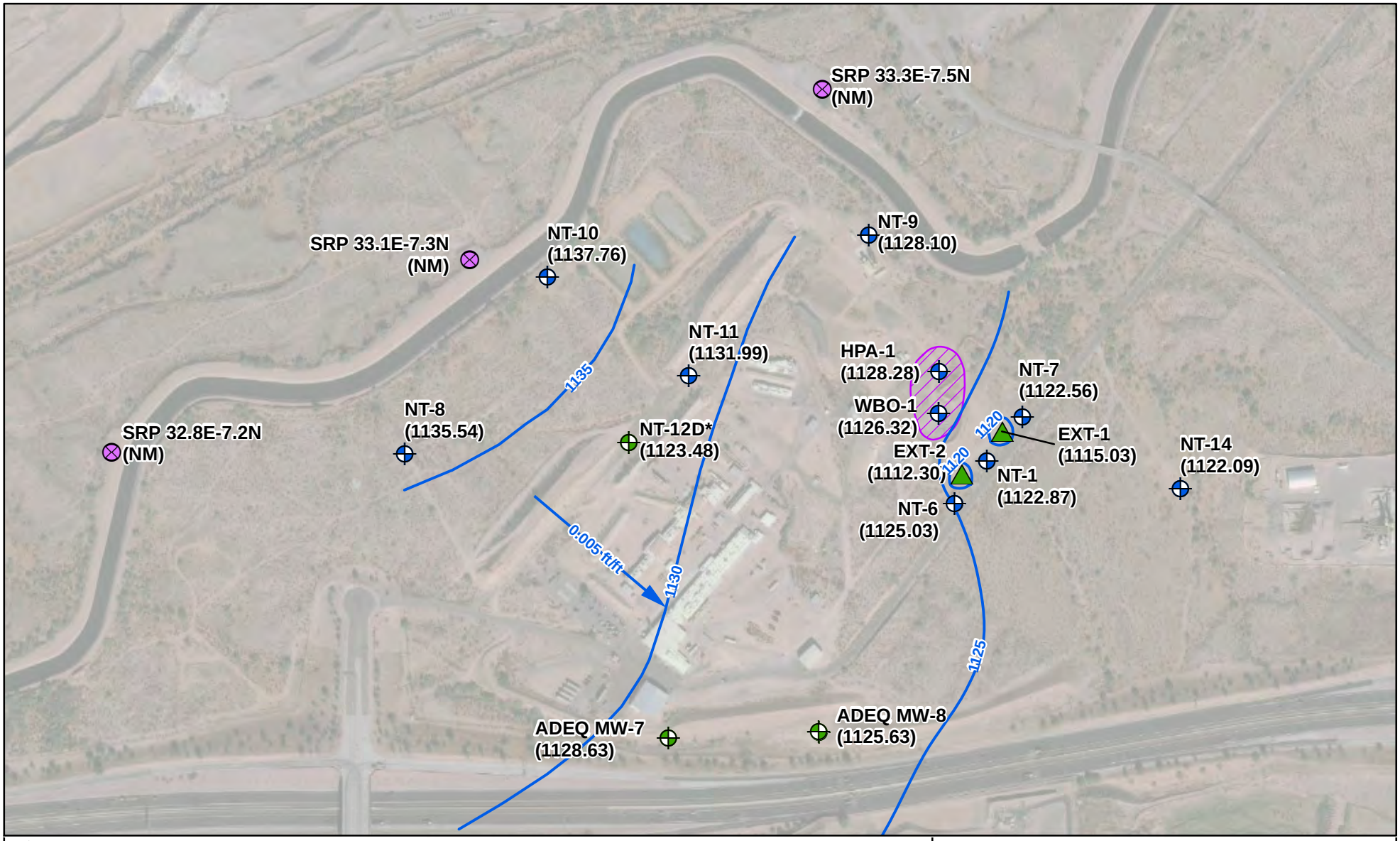
Groundwater Elevations and Contours in Shallow Wells
May 2021
Nammo Defense Systems Inc. Plant #3
Mesa, Arizona

Geosyntec consultants

Phoenix | September 2021

Figure 3

\\Sandiego-01\data\GIS_SanDiego01\SP0101_Nammo\MXD\WBO\WBO_GWM_2021Q2\Fig02_2021Q2_WBO_Groundwater_Contours_Shallow_Wells.mxd 9/27/2021 (Author: SMcKnight) 6:43:20 PM



Extraction Well
Industrial/Irrigation Well
Monitoring Well
Monitoring Well with Submerged Screen Interval
Groundwater Elevation Contour (ft amsl)
Flow Direction and Hydraulic Gradient (ft/ft)
Approximate Perchlorate Source Area

NT-1 = Monitoring Well Location
1122.87 = Groundwater Elevation (ft amsl)

ft amsl: feet above mean sea level
NDS: Nammo Defense Systems Inc.
NM: Not Measured
* : Not used for contouring
NT-12D is a deep well.
Approximate perchlorate source area is within the vicinity of WBO-1 and HPA-1.

N

0 500 Feet

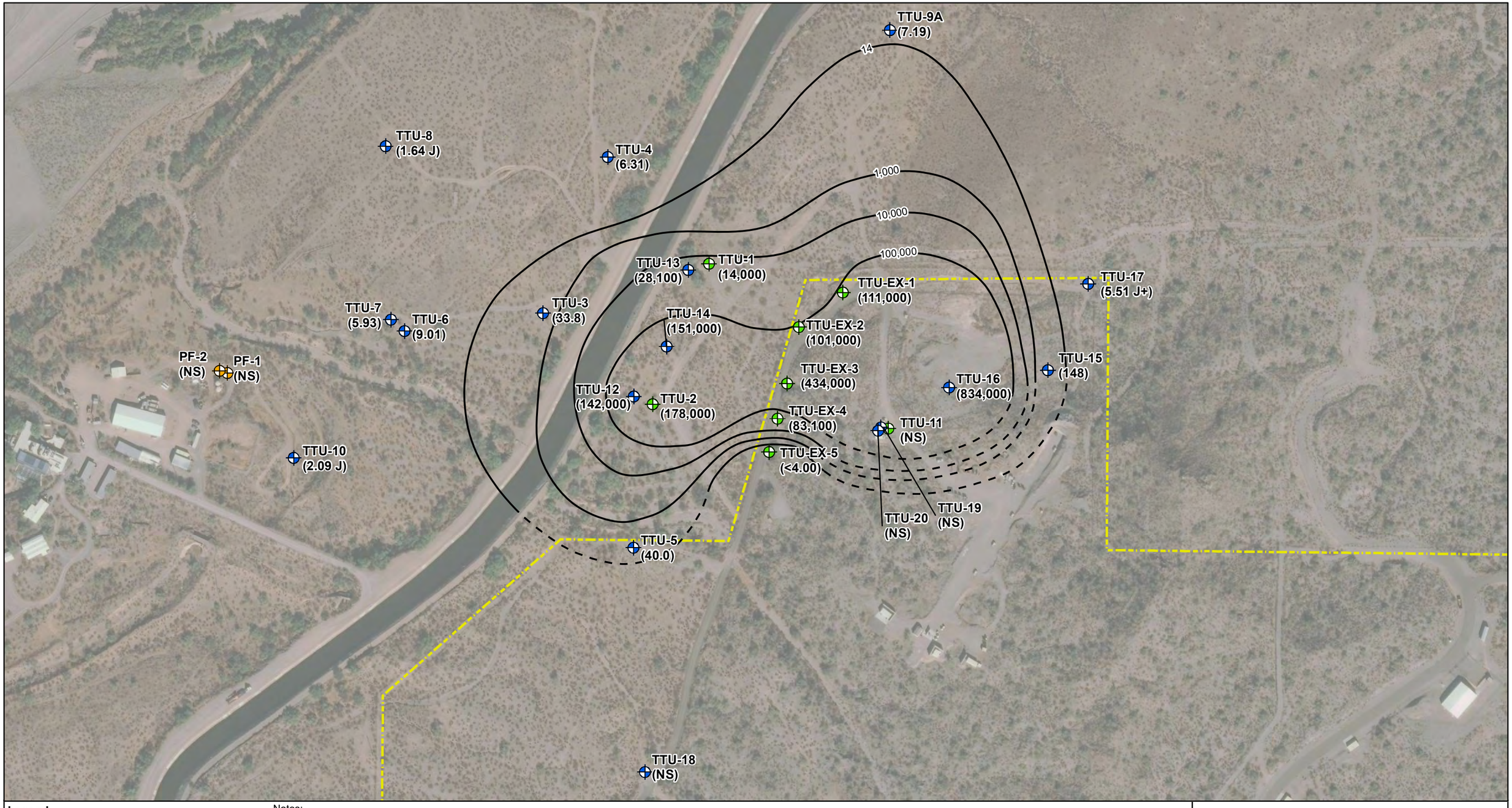
Plant #3: Groundwater Elevations and Contours in Shallow Wells May 2021
Nammo Defense Systems Inc. Plant #3
Mesa, Arizona

Geosyntec consultants

Phoenix | September 2021

Figure 4

\\SANDIEGO-01\Data\GIS_SanDiego01\SP0101_Nammo\MXD\WBO\WBO_GWM_2021Q2\Fig03_2021Q2_WBO_Groundwater_Contours_Shallow_Wells_Plant3.mxd 8/26/2021 (Author: MBradford) 1:36:26 PM



Legend

- Primate Well
- Extraction Well
- Monitoring Well
- Perchlorate Concentration Contour µg/L
- NDS Leased Property Boundary with SRP-MIC

Notes:

All locations are approximate.
NS: Not Sampled
J: estimated concentration.
J+ = The analyte was positively identified; however, the associated numerical value is likely to be higher than the concentration of the analyte in the sample due to negative bias of associated QC or calibration data or attributable to matrix interference.
Non-detect results are indicated by "<" followed by the laboratory RL.
Highest result used where duplicate samples are collected.
TTU-18: This well is dry and has not been sampled since installation in 1Q 2020.
PF-1: The pump for this well is not operational and the well is not in use. Samples for this well have not been collected for the 2020-2021 monitoring period. TTU-11, TTU-19, and TTU-20: Wells are sampled and reported as part of a separate scope for the Enhanced In Situ Bioremediation Pilot Test.
Perchlorate groundwater Health Based Guidance Level is 14 µg/L.

TTU-1 = Monitoring Well Location
14,000 = Perchlorate Concentration in micrograms per liter (µg/L).

N

0 220 Feet

Perchlorate Detections in Groundwater
Second Quarter 2021

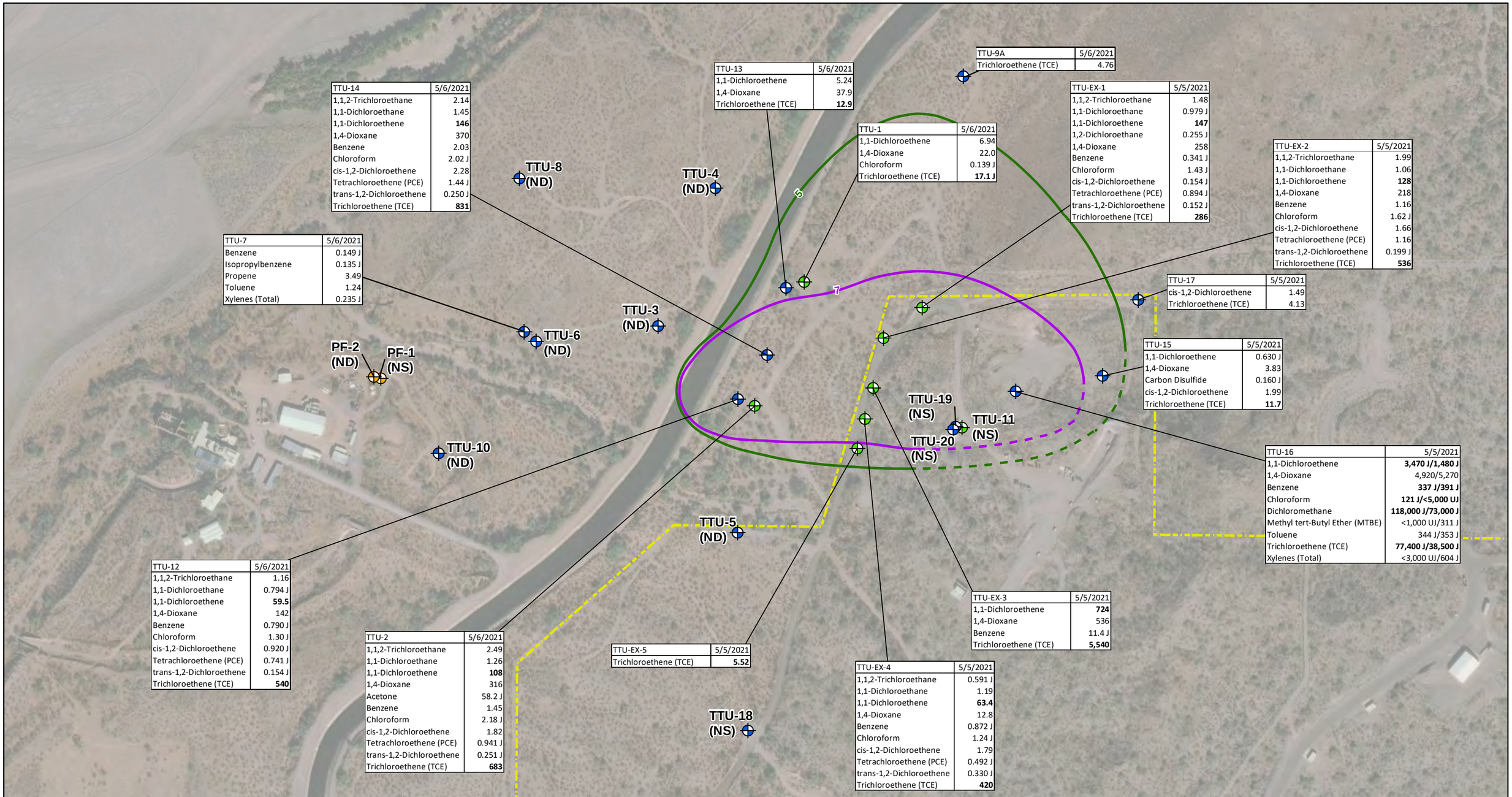
Nammo Defense Systems Inc.
Former Thermal Treatment Unit (TTU)
Mesa, Arizona

Geosyntec consultants

Phoenix, AZ | September 2021

Figure 5

\\SANDIEGO-01\Data\GIS_SanDiego01\SP0101_Nammo\MXD\TTU\TTU_GWM_ANNUAL_2021\Fig03_2021Q2_Perchlorate_Detections_GW.mxd 8/31/2021 (Author: MBradford) 4:26:42 PM



TTU-14	5/6/2021
1,1,2-Trichloroethane	2.14
1,1-Dichloroethane	1.45
1,1-Dichloroethene	**146**
1,4-Dioxane	370
Benzene	2.03
Chloroform	2.02 J
cis-1,2-Dichloroethene	2.28
Tetrachloroethene (PCE)	1.44 J
trans-1,2-Dichloroethene	0.250 J
Trichloroethene (TCE)	**831**

TTU-7	5/6/2021
Benzene	0.149 J
Isopropylbenzene	0.135 J
Propene	3.49
Toluene	1.24
Xylenes (Total)	0.235 J

TTU-13	5/6/2021
1,1-Dichloroethene	5.24
1,4-Dioxane	37.9
Trichloroethene (TCE)	**12.9**

TTU-1	5/6/2021
1,1-Dichloroethene	6.94
1,4-Dioxane	22.0
Chloroform	0.139 J
Trichloroethene (TCE)	**17.1 J**

TTU-9A	5/6/2021
Trichloroethene (TCE)	4.76

TTU-EX-1	5/5/2021
1,1,2-Trichloroethane	1.48
1,1-Dichloroethane	0.979 J
1,1-Dichloroethene	**147**
1,2-Dichloroethane	0.255 J
1,4-Dioxane	258
Benzene	0.341 J
Chloroform	1.43 J
cis-1,2-Dichloroethene	0.154 J
Tetrachloroethene (PCE)	0.894 J
trans-1,2-Dichloroethene	0.152 J
Trichloroethene (TCE)	**286**

TTU-EX-2	5/5/2021
1,1,2-Trichloroethane	1.99
1,1-Dichloroethane	1.06
1,1-Dichloroethene	**128**
1,4-Dioxane	218
Benzene	1.16
Chloroform	1.62 J
cis-1,2-Dichloroethene	1.66
Tetrachloroethene (PCE)	1.16
trans-1,2-Dichloroethene	0.199 J
Trichloroethene (TCE)	**536**

TTU-17	5/5/2021
cis-1,2-Dichloroethene	1.49
Trichloroethene (TCE)	4.13

TTU-15	5/5/2021
1,1-Dichloroethene	0.630 J
1,4-Dioxane	3.83
Carbon Disulfide	0.160 J
cis-1,2-Dichloroethene	1.99
Trichloroethene (TCE)	**11.7**

TTU-16	5/5/2021
1,1-Dichloroethene	**3,470 J/1,480 J**
1,4-Dioxane	4,920/5,270
Benzene	**337 J/391 J**
Chloroform	**121 J/<5,000 UJ**
Dichloromethane	**118,000 J/73,000 J**
Methyl tert-Butyl Ether (MTBE)	<1,000 UJ/311 J
Toluene	344 J/353 J
Trichloroethene (TCE)	**77,400 J/38,500 J**
Xylenes (Total)	<3,000 UJ/604 J

TTU-12	5/6/2021
1,1,2-Trichloroethane	1.16
1,1-Dichloroethane	0.794 J
1,1-Dichloroethene	**59.5**
1,4-Dioxane	142
Benzene	0.790 J
Chloroform	1.30 J
cis-1,2-Dichloroethene	0.920 J
Tetrachloroethene (PCE)	0.741 J
trans-1,2-Dichloroethene	0.154 J
Trichloroethene (TCE)	**540**

TTU-2	5/6/2021
1,1,2-Trichloroethane	2.49
1,1-Dichloroethane	1.26
1,1-Dichloroethene	**108**
1,4-Dioxane	316
Acetone	58.2 J
Benzene	1.45
Chloroform	2.18 J
cis-1,2-Dichloroethene	1.82
Tetrachloroethene (PCE)	0.941 J
trans-1,2-Dichloroethene	0.251 J
Trichloroethene (TCE)	**683**

TTU-EX-5	5/5/2021
Trichloroethene (TCE)	**5.52**

TTU-EX-3	5/5/2021
1,1-Dichloroethene	**724**
1,4-Dioxane	536
Benzene	11.4 J
Trichloroethene (TCE)	**5,540**

TTU-EX-4	5/5/2021
1,1,2-Trichloroethane	0.591 J
1,1-Dichloroethane	1.19
1,1-Dichloroethene	**63.4**
1,4-Dioxane	12.8
Benzene	0.872 J
Chloroform	1.24 J
cis-1,2-Dichloroethene	1.79
Tetrachloroethene (PCE)	0.492 J
trans-1,2-Dichloroethene	0.330 J
Trichloroethene (TCE)	**420**

Legend

- Primate Well
- Extraction Well
- Monitoring Well
- Extent of Estimated 1,1-Dichloroethene (1,1-DCE) concentration in Groundwater May 2021 (Dashed Where Inferred)
- Extent of Estimated Trichloroethene (TCE) Concentration in Groundwater May 2021 (Dashed Where Inferred)
- NDS Leased Property Boundary with SRP-MIC

Notes:
All locations are approximate.
Concentrations are in micrograms per liter (µg/L)
Only detected results are shown.
Primary/duplicate sample results.
ND: Not Detected; NS: Not Sampled
J: estimated concentration.
TTU-18: This well is dry and has not been sampled since installation in 1Q 2020.
PF-1: The pump for this well is not operational and the well is not in use.
Samples for this well have not been collected for the 2019-2020 monitoring period.
TTU-11, TTU-19, and TTU-20: Wells are sampled and reported as part of a separate scope for the Enhanced In Situ Bioremediation Pilot Test.

Contours represent the approximate extent of the TCE plume (green) and 1,1 DCE plume (purple) with concentrations above the Arizona Water Quality Standards (AWQS) for TCE and 1,1 DCE.
Concentrations exceeding the AWQS indicated in **bold.**

AWQS Screening Levels (µg/L):

1,1-DCE - 7	Total Trihalomethanes (including Chloroform) - 100
1,1,1-TCA - 200	Dichloromethane - 5
1,1,2-TCA 5	Trans-1,2-Dichloroethene - 100
Benzene - 5	PCE - 5
Cis-1,2-DCE - 70	TCE - 5

N

0 250 Feet

VOC Detections in Groundwater
Second Quarter 2021

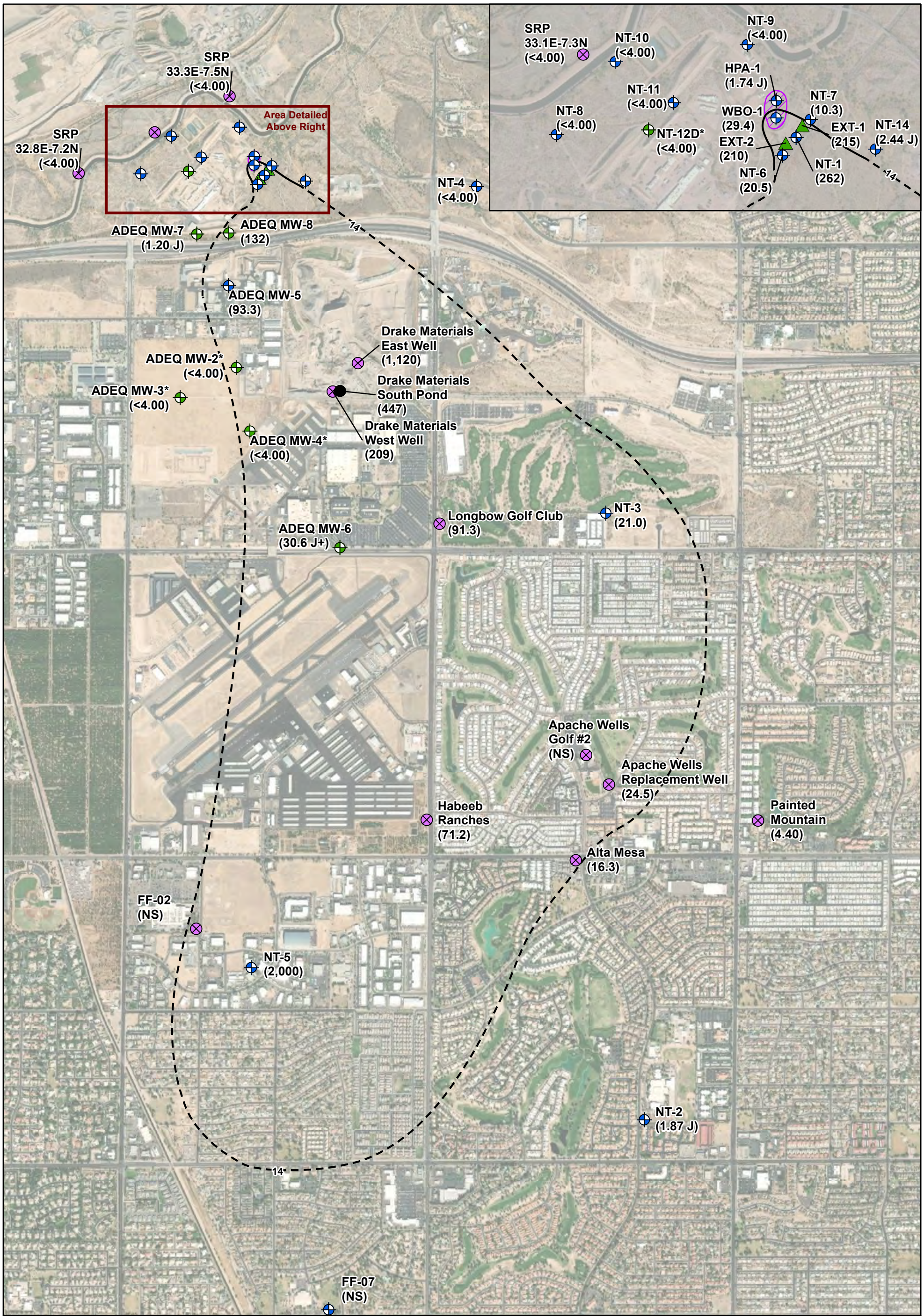
Nammo Defense Systems Inc.
Former Thermal Treatment Unit (TTU)
Mesa, Arizona

Geosyntec consultants

Phoenix, AZ | September 2021

Figure 6

\\SANDIEGO-01\Data\GIS_SanDiego01\SP0101_Nammo\MXD\TTU\TTU_GWM_ANNUAL_2021\Fig04_2021Q2_VOC_Detections_GW.mxd 8/24/2021 (Author: MBradford) 10:45:37 AM



Extraction Well
Industrial/Irrigation Well
Monitoring Well
Monitoring Well with Submerged Screen Interval
Drake Materials South Pond
Estimated Perchlorate Concentration Contour (µg/l) - Dashed Where Inferred
Approximate Perchlorate Source Area

NT-2 = Monitoring Well Location
1.87 J = Perchlorate Concentration in micrograms per liter (µg/l)
NDS: Nammo Defense Systems Inc.
NS: Not sampled for perchlorate in this monitoring event.
<: concentration was below the indicated laboratory reporting limit
J: estimated concentration
J+ = Estimated concentration; actual concentration is likely higher than the detected value.
*: The casings conditions of ADEQ-MW-2, ADEQ-MW-3 and ADEQ-MW4 are greatly deteriorated (Geosyntec, 2020a), therefore the iso-contour near these wells has been inferred.
Samples from irrigation wells were collected from spigots during pumping. These samples consist of purged water from a pumping zone and may be representative of blended concentrations, whereas samples from monitor wells are considered depth specific. Therefore the iso-contour near irrigation wells has been inferred.
Maximum result is shown for duplicate detections.
Arizona Health Based Guidance Level for Perchlorate is 14 µg/l.
Approximate perchlorate source area is within the vicinity of WBO-1 and HPA-1.

N

0 1,500 Feet

Perchlorate Concentrations and Contours
May 2021

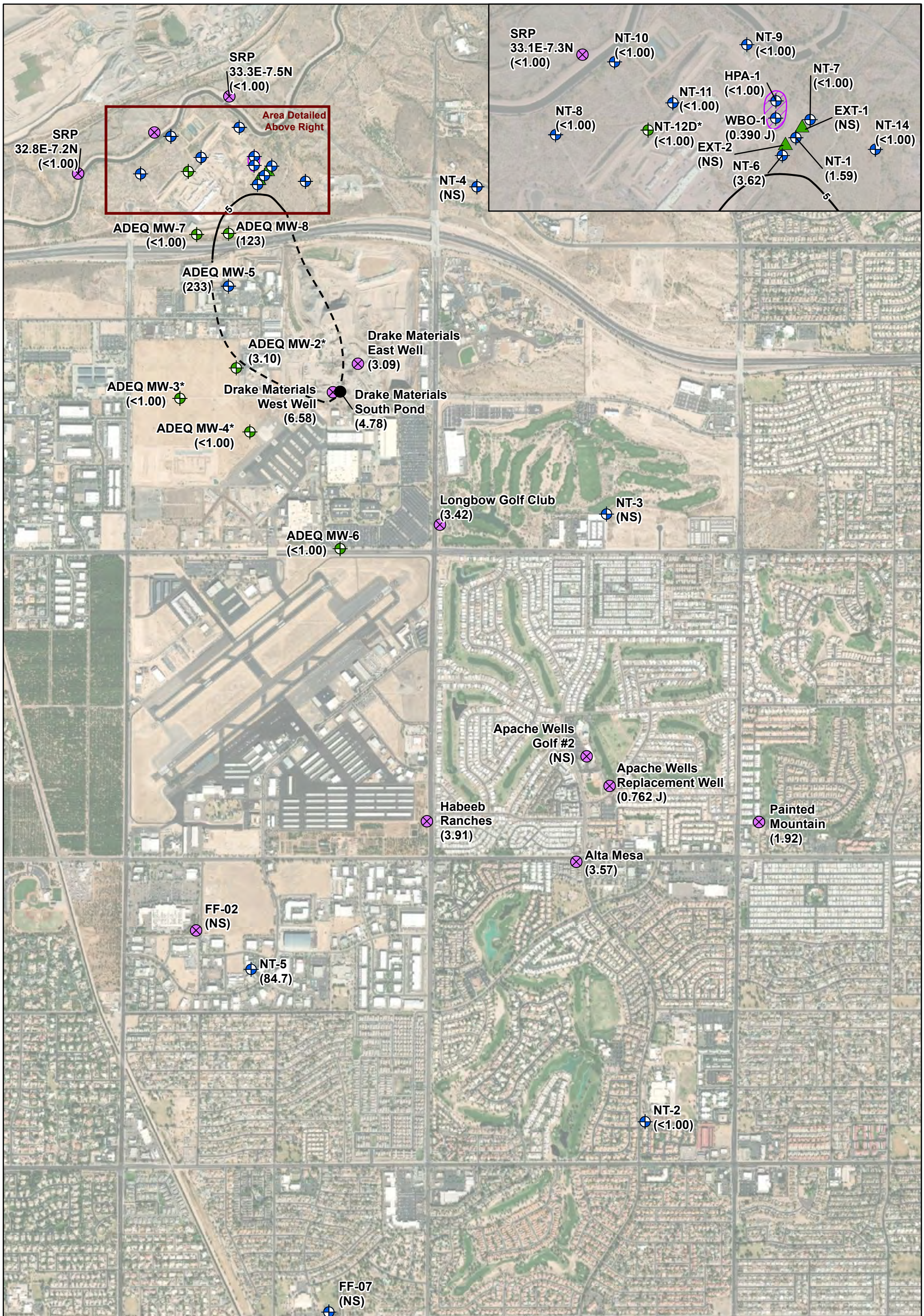
Nammo Defense Systems Inc. Plant #3
Mesa, Arizona

Geosyntec consultants

Phoenix | September 2021

Figure 7

\\Sandiego-01\data\GIS_SanDiego01\SP0101_Nammo\MXD\WBO\WBO_GWM_2021Q2\Fig04_2021Q2_WBO_Perchlorate_Detections_GW.mxd 9/27/2021 (Author: SMcKnight) 6:49:23 PM



Extraction Well
Industrial/Irrigation Well
Monitoring Well
Monitoring Well with Submerged Screen Interval
Drake Materials South Pond
Estimated TCE Concentration Contour (µg/l) - Dashed Where Inferred
Approximate Perchlorate Source

NT-5 = Monitoring Well Location
84.7 = TCE Concentration in micrograms per liter (µg/l)

NDS: Nammo Defense Systems Inc.
NS: Not sampled for TCE in this monitoring event.
TCE: Trichloroethene
J: estimated concentration.
<: concentration was below the indicated laboratory reporting limit
*: The casings conditions of ADEQ-MW-2, ADEQ-MW-3 and ADEQ-MW4 are greatly deteriorated (Geosyntec, 2020a), therefore the iso-contour near these wells has been inferred.
Samples from irrigation wells were collected from spigots during pumping. These samples consist of purged water from a pumping zone and may be representative of blended concentrations, whereas samples from monitor wells are considered depth specific. Therefore the iso-contour near irrigation wells has been inferred.
Maximum result is shown for duplicate detections.
Arizona Water Quality Standard for TCE is 5 µg/l.

N

0 1,500 Feet

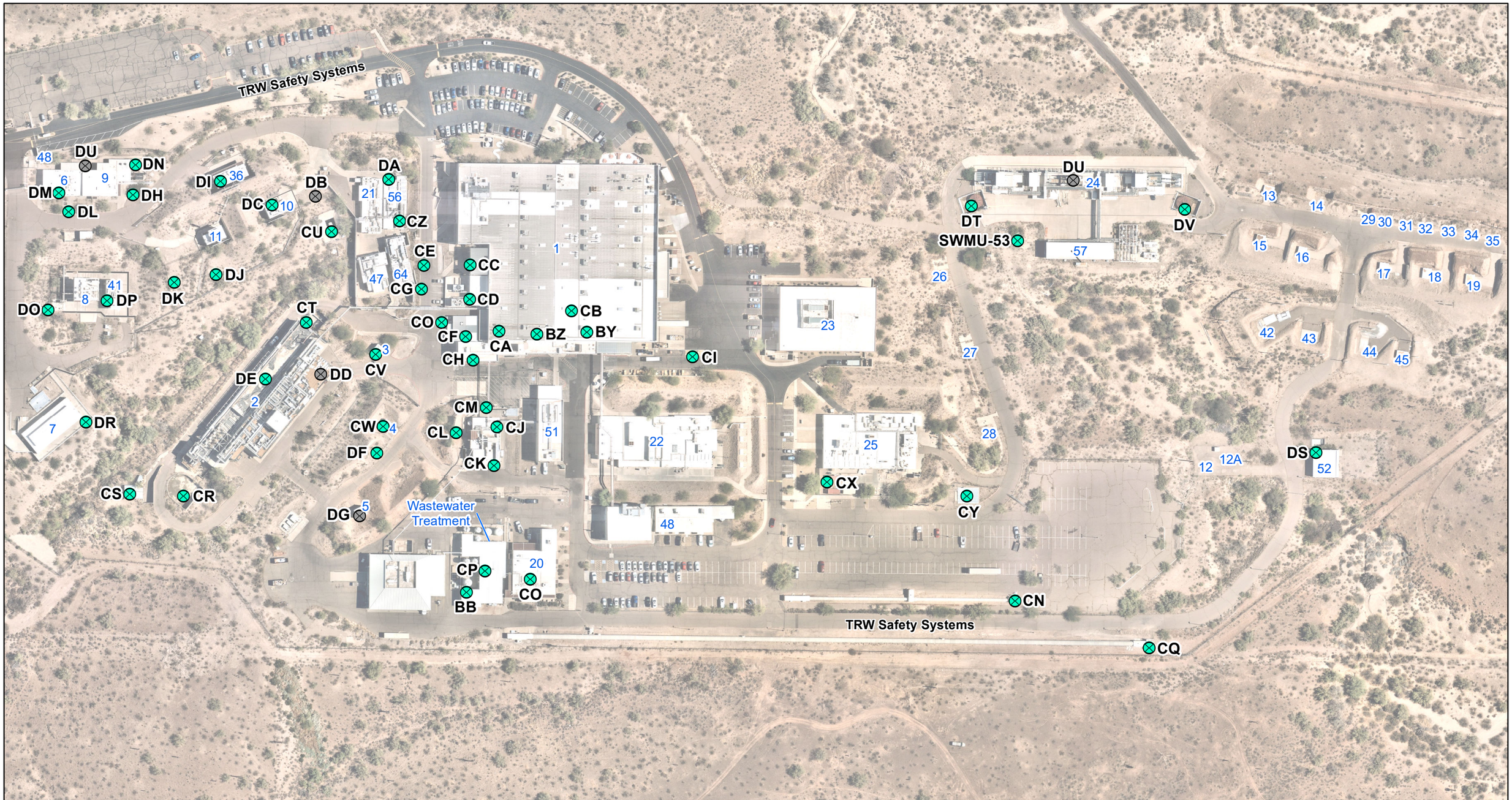
Trichloroethene (TCE) Concentrations and Contours May 2021
Nammo Defense Systems Inc. Plant #3
Mesa, Arizona

Geosyntec consultants

Phoenix | September 2021

Figure 8

\\Sandiego-01\data\GIS_SanDiego01\SP0101_Nammo\MXD\WBO\WBO_GWM_2021Q2\Fig05_2021Q2_WBO_TCE_Detections_GW.mxd 9/27/2021 (Author: SMcKnight) 6:50:20 PM



SOLID WASTE MANAGEMENT UNIT

- ACTIVE
- INACTIVE

Building Number

AOC - Area of Concern
SWMU - Solid Waste Management Unit
IMAGERY SOURCE: Nearmap, 5/24/2021

N

0 75 150 300
Feet

Plant #1 SWMUs and AOCs

Nammo Defense Systems Inc., Plant 1
Mesa, Arizona

Geosyntec consultants

Phoenix | May 2022

Figure 9

\\SanDiego-01\Data\GIS_SanDiego01\SP0101_Nammo\MXD\SWMU\Fig09_SWMU_Plant1.mxd 5/19/2022 (Author: SWolfskill) 4:57:17 PM

SOLID WASTE MANAGEMENT UNIT

- ACTIVE
- INACTIVE

Building Number

AOC - Area of Concern
SWMU - Solid Waste Management Unit
IMAGERY SOURCE: Nearmap, 5/24/2021

N

0 50 100 200
Feet

Plant #2 SWMUs and AOCs

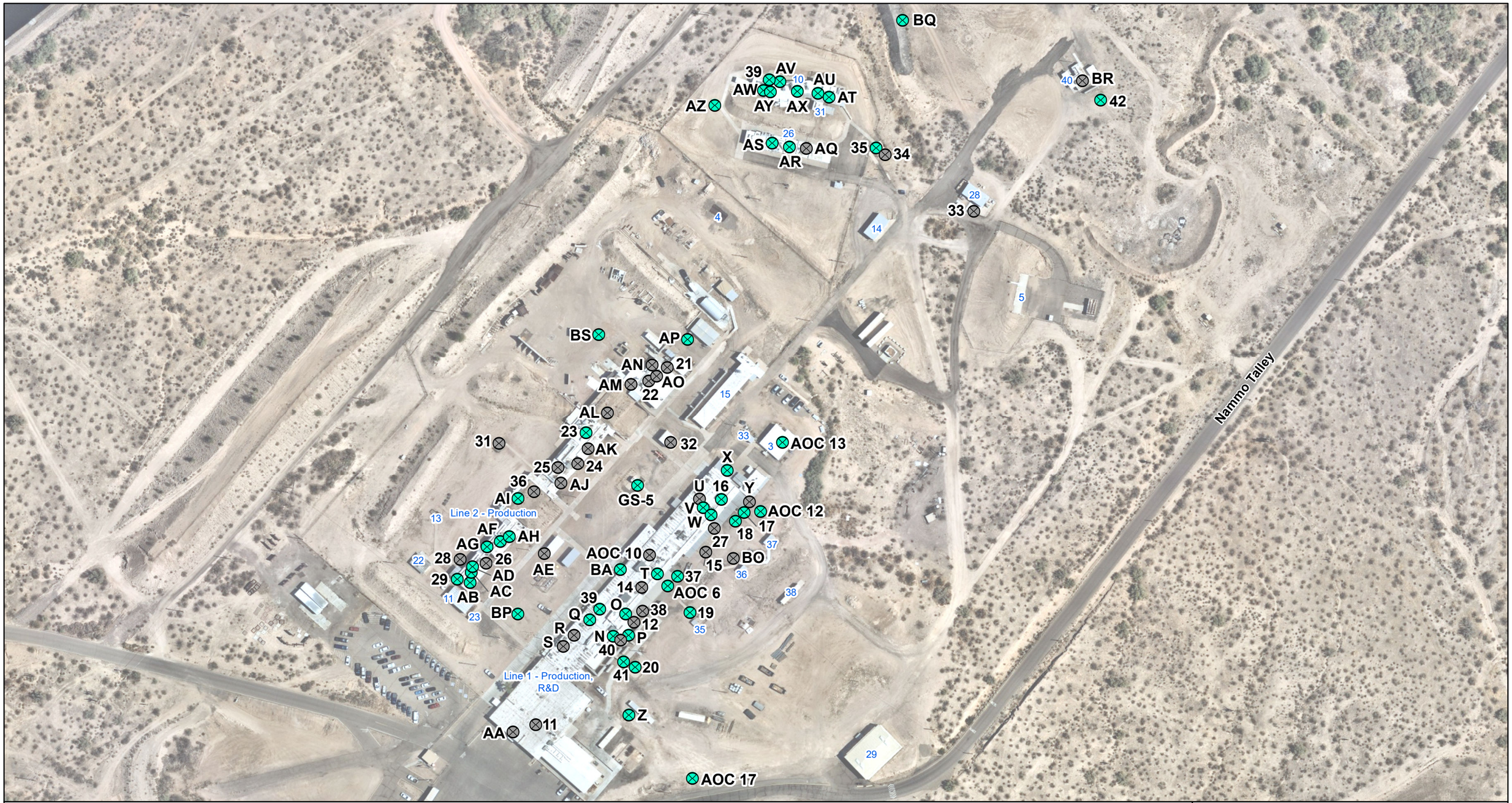
Nammo Defense Systems Inc., Plant 2
Mesa, Arizona

Geosyntec consultants

Phoenix | May 2022

Figure
10

\\SanDiego-01\Data\GIS_SanDiego01\SP0101_Nammo\MXD\SWMU\Fig10_SWMU_Plant2.mxd 5/20/2022 (Author: SWolfskill) 11:09:31 AM



SOLID WASTE MANAGEMENT UNIT

- ACTIVE
- INACTIVE

Building Number

AOC - Area of Concern
SWMU - Solid Waste Management Unit
IMAGERY SOURCE: Nearmap, 5/24/2021

N

0 75 150 300
Feet

Plant #3 SWMUs and AOCs

Nammo Defense Systems Inc., Plant 3
Mesa, Arizona

Geosyntec consultants

Phoenix | May 2022

Figure 11

\\SanDiego-01\Data\GIS_SanDiego01\SP0101_Nammo\MXD\SWMU\Fig11_SWMU_Plant3.mxd 5/20/2022 (Author: SWolfskill) 10:19:08 AM

SOLID WASTE MANAGEMENT UNIT

- ACTIVE
- INACTIVE

Building Number
*Former Buildings 40 and 41 per 1994 RFA

AOC - Area of Concern
SWMU - Solid Waste Management Unit
IMAGERY SOURCE: Nearmap, 5/24/2021

N

0 75 150 300
Feet

Plant #4 SWMUs and AOCs

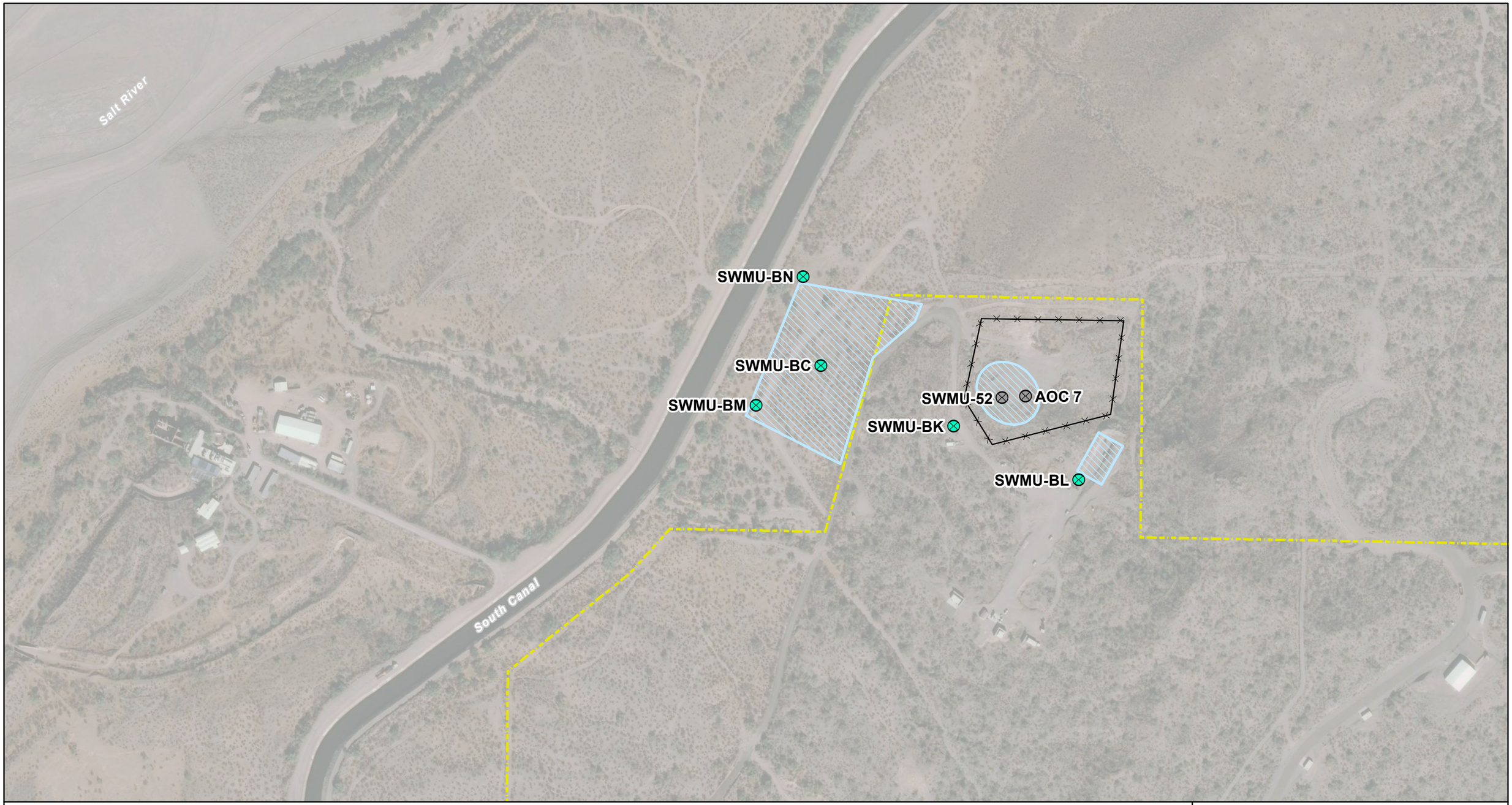
Nammo Defense Systems Inc., Plant 4
Mesa, Arizona

Geosyntec consultants

Phoenix | May 2022

Figure
12

\\SANDIEGO-01\Data\GIS_SanDiego01\SP0101_Nammo\MXD\SWMU\Fig12_SWMU_Plant4.mxd 5/26/2022 (Author: MBradford) 9:41:47 AM



SOLID WASTE MANAGEMENT UNIT

- ACTIVE
- INACTIVE

- FENCE LINE, TTU BOUNDARY
- APPROXIMATE RETENTION BASIN AREA
- NDS LEASED PROPERTY BOUNDARY WITH SALT RIVER
- PIMA - MARICOPA INDIAN COMMUNITY

AOC - Area of Concern
NDS - Nammo Defense Systems Inc.
SWMU - Solid Waste Management Unit
SWMU-52 contains AOCs 3, 7, and 9
All locations are approximate.
IMAGERY SOURCE: Esri World Imagery, 11/17/2020

N

0 125 250 500
Feet

Desert Firing Range SWMUs and AOCs

Nammo Defense Systems Inc.
Former Thermal Treatment Unit (TTU)
Mesa, Arizona

Geosyntec consultants

Phoenix | May 2022

Figure 13

\\SanDiego-01\Data\GIS_SanDiego01\SP0101_Nammo\MXD\SWMU\Fig13_SWMU_DFR.mxd 5/20/2022 (Author: SWolfskill) 10:59:58 AM

SOLID WASTE MANAGEMENT UNIT

- ACTIVE
- INACTIVE

AOC - Area of Concern
SWMU - Solid Waste Management Unit
IMAGERY SOURCE: Nearmap, 5/26/2022

N

0 75 150 300
Feet

Desert Magazine Area SWMUs and AOCs

Nammo Defense Systems Inc.
Mesa, Arizona

Geosyntec consultants

Phoenix | May 2022

Figure
14

\\SANDIEGO-01\Data\GIS_SanDiego01\SP0101_Nammo\MXD\SWMU\Fig14_SWMU_DMA.mxd 5/26/2022 (Author: MBradford) 1:56:57 PM

APPENDIX A

Previous Investigations Figures and Data Tables

APPENDIX A

Previous Investigations Figures and Data Tables

Facility Wide Documents

DCN: TZ4-R09052-RN-M21086

RECEIVED
ADEQ
MAY 13 1994
Hazardous
Waste
Permits

SUMMARY AND RECOMMENDATIONS
RCRA FACILITY ASSESSMENT REPORT
FOR
TALLEY DEFENSE SYSTEMS, TALLEY INDUSTRIES, INC.
MESA, ARIZONA

EPA I.D. NOS.:

AZD980816276 (Plant 2);
AZD980885362 (Plant 3);
AZD982361347 (Plant 4);
AZD982471096 (Plant 6);
AZD020132502 (Burn Ground)

APRIL 1994

PREPARED FOR:

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 HAWTHORNE STREET
SAN FRANCISCO, CALIFORNIA 94105

PREPARED BY:

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
TECHNOLOGY SERVICES COMPANY
20 CALIFORNIA STREET, SUITE 400
SAN FRANCISCO, CALIFORNIA 94111

EPA CONTRACT NO. 68-W9-0008
EPA WORK ASSIGNMENT NO. R09052
SAIC/TSC PROJECT NO. 06-6075-03-4421

TABLE 8.1

SUMMARY OF SWMU FINDINGS AND SUGGESTED FURTHER ACTIONS

TABLE8.1
SUMMARYOF SWMU FINDINGSANDSUGGESTEDFURTHERACTIONS

SWMU/ AOC #	SWMU Name	Documented Releases [1]	Suspected Releases [2]	Release Potential [3]	Recommendation for RCRA Facility Investigation / Level of Priority [4]	Recommendations for Interim Measures
SOLID WASTE MANAGEMENT UNITS						
1 - 4	Plant 2 - SAAs/HWAA - Main Bldg.	No	No	Low	No	No
5	North Hold SAA Plant 2	Yes	Yes	Low	No	TDS should place drums of liquids waste in plastic catch basins.
6	Former 1,1,1-TCA SAA Plant 2	No	No	Low-A, S (hist'l)	No	No
7	East Hold HWAA Plant 2	No	Yes	Low-S (hist'l)	No	No. Concrete slopes to center.
8	HWAA Bldg. 20 Plant 2	Unknown	Yes	Medium-S	No	TDS should sample to determine the presence (or not) of hazardous waste or constituents in soil. (Remove soil if HW present). TDS should construct curbs or berms around unit.
9	HWAA Ignitor Bldg. Plant 2	No	No	Low	No	No
10	Water Bore-Out Ops. at Plant 2	No	No	Low	No	No
11 - 18	SAAs Line 1 - Plant 3	No	No	Low-S, A	No	No
19	HWAA Line 1 - Plant 3 (ERM)	No	No	No	No	No
20	SAA Line 1 - Plant 3 (ERM)	No	No	Low-S	No	No
21 - 30	SAAs Line 2 - Plant 3	No	No	SWMU 27: Low-S SWMU 30: Low-S	No	No
31	HWAA Line 2	No	Unknown	Low-S (if only solids managed)	No	No
32	SAA Test Office	Mo	No	Low	No	No

[1] Documented Releases: Records are available documenting a release, or releases can be assumed based on presence of soil or groundwater contamination.

[2] Suspected Releases: This category includes facilities for which no quantitative samples are available, but release is suspected based on the nature and frequency of hazardous material operations and presence of staining or other indicators of possible release.

[3] Release Potential: Release potential from hazardous material operations to each media.

[4] Recommendations for RCRA Facility Investigation (RFI): In the RFI, the facility is responsible for establishing the extent of on-site and off-site contamination. This category attempts to prioritize the need for further action and presents recommendations for further action to be conducted in the RFI.

LEGEND: S = Release to Soil SW = Release to Surface Water G = Release to Groundwater A = Release to Air SG = Release to Soil Gas

SOURCE: RCRA Facility Assessment, Talley Defense System, Inc., Science Applications International Corporation/Technology Services Company (SAIC/TSC), April 1994.

TABLE8.1
SUMMARYOF SWMU FINDINGSANDSUGGESTEDFURTHERACTIONS

SWMU/ AOC #	SWMU Name	Documented Releases [1]	Suspected Releases [2]	Release Potential [3]	Recommendation for RCRA Facility Investigation / Level of Priority [4]	Recommendations for Interim Measures
33	HWAA Bldg. 28	No	Yes	Med/High-S (hist'l) Low/Med-S (curr.)	No	TDS should construct curbs if liquid hazardous waste or constituents will be managed here.
34	HWAA Bldg. 10	No	No	Low	No	No
35 - 41	SAAs Bldg. 10	No	No	Low	No	No
42	Former Water Bore-Out Ops. Area	Yes	Yes	High-S (HWAA) High-S (Pits) Low-GW	No; facility is working with ADEQ to determine extent of cleanup needed	Yes; remove containers from pad, discontinue use of pad, sample soil, and remediate as necessary.
43	Plant 4 HWAA	No	No	Low	No	No
44	Bldg. 23 - Plant 4 Casting Room	No	No	Low/NA	No	No
45	Bldg. 22 - Plant 4 Mixing Room	No	Yes	Low/Med-S	No	TDS should implement policy to repair equipment in a timely manner.
46	Bldg. 24 - Plant 4 Curing Room	Unknown	Yes	Low-S	No	TDS should implement policy to repair equipment in a timely manner.
47	SAAs Bldg. 20 Plant 4	No	No	Low	No	No
48	SAA Bldg. 18 Plant 4	No	Unknown	Low	No	No
49	SAA Bldg. 1 Plant 6	No	No	Low	No	No
50	Historical SAA Bldg. 2	No	No	Low	No	No
51	Historical SIs	No	Yes	Med/High-S (drums) Low-S (ponds) Low-A	Yes; TDS should sample perimeter of area known to encompass ponds and drum pile to determine if remnant contamination may be present from (primarily) the drums. Locate piping from plant 6 to ponds; determine if contamination exists.	No
52	Burn Ground	Yes	Yes	Med-S Air releases have permit restrictions	No	Sample before constructing proposed unit additions.

[1] Documented Releases: Records are available documenting a release, or releases can be assumed based on presence of soil or groundwater contamination.
[2] Suspected Releases: This category includes facilities for which no quantitative samples are available, but release is suspected based on the nature and frequency of hazardous material operations and presence of staining or other indicators of possible release.
[3] Release Potential: Release potential from hazardous material operations to each media.
[4] Recommendations for RCRA Facility Investigation (RFI): In the RFI, the facility is responsible for establishing the extent of on-site and off-site contamination. This category attempts to prioritize the need for further action and presents recommendations for further action to be conducted in the RFI.

LEGEND: S = Release to Soil SW = Release to Surface Water G = Release to Groundwater A = Release to Air SG = Release to Soil Gas

SOURCE: RCRA Facility Assessment, Talley Defense System, Inc., Science Applications International Corporation/Technology Services Company (SAIC/TSC), April 1994.

TABLE8.1
SUMMARYOF SWMU FINDINGSANDSUGGESTEDFURTHERACTIONS

SWMU/ AOC #	SWMU Name	Documented Releases [1]	Suspected Releases [2]	Release Potential [3]	Recommendation for RCRA Facility Investigation / Level of Priority [4]	Recommendations for Interim Measures
AREAS OF CONCERN						
1	See SWMU No. 51	-	-	-	-	-
2	March 1984 Incident	NA	NA	NA	NA	NA
3	BG Burial Pits	Yes	Yes	NA - Soil is removed	No	No
4	Plant 2 Cooling Tower Tank and Overflow Impoundment	No	No	Low	No	No
5	TCA Product Storage Tank	Yes	Yes	Low-S	No	TDS should and obtain information to agency(s)
6	X-Ray Film Developing Process Water	No	No	Low	No	No
7	BG Burn Plate Sump Removal	No	No	Med-S, A	No	No
8	Buried Layers of Waste - Plant 6	No	No	NA	NA	NA
9	Pb/Cr Contaminated Soil at BG	See SWMU 52	-	-	-	-
10	Laboratory at Plant 3	No	No	Low	No	No
11	Septic Tanks	Unknown	Yes	Med-S	TDS should determine locations of all septic tanks and leach fields, and sample area to determine if hazardous constituents are present.	No
12	Cess Pool at Plant 3	No	No	Low-S	TDS should sample surrounding soil (and through cess pool) to determine if hazardous constituents are present.	Discontinue use/remove.
13	TRW Ops at Plant 3	No	No	Low	No	No
14	TRW Ops. at Plant 6	No	No	Low	No	No

[1] Documented Releases: Records are available documenting a release, or releases can be assumed based on presence of soil or groundwater contamination.
[2] Suspected Releases: This category includes facilities for which no quantitative samples are available, but release is suspected based on the nature and frequency of hazardous material operations and presence of staining or other indicators of possible release.
[3] Release Potential: Release potential from hazardous material operations to each media.
[4] Recommendations for RCRA Facility Investigation (RFI): In the RFI, the facility is responsible for establishing the extent of on-site and off-site contamination. This category attempts to prioritize the need for further action and presents recommendations for further action to be conducted in the RFI.

LEGEND: S = Release to Soil SW = Release to Surface Water G = Release to Groundwater A = Release to Air SG = Release to Soil Gas

SOURCE: RCRA Facility Assessment, Talley Defense System, Inc., Science Applications International Corporation/Technology Services Company (SAIC/TSC), April 1994.

TABLE8.1
SUMMARYOF SWMU FINDINGSANDSUGGESTEDFURTHERACTIONS

SWMU/ AOC #	SWMU Name	Documented Releases [1]	Suspected Releases [2]	Release Potential [3]	Recommendation for RCRA Facility Investigation / Level of Priority [4]	Recommendations for Interim Measures
15	Unknown or Abandoned Area	Unknown	Yes	High-S	TDS should conduct extensive review/research of activities that resulted in this debris, burn area(s) and yellow substances. Sampling would determine extent of possible contamination. Report of findings should be presented to agency(s).	Remove debris, discontinue practice of dumping.
16	Alleged TCA Dump Area	Unknown	Yes	High-S	TDS should conduct extensive review/research of activities that may have resulted in TCA dumping. Report of preliminary findings should be submitted to agency(s). If a location is determined, sampling would determine extent of possible contamination. Report of findings should be presented to agency(s).	No

[1] Documented Releases: Records are available documenting a release, or releases can be assumed based on presence of soil or groundwater contamination.
[2] Suspected Releases: This category includes facilities for which no quantitative samples are available, but release is suspected based on the nature and frequency of hazardous material operations and presence of staining or other indicators of possible release.
[3] Release Potential: Release potential from hazardous material operations to each media.
[4] Recommendations for RCRA Facility Investigation (RFI): In the RFI, the facility is responsible for establishing the extent of on-site and off-site contamination. This category attempts to prioritize the need for further action and presents recommendations for further action to be conducted in the RFI.
LEGEND: S = Release to Soil SW = Release to Surface Water G = Release to Groundwater A = Release to Air SG = Release to Soil Gas
SOURCE: RCRA Facility Assessment, Talley Defense System, Inc., Science Applications International Corporation/Technology Services Company (SAIC/TSC), April 1994.

Arizona Department of Environmental Quality
Inter-Office Memorandum

DATE: February 6, 1998
REF: HWP-IN740

TO: TALLEY DEFENSE SYSTEMS - For Facility File

FROM: Jeff Bryan, HWPU JNB

RE: **Meeting of February 4, 1998**; Talley Defense Systems

****

On Wednesday, February 4, 1998, I met at 14:00 hours with Donovan Jones and Robert Blomberg of Talley Defense Systems (TDS) in room #334 of 3033 North Central Avenue, Phoenix, to discuss and possibly resolve the following issues. This meeting lasted till approximately 17:00 hours.

- We reviewed the entire document "Summary and Recommendations RCRA Facility Assessment Report For Talley Defense Systems," April 1994, and discussed each listed SWMU and AOC. Only SWMU #51 is recommended for RCRA Facility Investigation. TDS stated that they would investigate this site and take corrective action if necessary. TDS was informed that the document "Talley Plant No.6" by Geotechnical and Environmental Consultants, Inc., concerning #51, was not acceptable and why (VOCs were not analyzed for, disclaimer, and etc.). TDS was persuaded to complete an RCRA Facility Investigation Work Plan. The requirements and contents of the work plan were also discussed in detail, such as the use of ADEQ's Quality Assurance Project Plan (1991). The format for an RFI Work Plan was also sent to TDS by mail on 2-4-98.

  TDS will also investigate AOC #15, and provided information at the meeting concerning the yellow smoke activities from the past. They will sample the old sump as well. TDS has already corrected those items listed as recommendations for Interim Measures (SWMU #s 5, 8, 33, 42, 45, and 46). TDS is handling AOC #11 (septic tanks) and #12 (cess pool at plant 3) under APP. We agreed that AOC #16 would be near impossible to locate if ever it existed. AOC #5 is also near impossible to understand from the report description.

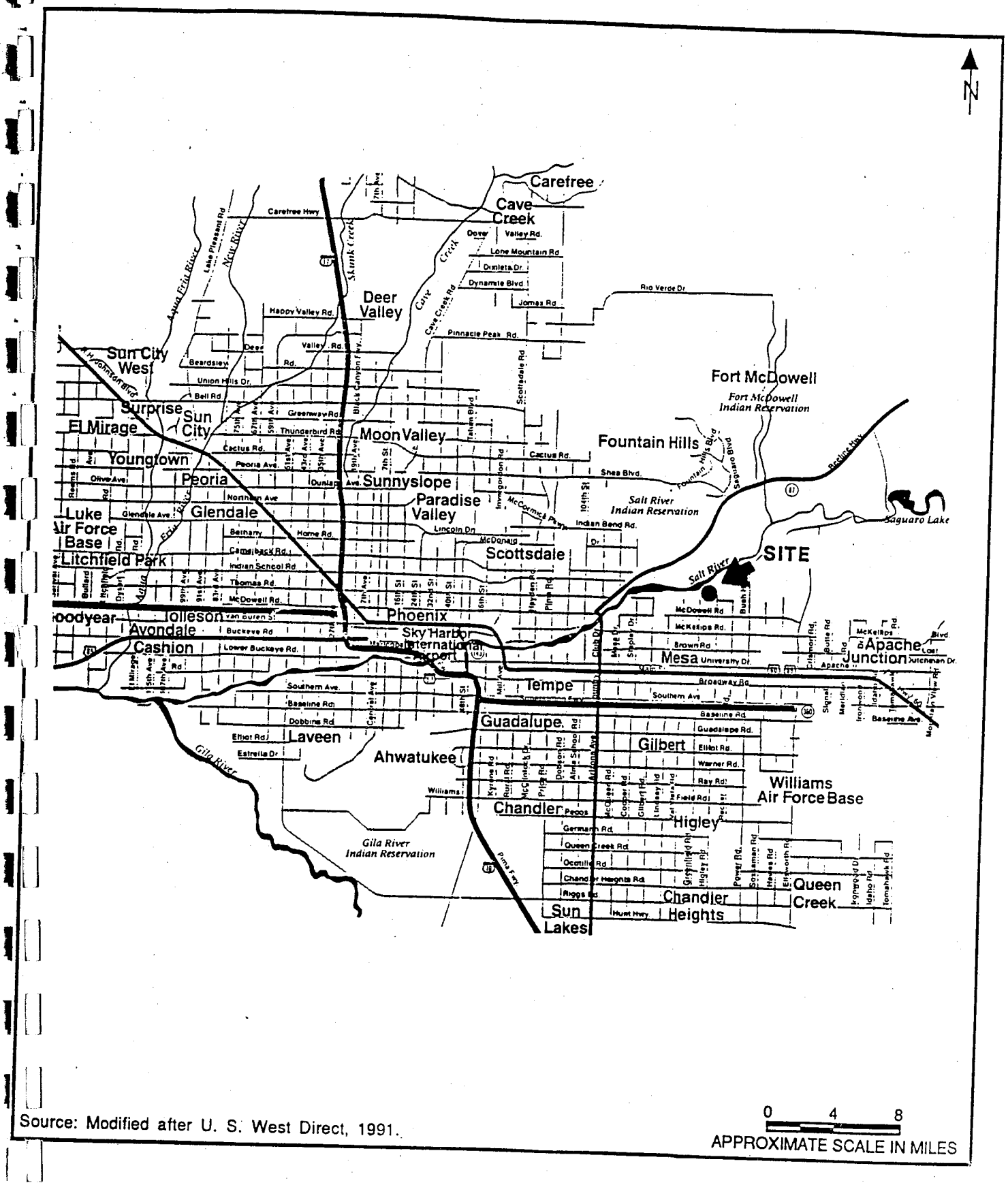
- TDS says ADEQ HWCU accepted the Site Assessment Plan for the Thermal Treatment Unit knowing that the document "Investigation of Metals in Soils" by TRC Environmental Consultants for pits 6-10 (graded area of TTU) was attached (1988, 1991, and later amendments) and showed pits were not sampled at the 6 to 12 inch depth as was completed for the TTU burn pits 1-6 (non-graded area) and former burn box area. Lead levels above

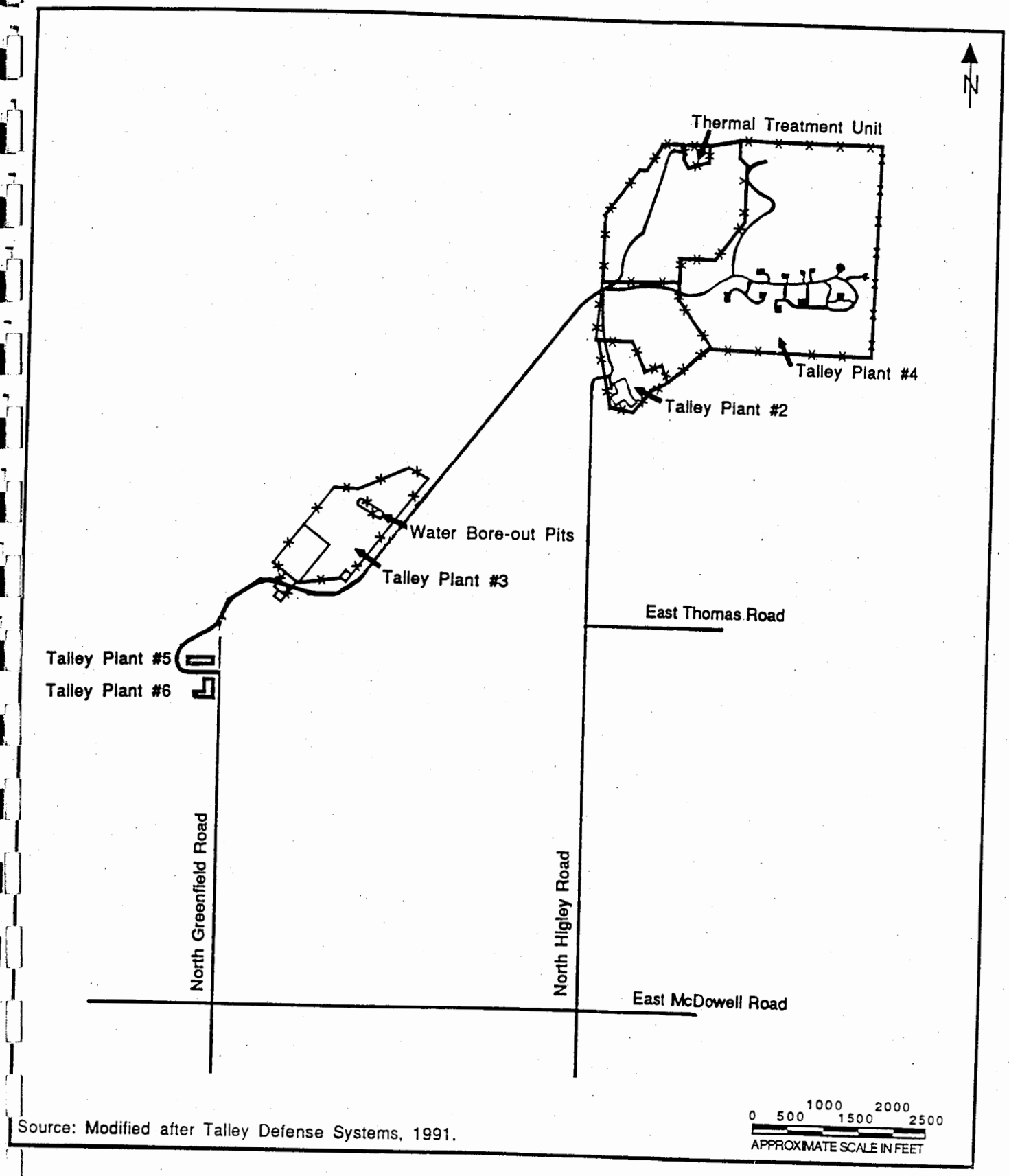
non-residential HBGL were detected at the 6 to 12 inch sample unit for these TTU sites. However, TDS did excavate down to so-called bedrock for all pits except pit #6 which had very low levels of lead. TDS will attempt to provide the excavation depths. Mr. Jones *will* provide the correspondence from ADEQ approving the plan and showing submittals. I informed TDS that this investigation may be unacceptable and why (no certified labs, QA/QC, and etc.). I was not provided or told that the above document was part of the plan for my review and comments of 11-19-96.

APPENDIX A

FIGURES

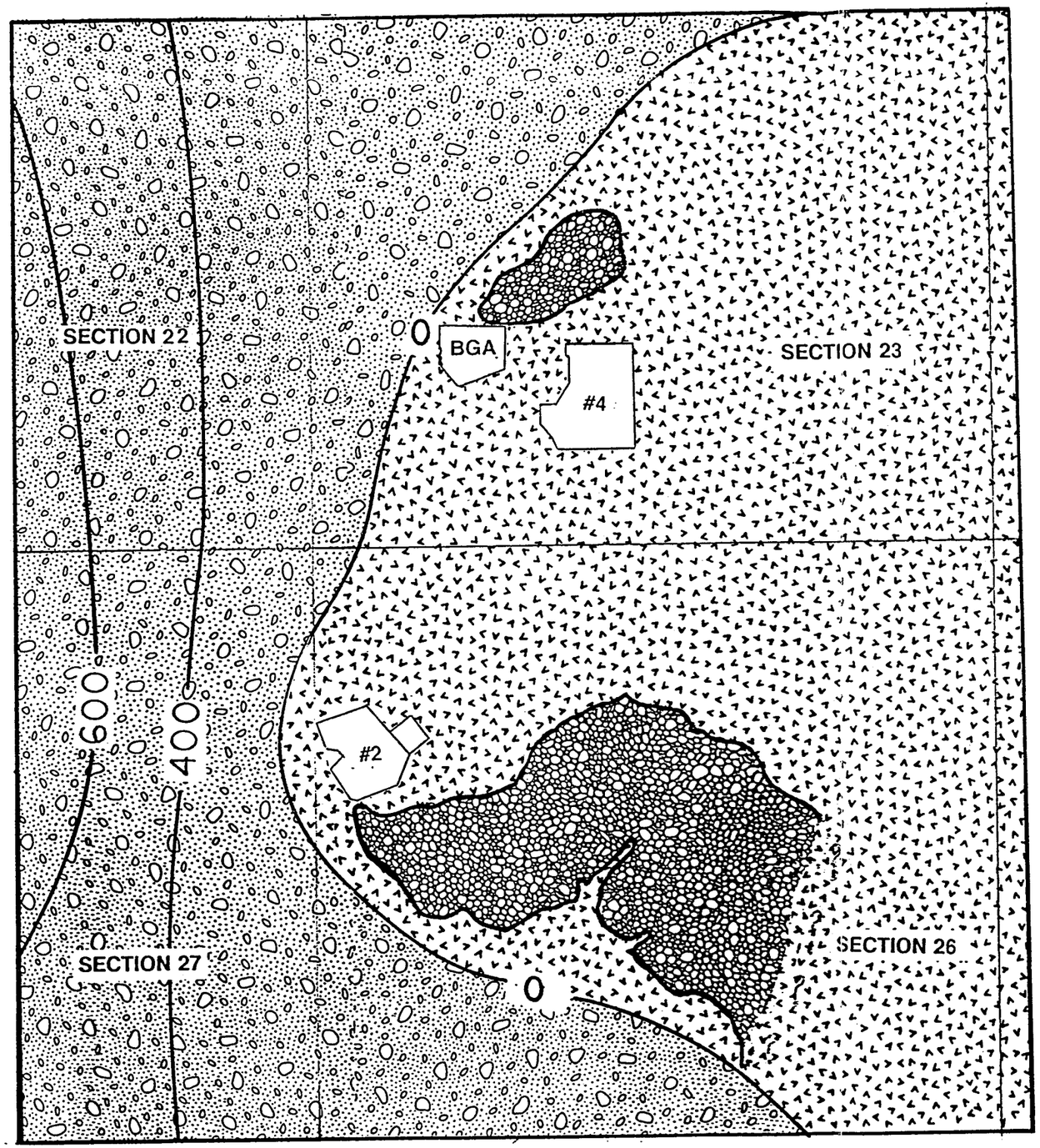
From 1994 SAIC Report


N
Carefree
Cave Creek
Deer Valley
Sun City West
Surprise
Sun City
El Mirage
Youngtown
Peoria
Luke Air Force Base
Glendale
Litchfield Park
Goodyear
Tolleson
Avondale
Cashion
Moon Valley
Sunnyslope
Paradise Valley
Scottsdale
Phoenix
Sky Harbor International Airport
Tempe
Guadalupe
Laveen
Ahwatukee
Gilbert
Chandler
Higley
Williams Air Force Base
Chandler Heights
Queen Creek
Sun Lakes
Fountain Hills
Fort McDowell
Fort McDowell Indian Reservation
Salt River Indian Reservation
Gila River Indian Reservation
Saguaro Lake
Mesa
Apache Junction
SITE
Salt River
Gila River
Skunk Creek
Cave Creek
Aqua Fria River
New River
Lake Pleasant Rd
Carefree Hwy
Dove Valley Rd.
Lone Mountain Rd
Dynamite Blvd
Jomax Rd
Rio Verde Dr
Happy Valley Rd.
Pinnacle Peak Rd.
Beardsley
Union Hills Dr.
Bell Rd
Greenway Rd
Thunderbird Rd
Cactus Rd.
Peoria Ave.
Dunlap Ave.
Northern Ave
Glendale Ave.
Bethany Home Rd.
Camelback Rd.
Indian School Rd.
Thomas Rd.
McDowell Rd.
Buckeye Rd
Lower Buckeye Rd.
Southern Ave.
Baseline Rd
Dobbins Rd
Elliot Rd
Estrella Dr
Williams
Pecos
Germann Rd.
Queen Creek Rd
Ocotillo Rd
Chandler Heights Rd
Riggs Rd
Hunt Hwy
Shea Blvd.
Indian Bend Rd.
McDonald Dr.
McKellips Rd.
Brown Rd
University Dr.
Broadway Rd
Guadalupe Rd.
Warner Rd.
Ray Rd
Field Rd
Beck Rd
Germann Rd
Queen Creek Rd
Ocotillo Rd
Chandler Heights Rd
Riggs Rd
Hunt Hwy
Pima Fwy
Scottsdale Rd
Tatum Blvd
Cave Creek Rd
Black Canyon Fwy
Beeline Hwy
Apache Blvd
Signal Butte Rd
Meridian Rd
Ironwood Dr
Idaho Rd
Tomahawk Rd
Power Rd
Sossaman Rd
Hawes Rd
Ellsworth Rd
Greenfield Rd
Higley Rd
Gilbert Rd
Lindsay Rd
Val Vista Rd
Cooper Rd
McClintock Dr
Price Rd
Dobson Rd
Alma School Rd
Rural Rd
Kyrene Rd
Arizona Ave
Mill Ave
Rural Rd
Hayden Rd
Pima Rd
Scottsdale Rd
Tatum Blvd
Cactus Rd.
Shea Blvd.
McDowell Rd
McKellips Rd.
Brown Rd
University Dr.
Broadway Rd
Southern Ave
Baseline Rd
Guadalupe Rd.
Elliot Rd.
Warner Rd.
Ray Rd
Field Rd
Germann Rd
Queen Creek Rd
Ocotillo Rd
Chandler Heights Rd
Riggs Rd
Hunt Hwy
Apache Blvd
Baseline Ave
Mountain View Rd
Hutchinson Dr.
Van Buren St
Thomas Rd
McDowell Rd
Indian School Rd
Camelback Rd
Glendale Ave
Olive Ave
Peoria Ave
Thunderbird Rd
Bell Rd
Greenway Rd
Cactus Rd
Dunlap Ave
Northern Ave
Bethany Home Rd
Lincoln Dr
McDonald Dr
Indian Bend Rd
Shea Blvd
Bell Rd
Union Hills Dr
Beardsley
Happy Valley Rd
Dove Valley Rd
Lone Mountain Rd
Dynamite Blvd
Jomax Rd
Pinnacle Peak Rd
Rio Verde Dr
Carefree Hwy
Lake Pleasant Rd
Aqua Fria River
New River
Skunk Creek
Cave Creek
Black Canyon Fwy
Beeline Hwy
Apache Blvd
Signal Butte Rd
Meridian Rd
Ironwood Dr
Idaho Rd
Tomahawk Rd
Power Rd
Sossaman Rd
Hawes Rd
Ellsworth Rd
Greenfield Rd
Higley Rd
Gilbert Rd
Lindsay Rd
Val Vista Rd
Cooper Rd
McClintock Dr
Price Rd
Dobson Rd
Alma School Rd
Rural Rd
Kyrene Rd
Arizona Ave
Mill Ave
Rural Rd
Hayden Rd
Pima Rd
Scottsdale Rd
Tatum Blvd
Cactus Rd
Shea Blvd
McDowell Rd
McKellips Rd
Brown Rd
University Dr
Broadway Rd
Southern Ave
Baseline Rd
Guadalupe Rd
Elliot Rd
Warner Rd
Ray Rd
Field Rd
Germann Rd
Queen Creek Rd
Ocotillo Rd
Chandler Heights Rd
Riggs Rd
Hunt Hwy
Apache Blvd
Baseline Ave
Mountain View Rd
Hutchinson Dr
Van Buren St
Thomas Rd
McDowell Rd
Indian School Rd
Camelback Rd
Glendale Ave
Olive Ave
Peoria Ave
Thunderbird Rd
Bell Rd
Greenway Rd
Cactus Rd
Dunlap Ave
Northern Ave
Bethany Home Rd
Lincoln Dr
McDonald Dr
Indian Bend Rd
Shea Blvd
Bell Rd
Union Hills Dr
Beardsley
Happy Valley Rd
Dove Valley Rd
Lone Mountain Rd
Dynamite Blvd
Jomax



Source: Modified after Talley Defense Systems, 1991.

Figure 2-2: Specific Site Location Map (Source: d:1-4)



EXPLANATION

- DEPTH TO CRYSTALLINE ROCKS (IN FEET) (MODIFIED FROM SRP, 1988)
- ALLUVIUM/ TERRACE DEPOSITS
- GRANITIC BEDROCK
- PEDIMENT GRAVELS (MODIFIED AFTER TRC, 1988)
- BGA — TDS BURNING GROUND AREA
- #4 — TDS PLANT #4
- #2 — TDS PLANT #2

0 1000 2000

SCALE IN FEET

Figure 5-1: Geologic Map of Plants 2 and 4 and the BG Vicinity (Source: a:Appendix B-H)

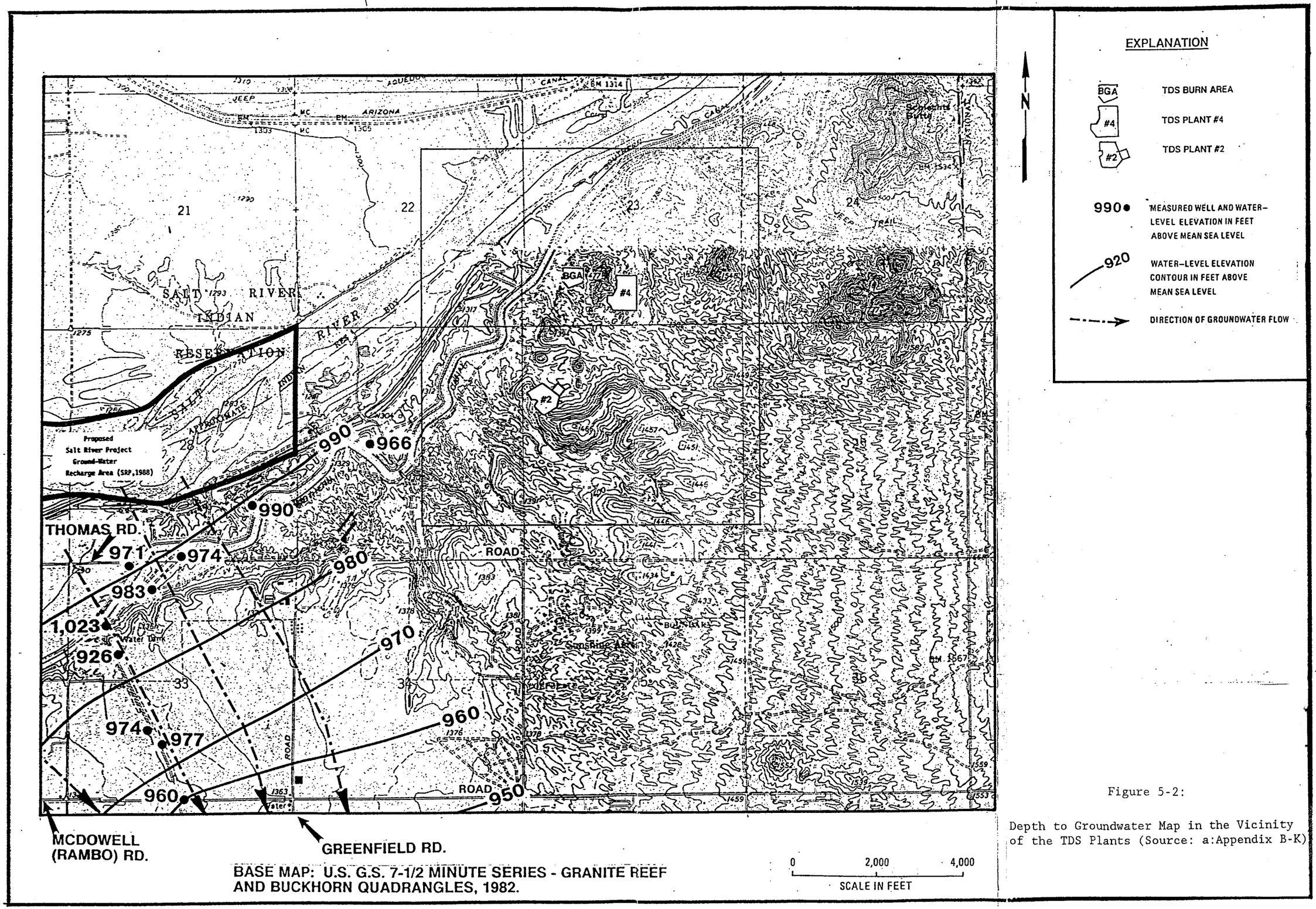
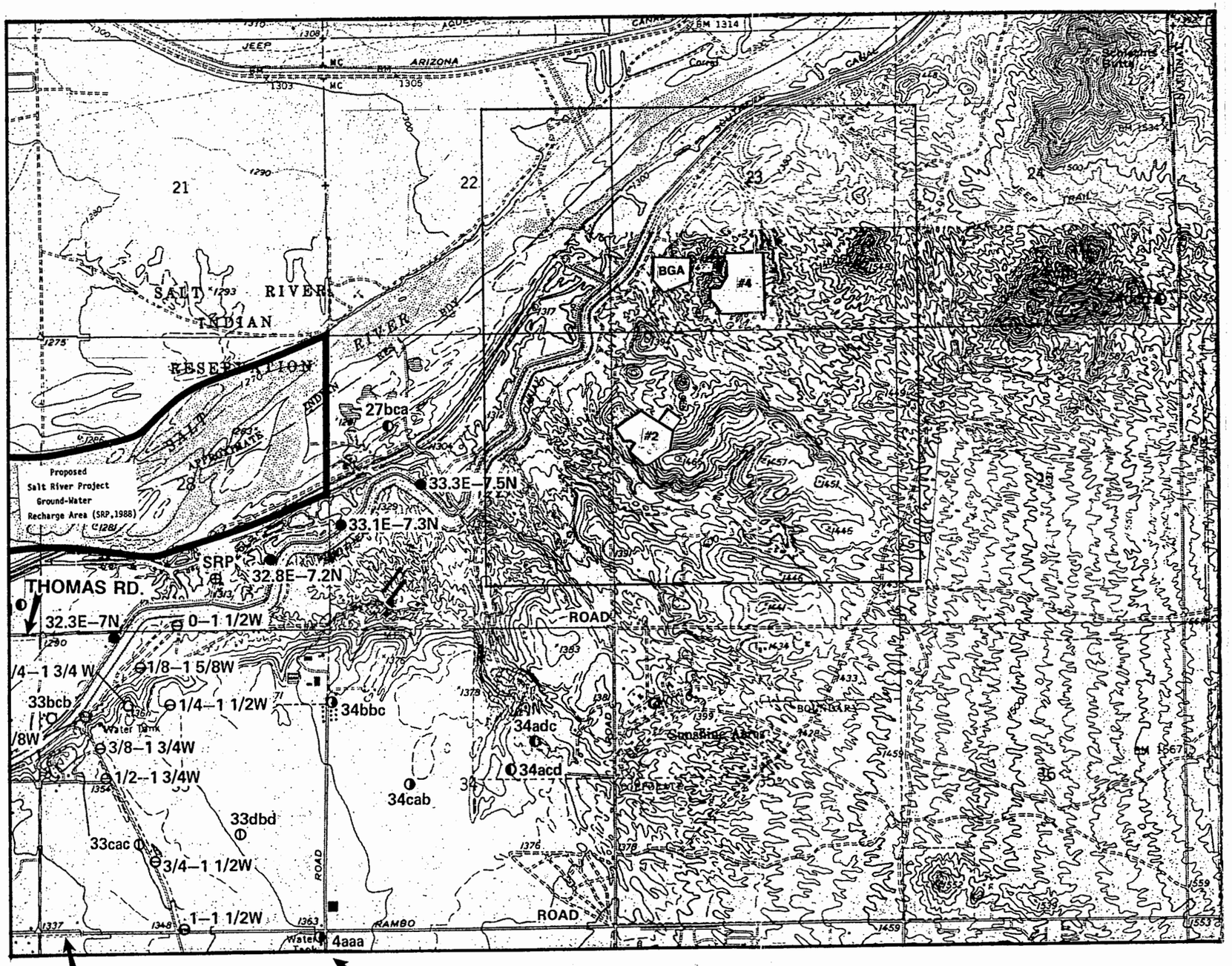


Figure 5-2:

Depth to Groundwater Map in the Vicinity of the TDS Plants (Source: a:Appendix B-K)



BASE MAP: U.S. G.S. 7-1/2 MINUTE SERIES - GRANITE REEF AND BUCKHORN QUADRANGLES, 1982.

EXPLANATION

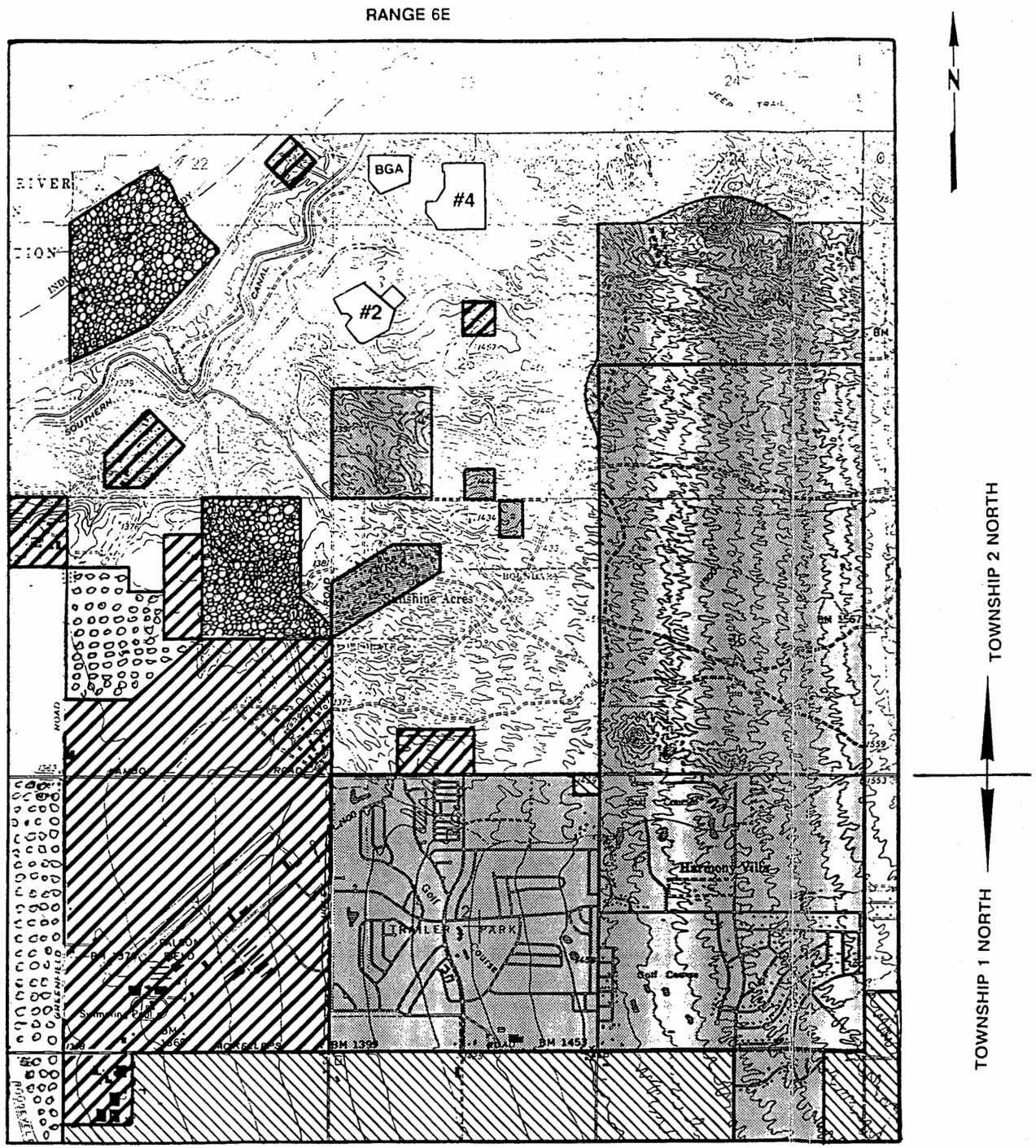
- BGA — TDS BURN AREA
- #4 — TDS PLANT #4
- #2 — TDS PLANT #2
- ● SALT RIVER PROJECT
- ⊖ ROOSEVELT WATER CONSERVATION DISTRICT IRRIGATION
- ◐ DOMESTIC
- ◐ GRAVEL PROCESSING
- ◑ OTHER IRRIGATION
- ⊕ MONITOR
- ○ UNUSED

Note: Well numbers are those designated by Salt River Project, 1988.

MODIFIED FROM SRP, 1988

Figure 5-3:

Location of Wells in the Vicinity of the TDS plants (Source: a:Appendix B-J)



EXPLANATION

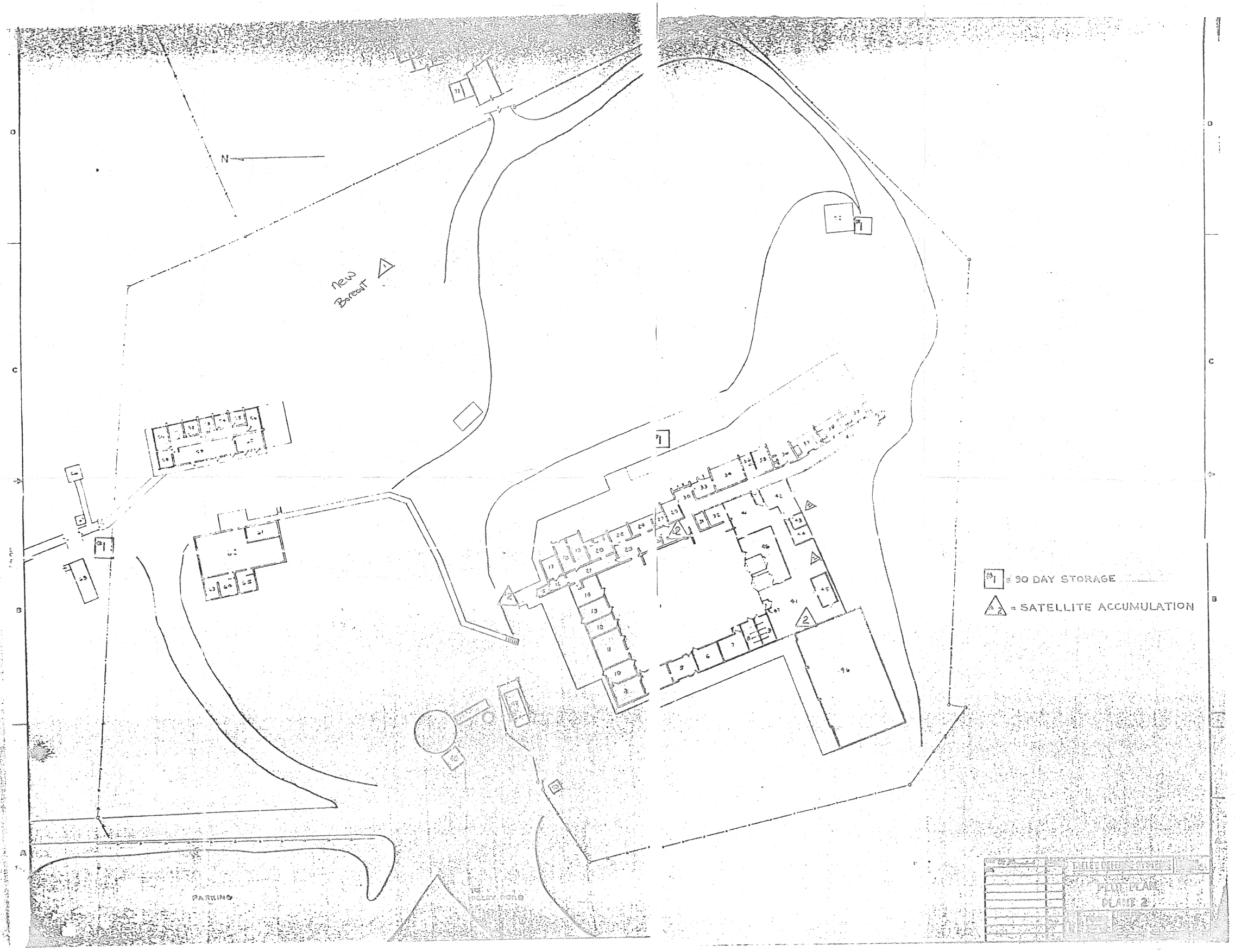
- #4 — TDS PLANT #4
- BGA — TDS BURNING GROUND AREA
- #2 — TDS PLANT #2
- INDUSTRIAL
- SAND & GRAVEL OPERATIONS
- AGRICULTURAL (CITRUS)
- RESIDENTIAL / PRIVATE
- UNDEVELOPED OR VACANT
- COMMERCIAL/ SERVICES

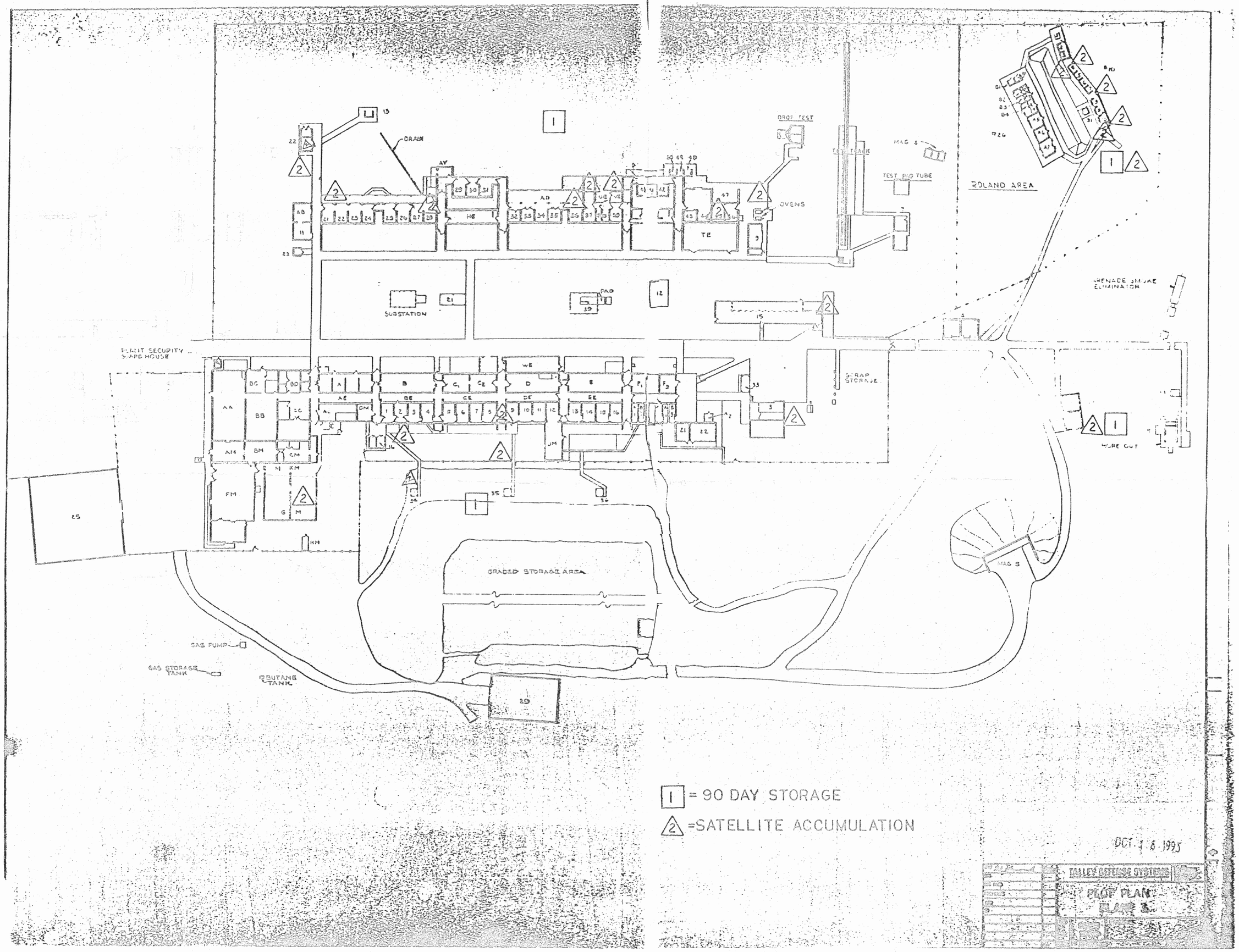
0 2,000 4,000

SCALE IN FEET

BASE MAP SOURCE: U.S. GEOLOGICAL SURVEY, 7-1/2 MINUTE SERIES
GRANITE REEF AND BUCKHORN QUADRANGLES, 1982

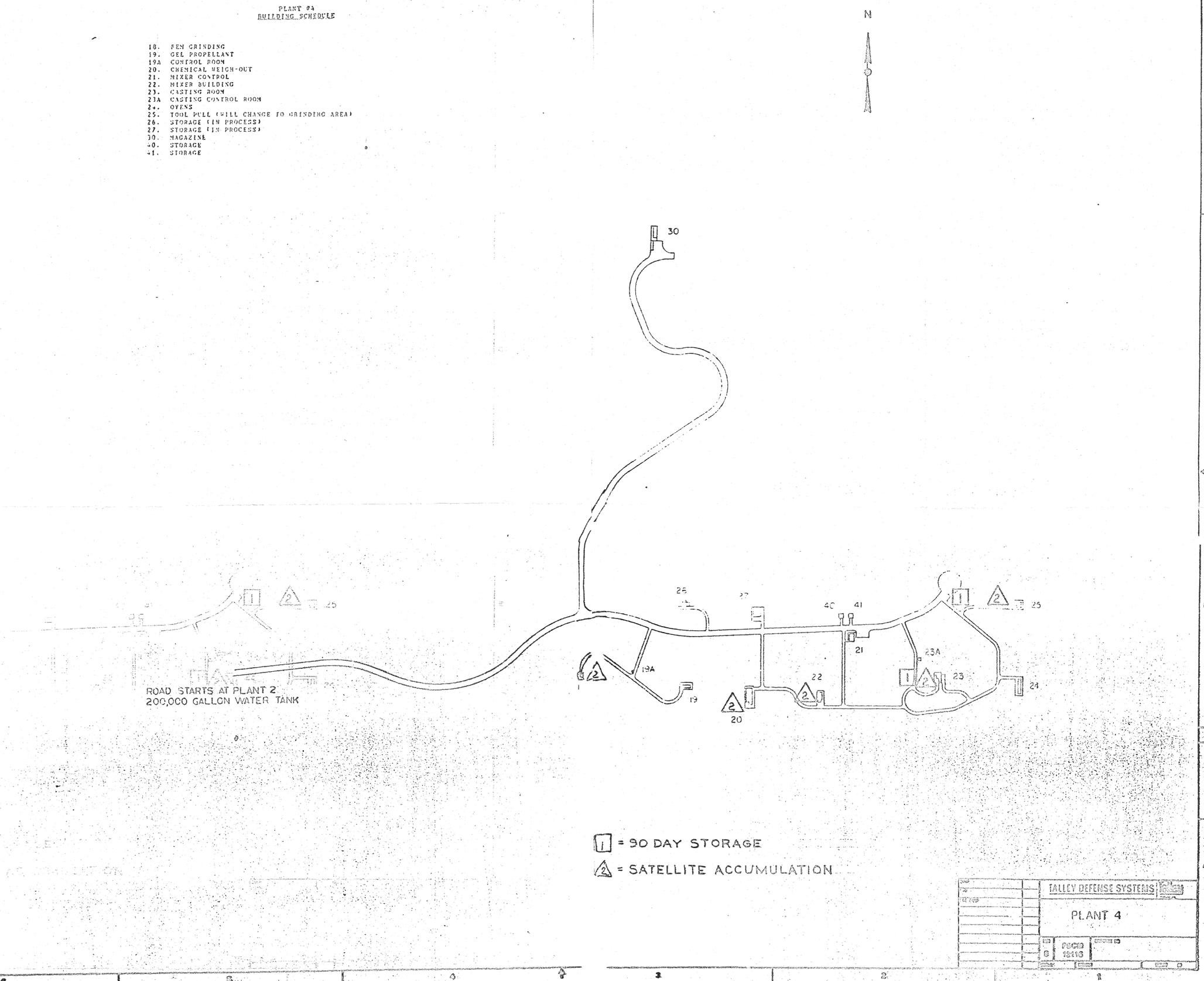
Figure 5-4: Land Use Map in TDS Vicinity
(Source: a:Appendix B-G)


N
New Barout
PARKING
= 90 DAY STORAGE
= SATELLITE ACCUMULATION
PLOT PLAN
PLANT 2


DRAIN
DROP TEST
TEST TRAIN
MAG 4
TEST PIPE TUBE
OVENS
ROLAND AREA
SUBSTATION
PAD
GRENADE SMOKE ELIMINATOR
PLANT SECURITY SCRAP HOUSE
SCRAP STORAGE
HORE CUT
GRADED STORAGE AREA
MAG 3
GAS PUMP
GAS STORAGE TANK
BUTANE TANK
= 90 DAY STORAGE
=SATELLITE ACCUMULATION
OCT 18 1995
PLOT PLAN

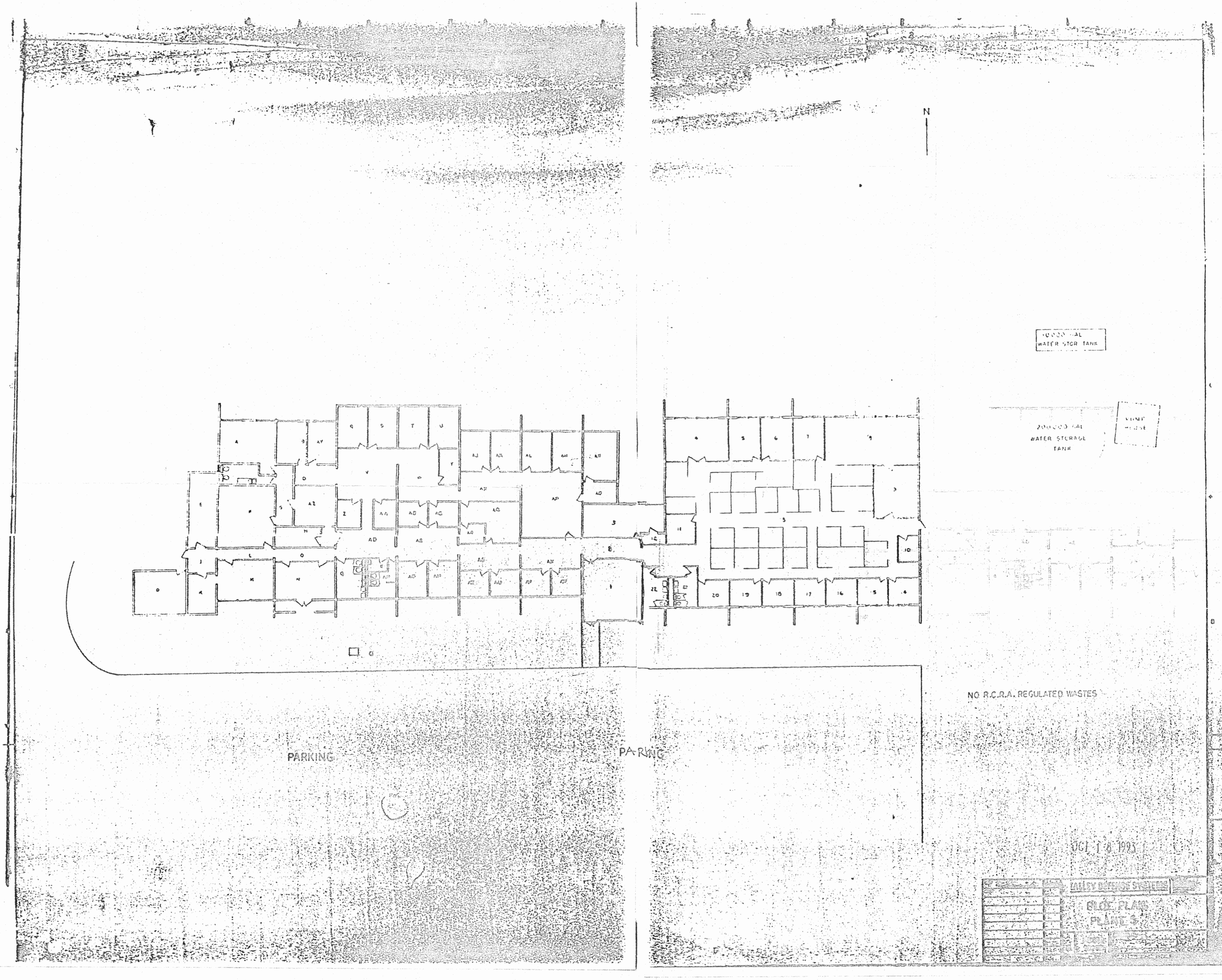
PLANT #4
BUILDING SCHEDULE

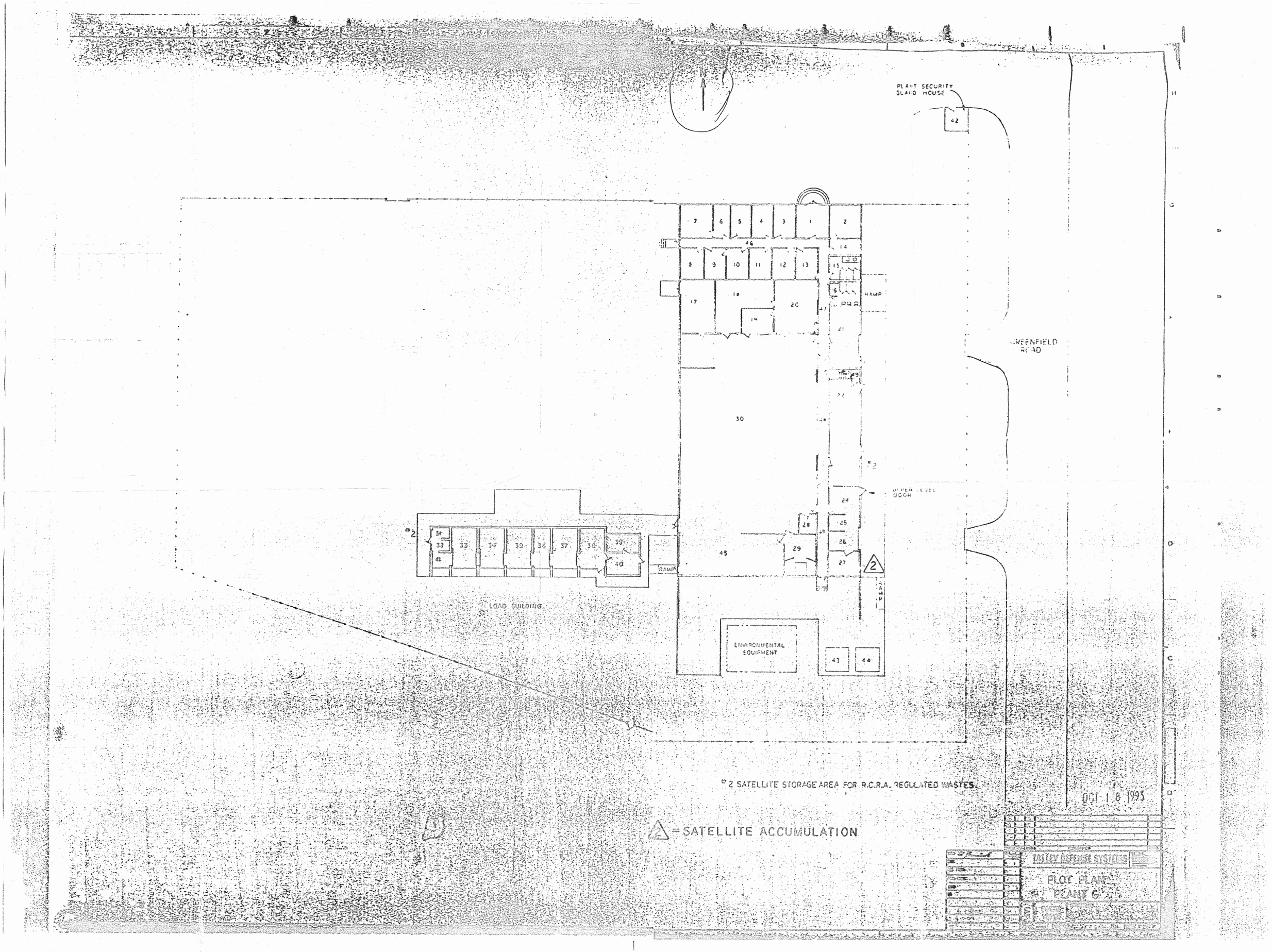
18. FEM GRINDING
19. GEL PROPELLANT
19A CONTROL ROOM
20. CHEMICAL WEIGH-OUT
21. MIXER CONTROL
22. MIXER BUILDING
23. CASTING ROOM
23A CASTING CONTROL ROOM
24. OVENS
25. TOOL PULL (WILL CHANGE TO GRINDING AREA)
26. STORAGE (IN PROCESS)
27. STORAGE (IN PROCESS)
30. MAGAZINE
40. STORAGE
41. STORAGE



TALLEY DEFENSE SYSTEMS
PLANT 4
B
PDCD 18113

OCT 1 8 1993


N
WATER STOR TANK
WATER STORAGE
TANK
PARKING
PARKING
NO R.C.R.A. REGULATED WASTES
OCT 1 8 1993
BLDG. PLAN
PLANT 5


PLANT SECURITY
GUARD HOUSE
42
GREENFIELD
ROAD
RAMP
UPPER LEVEL
DOOR
LOAD BUILDING
RAMP
ENVIRONMENTAL
EQUIPMENT
#2 SATELLITE STORAGE AREA FOR R.C.R.A. REGULATED WASTES.
= SATELLITE ACCUMULATION
OCT 1 8 1993
BAILEY DEFENSE SYSTEMS
FLOOR PLAN
PLANT 6

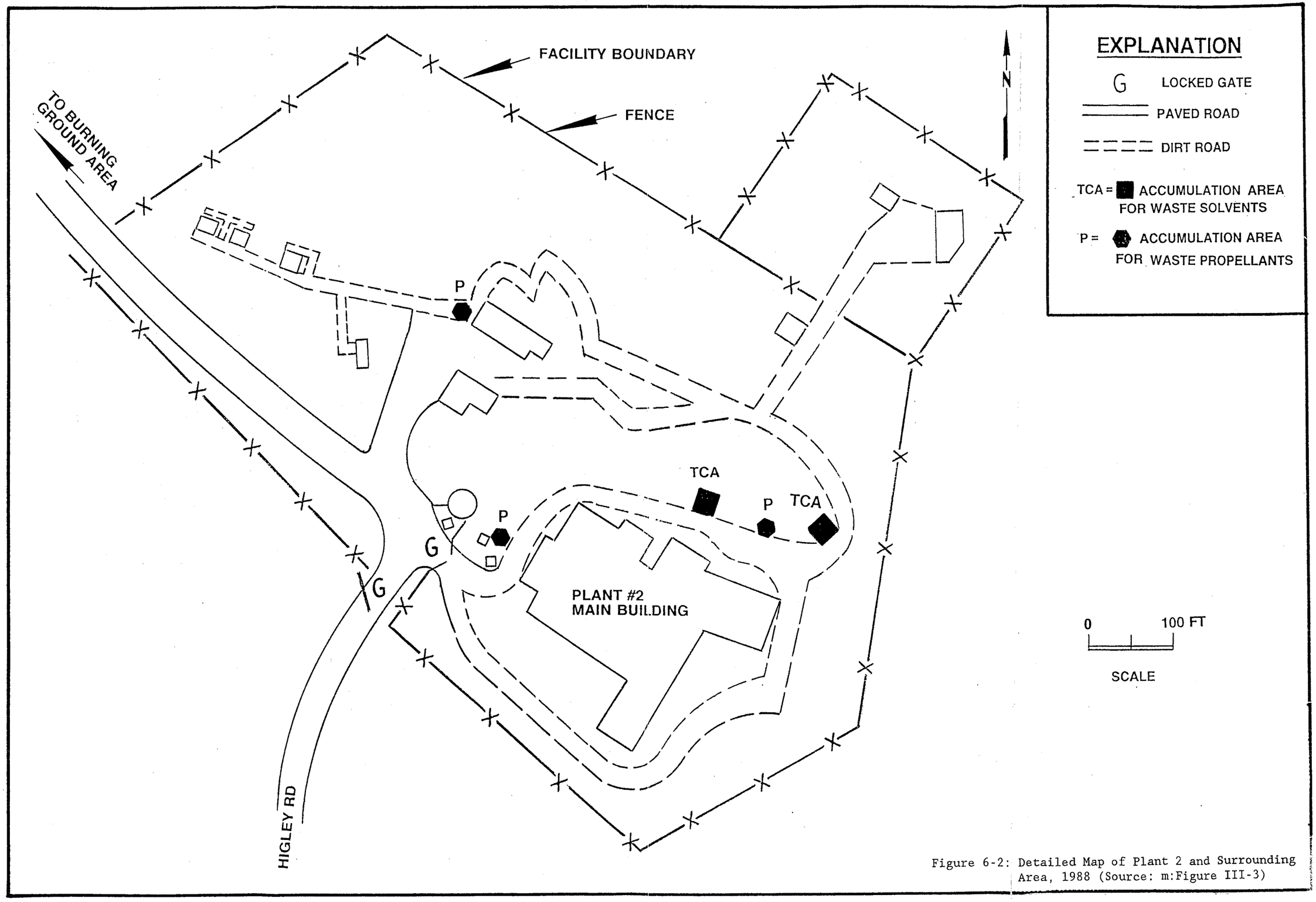


Figure 6-2: Detailed Map of Plant 2 and Surrounding Area, 1988 (Source: m:Figure III-3)

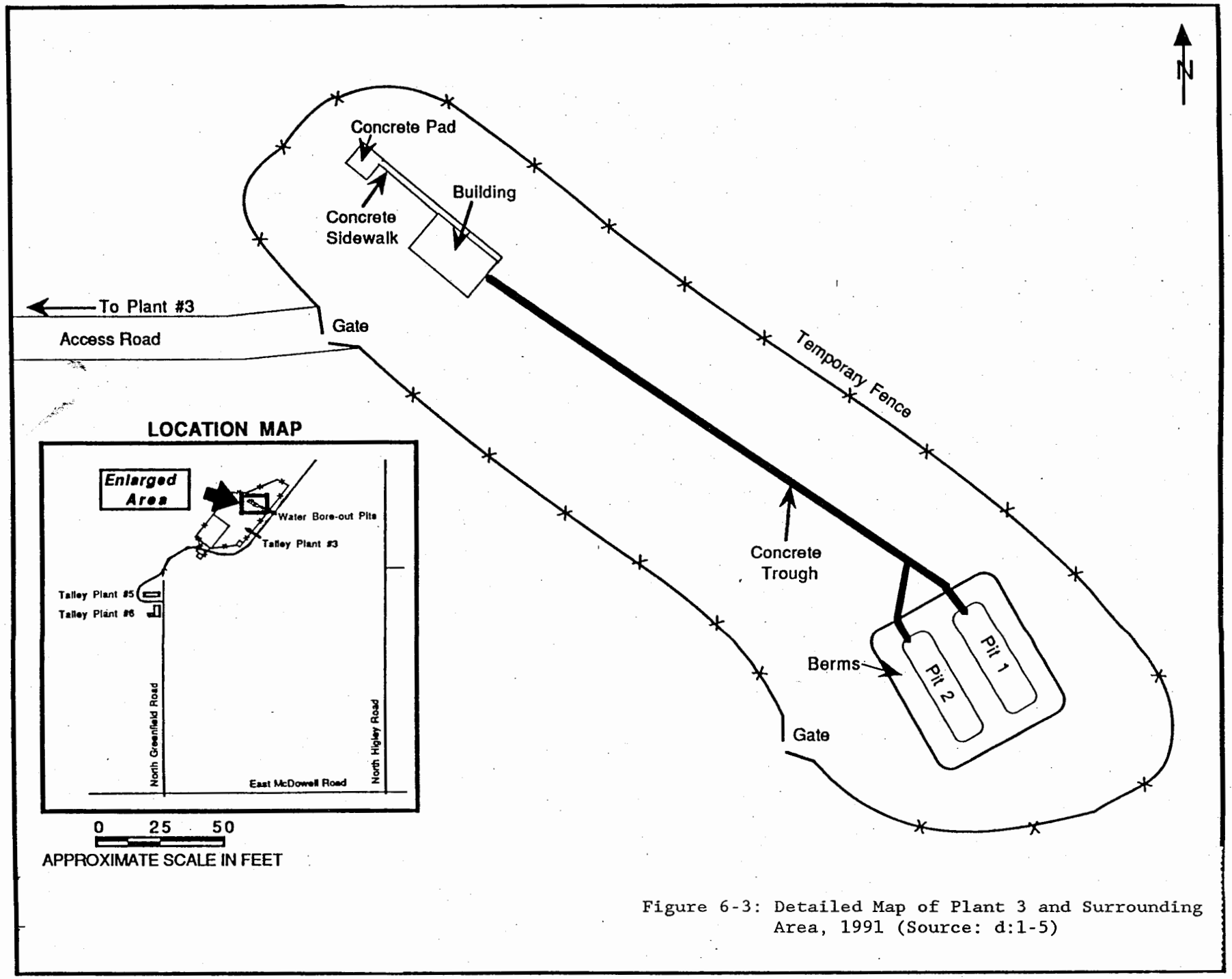


Figure 6-3: Detailed Map of Plant 3 and Surrounding Area, 1991 (Source: d:1-5)

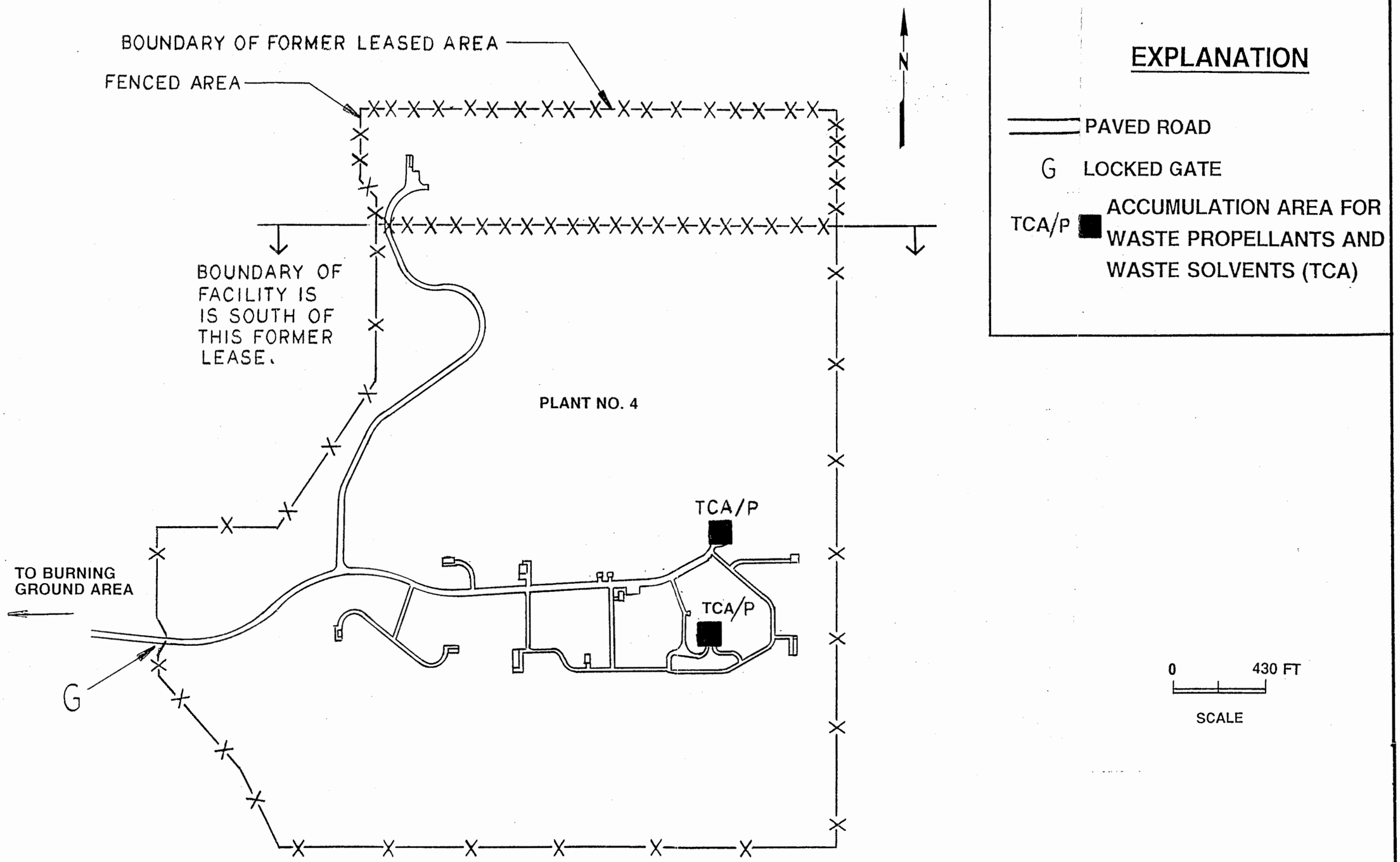
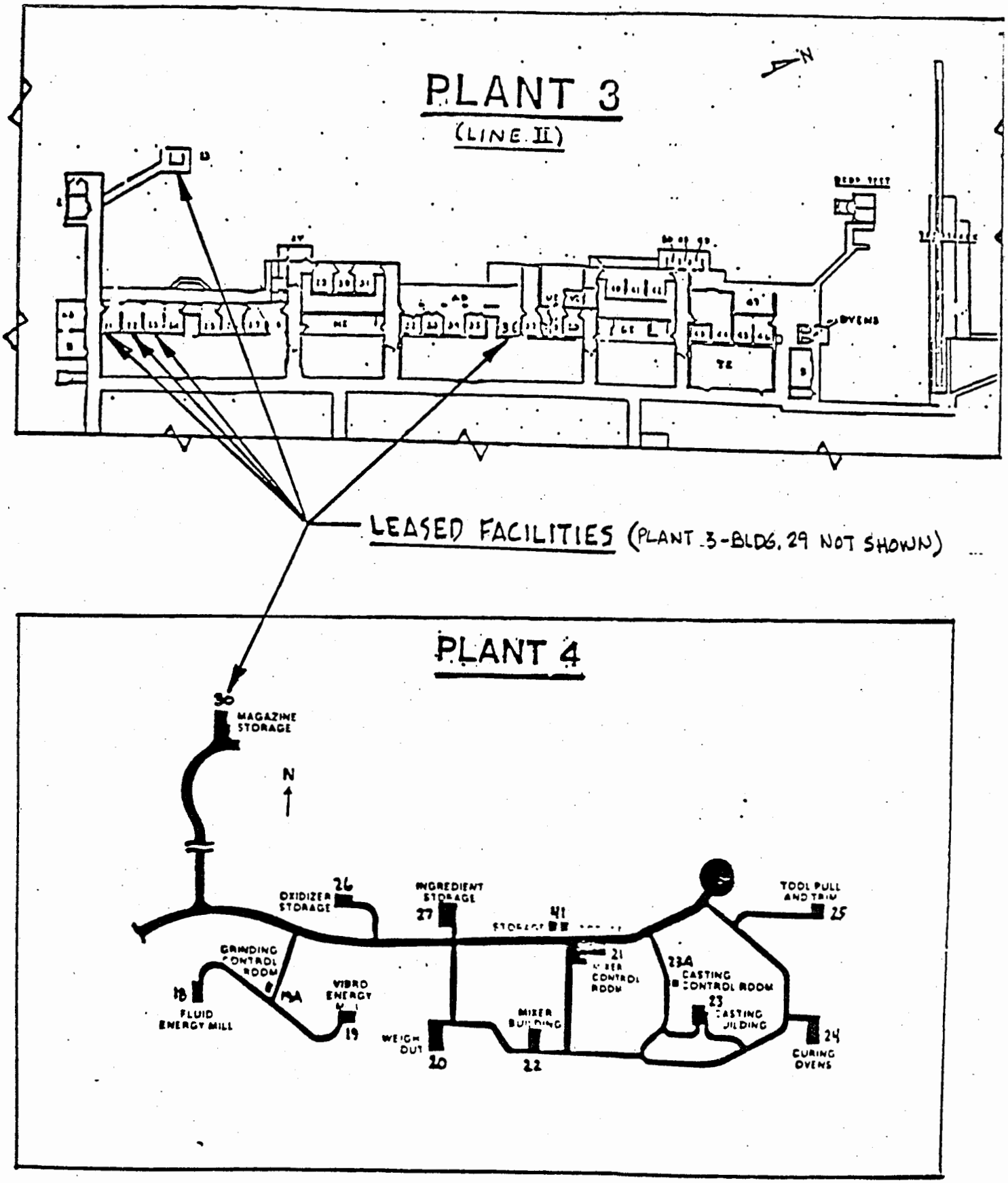


Figure 6-4: Detailed Map of Plant 4 and Surrounding Area, 1988 (Source: m:Figure III-4)

Figure 6-5: Portions of TDS plants Leased by TRW Safety Systems (Source: J:Exhibit A)



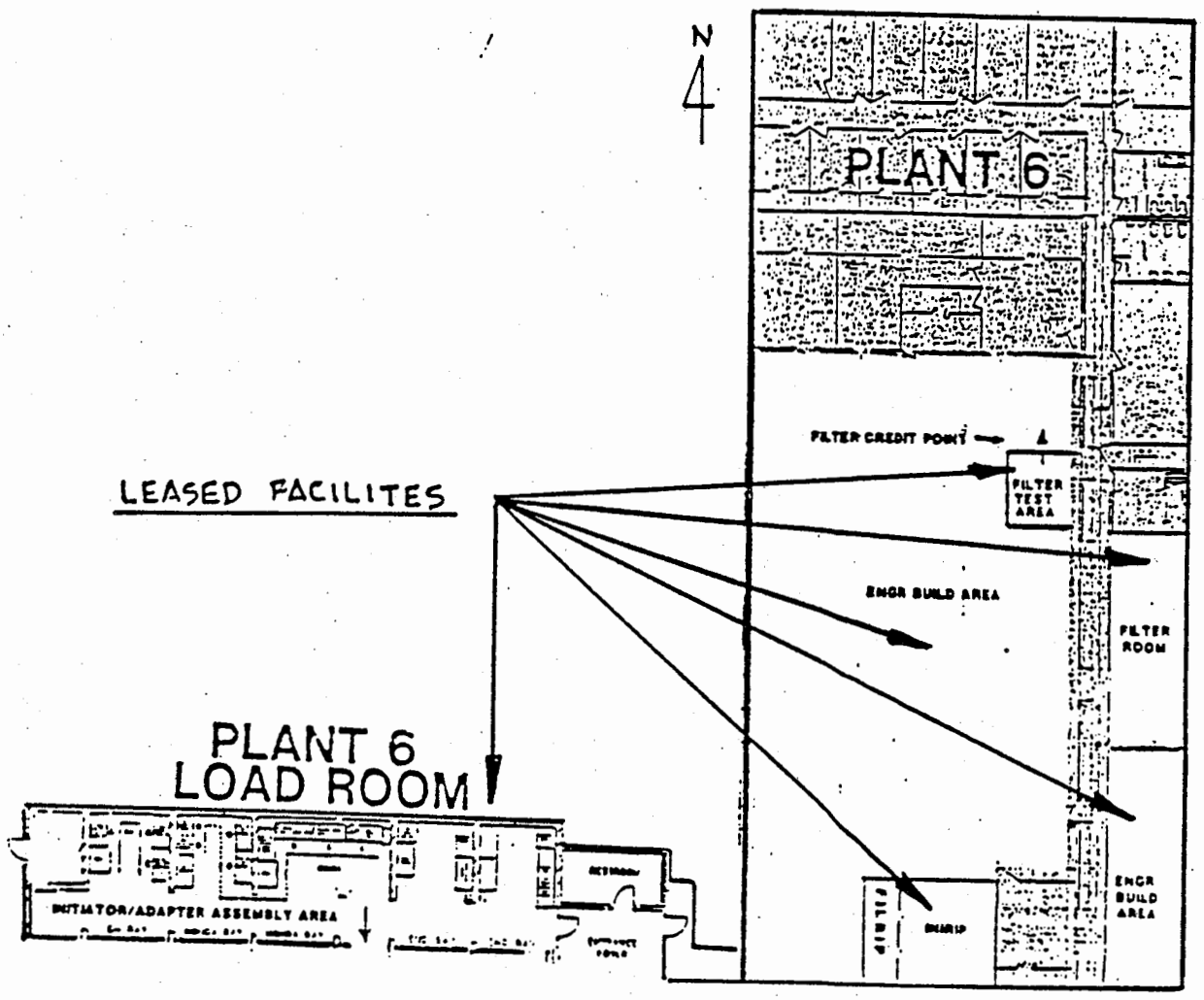


Figure 6-5a: Portions of TDS plants Leased by TRW Safety Systems (Source: J:Exhibit A)

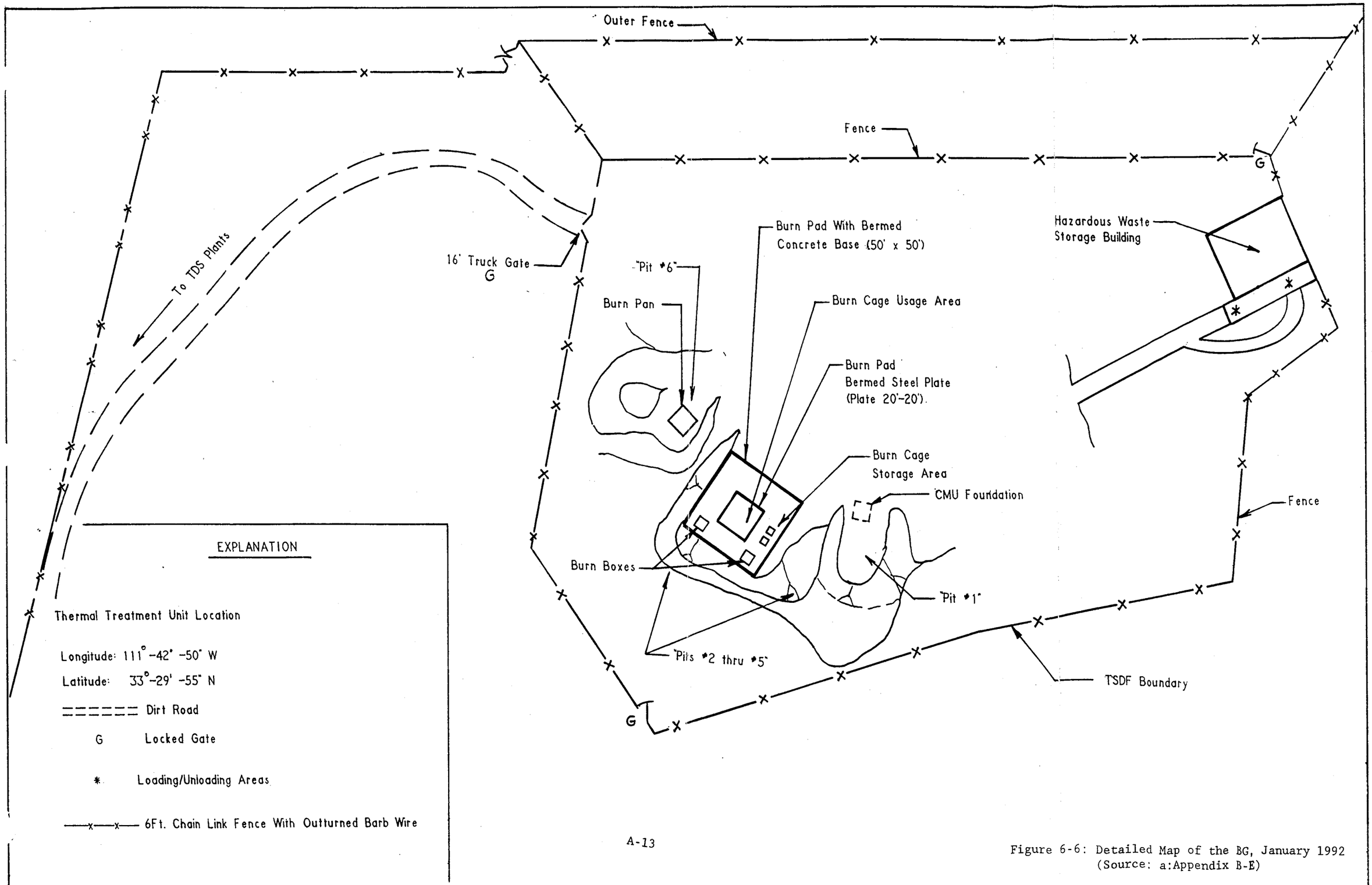


Figure 6-6: Detailed Map of the BG, January 1992
(Source: a:Appendix B-E)

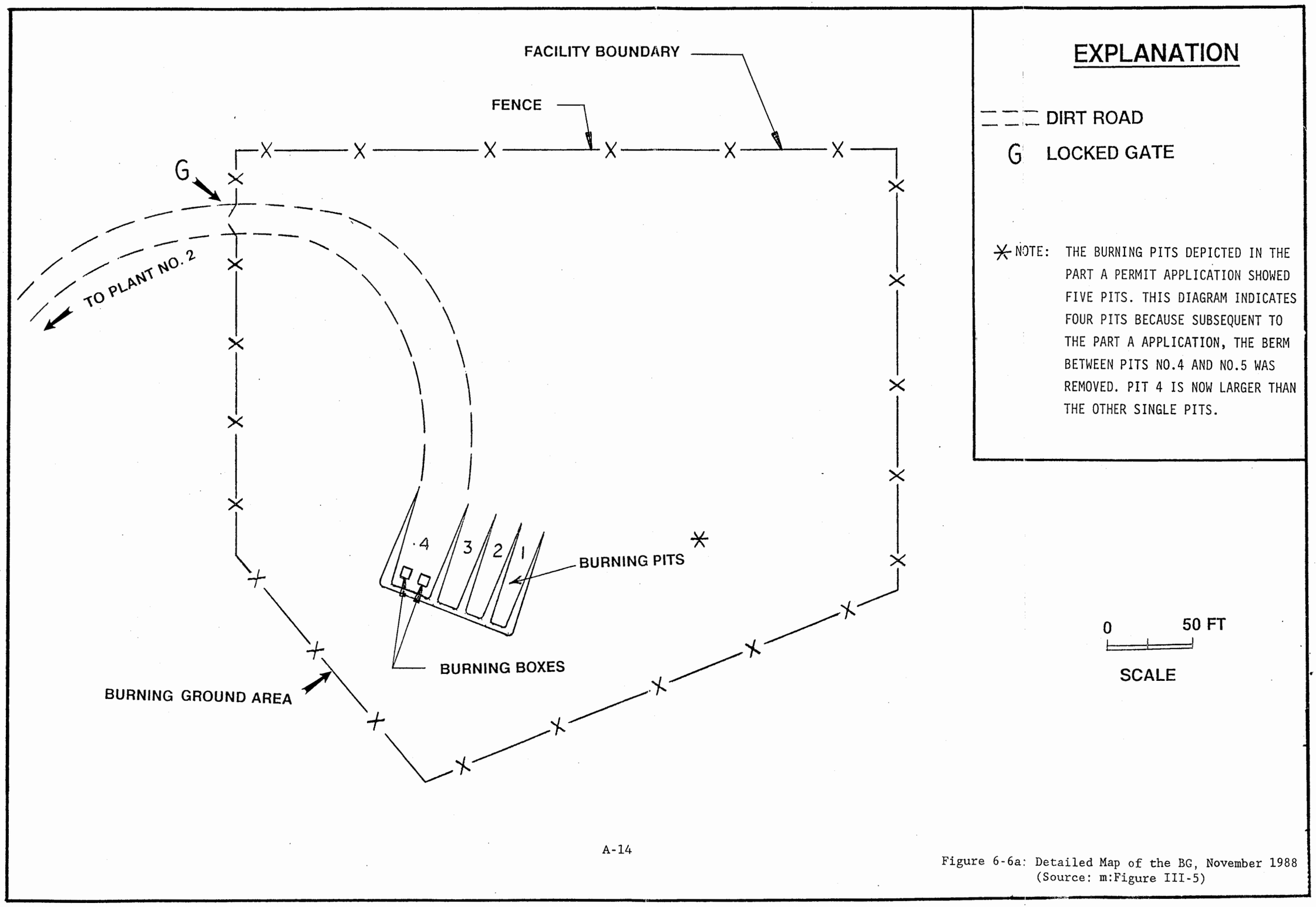


Figure 6-6a: Detailed Map of the BG, November 1988
(Source: m:Figure III-5)

TALLEY DEFENSE SYSTEMS | Talley Industries

Refer To: DJJ-9002

January 12, 1999

Mr. Jeffrey Bryan
Arizona Department of Environmental Quality
3033 North Central Avenue
Phoenix, Az 85012

Subject: Solid Waste Management Unit (SWMU) Investigations

Dear Mr. Bryan:

Table 8 of the SAIC RCRA Facility Assessment Summary and Investigation Report dated 5/13/94, listed five (5) recommended "investigations" for the total list of fifty-two (52) Solid Waste Management Units (SWMU) and sixteen (16) Areas of Concern (AOC). The report also recommended that "Interim Measures" be taken on ten (10) of the total list of fifty-two (52) SWMUs and sixteen (16) AOCs. The five (5) recommended investigations have been completed and the ten 10) recommended "interim measures" have been taken. ADEQ has previously reviewed and approved the TDS investigation of the DISCOM surface impoundments. The attached four (4) reports and two (2) summary tables positively respond to each of the remaining four (4) recommended "investigations" and ten (10) recommended "interim measures" and show that no further action is necessary to address any concerns the ADEQ may have had regarding potential contamination.

If there is any information in this report that you do not understand, have questions on, or need more information, please contact either myself or Robert Blomberg at 898-2204 or 898-2433 respectively.

Sincerely,
TALLEY DEFENSE SYSTEMS, INC.

Donovan J. Jones

Donovan J. Jones
Director of Safety and
Environmental Quality

DJJ/pnk
Attachment

cc: Robert Blomberg
Steve Wegener
File #95.2.8 & 9

RECOMMENDATIONS FOR INTERIM MEASURES

The following units were identified as requiring "Interim Measures" and TDS responded as shown.

SWMU/ AOC #	UNIT NAME	RECOMMENDED INTERIM MEASURE	TDS ACTION TAKEN
5	North Hold SAA Plant 2	TDS should place drums of liquid waste in plastic catch basins.	Drums were removed from this collection area and placed in Bldg. 20 which now has secondary containment. (See photos.)
8	HWAA, Bldg. 20, Plant 2	TDS should sample soil to determine the presence (or not) of hazardous waste or constituents in soil. TDS should construct curbs or berms around unit.	TDS had secondary containment berms constructed around the unit and hired a consultant to take soil samples around the units' concrete pad. The sampling report is attached.
33	HWAA, Bldg. 28	TDS should construct curbs if liquid hazardous waste or constituents will be managed here.	TDS had secondary containment berms constructed around the unit. (See attached photographs.)
42	Former Water Bore-out Ops Area	Yes: remove containers from pad, discontinue use of pad, sample soil and remediate as necessary.	TDS removed the containers from the pad, discontinued its use, and removed the concrete pad. (See attached photographs.) No soil samples have been taken.
45	Bldg. 22, Plant 4 Mixing Room	TDS should implement policy to repair equipment in a timely manner.	TDS has implemented a Quality Policy (company wide) whereby each department strives to improve response time and quality. This process includes semi-annual surveys which monitors improvement. This policy has helped to shorten response times for equipment repair.
~~45~~ 46	Bldg. 24, Plant 4 Curing Room	TDS should implement policy to repair equipment in a timely manner.	
52	Burn Ground	Sample before constructing proposed unit.	Proposed unit additions were never constructed so this does not apply.
/5	TCA Product Storage Tank (at Plant 1)	TDS should and obtain information to agency(s).	This comment is incomplete but the tank and stand were removed and soil sampled. The report is attached.
/12	Cesspool at Plant 3	Discontinue use - remove.	The use of the cesspool was discontinued, removed and is currently undergoing closure through the ADEQ APP process. Please contact Marnie Greenbie in the APP Unit for copies of the sampling reports.
/15	Unknown or abandoned area	Remove debris, discontinue practice of dumping.	TDS removed the debris and discontinued the practice of stockpiling debris in the area. See clean-up reports attached.

RECOMMENDATIONS FOR RCRA FACILITY INVESTIGATION

The following units were identified as requiring "RCRA Facility Investigation" and TDS responded as shown.

SWMU/ AOC #	SWMU NAME	RECOMMENDED INVESTIGATION	TDS ACTION TAKEN
51	Historical SI's	Yes; TDS should sample perimeter of area known to encompass ponds and drum pile to determine if remnant contamination may be present from (primarily) the drums. Locate piping from Plant #6 to ponds; determine if contamination exists.	TDS has completed site investigations for both VOC's and metals. ADEQ has provided TDS with a no further action/ investigation letter to give closure to this issue.
/11	Septic Tanks	TDS should determine locations of all septic tanks and leach fields, and sample area to determine if hazardous constituents are present.	Based on the text in the SAIC RFA report AOC #11 and #12 are referring to the same area which is the cesspool/septic tank/ injection well located North of Plant #3 Line II. TDS has filed for closure under the ADEQ APP permit unit, removed the unit and submitted sampling results. TDS is currently awaiting approval for closure. A second (similar) unit was located at Plant 6 and TDS has already received clean closure on it. Two more (similar) units are also under going closure at Plant #1 and are also at the stage of waiting for ADEQ final approval. No other "regulated units" require closure per APP regulations. Septic tanks which receive bathroom waste are exempt.
/12	Cesspool at Plant #3	TDS should sample surrounding soil (and through cesspool) to determine if hazardous constituents are present.	
/15	Unknown or Abandoned Area	TDS should conduct extensive review/research of activities that resulted in this debris, burn area(s) and yellow substances. Sampling would determine extent of possible contamination. Report of finding should be presented to agency(s).	TDS has conducted extensive review/research, investigation, sampling and remediation to both the debris and burn area(s). The results of this work are included in the two reports included with this packet.
/16	Alleged TCA Dump Area	TDS should conduct extensive review/research of activities that may have resulted in TCA dumping. Report of preliminary findings should be submitted to agency(s). If a location is determined, sampling would determine extent of possible contamination. Report of findings should be presented to agency(s).	TDS has no knowledge of such dumping and the allegation was from an unknown anonymous source. An ADHS inspection occurred as a result of complaint and no evidence was found to substantiate the complaint. Exact area where complainant said dumping occurred is unknown. As discussed and agreed upon by ADEQ, during a meeting on 2/4/98, no further investigation can be done if location or source is unknown. TDS has no knowledge of TCA or TCE dumping. Employees have never been directed to dispose of TCA or TCE by dumping on-site. This alleged AOC should not be a Part B or WQARF issue. No action planned by TDS.

TALLEY DEFENSE SYSTEMS, INC.

PLANT #2 - SWMU # 8
HWAA BLDG. 20 SOLVENT PAD

SAMPLING PLAN & RESULTS REPORT

RECEIVED
JAN 14 1999
ADEQ-HAZARDOUS WASTE PERMITS

BY

TALLEY DEFENSE SYSTEMS, INC.

ENVIRONMENTAL DEPARTMENT

3450 NORTH GREENFIELD ROAD

MESA, ARIZONA 85215

JANUARY 8, 1999

Plt2Bldg20.wpd

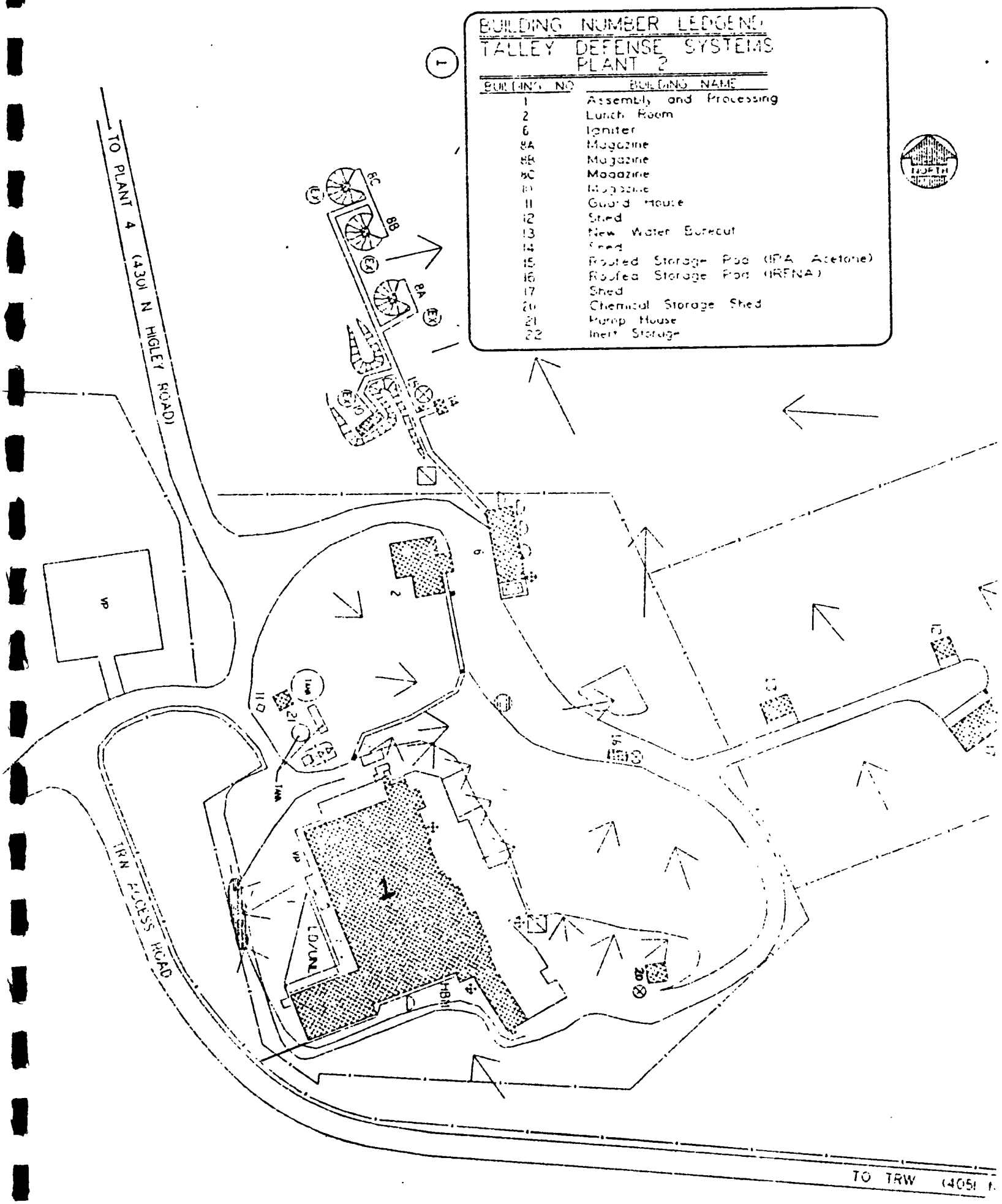
TABLE 1. LABORATORY TEST RESULTS FOR COMPOUNDS DETECTED IN THE SOIL SAMPLES COLLECTED AT TALLEY DEFENSE SYSTEMS' PLANT 2, BUILDING 20

SAMPLE IDENTIFICATION NUMBER[1]	SAMPLE DEPTH (feet)[2]	ANALYTICAL RESULTS				
		TRPH[3] (mg/kg)[4]	Total Barium (mg/kg)	Total Chromium (mg/kg)	Total Lead (mg/kg)	TCLP[5] Barium (mg/L)[6]
94447-P2S1-1.0	0.5 to 1.0	240	160	10	32	<1[7]
94447-P2S2-1.0	0.5 to 1.0	<40	160	7.2	23	1.1
94447-P2S3-1.0	0.5 to 1.0	<40	150	7.6	31	<1
94447-P2S4-1.0	0.5 to 1.0	<40	150	11	29	1.1
Residential Soil Remediation Level[8]		4,100	5,300	2,100	400	NA
Non-residential Soil Remediation Level		18,000	110,000	4,500	2,000	NA
Minimum GPL[9]		NE[11]	12,000	590	290	NA
RCRA Regulatory Level[10]		NA[12]	NA	NA	NA	100

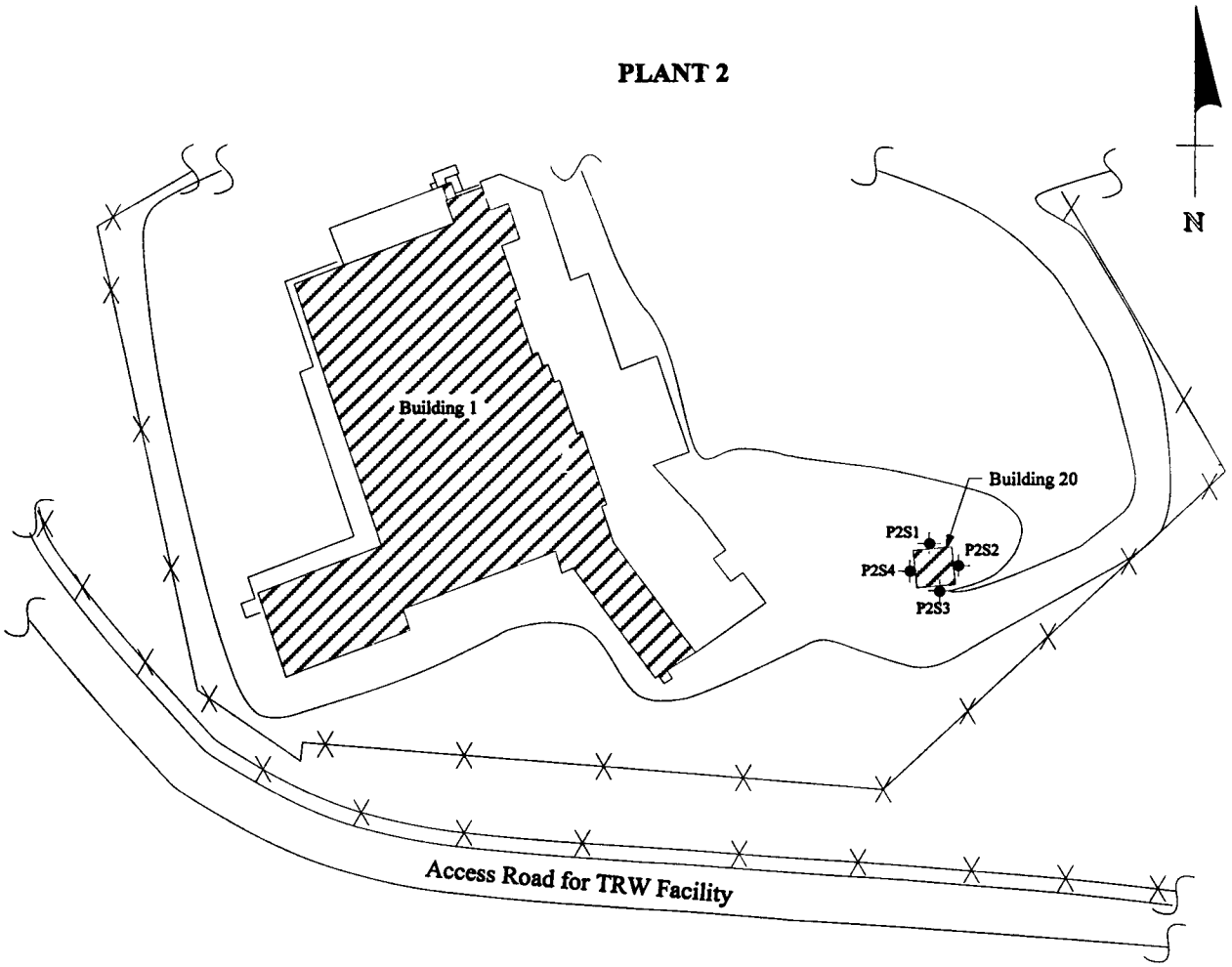
Notes:
(1) Approximate locations of soil samples are shown on *Exhibit 2*.
(2) Sample depth in feet below ground surface.
(3) TRPH = Total recoverable petroleum hydrocarbons
(4) mg/kg = Milligrams per kilogram
(5) TCLP = Toxicity characteristic leaching procedure.
(6) mg/L = Milligrams per liter.
(7) <1 = Not detected at a concentration equal to or greater than the indicated laboratory reporting limit.
(8) Residential and non-residential soil remediation levels listed in A.A.C. R18-7-201 et seq.
(9) Minimum groundwater protection levels (GPLs) developed by the Leachability Working Group of the Cleanup Standards/Policy Task Force, and listed in ADEQ's September 1996 guidance document entitled "*A Screening Method to Determine Soil Concentrations Protective of Groundwater Quality.*"
(10) Resource Conservation and Recovery Act (RCRA) regulatory levels listed in 40 CFR §261.24 for the hazardous waste characteristic of toxicity.
(11) NE = Not established
(12) NA = Not applicable.

94447/Lu/1611/123197

Exhibit 1


BUILDING NUMBER LEGEND
TALLEY DEFENSE SYSTEMS
PLANT 2
BUILDING NO
BUILDING NAME
1 Assembly and Processing
2 Lunch Room
6 Igniter
8A Magazine
8B Magazine
8C Magazine
10 Magazine
11 Guard House
12 Shed
13 New Water Bureau
14 Shed
15 Roofed Storage Pad (IPA Acetone)
16 Roofed Storage Pad (IRFNA)
17 Shed
20 Chemical Storage Shed
21 Pump House
22 Inert Storage
TO PLANT 4 (4301 N HIGLEY ROAD)
TRW ACCESS ROAD
TO TRW (4051
NORTH

PLANT 2



EXPLANATION

Chain-link fence

Building

P2S1 — Identification number and approximate location of soil sample

0 100 200

Approximate Scale in Feet

Source: Base map modified after Talley Defense Systems, 1992

CLIENT: TALLEY DEFENSE SYSTEMS	BASIN & RANGE	SAMPLE LOCATION MAP PLANT 2, BUILDING 20	EXHIBIT 2

94447/EXH2/122997

Prepared for

Nammo Talley Inc.
4051 North Higley Road
Mesa, Arizona 85215

PERCHLORATE SOURCE INVESTIGATION
NAMMO TALLEY, INC.
MESA, ARIZONA

Prepared by

Geosyntec consultants

engineers | scientists | innovators

10875 Rancho Bernardo Road, Suite 200
San Diego, California 92127

Project Number: SC0475

June 2009

TABLES

Geosyntec consultants

Table 1
Plant #2 Summary of Soil Field Screening Results
Nammo Talley Inc.
Mesa, Arizona

Location	Sample ID	Depth (ft bgs)	Perchlorate Concentrations (mg/kg) Field Screening
Building #6	P2-B8-0.5	0.5	ND <1.0
	P2-B8-2.5	2.5	ND <1.0
	P2-B8-5.0	5.0	ND <1.0
	P2-B10-0.5	0.5	ND <1.0
	P2-B10-2.5	2.5	ND <1.0
	P2-B10-5.0	5.0	ND <1.0
	P2-B13-0.5	0.5	ND <1.0
	P2-B13-3.0A	3.0	ND <1.0
Western Storm Water Retention Basin	P2-B1-0.5A	0.5	ND <1.0
	P2-B2-0.5	0.5	ND <1.0
Eastern Storm Water Drainage Area	P2-B9-0.5	0.5	ND <1.0
	P2-B9-2.5	2.5	ND <1.0
	P2-B9-5.0	5.0	ND <1.0
	P2-B14-1.0	1.0	ND <1.0
	P2-B15-0.5	0.5	ND <1.0
	P2-B15-2.5	2.5	ND <1.0
	P2-B15-4.0	4.0	ND <1.0
Storage Pads #1 - #3	P2-B4-0.5	0.5	ND <1.0
	P2-B4-2.5	2.5	ND <1.0
	P2-B4-5.0A	5.0	ND <1.0
	P2-B5-0.5	0.5	ND <1.0
	P2-B5-2.5	2.5	ND <1.0
	P2-B5-5.0	5.0	ND <1.0
	P2-B6-0.5	0.5	ND <1.0
	P2-B6-2.5	2.5	ND <1.0
	P2-B6-5.0	5.0	ND <1.0
	P2-B7-0.5	0.5	ND <1.0
	P2-B7-2.5	2.5	ND <1.0
	P2-B7-5.0A	5.0	ND <1.0
	P2-B11-0.5	0.5	ND <1.0
	P2-B11-2.5	2.5	ND <1.0
	P2-B11-5.0	5.0	ND <1.0
	P2-B12-0.5	0.5	3.4
	P2-B12-2.5	2.5	1.7
	P2-B12-5.0	5.0	ND <1.0

Geosyntec consultants

Table 2
Plant #3 Summary of Soil Field Screening and Laboratory Results
Nammo Talley Inc.
Mesa, Arizona

Location	Sample ID	Depth (ft bgs)	Perchlorate Concentrations (mg/kg)	Metals Concentrations (mg/kg)			
			Field Screening	Cadmium	Chromium	Lead	Chromium VI
Former Grinding Facility & Storm Water Retention Pond	P3-B36-0.5	0.5	ND <1.0	-	-	-	-
	P3-B36-2.5	2.5	ND <1.0	-	-	-	-
	P3-B36-5.0A	5.0	ND <1.0	-	-	-	-
	P3-B37-0.5	0.5	ND <1.0	-	-	-	-
	P3-B37-2.5	2.5	ND <1.0	-	-	-	-
	P3-B37-5.0A	5.0	ND <1.0	-	-	-	-
	P3-B38-0.5	0.5	ND <1.0	-	-	-	-
	P3-B38-2.5	2.5	ND <1.0	-	-	-	-
	P3-B38-5.0	5.0	ND <1.0	-	-	-	-
	P3-B41-0.5	0.5	ND <1.0	-	-	-	-
	P3-B41-2.5	2.5	ND <1.0	-	-	-	-
	P3-B41-5.0	5.0	ND <1.0	-	-	-	-
	P3-B42-0.5	0.5	ND <1.0	-	-	-	-
	P3-B42-2.5	2.5	ND <1.0	-	-	-	-
	P3-B42-5.0	5.0	ND <1.0	-	-	-	-
Former WBO Facility	P3-B24-0.5	0.5	ND <1.0	-	-	-	-
	P3-B24-2.5	2.5	ND <1.0	-	-	-	-
	P3-B24-5.0	5.0	ND <1.0	-	-	-	-
	P3-B25-0.5	0.5	ND <1.0	-	-	-	-
	P3-B25-2.5	2.5	ND <1.0	-	-	-	-
	P3-B25-5.0A	5.0	ND <1.0	-	-	-	-
	P3-B26-0.5	0.5	ND <1.0	-	-	-	-
	P3-B26-2.5	2.5	ND <1.0	-	-	-	-
	P3-B26-5.0	5.0	ND <1.0	-	-	-	-
	P3-B33-0.5	0.5	ND <1.0	-	-	-	-
	P3-B33-2.5	2.5	ND <1.0	-	-	-	-
	P3-B33-5.0	5.0	ND <1.0	-	-	-	-
Historical Pond Area	P3-B29-3.0A	3.0	7.5	-	-	-	-
	P3-B30-0.5	0.5	3000	-	-	-	-
	P3-B30-5.0	5.0	1200	-	-	-	-
	P3-B30-10.0A	10.0	230	-	-	-	-
	P3-B31-5.0	5.0	99	-	-	-	-
	P3-B31-8.0A	8.0	130	-	-	-	-
	P3-B32-5.0	5.0	410	-	-	-	-
	P3-B32-10.0A	10.0	120	-	-	-	-
	P3-B43-0.5	0.5	1.4	-	-	-	-
	P3-B43-4.5	4.5	2	-	-	-	-
	P3-B44-0.5	0.5	2.5	-	-	-	-
	P3-B44-5.0	5.0	88	-	-	-	-
	P3-B44-9.0	9.0	150	-	-	-	-
	P3-B45-0.5	0.5	1.7	-	-	-	-
	P3-B45-1.0	1.0	3.1	-	-	-	-
	P3-B45-4.5	4.5	40	-	-	-	-
	P3-B46-0.5	0.5	ND <1.0	-	-	-	-
	P3-B46-5.0	5.0	ND <1.0	-	-	-	-
	P3-B46-7.5	7.5	ND <1.0	-	-	-	-
	P3-B47-0.5*	0.5	1.2	-	-	-	-
	P3-B47-5.0*	5.0	7.2	-	-	-	-
	P3-B47-8.0*	8.0	ND <1.0	-	-	-	-
	P3-B48-0.5*	0.5	ND <1.0	-	-	-	-
	P3-B48-5.0*	5.0	ND <1.0	-	-	-	-
	P3-B49-0.5	0.5	ND <1.0	-	-	-	-
	P3-B49-5.0	5.0	3.6	-	-	-	-
	P3-B49-8.5	8.5	140	-	-	-	-
	P3-B50-0.5	0.5	2.3	-	-	-	-
	P3-B50-5.0	5.0	ND <1.0	-	-	-	-
	P3-B50-7.0	7.0	ND <1.0	-	-	-	-
	P3-B51-0.5	0.5	ND <1.0	-	-	-	-
	P3-B51-5.0	5.0	ND <1.0	-	-	-	-
	P3-B51-9.0	9.0	ND <1.0	-	-	-	-
	P3-B52-0.5	0.5	ND <1.0	-	-	-	-
	P3-B52-4.0	4.0	ND <1.0	-	-	-	-
	P3-B53-0.5	0.5	130	-	-	-	-
	P3-B53-5.0	5.0	420	-	-	-	-
	P3-B54-0.5	0.5	100	-	-	-	-
	P3-B54-5.0	5.0	170	-	-	-	-
	P3-B54-7.0	7.0	260	-	-	-	-
	P3-B55-0.5	0.5	1.0	-	-	-	-
	P3-B55-5.0	5.0	31	-	-	-	-
	P3-B56-0.5*	0.5	ND <1.0	-	-	-	-
	P3-B56-5.0*	5.0	8.0	-	-	-	-
	P3-B56-10.0*	10.0	3.6	-	-	-	-

Geosyntec consultants

Table 2
Plant #3 Summary of Soil Field Screening and Laboratory Results
Nammo Talley Inc.
Mesa, Arizona

Location	Sample ID	Depth (ft bgs)	Perchlorate Concentrations (mg/kg)	Metals Concentrations (mg/kg)			
			Field Screening	Cadmium	Chromium	Lead	Chromium VI
Historical Pond Area	P3-B57-0.5	0.5	ND <1.0	-	-	-	-
	P3-B57-5.0	5.0	140	-	-	-	-
	P3-B57-8.0	8.0	260	-	-	-	-
	P3-B58-0.5*	0.5	ND <1.0	-	-	-	-
	P3-B58-5.0*	5.0	ND <1.0	-	-	-	-
	P3-B59-0.5	0.5	ND <1.0	-	-	-	-
	P3-B59-5.0	5.0	ND <1.0	-	-	-	-
	P3-B60-0.5	0.5	ND <1.0	-	-	-	-
	P3-B60-5.0	5.0	ND <1.0	-	-	-	-
	P3-B61-0.5	0.5	ND <1.0	-	-	-	-
	P3-B61-5.0	5.0	ND <1.0	-	-	-	-
	P3-B61-7.0	7.0	ND <1.0	-	-	-	-
	P3-B62-0.5	0.5	ND <1.0	-	-	-	-
	P3-B62-5.0	5.0	ND <1.0	-	-	-	-
	P3-B63-0.5	0.5	ND <1.0	-	-	-	-
	P3-B63-5.0	5.0	7.6	-	-	-	-
	P3-B64-0.5*	0.5	ND <1.0	-	-	-	-
	P3-B64-5.0*	5.0	ND <1.0	-	-	-	-
	P3-B65-0.5	0.5	ND <1.0	-	-	-	-
	P3-B65-5.0	5.0	1.9	-	-	-	-
	P3-B65-10.0	10.0	3.0	-	-	-	-
	P3-B66-0.5	0.5	ND <1.0	-	-	-	-
	P3-B66-3.0	3.0	28	-	-	-	-
	P3-B66-5.0	5.0	12	-	-	-	-
	P3-B66-9.0	9.0	5.5	-	-	-	-
	P3-B67-0.5	0.5	ND <1.0	-	-	-	-
	P3-B67-5.0	5.0	ND <1.0	-	-	-	-
	P3-B67-10.0	10.0	ND <1.0	-	-	-	-
	P3-B68-0.5	0.5	ND <1.0	-	-	-	-
	P3-B68-5.0	5.0	ND <1.0	-	-	-	-
	P3-B69-0.5	0.5	ND <1.0	-	-	-	-
	P3-B69-5.0	5.0	55	-	-	-	-
	P3-B70-0.5	0.5	3.6	-	-	-	-
	P3-B70-5.0	5.0	230	-	-	-	-
	P3-B70-8.0	8.0	46	-	-	-	-
	P3-B71-0.5	0.5	-	ND<0.50	12	7.5	ND<1.0
	P3-B71-1.0*	1.0	1.8	-	-	-	-
	P3-B71-5.5*	5.5	ND <1.0	-	-	-	-
	P3-B71-6.0*	6.0	ND <1.0	-	-	-	-
	P3-B71-7.0*	7.0	ND <1.0	-	-	-	-
	P3-B72-0.5	0.5	-	ND<0.50	11	8.5	ND<1.0
	P3-B72-1.0	1.0	130	-	-	-	-
	P3-B72-4.5	4.5	86	-	-	-	-
	P3-B72-8.0	8.0	27	-	-	-	-
	P3-B73-0.5	0.5	-	ND<0.50	14	6.2	ND<0.99
	P3-B73-1.0	1.0	7.5	-	-	-	-
	P3-B73-4.5	4.5	5.2	-	-	-	-
	P3-B74-0.5	0.5	-	0.56	8.5	ND<5.0	ND<0.99
	P3-B74-1.0	1.0	160	-	-	-	-
	P3-B74-5.5	5.5	230	-	-	-	-
	P3-B74-10.0	10.0	20	-	-	-	-
	P3-B74-11.0	11.0	79	-	-	-	-
	P3-B75-1.5	1.5	16	-	-	-	-
	P3-B75-2.0	2.0	-	6.7	14	10	ND<1.0
	P3-B75-4.5	4.5	52	-	-	-	-
	P3-B75-7.5	7.5	110	-	-	-	-
	P3-B75-10.0	10.0	44	-	-	-	-
	P3-B76-0.5	0.5	ND <1.0	-	-	-	-
	P3-B76-1.0	1.0	-	2.6	10	23	ND<0.99
	P3-B76-5.5	5.5	110	-	-	-	-
	P3-B76-7.0	7.0	130	-	-	-	-
	P3-B77-0.5	0.5	-	ND<0.50	7.7	ND<5.0	ND<1.0
	P3-B77-1.0	1.0	3.9	-	-	-	-
	P3-B77-5.5	5.5	360	-	-	-	-
	P3-B77-8.0	8.0	99	-	-	-	-
	P3-B83-0.5	0.5	5.0	-	-	-	-
	P3-B83-5.0	5.0	180	-	-	-	-
	P3-B83-7.5	7.5	32	-	-	-	-
	P3-B84-0.5	0.5	ND <1.0	-	-	-	-
	P3-B84-5.0	5.0	290	-	-	-	-
	P3-B84-8.0	8.0	210	-	-	-	-
	P3-B85-0.5	0.5	ND <1.0	-	-	-	-
	P3-B85-5.0	5.0	47	-	-	-	-
	P3-B85-7.0	7.0	26	-	-	-	-

Geosyntec consultants

Table 2
Plant #3 Summary of Soil Field Screening and Laboratory Results
Nammo Talley Inc.
Mesa, Arizona

Location	Sample ID	Depth (ft bgs)	Perchlorate Concentrations (mg/kg)	Metals Concentrations (mg/kg)			
			Field Screening	Cadmium	Chromium	Lead	Chromium VI
Laundry Room/Septic System	P3-B1-5.0	5.0	ND <1.0	-	-	-	-
	P3-B1-10.0	10.0	ND <1.0	-	-	-	-
	P3-B1-15.0	15.0	ND <1.0	-	-	-	-
	P3-B1-20.0	20.0	ND <1.0	-	-	-	-
	P3-B1-24.0A	24.0	ND <1.0	-	-	-	-
	P3-B2-5.0	5.0	1.8	-	-	-	-
	P3-B2-10.0	10.0	1.4				
	P3-B2-15.0	15.0	ND <1.0	-	-	-	-
	P3-B2-20.0	20.0	ND <1.0	-	-	-	-
	P3-B2-24.0A	24.0	ND <1.0	-	-	-	-
	P3-B3-5.0	5.0	ND <1.0	-	-	-	-
	P3-B3-10.0	10.0	ND <1.0	-	-	-	-
	P3-B3-15.0	15.0	ND <1.0	-	-	-	-
	P3-B3-20.0	20.0	ND <1.0	-	-	-	-
	P3-B3-25.0A	25.0	ND <1.0	-	-	-	-
	P3-B4-5.0	5.0	ND <1.0	-	-	-	-
	P3-B4-10.0	10.0	ND <1.0	-	-	-	-
	P3-B4-15.0	15.0	ND <1.0	-	-	-	-
	P3-B4-20.0	20.0	ND <1.0	-	-	-	-
	P3-B4-25.0A	25.0	ND <1.0	-	-	-	-
Storage Pads #1 - #6	P3-B12-0.5	0.5	ND <1.0	-	-	-	-
	P3-B12-2.5	2.5	ND <1.0	-	-	-	-
	P3-B12-5.0	5.0	ND <1.0	-	-	-	-
	P3-B16-0.5	0.5	ND <1.0	-	-	-	-
	P3-B16-2.5	2.5	ND <1.0	-	-	-	-
	P3-B16-5.0	5.0	ND <1.0	-	-	-	-
	P3-B17-0.5	0.5	ND <1.0	-	-	-	-
	P3-B17-2.5	2.5	ND <1.0	-	-	-	-
	P3-B17-5.0	5.0	ND <1.0	-	-	-	-
	P3-B21-0.5	0.5	ND <1.0	-	-	-	-
	P3-B21-2.5	2.5	ND <1.0	-	-	-	-
	P3-B21-5.0	5.0	ND <1.0	-	-	-	-
	P3-B22-0.5	0.5	ND <1.0	-	-	-	-
	P3-B22-2.5	2.5	ND <1.0	-	-	-	-
	P3-B22-5.0	5.0	ND <1.0	-	-	-	-
	P3-B23-0.5	0.5	ND <1.0	-	-	-	-
	P3-B23-2.5	2.5	ND <1.0	-	-	-	-
	P3-B23-5.0A	5.0	ND <1.0	-	-	-	-
	P3-B27-0.5	0.5	ND <1.0	-	-	-	-
	P3-B27-2.5	2.5	2.1	-	-	-	-
	P3-B27-5.0	5.0	28	-	-	-	-
	P3-B28-0.5	0.5	6.5	-	-	-	-
	P3-B28-2.5	2.5	ND <1.0	-	-	-	-
	P3-B28-5.0A	5.0	ND <1.0	-	-	-	-
	P3-B34-0.5	0.5	ND <1.0	-	-	-	-
	P3-B34-2.5	2.5	ND <1.0	-	-	-	-
	P3-B34-5.0	5.0	ND <1.0	-	-	-	-
	P3-B35-0.5	0.5	ND <1.0	-	-	-	-
	P3-B35-2.5	2.5	ND <1.0	-	-	-	-
	P3-B35-5.0	5.0	ND <1.0	-	-	-	-
	P3-B39-0.5	0.5	2.7	-	-	-	-
	P3-B39-2.5	2.5	2.8	-	-	-	-
	P3-B39-5.0	5.0	ND <1.0	-	-	-	-
	P3-B40-0.5	0.5	ND <1.0	-	-	-	-
	P3-B40-2.5	2.5	ND <1.0	-	-	-	-
	P3-B40-5.0	5.0	ND <1.0	-	-	-	-
	P3-B78-0.5	0.5	1.7	-	-	-	-
	P3-B78-5.0	5.0	25	-	-	-	-
	P3-B78-10.0	10.0	96	-	-	-	-
	P3-B79-0.5	0.5	ND <1.0	-	-	-	-
	P3-B79-1.5	1.5	ND <1.0	-	-	-	-
	P3-B79-5.0	5.0	ND <1.0	-	-	-	-
	P3-B79-10.0	10.0	1.2	-	-	-	-
	P3-B80-0.5	0.5	ND <1.0	-	-	-	-
	P3-B80-5.0	5.0	7.7	-	-	-	-
	P3-B81-0.5	0.5	ND <1.0	-	-	-	-
	P3-B81-5.0	5.0	2.2	-	-	-	-
	P3-B81-10.0	10.0	20	-	-	-	-
	P3-B82-0.5	0.5	ND <1.0	-	-	-	-
	P3-B82-4.6	4.6	ND <1.0				
Manufacturing Line #2 Stormwater Area	P3-B13-0.5	0.5	ND <1.0	-	-	-	-
	P3-B13-2.5	2.5	ND <1.0	-	-	-	-
	P3-B13-5.0	5.0	ND <1.0	-	-	-	-

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Table 2
Plant #3 Summary of Soil Field Screening and Laboratory Results
Nammo Talley Inc.
Mesa, Arizona

Location	Sample ID	Depth (ft bgs)	Perchlorate Concentrations (mg/kg)	Metals Concentrations (mg/kg)			
			Field Screening	Cadmium	Chromium	Lead	Chromium VI
Manufacturing Line #2 Stormwater Area	P3-B14-0.5	0.5	ND <1.0	-	-	-	-
	P3-B14-2.5	2.5	ND <1.0	-	-	-	-
	P3-B14-5.0	5.0	ND <1.0	-	-	-	-
	P3-B15-0.5	0.5	ND <1.0	-	-	-	-
	P3-B15-2.5	2.5	ND <1.0	-	-	-	-
	P3-B15-5.0	5.0	ND <1.0	-	-	-	-
	P3-B19-0.5	0.5	ND <1.0	-	-	-	-
	P3-B19-2.5	2.5	140	-	-	-	-
	P3-B19-3.5	3.5	17	-	-	-	-
	P3-B19-5.0	5.0	1.2	-	-	-	-
	P3-B20-0.5	0.5	ND <1.0	-	-	-	-
	P3-B20-2.5	2.5	ND <1.0	-	-	-	-
	P3-B20-5.0	5.0	ND <1.0	-	-	-	-
	P3-B86-0.5	0.5	ND <1.0	-	-	-	-
	P3-B86-1.5	1.5	3.9	-	-	-	-
	P3-B86-5.0	5.0	ND <1.0	-	-	-	-
	P3-B86-10.0	10.0	1.2	-	-	-	-
	P3-B87-0.5	0.5	ND <1.0	-	-	-	-
	P3-B87-3.5	3.5	42	-	-	-	-
	P3-B87-5.0	5.0	4.8	-	-	-	-
	P3-B87-10.0	10.0	9.5	-	-	-	-
	P3-B88-0.5	0.5	ND <1.0	-	-	-	-
	P3-B88-3.5	3.5	ND <1.0	-	-	-	-
	P3-B88-5.0	5.0	ND <1.0	-	-	-	-
	P3-B88-5.5	5.5	ND <1.0	-	-	-	-
	P3-B89-0.5	0.5	ND <1.0	-	-	-	-
	P3-B89-5.0	5.0	ND <1.0	-	-	-	-
	P3-B89-10.0	10.0	ND <1.0	-	-	-	-
	P3-B90-0.5	0.5	ND <1.0	-	-	-	-
	P3-B90-5.0	5.0	ND <1.0	-	-	-	-
	P3-B90-10.0	10.0	1.2	-	-	-	-
Northwest Storm Water Pond Areas	P3-B91-0.5	0.5	ND <1.0	-	-	-	-
	P3-B91-5.0	5.0	ND <1.0	-	-	-	-
	P3-B92-0.5	0.5	ND <1.0	-	-	-	-
	P3-B92-5.0	5.0	ND <1.0	-	-	-	-
	P3-B92-10.0	10.0	ND <1.0	-	-	-	-
	P3-B93-0.5	0.5	ND <1.0	-	-	-	-
	P3-B93-5.0	5.0	ND <1.0	-	-	-	-
	P3-B93-10.0	10.0	ND <1.0	-	-	-	-
	P3-B94-0.5	0.5	1.2	-	-	-	-
	P3-B94-5.0	5.0	ND <1.0	-	-	-	-
	P3-B94-10.0	10.0	ND <1.0	-	-	-	-
Test Dept. Firing Area	P3-B5-0.5	0.5	1.1	-	-	-	-
	P3-B5-2.5	2.5	1.6	-	-	-	-
	P3-B5-5.0	5.0	1.8				
	P3-B6-0.5	0.5	ND <1.0	-	-	-	-
	P3-B6-2.5	2.5	ND <1.0	-	-	-	-
	P3-B6-5.0	5.0	ND <1.0	-	-	-	-
	P3-B7-0.5	0.5	1.0				
	P3-B7-2.5	2.5	ND <1.0	-	-	-	-
	P3-B7-5.0	5.0	ND <1.0	-	-	-	-
	P3-B8-0.5	0.5	ND <1.0	-	-	-	-
	P3-B8-2.5	2.5	ND <1.0	-	-	-	-
	P3-B8-5.0	5.0	ND <1.0	-	-	-	-
	P3-B9-0.5	0.5	1.0	-	-	-	-
	P3-B9-2.5	2.5	ND <1.0	-	-	-	-
	P3-B9-5.0	5.0	ND <1.0	-	-	-	-
	P3-B10-0.5	0.5	ND <1.0	-	-	-	-
	P3-B10-5.0	5.0	4.7	-	-	-	-
	P3-B10-2.5	2.5	ND <1.0	-	-	-	-
	P3-B11-0.5	0.5	ND <1.0	-	-	-	-
	P3-B11-2.5	2.5	1.0	-	-	-	-
	P3-B11-5.0	5.0	ND <1.0	-	-	-	-
	P3-B18-10	10.0	ND <1.0	-	-	-	-
	P3-B18-20	20.0	1.3	-	-	-	-

"-" Sample not analyzed

*-Portions of sample used to prepare composite extract submitted for laboratory confimation analysis; Results provided in Appendix E, Certificates of Analysis.

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Table 3
Plant #4 Summary of Soil Field Screening Results
Nammo Talley Inc.
Mesa, Arizona

Location	Sample ID	Depth (ft bgs)	Perchlorate Concentrations (mg/kg) Field Screening
Building #25	P4-B3-0.5	0.5	ND <1.0
	P4-B3-2.5	2.5	ND <1.0
	P4-B3-5.0A	5.0	ND <1.0
	P4-B4-0.5	0.5	120
	P4-B4-2.5	2.5	ND <1.0
	P4-B4-4.0	4.0	ND <1.0
	P4-B5-0.5	0.5	1.0
	P4-B5-2.5	2.5	ND <1.0
	P4-B5-3.5A	3.5	ND <1.0
Storage Pads #1 - #2	P4-B1-0.5	0.5	ND <1.0
	P4-B1-2.5	2.5	ND <1.0
	P4-B1-5.0	5.0	ND <1.0
	P4-B2-0.5	0.5	ND <1.0
	P4-B2-2.5	2.5	ND <1.0
	P4-B2-5.0A	5.0	ND <1.0
	P4-B9-0.5	0.5	ND <1.0
	P4-B9-2.5	2.5	ND <1.0
	P4-B9-4.0A	4.0	ND <1.0
	P4-B10-0.5	0.5	ND <1.0
	P4-B10-3.0	3.0	ND <1.0
Storm Water Areas	P4-B6-0.5	0.5	ND <1.0
	P4-B6-3.0	3.0	ND <1.0
	P4-B7-0.5	0.5	ND <1.0
	P4-B8-0.5	0.5	ND <1.0
	P4-B8-2.5	2.5	ND <1.0
	P4-B8-5.0	5.0	ND <1.0
	P4-B11-0.5	0.5	ND <1.0
	PB-B11-2.5	2.5	ND <1.0
	P4-B11-5.0	5.0	ND <1.0
	P4-B12-0.5	0.5	ND <1.0
	P4-B12-1.0	1.0	ND <1.0
Quality Assurance	P4-B1-0.5	0.5	2*
	P4-B1-5.0	5.0	80*

*- Represents non-detect soil sample spiked with known concentration of perchlorate

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Table 4
HPA-1 Summary of Soil Analytical Results
Nammo Talley Inc.
Mesa, Arizona

Location	Sample ID	Depth (ft bgs)	Laboratory Analysis (mg/kg)		
			Perchlorate	Nitrate	Ammonia
HPA-1	HPA-1-0.5	0.5	260 D	8.1	-
	HPA-1-10.0	10.0	65 D	56	-
	HPA-1-19.5	19.5	230 D	110 D	110 D
	HPA-1-25.5	25.5	1.4 D	90	-
	HPA-1-30.0	30.0	640 D	ND < 1.0	-
	HPA-1-40.0	40.0	1200 D	7.3	ND < 5.0
	HPA-1-46.0	46.0	1200 D	3.2	-
	HPA-1-50.0	50.0	1100 D	5.6	-
	HPA-1-60.0	60.0	100 D	6.0 D	ND < 5.0
	HPA-1-65.0	65.0	120 D	23 D	-
	HPA-1-70.0	70.0	37 D	7.2	-
	HPA-1-78.0	78.0	72 D	20	ND < 5.0
	HPA-1-90.0	90.0	3.5 D	1.4	-
	HPA-1-90.0B	90.0B	3.7 D	1.6	-
	HPA-1-100.0	100.0	0.039	ND < 1.0	ND < 5.0
	HPA-1-120.0	120.0	0.077	ND < 1.0	ND < 5.0
	HPA-1-140.0	140.0	0.48 D	1.0	ND < 5.0
	HPA-1-157.0	157.0	0.77 D	ND < 1.0	ND < 5.0
	HPA-1-180.0	180.0	ND < 0.020	ND < 1.0	ND < 5.0
	HPA-1-197.0	197.0	0.27	ND < 1.0	ND < 5.0
	HPA-1-197.0B	197.0B	0.29	ND < 1.0	ND < 5.0

D - Samples required dilution due to matrix, dilution factors listed in Appendix E - Certificates of Analysis.

"-" Sample not analyzed

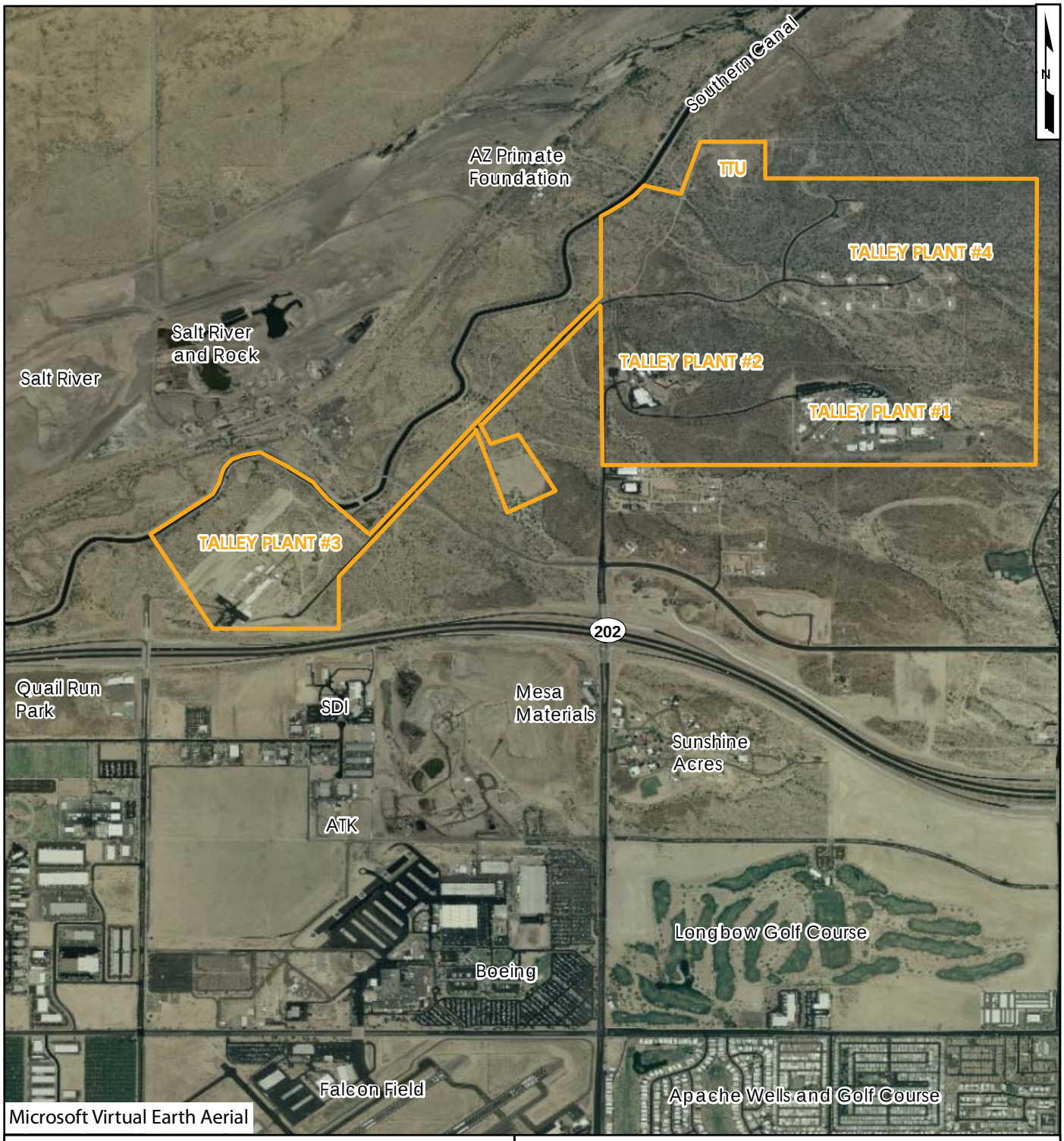
Geosyntec consultants

Table 5
HPA-1 Summary of Groundwater Analytical Results
Nammo Talley Inc.
Mesa, Arizona

Parameters	Units	HPA-1
		2/16/2009
Ammonia	mg/L	ND < 0.50
Chlorate	µg/L	ND < 20
Dissolved Organic Carbon	mg/L	ND < 1.0
Methane	µg/L	1.1
Perchlorate	µg/L	39
Sulfide	mg/L	ND < 0.040
Anions		
Bromide	mg/L	ND < 0.50
Chloride	mg/L	160 D
Nitrate (as N)	mg/L	1.9
Nitrite	mg/L	ND < 0.20
Sulfate	mg/L	56
Dissolved Metals		
Arsenic	mg/L	ND < 0.10
Barium	mg/L	ND < 0.10
Beryllium	mg/L	ND < 0.0010
Cadmium	mg/L	ND < 0.0010
Chromium	mg/L	ND < 0.010
Copper	mg/L	ND < 0.010
Iron	mg/L	ND < 0.050
Lead	mg/L	ND < 0.015
Manganese	mg/L	0.031
Nickel	mg/L	ND < 0.010
Selenium	mg/L	ND < 0.10
Silver	mg/L	ND < 0.010
Thallium	mg/L	ND < 0.10

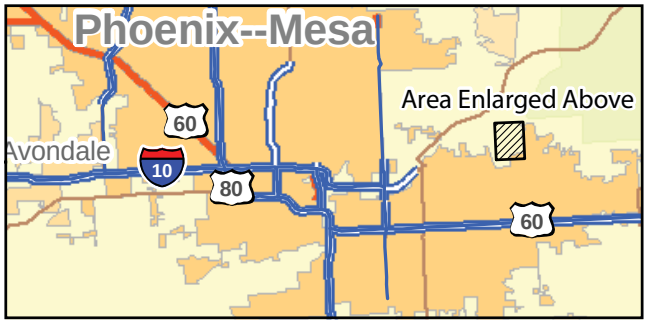
D - Samples required dilution due to matrix, dilution factors listed in Appendix E - Certificates of Analysis.

FIGURES



Legend

Approximate Boundary of Talley Property



2,000 1,000 0 2,000 Feet

Site Vicinity and Location Map

Nammo Talley Inc.
Mesa, Arizona

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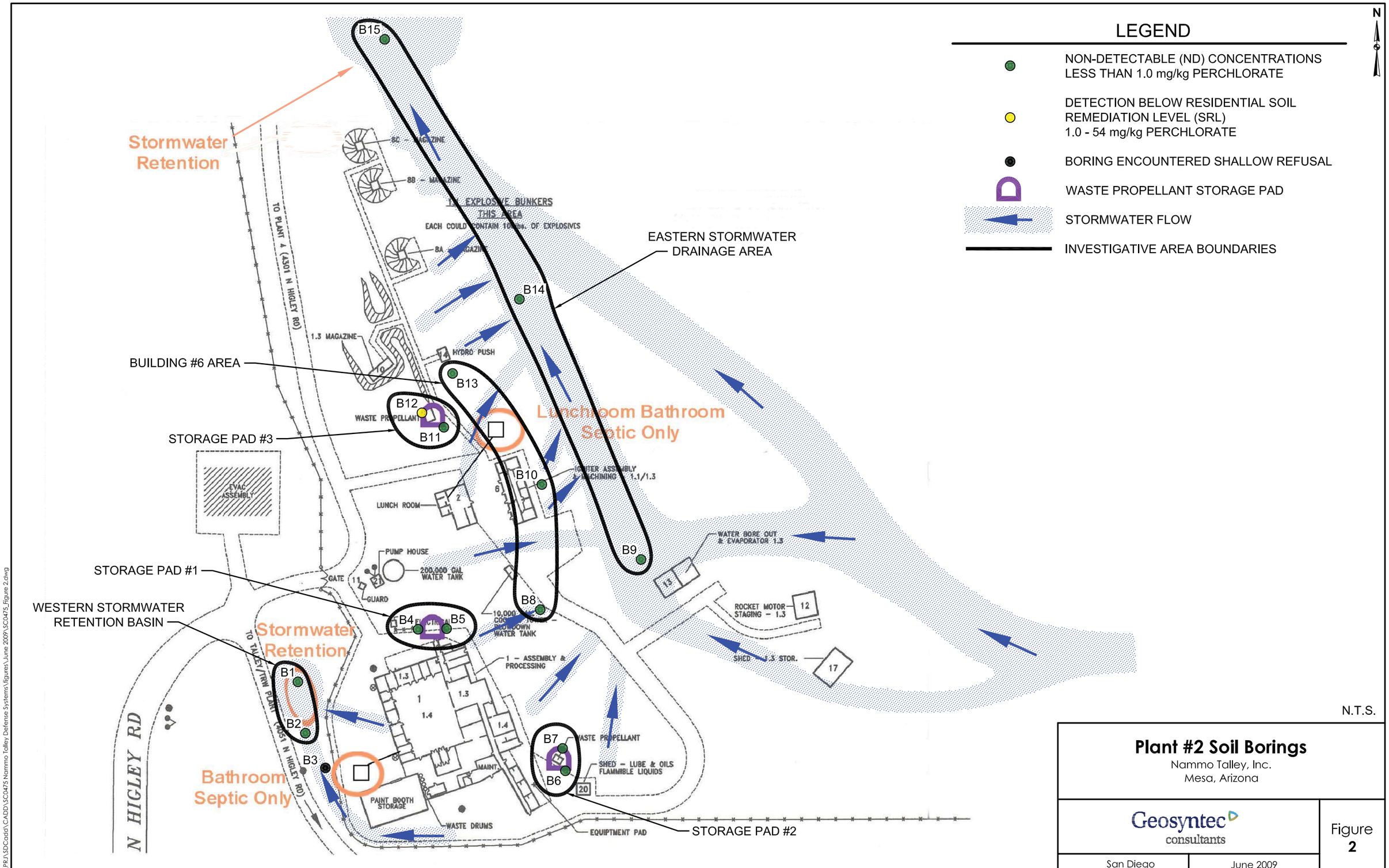
Figure 1

P:\GIS\SC0475 Mesa\SiteVicinity.mxd; Jlarson;SC0475



N.T.S.

Plant #2 Soil Borings

Nammo Talley, Inc.
Mesa, Arizona

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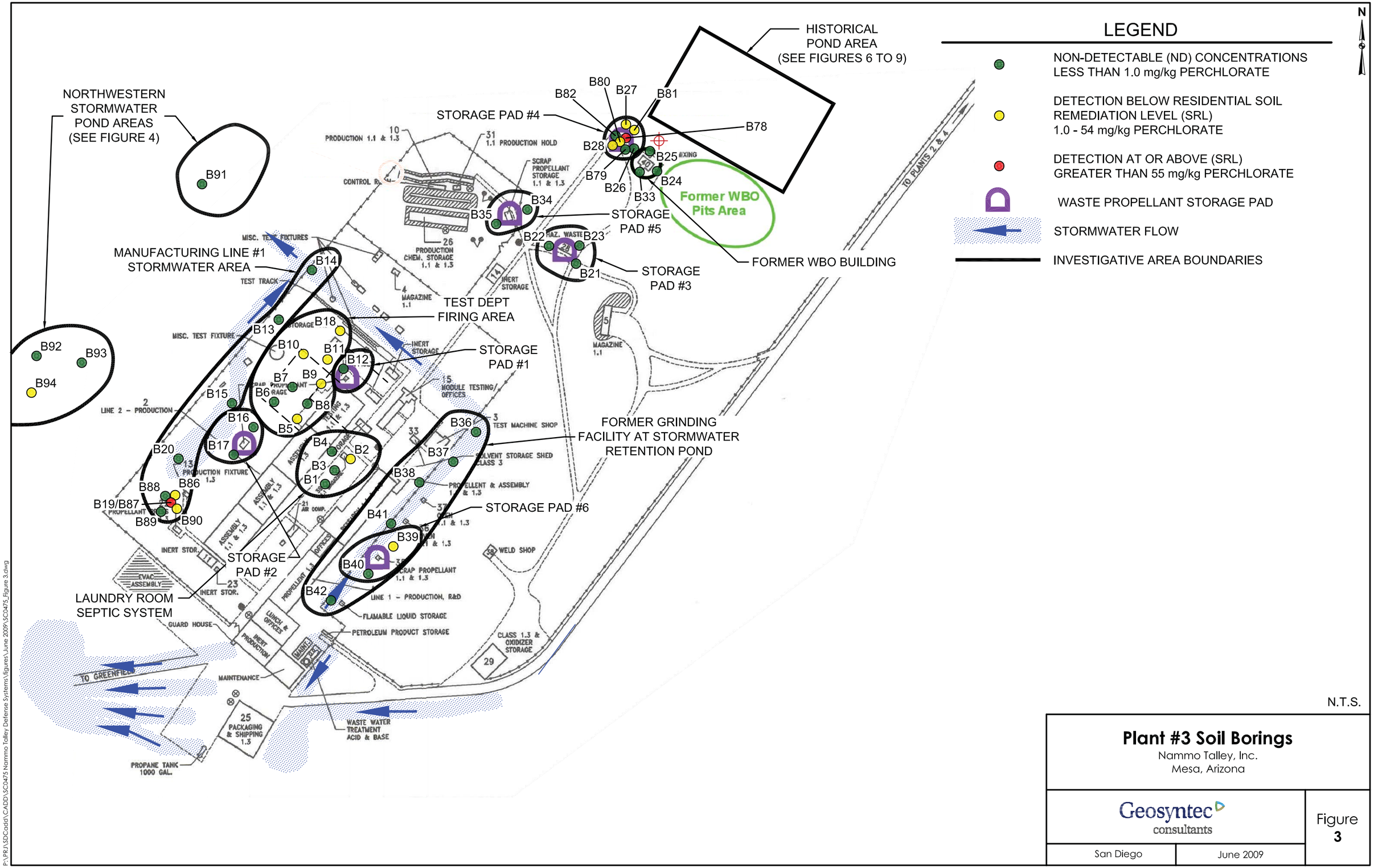
Figure 2

P:\PRJ\SDCadd\CADD\SC0475 Nammo Talley Defense Systems\figures\June 2009\SC0475_Figure 2.dwg


LEGEND
NON-DETECTABLE (ND) CONCENTRATIONS LESS THAN 1.0 mg/kg PERCHLORATE
DETECTION BELOW RESIDENTIAL SOIL REMEDIATION LEVEL (SRL) 1.0 - 54 mg/kg PERCHLORATE
DETECTION AT OR ABOVE (SRL) GREATER THAN 55 mg/kg PERCHLORATE
WASTE PROPELLANT STORAGE PAD
STORMWATER FLOW
INVESTIGATIVE AREA BOUNDARIES
N
HISTORICAL POND AREA (SEE FIGURES 6 TO 9)
NORTHWESTERN STORMWATER POND AREAS (SEE FIGURE 4)
STORAGE PAD #4
STORAGE PAD #5
STORAGE PAD #3
STORAGE PAD #1
STORAGE PAD #6
STORAGE PAD #2
Former WBO Pits Area
FORMER WBO BUILDING
MANUFACTURING LINE #1 STORMWATER AREA
TEST DEPT FIRING AREA
FORMER GRINDING FACILITY AT STORMWATER RETENTION POND
LAUNDRY ROOM SEPTIC SYSTEM
B91
B92
B93
B94
B80
B82
B27
B81
B78
B28
B25
B79
B26
B33
B24
B34
B35
B22
B23
B21
B14
B13
B18
B10
B11
B12
B7
B9
B6
B15
B8
B16
B5
B17
B4
B2
B3
B1
B36
B37
B38
B20
B86
B88
B19/B87
B89
B90
B41
B39
B40
B42
TO PLANTS 2 & 4
TO GREENFIELD
N.T.S.
Plant #3 Soil Borings
Nammo Talley, Inc.
Mesa, Arizona
Geosyntec consultants
San Diego
June 2009
Figure 3
P:\PRJ\SDCadd\CADD\SC0475 Nammo Talley Defense Systems\Figures\June 2009\SC0475_Figure 3.dwg

Legend

- Non-Detectable (ND) Concentration Less Than 1.0 mg/kg Perchlorate
- Detection Below Residential Soil Remediation Level (SRL) 1.0 - 54 mg/kg Perchlorate
- Investigative Area Boundary

Microsoft Virtual Earth Aerial.

Plant #3 Northwestern Pond Sample Locations

Nammo Talley, Inc.
Mesa, Arizona

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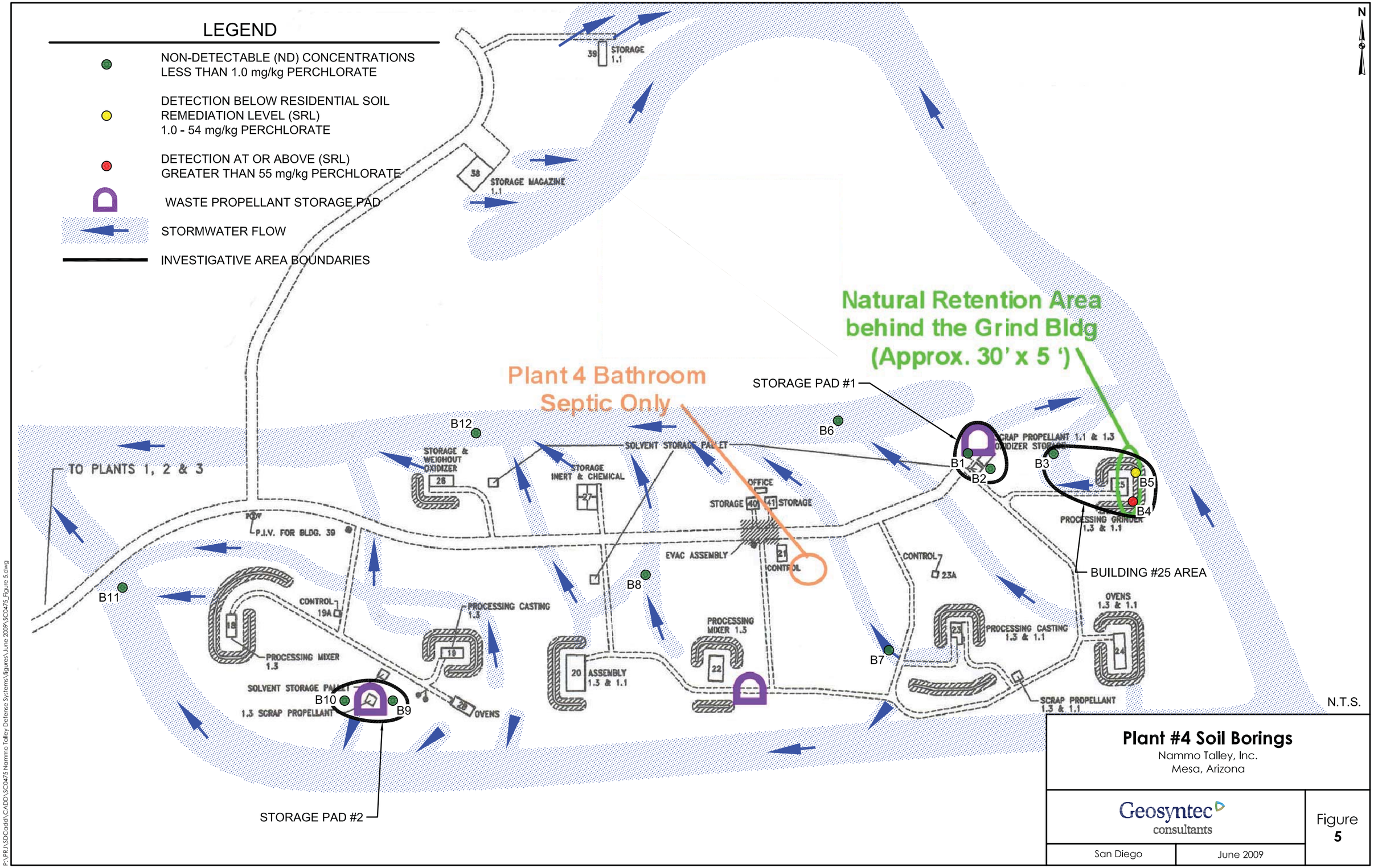
San Diego | June 2009

Figure 4



Plant #4 Soil Borings

Nammo Talley, Inc.
Mesa, Arizona

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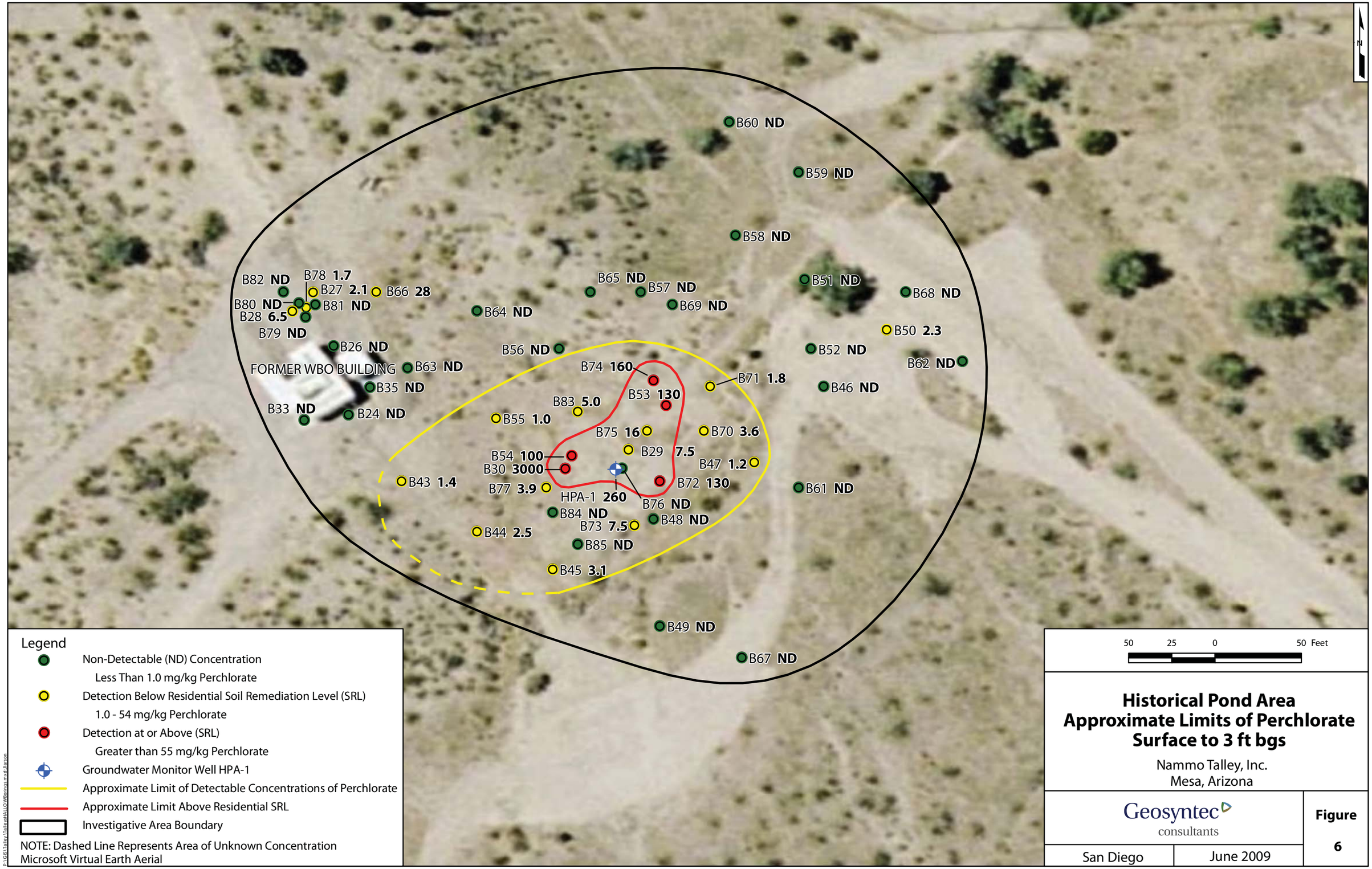
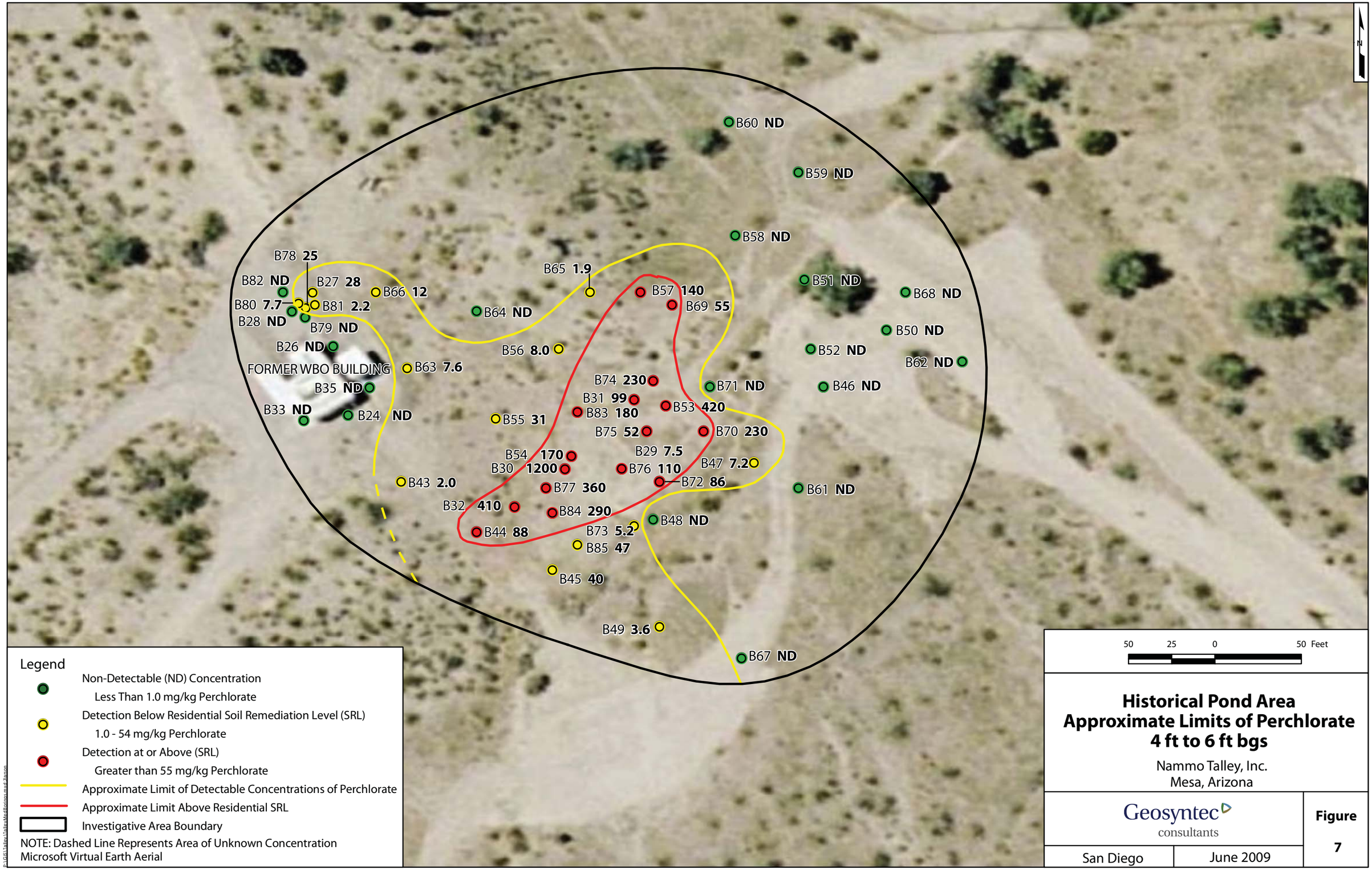
San Diego | June 2009

Figure 5

P:\PRJ\SDCadd\CADD\SC0475 Nammo Talley Defense Systems\figures\June 2009\SC0475_Figure 5.dwg


B60 ND
B59 ND
B58 ND
B82 ND
B78 1.7
B27 2.1
B66 28
B80 ND
B81 ND
B28 6.5
B79 ND
B64 ND
B65 ND
B57 ND
B69 ND
B51 ND
B68 ND
B50 2.3
B52 ND
B62 ND
B26 ND
FORMER WBO BUILDING
B63 ND
B35 ND
B33 ND
B24 ND
B56 ND
B74 160
B53 130
B71 1.8
B46 ND
B83 5.0
B55 1.0
B75 16
B70 3.6
B29 7.5
B54 100
B30 3000
B47 1.2
B43 1.4
B77 3.9
HPA-1 260
B72 130
B76 ND
B61 ND
B84 ND
B73 7.5
B48 ND
B44 2.5
B85 ND
B45 3.1
B49 ND
B67 ND
Legend
Non-Detectable (ND) Concentration
Less Than 1.0 mg/kg Perchlorate
Detection Below Residential Soil Remediation Level (SRL)
1.0 - 54 mg/kg Perchlorate
Detection at or Above (SRL)
Greater than 55 mg/kg Perchlorate
Groundwater Monitor Well HPA-1
Approximate Limit of Detectable Concentrations of Perchlorate
Approximate Limit Above Residential SRL
Investigative Area Boundary
NOTE: Dashed Line Represents Area of Unknown Concentration
Microsoft Virtual Earth Aerial
50 25 0 50 Feet
Historical Pond Area
Approximate Limits of Perchlorate
Surface to 3 ft bgs
Nammo Talley, Inc.
Mesa, Arizona
Geosyntec consultants
San Diego
June 2009
Figure
6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B59 ND
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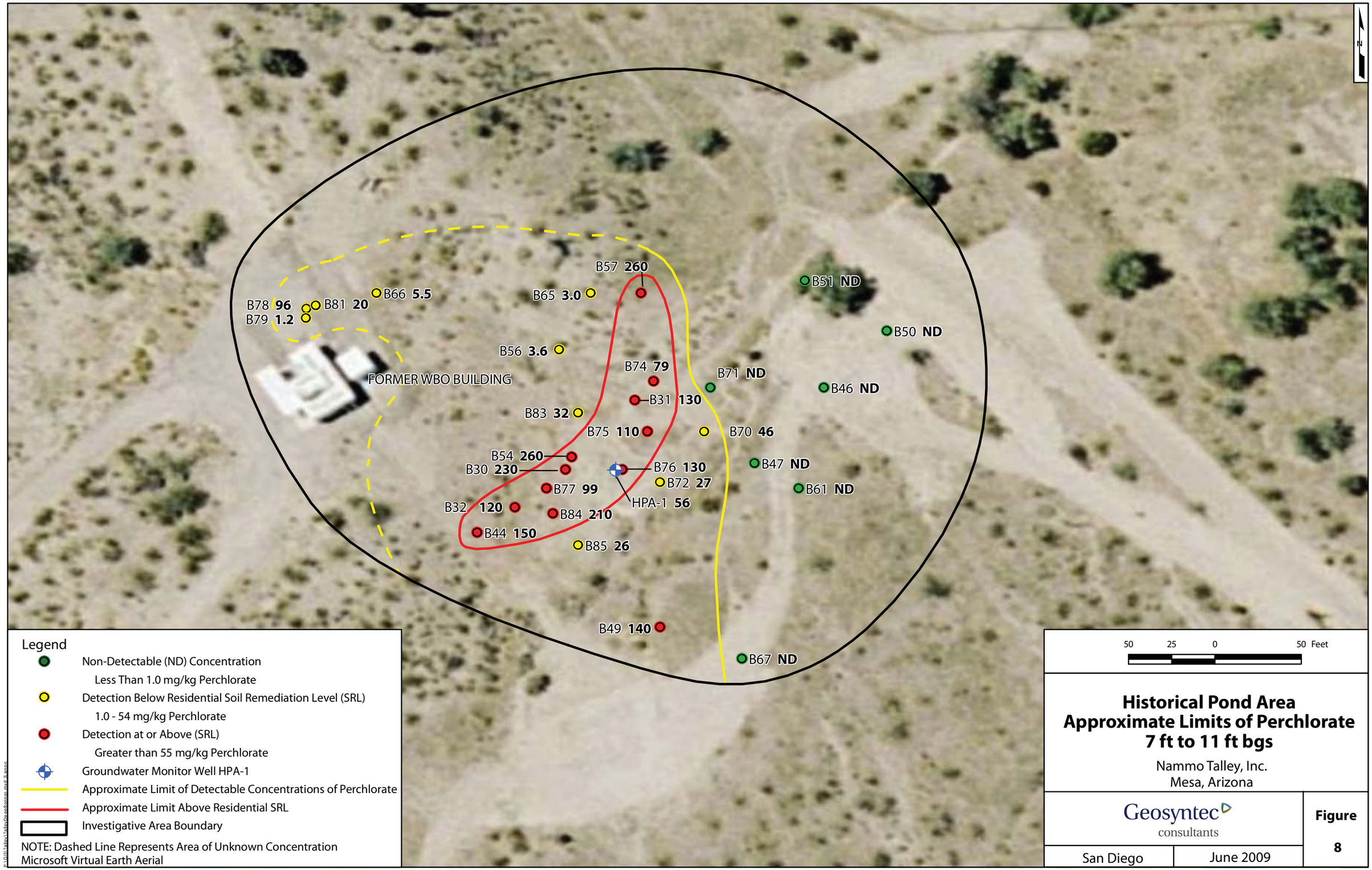
B71 ND
B78 25
B82 ND
B27 28
B66 12
B80 7.7
B81 2.2
B28 ND
B79 ND
B26 ND
FORMER WBO BUILDING
B63 7.6
B35 ND
B33 ND
B24 ND
B65 1.9
B64 ND
B56 8.0
B57 140
B69 55
B74 230
B31 99
B83 180
B53 420
B55 31
B75 52
B70 230
B29 7.5
B54 170
B30 1200
B76 110
B47 7.2
B72 86
B43 2.0
B77 360
B61 ND
B32 410
B84 290
B48 ND
B44 88
B73 5.2
B85 47
B45 40
B49 3.6
B67 ND
Legend
Non-Detectable (ND) Concentration
Less Than 1.0 mg/kg Perchlorate
Detection Below Residential Soil Remediation Level (SRL)
1.0 - 54 mg/kg Perchlorate
Detection at or Above (SRL)
Greater than 55 mg/kg Perchlorate
Approximate Limit of Detectable Concentrations of Perchlorate
Approximate Limit Above Residential SRL
Investigative Area Boundary
NOTE: Dashed Line Represents Area of Unknown Concentration
Microsoft Virtual Earth Aerial
50 25 0 50 Feet
Historical Pond Area
Approximate Limits of Perchlorate
4 ft to 6 ft bgs
Nammo Talley, Inc.
Mesa, Arizona
Geosyntec consultants
San Diego
June 2009
Figure
7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B51 ND
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B56 3.6
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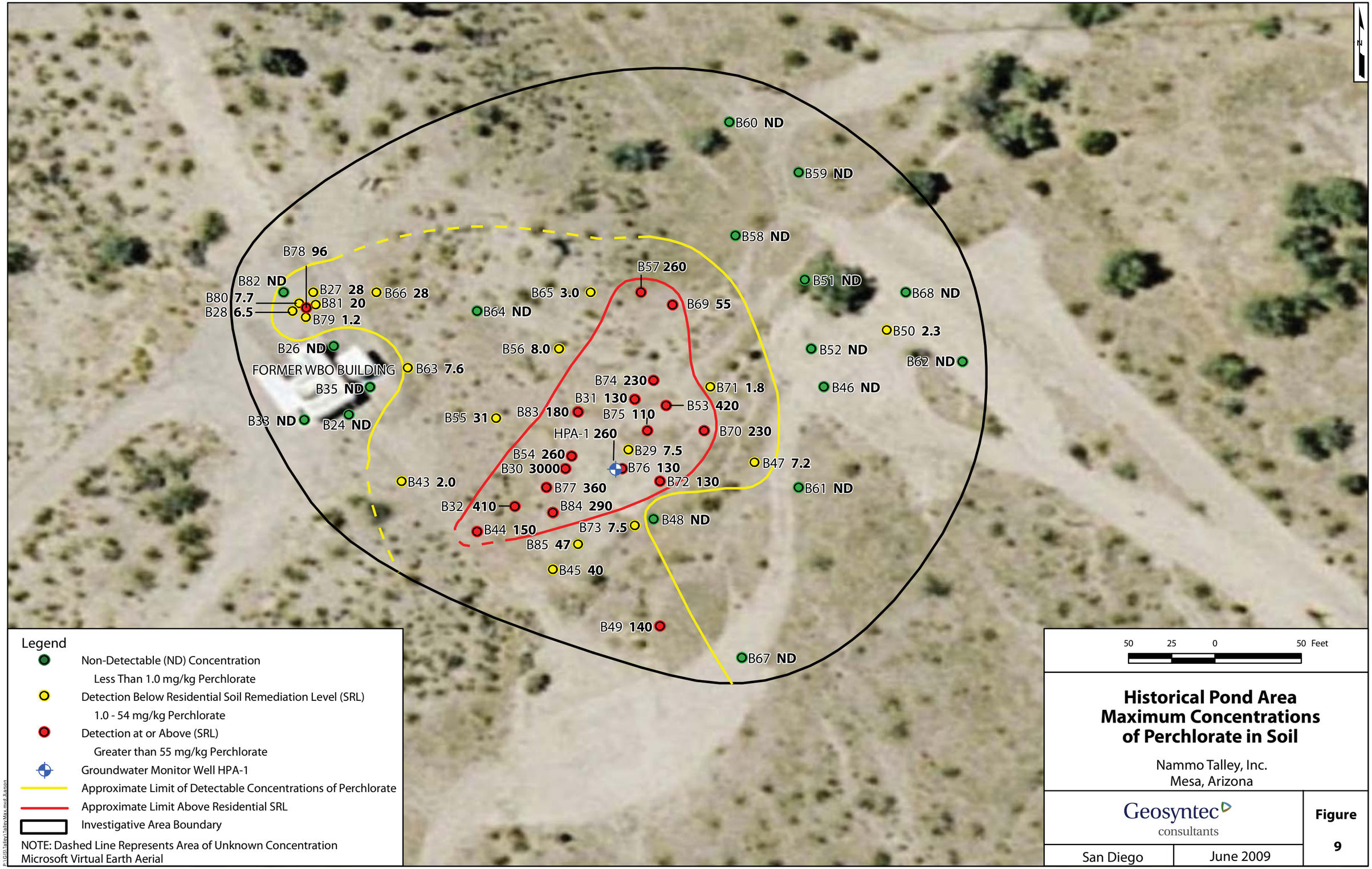
B71 ND
FORMER WBO BUILDING
B46 ND
B31 130
B83 32
B75 110
B70 46
B54 260
B30 230
B76 130
B47 ND
B72 27
B77 99
B61 ND
HPA-1 56
B32 120
B84 210
B44 150
B85 26
B49 140
B67 ND
Legend
Non-Detectable (ND) Concentration
Less Than 1.0 mg/kg Perchlorate
Detection Below Residential Soil Remediation Level (SRL)
1.0 - 54 mg/kg Perchlorate
Detection at or Above (SRL)
Greater than 55 mg/kg Perchlorate
Groundwater Monitor Well HPA-1
Approximate Limit of Detectable Concentrations of Perchlorate
Approximate Limit Above Residential SRL
Investigative Area Boundary
NOTE: Dashed Line Represents Area of Unknown Concentration
Microsoft Virtual Earth Aerial
50 25 0 50 Feet
Historical Pond Area
Approximate Limits of Perchlorate
7 ft to 11 ft bgs
Nammo Talley, Inc.
Mesa, Arizona
Geosyntec consultants
San Diego
June 2009
Figure
8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B59 ND
B58 ND
B51 ND
B68 ND
B50 2.3
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B62 ND
B46 ND
B47 7.2
B61 ND
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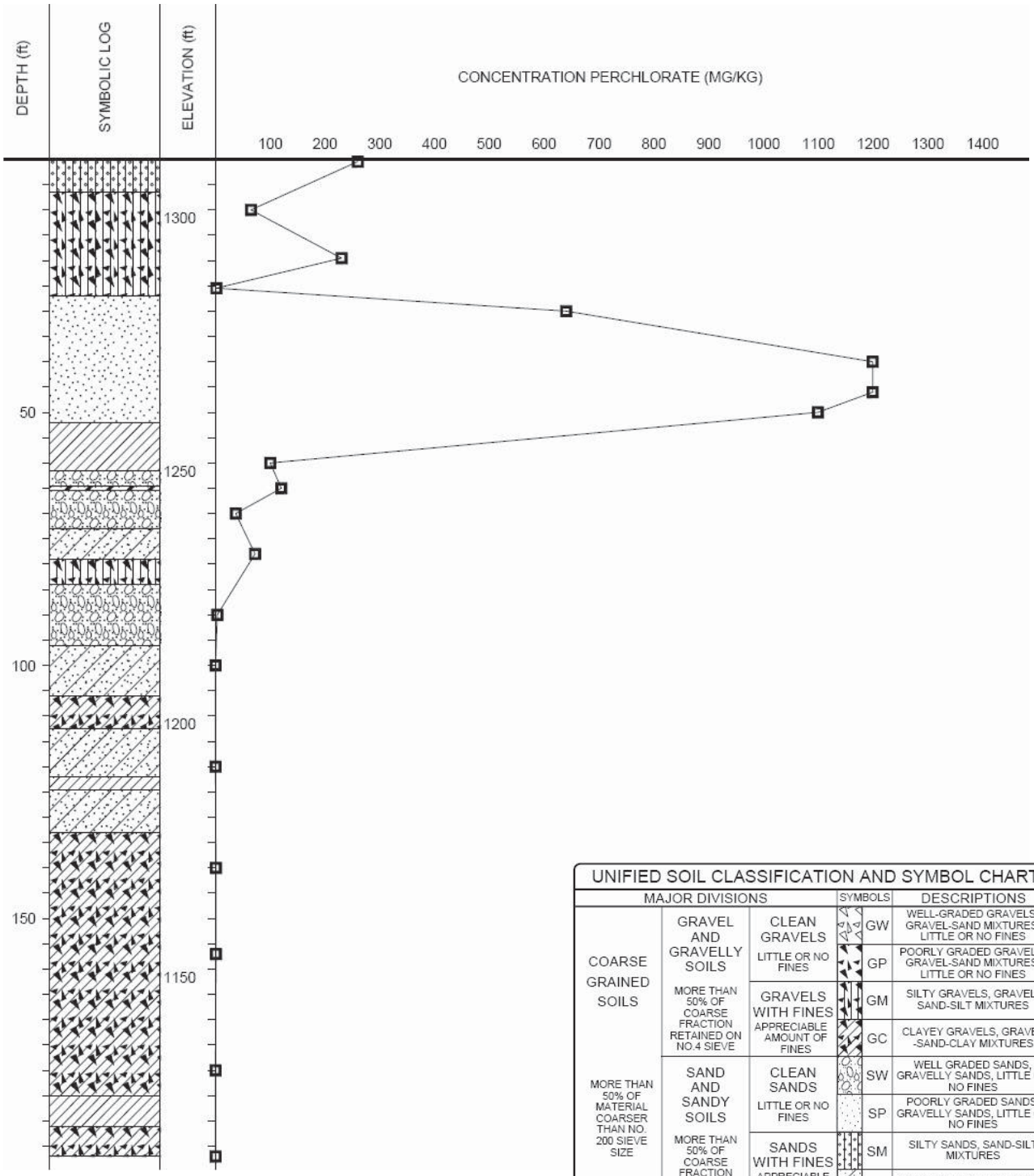
B67 ND
B78 96
B82 ND
B27 28
B66 28
B80 7.7
B81 20
B28 6.5
B79 1.2
B64 ND
B65 3.0
B57 260
B69 55
B26 ND
B56 8.0
FORMER WBO BUILDING
B63 7.6
B35 ND
B33 ND
B24 ND
B55 31
B74 230
B71 1.8
B31 130
B53 420
B83 180
B75 110
B70 230
HPA-1 260
B29 7.5
B54 260
B30 3000
B76 130
B43 2.0
B77 360
B72 130
B32 410
B84 290
B44 150
B73 7.5
B85 47
B45 40
B49 140
Legend
Non-Detectable (ND) Concentration
Less Than 1.0 mg/kg Perchlorate
Detection Below Residential Soil Remediation Level (SRL)
1.0 - 54 mg/kg Perchlorate
Detection at or Above (SRL)
Greater than 55 mg/kg Perchlorate
Groundwater Monitor Well HPA-1
Approximate Limit of Detectable Concentrations of Perchlorate
Approximate Limit Above Residential SRL
Investigative Area Boundary
NOTE: Dashed Line Represents Area of Unknown Concentration
Microsoft Virtual Earth Aerial
50 25 0 50 Feet
Historical Pond Area
Maximum Concentrations
of Perchlorate in Soil
Nammo Talley, Inc.
Mesa, Arizona
Geosyntec consultants
Figure
9
San Diego
June 2009
P:\GIS\Talley\TalleyMax.mxd:Jhanson



UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART

MAJOR DIVISIONS			SYMBOLS	DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO.4 SIEVE	LITTLE OR NO FINES	GP	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
		APPRECIABLE AMOUNT OF FINES	GC	CLAYEY GRAVELS, GRAVEL -SAND-CLAY MIXTURES
MORE THAN 50% OF MATERIAL COARSER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	CLEAN SANDS	SW	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION PASSING NO.4 SIEVE	LITTLE OR NO FINES	SP	POORLY GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINES	SM	SILTY SANDS, SAND-SILT MIXTURES
		APPRECIABLE AMOUNT OF FINES	SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL FINER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILT
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENT

NOTE: DUAL SYMBOLS USED FOR BORDERLINE CLASSIFICATIONS

Boring HPA-1 Vertical Profile of Perchlorate in Soil

Nammo Talley Inc.
Mesa, Arizona

Geosyntec consultants

San Diego | June 2009

Figure 10

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REPORT ON
UPDATED RCRA FACILITY ASSESSMENT
NAMMO TALLEY, INC.
MESA, ARIZONA

by Haley & Aldrich, Inc.
Phoenix, Arizona

for Nammo Talley, Inc.
Mesa, Arizona

Registered Professional Engineer (Chemical)
CERTIFICATE NO.
26126
STEPHEN M.
RAKOWSKI
Date Signed 9-15-17
ARIZONA, U.S.A.
EXPIRES 3-31-19

File No. 130121-002
September 2017

TABLES

TABLE 1 - 1994 RFA SWMU AND AOC STATUS

UPDATED RFI REPORT

NAMMO TALLEY, INC.

General Location	SWMU/AOC	Name	Brief Description	Documented Releases[1]	Suspected Releases[2]	Release Potential[3]	Recommendation for RCRA Facility Investigation/ Level of Priority[4]	Recommendation for Interim Measures	Actions Taken	Documentation	Status	Location	Operational Status as of August 2017
Plant 2	SWMU 1-4	Plant 2 - SAAs/HWAA - Main Bldg.	SWMU 1: Paint Booth SAA SWMU2: Blast Residue SAA (drum between bays 44 and 45) SWMU 3: Area 29 SAA (waste AN propellant in concrete hallway in front of bays 25,27, and 29) SWMU 4: Former Glue Table SAA (north of bay 47)	No	No	Low	No	No		SAIC's Summary and Recommendations for RCRA Facility Assessment Report did not recommend a RFI or any interim measures for this SWMU (SAIC, 1994b)	No Action Required	33.49002 N -111.71722 W (SWMU 1)	SWMU's 1-3 appear to be active. A 55 gallon drum situated on the concrete floor and containing paint contaminated trash (SWMU #1) appeared to have moisture and rust around its base. No indication of spills or releases from SWMU 2 or 3. SWMU 4 could not be located and was listed as a former SWMU at the time of the 1994 RFA report.
	SWMU 5	North Hold SAA Plant 2	5' X 15' concrete pad located to the north of the northeast corner of the main building (liquid and solid waste AA)	Yes	Yes	Low	No	TDS should place drums of liquid waste in plastic catch basins.	Drums were removed from this collection area and placed in Bldg. 20 which now has secondary containment. (See photos.)	TDS SWMU Letter to ADEQ (TDS, 1999c); ADEQ Meeting Notes (ADEQ,2000)	No Further Action	-	Could not be located, and presumably no longer exists.
	SWMU 6	Former 1,1,1-TCA SAA Plant 2 Plant 2	SAA for waste 1,1,1-TCA (1 drum) located northeast of bays 25 and 27 on a pallet	No	No	Low-A, S (historical)	No	No		SAIC's Summary and Recommendations for RCRA Facility Assessment Report did not recommend a RFI or any interim measures for this SWMU (SAIC, 1994b)	No Action Required	-	Could not be located, and presumably no longer exists.
	SWMU 7	East Hold HWAA Plant 2	Drums on 40' x 40' concrete pad located outside and to the northeast of bays 30 and 33.	No	Yes	Low-S (historical)	No	No. Concrete slopes to center.		SAIC's Summary and Recommendations for RCRA Facility Assessment Report did not recommend a RFI or any interim measures for this SWMU (SAIC, 1994b)	No Action Required	33.49023 N -111.71647 W	Appears to be active, with 4 bins containing explosive waste, flammable solids, and propellant waste. No signs of spills or leaks.
	SWMU 8	HWAA Bldg. 20 Plant 2	Concrete pad (18' x18') with sheet metal roof located outside and to the southeast of the main building for storage of drums	Unknown	Yes	Medium-S	No	TDS should sample to determine the presence (or not) of hazardous waste or constituents in soil. (Remove soil if HW present.) TDS should construct curbs or berms around unit.	TDS had secondary containment berms constructed around the unit an hired a consultant to take soil samples around the units' concrete pad. A sampling report was provided.	TDS SWMU Letter to ADEQ (TDS, 1999c); ADEQ NFA Letter (ADEQ,2001)	No Further Action	33.49002 N -111.71626 W	Appears to be active with several drums containing flammable liquids were observed situated on concrete. No signs of spills or leaks.
	SWMU 9	HWAA Ignitor Bldg. Plant	Outdoor concrete pad (8' x12') located to the north of the ignitor building (solid waste only)	No	No	Low	No	No		SAIC's Summary and Recommendations for RCRA Facility Assessment Report did not recommend a RFI or any interim measures for this SWMU (SAIC, 1994b)	No Action Required	33.49146 N -111.71701 W	Appears to be active with 3 bins containing solid propellant waste. No signs of spills or leaks.
	SWMU 10	Water Bore-Out Ops. At Plant 2	WBO Concrete pad (30' x 30')	No	No	Low	No	No		SAIC's Summary and Recommendations for RCRA Facility Assessment Report did not recommend a RFI or any interim measures for this SWMU (SAIC, 1994b)	No Action Required	33.49088 N -111.71594 W	Active. Bore out operations are conducted on a bermed concrete pad with a sheet metal roof. Wastewater is collected in an above ground tank near the bore out operations. Approximately 1/2 inch of standing water was observed on an unoccupied portion of the concrete pad. Talley stated that the portion of the pad with standing water had recently been cleared so that new equipment could be installed there. Additionally, three drums of propellant water were stored outside Water Bore out Building 13 on concrete. No signs of spills or leaks were observed.
Plant 3	SWMU 11 - 18	SAAs Line 1- Plant 3	SWMU 11: Maintenance bay, indoor (Solvents, TCA, TCE) SWMU 12: Bay 2, outdoor on concrete (Solvent contaminated trash) SWMU 13: Bay 5 hallway, indoor (x-ray systems cleaner) SWMU 14: Hallway between bays 8 &9, indoor SWMU 15: Bay 13, outdoor on concrete (nonhalogenated solvent) SWMU 16: Hallway EE, northeast end, indoor (solvent contaminated trash) SWMU 17: Bay 16, outdoor on concrete (halogenated and non-halogenated solvents) SWMU 18: North end of line 1, outdoor on concrete (sand blast residue)	No	No	Low-S, A	No	No		SAIC's Summary and Recommendations for RCRA Facility Assessment Report did not recommend a RFI or any interim measures for this SWMU (SAIC, 1994b)	No Action Required	33.48242 N -111.73204 W (SWMU 11) 33.48332 N -111.73095 W (SWMU 18)	SWMUs 11 and 18 appear to be active. No signs of leaks or spills were observed. Other listed SWMUs could not be located and presumably no longer exist. SWMU 11: Two 55-gallon drums containing solvent contaminated trash were situated on concrete in maintenance bay BB, along with approximately 7 5-gallon solvent contaminated trash day cans situated on concrete, and a 1-gallon solvent waste container located on a bench. Two flammable cabinets are also located in the maintenance bay and contain a variety of alcohols, solvents, epoxies, and primers. SWMU 18: A 55 gallon-drum of sand blaster waste was located outside of Bay 18A (on the northern end of the Line 1 building) and situated on concrete.
	SWMU 19	HWAA Line 1 - Plant 3 (ERM)	Extended range munitions (ERM)/research hold HWAA located southeast of bay 8. Referred to as reactive waste AA, building 35. This is a sheet metal structure open on one side with a concrete pad (20' x 12')	No	No	No	No	No		SAIC's Summary and Recommendations for RCRA Facility Assessment Report did not recommend a RFI or any interim measures for this SWMU (SAIC, 1994b)	No Action Required	33.48288 N -111.73125 W	Appears to be active with 3 bins and 3 55-gallon drums containing propellant waste and M-7 waste. Talley personnel stated that this area accumulates waste generated from the Line 1 building. No details could be provided regarding the nature or composition of the M-7 waste. This pad is located outside of Bay 8A. No signs of leaks or spills were observed.
	SWMU 20	SAA Line 1 - Plant 3 (ERM)	SAA for more than 55 gallons of waste just south of SWMU 19 is a concrete pad (15' x 20')	No	No	Low-S	No	No		SAIC's Summary and Recommendations for RCRA Facility Assessment Report did not recommend a RFI or any interim measures for this SWMU (SAIC, 1994b)	No Action Required	33.48260 N -111.73156 W	Appears to be active with 3 empty 55-gallon drums stored within a smaller fenced in area (4' x 6') situated on the concrete pad. No signs of leaks or spills were observed.
	SWMU 21 - 30	SAAs Line 2 - Plant 3	SWMU 21: North of bay 47, indoor (waste propellant and solvent) SWMU 22: Bay 45, indoor (Solvent contaminated trash) SWMU 23: VE, paint booth, indoor (paint contaminated trash) SWMU 24: Northwest of bay 36, indoor (solvent contaminated trash) SWMU 25: Northwest of bay 36, indoor (waste solvent) SWMU 26: Bay 25, outdoor (solvent contaminated trash) SWMU 27: Bay 16, outdoor (halogenated and non-halogenated solvents) SWMU 28: Bay 22, outdoor (waste propellant) SWMU 29: South end Line 2, indoor (waste NaN3, propellant and liners) SWMU 30: South of Model T press, outdoor (Cr contaminated wastewater)	No	No	SWMU 27: Low-S SWMU 30: Low-S	No	No		SAIC's Summary and Recommendations for RCRA Facility Assessment Report did not recommend a RFI or any interim measures for this SWMU (SAIC, 1994b)	No Action Required	-	SWMUs 21 - 22 and 24 - 30 could not be located and presumably no longer exist. The indoor paint booth bay (SWMU 23) could not be accessed for inspection due to active painting operations requiring the use of a respirator.
	SWMU 31	HWAA Line 2	Line 2 hold area HWAA located north and west of bays 32-35 in Line 2. Waste propellant is stored in drums on concrete pad (8' x 20')	No	Unknown	Low-S (if only solids managed)	No	No		SAIC's Summary and Recommendations for RCRA Facility Assessment Report did not recommend a RFI or any interim measures for this SWMU (SAIC, 1994b)	No Action Required	33.48359 N -111.73224 W	No longer exists. No waste is managed or stored here. No signs of spills or leaks observed. Rolling metal carts are present within fenced area.
	SWMU 32	SAA Test Office	SAA on patio of Test Department located between Lines 1 and 2, at the northern end. Solvent contaminated trash managed here on a concrete floor.	No	No	Low	No	No		SAIC's Summary and Recommendations for RCRA Facility Assessment Report did not recommend a RFI or any interim measures for this SWMU (SAIC, 1994b)	No Action Required	33.48362 N -111.73137 W	No longer exists. No waste is managed or stored here. No signs of spills or leaks observed.
	SWMU 33	HWAA Bldg. 28	Drums on a concrete pad (15' x 25') located near building 28. Wastes are generated from Plant 3.	No	Yes	Med/High-S (historical) Low/Med-S (current[5])	No	TDS should construct curbs if liquid hazardous waste or constituents will be managed here.	TDS had secondary containment berms constructed around the unit.	TDS SWMU Letter to ADEQ (TDS, 1999c); ADEQ Meeting Notes (ADEQ, 2000)	No Further Action	33.48463 N -111.72974 W	No longer exists. No waste is managed or stored here. No signs of spills or leaks observed.
	SWMU 34	HWAA Bldg. 10	HWAA located on a concrete floor (12' x 12') near building 10. TDS refers to this area of Plant 3 as the Roland Area and to this HWAA as the "snake pit."	No	No	Low	No	No		SAIC's Summary and Recommendations for RCRA Facility Assessment Report did not recommend a RFI or any interim measures for this SWMU (SAIC, 1994b)	No Action Required	33.48487 N -111.73026 W	Appears to be active with one bin for hazardous waste stored in the fenced in concrete pad. The specific type of hazardous waste could not be identified from the bin markings. No signs of spills or leaks observed.
	SWMU 35 - 41	SAAs Bldg. 10	SWMU 35: Adjacent to SWMU 34, outdoor (solvent contaminated trash, Cr water) SWMU 36: Bay 31, indoor SWMU 37: Bay 10, outdoor SWMU 38: Bay 7, outdoor SWMU 39: Bay 4, outdoor (waste propellant) SWMU 40: Bay 1, indoor (NaN3, liners) SWMU 41: South of Bay 4, outdoor (solvent contaminated trash)	No	No	Low	No	No		SAIC's Summary and Recommendations for RCRA Facility Assessment Report did not recommend a RFI or any interim measures for this SWMU (SAIC, 1994b)	No Action Required	33.48524 N -111.73078 W (SWMU 39)	SWMU 39 appears to be active with a 55-gallon drum containing solvent contaminated trash situated on concrete. No signs of leaks or spills were observed. SWMUs 35 - 38 and 40 -41 could not be located and presumably no longer exist.
	SWMU 42	Former Water Bore-Out Ops. Area		Yes	Yes	High-S (HWAA) High-S (Pits) Low-GW	No; facility is working with ADEQ to determine extent of cleanup needed	Yes; remove containers from pad, discontinue use of pad, sample soil, and remediate as necessary.	TDS removed the containers from the pad, discontinued its use, and removed the concrete pad. (See attached photographs.) No soil samples have been taken.	Not reviewed for this updated RFA. This unit has been characterized and is currently being remediated by Nammo Talley under to APP No. P-101370.			
Plant 4	SWMU 43	Plant 4 HWAA	HWAA located in the cul de sac to the east of Building 25. TDS refers to this area as the Plant 4 Hold Area, and it is constructed on unsealed concrete pad (40' x 20') surrounded by a fence. Cargotainers and, bagged propellant waste, and drums of propellant waste present.	No	No	Low	No	No		SAIC's Summary and Recommendations for RCRA Facility Assessment Report did not recommend a RFI or any interim measures for this SWMU (SAIC, 1994b)	No Action Required	-	Appears to be active with 2 drums of ammonium propellant mop water situated on concrete, No signs of spills or leaks observed.
	SWMU 44	Bldg. 23 - Plant 4 Casting	HWAA located just east of Building 23. The casting room two stories tall with drums stored on concrete both upstairs and downstairs. Contaminated trash managed outside downstairs.	No	No	Low/NA	No	No		SAIC's Summary and Recommendations for RCRA Facility Assessment Report did not recommend a RFI or any interim measures for this SWMU (SAIC, 1994b)	No Action Required	-	Appears to be active, with one bin containing hazardous waste located on soil within a 3' x3' fenced area. No signs of spills or leaks.
	SWMU 45	Bldg. 22 - Plant 4 Mixing	Propellant contaminated trash stored inside the building on a concrete floor.	No	Yes	Low/Med-S	No	TDS should implement policy to repair equipment in a timely manner.	TDS has implemented a Quality Policy (company wide) whereby each department strives to improve response time and quality. The process includes semi-annual surveys which monitors improvement. This policy has helped to shorten response times for equipment repair.	TDS SWMU Letter to ADEQ (TDS, 1999c); 7/5/2000 ADEQ Meeting Notes	No Further Action	-	This building could not be visually inspected during the site visit due to ongoing mixing operations which presented a safety hazard.
	SWMU 46	Bldg. 24 - Plant 4 Curing	Propellant contaminated trash and NaN3 propellant contaminated debris managed in drum(s) on concrete.	Unknown	Yes	Low-S	No	TDS should implement policy to repair equipment in a timely manner.		TDS SWMU Letter to ADEQ (TDS, 1999c); ADEQ Meeting Notes (ADEQ, 2000)	No Further Action	-	This building could not be visually inspected during the site visit, but Talley stated no waste accumulation areas in building. No waste observed outside of building; presumed to no longer exist.
	SWMU 47	SAAs Bldg. 20 Plant 4	(5-bay weigh out room) TCA contaminated trash maintained inside bay 3, liquid TCA and later Rinsolve maintained outside near bay 1, alcohol contaminated trash accumulated in bay 2.	No	No	Low	No	No		SAIC's Summary and Recommendations for RCRA Facility Assessment Report did not recommend a RFI or any interim measures for this SWMU (SAIC, 1994b)	No Action Required	-	Appears to be active, with 3 drums outside of Bay 1 situated on pallets, one drum outside of bay 5 on concrete, and 2 - 5 gallon pots containing hazardous waste situated on a stand in bay 4. No signs of spills or leaks observed.
	SWMU 48	SAA Bldg. 18 Plant 4	(Mixer building) Waste liners containing NaN3 were accumulated in a metal cabinet outside the building located on a concrete base. AP mop water is accumulated in a drum outside the northwest corner of the building.	No	Unknown	Low	No	No		SAIC's Summary and Recommendations for RCRA Facility Assessment Report did not recommend a RFI or any interim measures for this SWMU (SAIC, 1994b)	No Action Required	-	Appears to be active with a drum of solvent contaminated trash located on concrete outside of the building. No metal cabinet were present. No signs of spills or leaks observed.

TABLE 1 - 1994 RFA SWMU AND AOC STATUS
UPDATED RFI REPORT
NAMMO TALLEY, INC.

General Location	SWMU/AOC	Name	Brief Description	Documented Releases[1]	Suspected Releases[2]	Release Potential[3]	Recommendation for RCRA Facility Investigation/ Level of Priority[4]	Recommendation for Interim Measures	Actions Taken	Documentation	Status	Location	Operational Status as of August 2017
Plant 6	SWMU 49	SAA Bldg. 1 Plant 6	SAA with 5 gallon buckets containing solvent contaminated trash and developer tray cleaner (Cr) located east of bay 27, outside on the patio.	No	No	Low	No	No		SAIC's Summary and Recommendations for RCRA Facility Assessment Report did not recommend a RFI or any interim measures for this SWMU (SAIC, 1994b)	No Action Required	-	Nammo Talley no longer operates at this location.
	SWMU 50	Historical SAA Bldg. 2	Solid waste propellant stored in drum(s) on concrete and under a roof at the western end of the Load building.	No	No	Low	No	No		SAIC's Summary and Recommendations for RCRA Facility Assessment Report did not recommend a RFI or any interim measures for this SWMU (SAIC, 1994b)	No Action Required	-	
	SWMU 51	Historical SIs	Two surface impoundments located to the west of the parking lot between Plant 5 and Plant 6. Comdisk operated and discharged pretreated industrial wastewater through underground pipes to SI's. Each SI was approximately 100' x 200' x 5'. The bottom of the SIs were covered with asphalt. (More details in '94 report.)	No	Yes	Med/High-S (drums) Low S (ponds) Low-A	Yes; TDS should sample perimeter of area known to encompass ponds and drum pile to determine if remnant contamination may be present from (primarily) the drums. Locate piping from plant 6 to ponds; determine if contamination exists.	No	TDS has completed site investigations for both VOCs and metals. ADEQ has provided TDS with a no further action letter to give closure to this issue.	TDS SWMU Letter to ADEQ (TDS, 1999c); Former DISCOM Surface Impoundments Plant 6- VOC Investigation Report (TDS, 1998a); ADEQ NFA letter (ADEQ, 1998b)	No Further Action	-	
	SWMU 52	Burn Ground		Yes	Yes	Med-S Air Releases have permit restrictions	No	Sample before constructing proposed unit additions.	Proposed unit additions were never constructed so this does not apply.	Not reviewed for this updated RFA. This unit has undergone characterization and partial closure activities, is subject to final closure and post-closure upon issuance of a RCRA post-closure permit by ADEQ.			
	AOC 1	See SWMU No. 51	This AOC is SWMU 51.	-	-	-	-	-		SAIC's Summary and Recommendations for RCRA Facility Assessment Report did not recommend a RFI or any interim measures for this SWMU (SAIC, 1994b)	No Action Required		Talley no longer operates at this location.
	AOC 2	March 1984 Incident	Incident report indicated a spill of 1,1,1-TCA occurred on March 20, 1984. TDS indicated that the spill occurred at Plant 1 on March 19, 1984. A vertically mounted cylindrical product tank of TCA was turned on its side to stop the flow of product from a hole in the bottom of the tank caused by rust. An estimated maximum of 200 gallons was spilled, and ADHS oversaw remediation, which utilized a tractor to aerate contaminated soil on March 23, 1984.	NA	NA	NA	NA	NA		SAIC's Summary and Recommendations for RCRA Facility Assessment Report did not recommend a RFI or any interim measures for this SWMU (SAIC, 1994b) However, the following documentation relates to this AOC because the release that it addresses was from the TCA product storage tank identified as AOC 5. Plant #1-TCA Tank Closure, Sampling Plan & Results (TDS, 1998b); Plant 1 – TCA Tank Closure Additional VOC Sampling Plan & Results (TDS, 2001) ADEQ NFA Letter (ADEQ, 2001)	No Action Required, and No Further Action	-	Talley no longer operates at this location. A Walmart is now located at the former Plant 1 location.
	AOC 3	BG Burial Pits	TDS stated that the BG burial pits refer to 18 soil sampling locations located in the area that lead styphenate-containing propellant was detonated in 1979. Soils were tested for lead, and found to be contaminated. Soils were excavated and shipped to a facility in NV in 1986 and 1987. (More details in '94 report.)	Yes	Yes	NA - Soil is removed	No	No		Not reviewed for this updated RFA. This is part of the TTU (SWMU 52). This unit has undergone characterization and partial closure activities, is subject to final closure and post-closure upon issuance of a RCRA post-closure permit by ADEQ.			
	AOC 4	Plant 2 Cooling Tower Tank and Overflow Impoundment	Unlined surface impoundment at the bottom of the hill on which the Plant 2 main HWAA was located in 1991. The impoundment received cooling tower wastewater generated at Plant 2 when discharge was great than the capacity of a holding tank adjacent to the impoundment. (More details in '94 report.)	No	No	Low	No	No		SAIC's Summary and Recommendations for RCRA Facility Assessment Report did not recommend a RFI or any interim measures for this SWMU (SAIC, 1994b)	No Action Required	-	Talley personnel was not aware of the referenced cooling tower tank and overflow impoundment. This AOC was not observed.
	AOC 5	TCA Product Storage Tank (at Plant 1)	In March 1991 TDS utilized an above ground storage tank of virgin TCA. Documented releases of TCA have occurred during transfers.	Yes	Yes	Low-S	No	TDS should and obtain information to agency(s).	This comment is incomplete but the tank and stand were removed and soil sampled. A report was provided.	Plant #1-TCA Tank Closure, Sampling Plan & Results (TDS, 1998b); Plant 1 – TCA Tank Closure Additional VOC Sampling Plan & Results (TDS, 2001) TDS SWMU Letter to ADEQ (TDS, 1999c); ADEQ NFA Letter (ADEQ, 2001)	No Further Action	-	Talley no longer owns this property. A Walmart is now located at the Former Plant 1 location.
	AOC 6	X-Ray Film Developing Process Water	In March 1991, 150 55-gallon drums containing x-ray film developing process wastewater were accumulated just east of Plant 3. TDS stated that these drums were kept in storage northwest of building 29 at Plant 3.	No	No	Low	No	No		SAIC's Summary and Recommendations for RCRA Facility Assessment Report did not recommend a RFI or any interim measures for this SWMU (SAIC, 1994b)	No Action Required	-	X-ray process and wastewater generated from Line 1 at Plant 3 is no longer accumulated in 55 gallon drums and stored east of Plant 3 or in Plant 3 Building 29. Instead, it is now discharged to a large (~500 gallon) tank one the western side of the Line 1 building. (See new SWMU table for details.) No signs of spills or leaks were observed on the eastern side of the Line 1 building. Plant 3 building 29 was not visually inspected during the site visit due to time limitations. Talley personnel stated that Building 29 is used as overflow for shipping and receiving, and that no waste is generated or stored there.
	AOC 7	BG Burn Plate Sump Removal	On the BG Security and Safety Equipment Inspection Log Sheet for March 6, 1992, it is noted that the burn plate sump was removed from the BG. No indication of the design, procedure, sampling plan, or possible soil removal associated with the sump removal was found. This is possibly a remedial action or redesign of the BG performed without notification of the ADEQ.	No	No	Med-S, A	No	No		-			
	AOC 8	Buried Layers of Waste - Plant 6	one source document identified a landfill of layers of buried waste propellant near Plant 6. TDS stated that it is unaware of a buried propellant near Plant 6.	No	No	NA	NA	NA		SAIC's Summary and Recommendations for RCRA Facility Assessment Report did not recommend a RFI or any interim measures for this SWMU (SAIC, 1994b)	No Action Required	-	Nammo Talley no longer operates at this location.
	AOC 9	Pb/Cr Contaminated Soil at BG	See SWMU 52 for details.	See SWMU 52	-	-	-	-		Not reviewed for this updated RFA. This is part of the TTU (SWMU 52). This unit has undergone characterization and partial closure activities, is subject to final closure and post-closure upon issuance of a RCRA post-closure permit by ADEQ.			
	AOC 10	Laboratory at Plant 3	Laboratory at Plant 3, Line 2 practicing good housekeeping measures, with proper manifesting for offsite disposal . Sink water is not discharged, but piped to 55 gallon drums.	No	No	Low	No	No		SAIC's Summary and Recommendations for RCRA Facility Assessment Report did not recommend a RFI or any interim measures for this SWMU (SAIC, 1994b)	No Action Required	33.48323 N -111.73138 W	A laboratory is located in the Plant 3 line 1 building, and it is presumed that this AOC refers to that same laboratory based on Talley personnel who stated no significant changes to the operations conducted at Plant 3 have occurred. Therefore, this AOC is active. A 5 gallon-container for solvent contaminated trash was situated on concrete within the lab. Sink water is piped to the x-ray process and research wastewater tank located outside of the Line 1 building, and treated by an onsite evaporator located near Plant 1. No signs of spills or leaks were observed.
	AOC 11	Septic Tanks	TDS stated that wherever there is a bathroom, there is a septic tank. Two septic tanks are used at Plant 2. Historically TDS dismantled and washed out fired metal casings. Casings were washed out in sinks located in Plants 3 and 6. TDS stated that the products of combustions that were washed out consisted of copper and sodium hydroxide. These sinks drain to septic tanks. TDS has disposed of nonhazardous bathroom mop water to the septic system at Plant 4. TDS could not identify the locations of all septic tanks on site plans of each plant.	Unknown	Yes	Med-S	TDS should determine locations of all septic tanks and leach fields, and sample area to determine if hazardous constituents are present.	No	Based on the text of the SAIC RFA report, AOC #11 and #12 are referring to the same area which is the cesspool/septic tank/injection well located north of Plant #3 Line II. TDS has filed for closure under the ADEQ APP permit unit, removed the unit, and submitted sampling results. TDS was awaiting approval for closure as of January 1999. A second (similar) unit was located at Plant and TDS had already received clean closure on it as of January 1999. Two more (similar) units were also undergoing closure at Plant #1 and were waiting for final ADEQ approval at that time. No other "regulated units" require closure per APP regulations. Septic tanks which receive bathroom waste are exempt.	TDS SWMU Letter to ADEQ (TDS, 1999c); ADEQ 5 July 2000 Meeting Notes(ADEQ, 2000)	Presumed to be Closed	-	TDS personnel were aware of 2 septic tanks associated with Plant 2. Fired metal casings continue to be washed out at the Plant 3 Line 2 testing department sinks, with sink water piped to 55 gallon drums. Plant 6 no longer exists.
	AOC 12	Cesspool at Plant 3	In their notification of disposal forms submitted to the state, TDS identified a cess pool at Plant 3 used to receive photo lab wastewater and two sinks for metal parts washing and hand washing. The chemical nature of these waste streams was not determined at the visual site inspection (VSI).	No	No	Low-S	TDS should sample surrounding soil (and through cesspool) to determine if hazardous constituents are present.	Discontinue use/remove.	The use of the cesspool was discontinued, removed, and is was undergoing closure through the ADEQ APP process in January 1999. Marnie Greenbie was the contact person identified in the APP Unit department.	TDS SWMU Letter to ADEQ (TDS, 1999c); ADEQ 5 July 2000 Meeting Notes(ADEQ, 2000)	Presumed to be Closed	-	This AOC was not observed and is presumed to be closed based on Talley's correspondence with ADEQ on this AOC. Closure documentation was not located during the records review phase of this RFA and presents a data gap.
	AOC 13	TRW Ops. at Plant 3	TRW leased bays 21-23 and 36 at Line 2 building 29 and one additional unidentified building beginning on May 31, 1990. TDS states that TRW operations in bay 21-23 consisted of assembly of "enhancer packs" for airbag inflators and that no waste was generated in these bays. Bay 36 was a holding area for NaN3; no waste was generated. Bay 13 was also used for storage of boron potassium nitrate. Building 29 was also leased for storage of cupric oxide. During the file review at the VSI manifests reflecting the shipment of TRW waste propellant from Plant 3 to the TDS BG were discovered. These forms indicate that both TDS and TRW generates propellant waste at both Plants 3 and 6.	No	No	Low	No	No		SAIC's Summary and Recommendations for RCRA Facility Assessment Report did not recommend a RFI or any interim measures for this SWMU (SAIC, 1994b)	No Action Required	-	Plant 3 building 29 was not visually inspected during the site visit due to time limitations. Talley personnel stated that Building 29 is used as overflow for shipping and receiving, and that no waste is generated or stored there.

TABLE 1 - 1994 RFA SWMU AND AOC STATUS
UPDATED RFI REPORT
NAMMO TALLEY, INC.

General Location	SWMU/AOC	Name	Brief Description	Documented Releases[1]	Suspected Releases[2]	Release Potential[3]	Recommendation for RCRA Facility Investigation/ Level of Priority[4]	Recommendation for Interim Measures	Actions Taken	Documentation	Status	Location	Operational Status as of August 2017
	AOC 14	TRW Ops at Plant 6	TDS stated that TRW operations in Plant 6 consisted of weighing out and assembly operations. NaN3 propellant was put into tubes, ignitors were wire, and enhancer packs were assembled. Experimental work on air bag construction was also conducted. TDS stated that no waste was generated from TRW operations at Plant 6. During the file review at the VSI manifests reflecting the shipment of TRW waste propellant from Plant 3 to the TDS BG were discovered. These forms indicate that both TDS and TRW generates propellant waste at both Plants 3 and 6.	No	No	Low	No	No		SAIC's Summary and Recommendations for RCRA Facility Assessment Report did not recommend a RFI or any interim measures for this SWMU (SAIC, 1994b)	No Action Required		Nammo Talley no longer operates at this location.
	AOC 15	Unknown or Abandoned Area	An area covering approximately 50' x 100' located east of the TTU has possibly been used to dispose of building rubble, other debris, ad may be the site of a former unit associated with drains and concrete structures that appear to have been dismantled in place. The area appears to be a natural wash for surface water runoff. A pile of rubble that may have been deposited here after a structure was dismantled elsewhere is located in the wash. A yellow substance of unknown constituency or origin was scattered near the rubble piles. (More details in '94 report.)	Unknown	Yes	High-S	TDS should conduct extensive review/research of activities that resulted in this debris, burn area(s) and yellow substances. Sampling would determine extent of possible contamination. Report of findings should be presented to agency(s).	Remove debris, discontinue practice of dumping.	TDS removed the debris and discontinued the practice of stockpiling debris in the area. Clean-up reports provided. TDS has conducted extensive review/research, investigation, sampling, and remediation to both the debris and burn areas. The results of the work were provided in reports.	Plant #3- Thermate Grenade Pit Closure, Sampling Plan and Results (TDS, 1998c) Plant #3- Abandon Area/TTU/Smoke Tunnel Closure Sampling Plan & Results (TDS, 1999a); TDS SWMU Letter to ADEQ (TDS, 1999c); Thermate Grenade Pit Final Sampling Results (TDS, 2001); ADEQ NFA Letter (ADEQ, 2001)	No Further Action		This AOC was not observed during the site visit due to time limitations.
	AOC 16	Alleged TCA Dump Area	A complaint was lodged around 1/3/85 which alleged TDS was dumping 1,1,1-TCA "at the end of Higley Rd on the north side - plant 2(?)." ADHS inspected the site and did not find any evidence of spillage. No photos were taken. TDS stated they were unaware of any dumping and that employees are not directed to dispose of TCA by dumping.	Unknown	Yes	High-S	TDS should conduct extensive review/research of activities that may have resulted in TCA dumping. Report of preliminary findings should be submitted to agency(s). If a location is determined, sampling would determine extent of possible contamination. Report of findings should be presented to agency(s).	No	TDS has no knowledge of such dumping and the allegation was from an unknown anonymous source. An ADHS inspection occurred as a result of the complaint and no evidence was found to substantiate the complaint. Exact area where complainant said dumping occurred is unknown. As discussed and agreed upon by ADEQ during a meeting on 2/4/98, no further investigation can be done if location or source is unknown. TDS has no knowledge of TCA or TCE dumping. Employees have never been directed to dispose of TCA or TCE by dumping on-site. This alleged AOC should not be a Part B or WQARF issue. No action planned by TDS.	ADEQ Inter-office Memorandum (ADEQ, 1998a); TDS SWMU Letter to ADEQ (TDS, 1999c);	No Further Action		Not observed due to lack of detailed location information.

Notes:
[1] Documented Releases: Records are available documenting release, or release can be assumed based on the presence of soil or groundwater contamination.
2 Suspected Releases: This category includes facilities for which no quantitative samples are available, but release is suspected based on the nature and frequency of hazardous material operations and presence of staining or other indicators of possible release.
[3] Release Potential: Release potential from hazardous material operations to each media.
4 Recommendations for RCRA Facility Investigation (RFI): In the RFI the facility responsible for establishing the extent of on-site and off-site contamination. This category attempts to prioritize the need for further action and presents recommendations for further action to be conducted in the RFI.
[5] Current in 1994
A - release to air
GW - release to groundwater
S - release to soil

General Location	SWMU/AOC	Name	Brief Description	Known Release	Release Potential	Recommendation for Further Action	Recommendation for Interim Measures	Coordinates
Plant 2	A	Plant 2, Building 1, Bay 45	Approximately (16) 55-gallon drums of various types of primarily liquid wastes (waste paint, waste solvent, bomb rack and rotary wash water, irridite acid water) were stored in Bay 45 on the concrete floor near the paint booth. No evidence of a spill or release was observed.	No	Low	None	None	33.49003 N -111.71713 W
	B	Plant 2, Building 1	Cardboard drum of solid propellant waste located inside Plant 2 in the hallway near Bays 25, 27, and 29, situated on concrete. No evidence of a spill or release was observed.	No	Low	None	None	33.49039 N -111.71694 W
	C	Plant 2, Building 1	Solvent contaminated trash stored in a 55-gallon drum on concrete within the main working area of Plant 2. Drum approximately equilateral to bays 31 and 41. No evidence of a spill or release was observed.	No	Low	None	None	33.49029 N -111.71703 W
	D	Plant 2 , Building 1 X-Ray Process Wastewater Tank	Large x-ray process wastewater tank located outside of Plant 2, in covered area. Tank was situated on the concrete within a bermed area approximately 13' x 8'. No evidence of a spill or release was observed.	No	Low	None	None	33.49024 N -111.71672 W
	E	Plant 2, Building 1 Compressor Blowdown Oily Water	A 55-gallon drum located on the east side of building 1 in the covered area contained compressor blowdown oily water. The drum was situated on concrete. No evidence of a spill or release was observed.	No	Low	None	None	33.49053 N -111.71686 W
	F	Plant 2 Ignitor Building 6	Solvent contaminated trash and propellant trash stored in two 55-gallon drums on concrete on the west side of Ignitor Building 6. No evidence of a spill or release was observed.	No	Low	None	None	33.49124 N -111.71684 W
	G	Plant 2 Ignitor Building 6	Propellant waste generated from ignitor building 6 is piped to two metal tanks (~80-gallon capacity) situated on secondary containment located outside on the north side of the building. No evidence of a spill or release was observed.	No	Low	None	None	33.49139 N -111.71679 W
	H	Plant 2 Ignitor Building 6	Propellant waste generated within ignitor building 6 is piped to six metal tanks (~50-gallon capacity each) located outside on the east side of the building. Five tanks were situated on secondary containment, and one was on a pallet. It is unclear how tank levels are monitored. No evidence of a spill or release was observed.	No	Low	None	None	33.49131 N -111.71671 W
	I	Plant 2 Building 17 Main Accumulation Area	Building 17 is a sheet metal building approximately 20' x 40' that was repurposed in late 2016 or early 2017 to be the main accumulation area for wastes generated from Plants 2, 3, and 4 that must be shipped offsite for disposal. A concrete berm runs across the center of the concrete floor, separating the two halves of the building. Drums of waste were stored on one side, and empty drums, buckets etc. were on the other side. At the time of the VSI, less than a dozen drums of waste were stored within the building. No evidence of a spill or release was observed.	No	Low	None	None	33.49064 N -111.71513 W
Plant 4	J	Plant 4 Building 23	Two drums of HMX contaminated trash, 1 55-gallon drum of HMX contaminated mop water, and a 55-gallon drum of compressor oil water were stored outside in the downstairs covered area of casting building 23. Three drums were situated on concrete, and one was on a metal stand. This areas is relatively new. No evidence of a spill or release was observed.	No	Low	None	None	33.49389 N -111.70670 W
	K	Plant 4, Access Road Leading to Building 20	Seven 55-gallon drums containing waste were stored on secondary containment off to the side of the access road leading to Building 20. Drums were covered with tarps and not disturbed during the VSI. No evidence of a spill or release was observed.	No	Low	None	None	33.49419 N -111. 70909 W
	L	Plant 4	Waste propellant was stored in a bin inside a fenced area between Buildings 18, 19, and 28. Three drums (not fenced in) contained used Rinsolve and were located nearby. Two drums were situated on secondary containment, and the third was situated on soil. No evidence of a spill or release was observed.	No	Low	None	None	33.49363 N -111.71074 W
	M	Plant 4 Magazine 42	This explosives magazine is approximately 20' x 15' and used to store solid and liquid waste propellant in drums. The magazine was locked, therefore the inside was not inspected. Site personnel stated that the magazine was empty at the time of the VSI. No evidence of a spill or release was observed around the structure.	No	Low	None	None	33.49570 N -111.71152 W
Plant 3	N	Plant 3, Line 1, Bay DM	~30 gallon drum of Tali 61 in mineral oil (hazardous waste) situated on a roller cart over concrete. A partial ring of rust-like staining was observed nearby on concrete.	No	Low	None	None	33.48266 N -111.73178 W
	O	Plant 3, Line 1, Bay 2 Day Can	~3-gallon metal container of alcohol waste stored in flammable cabinet on concrete. No evidence of a spill or release was observed.	No	Low	None	None	33.48276 N -111.73166 W
	P	Plant 3, Line 1, outside of Bay 1	55 gallon drum of Pocal mop water stored on secondary containment outside of Bay 1. This water may contain gun powder residue. No evidence of a spill or release was observed.	No	Low	None	None	33.48267 N -111.73170 W
	Q	Plant 3, Line 1, Bay A4	55-gallon drum of solvent contaminated trash stored on concrete. No evidence of a spill or release was observed.	No	Low	None	None	33.48274 N -111.73186 W
	R	Plant 3, Line 1, Bay A3	2 5-gallon day cans containing empty cartridges, one ~40 gallon drum, and one 5-gallon bucket of Tali 61 in mineral oil (hazardous waste) were stored on concrete. No evidence of a spill or release was observed.	No	Low	None	None	33.48270 N -111.73189 W
	S	Plant 3, Line 1, Bay A2 Day Can	One 5-gallon day can containing solvent contaminated trash was stored on a shelf. No evidence of a spill or release was observed.	No	Low	None	None	33.48265 N -111.73193 W
	T	Plant 3, Line 1, Bay 9 Day Can	5-gallon metal container containing waste propellant and oxidizer stored on shelf. No evidence of a spill or release was observed.	No	Low	None	None	33.48301 N -111.73144 W
	U	Plant 3, Line 1, Hallway FE	2 ~30-gallon plastic drums of halogenated waste stored in flammable cabinet (2' x4'). Discoloration and material deposits were observed on the bottom of the flammable cabinet. Signs of minor spills present on one drum and flammable cabinet door. Flammable cabinet was situated on concrete which appeared to have been sealed recently. No evidence of spills or leaks outside of the cabinet were observed.	No	Low	None	None	33.48333 N -111.73122 W
	V	Plant 3, Line 1, Bay 16	55 gallon drum of solvent contaminated trash situated on concrete. No evidence of a spill or release was observed.	No	Low	None	None	33.48326 N -111.73122 W

General Location	SWMU/AOC	Name	Brief Description	Known Release	Release Potential	Recommendation for Further Action	Recommendation for Interim Measures	Coordinates
Plant 3	W	Plant 3, Line 1, Bay 15	55 gallon drum of Tali-25 (contains barium chromate), plus 55 gallon drum of water and Tali 44 stored on concrete. No evidence of a spill or release was observed.	No	Low	None	None	33.48324 N -111.73119 W
	X	Plant 3, Line 1, End of Line 1, outside of Bays 18 and 19 Day Can	5-gallon day can containing solvent contaminated trash situated on a plastic pallet on concrete. No evidence of a spill or release was observed.	No	Low	None	None	33.48354 N -111.73103 W
	Y	Plant 3, Line 1, Bays 17A and 17B	Wet vacuum fluid generated from saw operations are piped to an ~80-gallon metal tank situated on concrete outside of Bays 17A and 17B . Collected fluid may contain propellant residue. Tank was unlabeled. No evidence of a spill or release was observed.	No	Low	None	None	33.48329 N -111.73096 W
	Z	Plant 3, Line 1, Fueling Area	A bermed concrete pad (8' x 50') with a sheet metal roof is located outside and to the southeast of Line 1, Bays 1-4. 3 55-gallon drums containing used oil and ethylene glycol were stored on secondary containment. An ~100 gallon above ground tank containing red diesel for fueling facility equipment was also situated on secondary containment on this concrete pad. No evidence of a spill or release was observed.	No	Low	None	None	33.48244 N -111.73158 W
	AA	Plant 3, Shipping and Receiving Building	A 5 gallon bucket of discarded live ammunition was stored in a flammable cabinet. Talley personnel stated that waste is not stored in this building. Shipments of waste to offsite disposal facilities are staged and palletized outside of the building, on asphalt, on the day of pickup. No evidence of a spill or release was observed.	No	Low	None	None	33.48193 N -111.732129 W
	AB	Plant 3, Line 2, Bay 22 Day Can	5-gallon metal container for solvent contaminated trash located on shelf. No evidence of a spill or release was observed.	No	Low	None	None	33.48301 N -111.73239 W
	AC	Plant 3, Line 2, Bay 23	55-gallon drum of propellant trash situated on concrete, plus 3 5-gallon containers of waste acetone were situated on a bench. No evidence of a spill or release was observed.	No	Low	None	None	33.48306 N -111.73239 W
	AD	Plant 3, Line 2, Bay 24	55 gallon drum of solvent contaminated trash and a 3-gallon solvent contaminated trash container situated on concrete. No evidence of a spill or release was observed.	No	Low	None	None	33.48309 N -111.73238 W
	AE	Plant 3, Line 2, Outside of Bays HE and 28	Spent solvent cans managed in a 55 gallon drum outside of the Line 2 building entrance leading to Bays HE and 28. Drum is situated on soil. No evidence of a spill or release was observed.	No	Low	None	None	33.48314 N -111.73205 W
	AF	Plant 3, Line 2, Bay 27 Day Can	5 gallon solvent contaminated trash day can situated on floor mat. No evidence of a spill or release was observed.	No	Low	None	None	33.48319 N -111.73223 W
	AG	Plant 3, Line 2, Bay 25	55-gallon drum of solvent contaminated trash situated on concrete. Some minor rust-like staining observed on concrete.	No	Low	None	None	33.48315 N -111.73232 W
	AH	Plant 3, Line 2, Bay HE Day Can	3 5-gallon day cans for solvent contaminated trash located on benches. No evidence of a spill or release was observed.	No	Low	None	None	33.48321 N -111.73219 W
	AI	Plant 3, Line 2, Bay 30 Day Can	5 gallon solvent contaminated trash day can situated on concrete. No evidence of a spill or release was observed.	No	Low	None	None	33.48338 N -111.73215 W
	AJ	Plant 3, Line 2, Bay 33	55 gallon drum containing solvent contaminated trash situated on concrete. No evidence of a spill or release was observed.	No	Low	None	None	33.48345 N -111.7319 W
	AK	Plant 3, Line 2, Bay 38	55-gallon drum containing solvent contaminated trash situated on concrete. No evidence of a spill or release was observed.	No	Low	None	None	33.48360 N -111.73179 W
	AL	Plant 3, Line 2, Outside of Bay 38	55-gallon drum containing waste paint is managed alongside unused acetone, and isopropanol in the covered carport-like area outside of Bay 38. Drums were situated on secondary containment. No evidence of a spill or release was observed.	No	Low	None	None	33.48377 N -111.73171 W
	AM	Plant 3, Line 2, Bay 43	55 gallon drum of solvent contaminated trash situated on concrete, plus a 5-gallon container for aerosol cans in cabinet. No evidence of a spill or release was observed.	No	Low	None	None	33.48389 N -111.73157 W
	AN	Plant 3, Line 2, Sinks in Bays 44 and 45 (Test Department)	Bays 44 and 45 contain sinks. Rocket motors are cleaned out in the sinks, generating corrosive wastewater, which is discharged into 55 gallon drums outside of Bay 46 situated on concrete. This water is periodically collected by a vacuum truck and transported to the on-site evaporator near Plant 1 for treatment. Some staining was observed on the concrete pad.	No	Low	None	None	33.48399 N -111.73148 W
	AO	Plant 3, Line 2, Bay 45 (Test Department)	5 gallon metal container for waste isopropanol located on bench. No evidence of a spill or release was observed.	No	Low	None	None	33.48391 N -111.73145 W
	AP	Plant 3, Line 2, Outside of Bay 46 (Test Department)	Fenced concrete pad (5' x 5') located near Bay 46 contains a waste propellant bin situated directly on concrete. This area is used very rarely according to Site personnel. No evidence of a spill or release was observed.	No	Low	None	None	33.48407 N -111.73125 W
	AQ	Plant 3, Building 26, Bay A6	55 gallon drum containing spent aerosol cans located outside of Bay A6 situated on concrete. Minor rust-like staining observed on concrete.	No	Low	None	None	33.48494 N -111.73062 W
	AR	Plant 3, Building 26, Bay A5	55 gallon drum containing solvent contaminated trash situated on concrete. Some rust-like staining on concrete observed.	No	Low	None	None	33.48494 N -111.73071 W
	AS	Plant 3, Building 26, Bay A4	Two 55 gallon drums situated on concrete containing solvent contaminated trash and propellant contaminated trash, plus a 5 gallon-day can for scrap propellant located on a shelf. Rust-like staining present on concrete near solvent contaminated trash drum.	No	Low	None	None	33.48495 N -111.73079 W
	AT	Plant 3, Building 10, Bay 10 Day Can	One 5-gallon day can for solvent contaminated trash located on a shelf. No evidence of a spill or release was observed.	No	Low	None	None	33.48516 N -111.73048 W
	AU	Plant 3, Building 10, Bay 9 Day Can	One 5-gallon day can for solvent contaminated trash can situated on concrete. No evidence of a spill or release was observed.	No	Low	None	None	33.48516 N -111.73053 W

General Location	SWMU/AOC	Name	Brief Description	Known Release	Release Potential	Recommendation for Further Action	Recommendation for Interim Measures	Coordinates
	AV	Plant 3, Building 10, Bay 7 HWAA	55 gallon cardboard drum containing solvent contaminated trash situated on concrete. No evidence of a spill or release was observed.	No	Low	None	None	33.48519 N -111.73066 W
	AW	Plant 3, Building 10, Bay 4 Day Can	5-gallon day can for solvent contaminated trash day can located on bench. No evidence of a spill or release was observed.	No	Low	None	None	33.48518 N -111.73077 W
	AX	Plant 3, Building 10, Bay 6 Day Can	5-gallon day can for unspecified hazardous waste situated on concrete. No evidence of a spill or release was observed.	No	Low	None	None	33.48525 N -111.73075 W
	AY	Plant 3, Building 10, Bay 3 Day Cans	2 5-gallon days cans for solvent contaminated trash located on benchtops, plus a 1-gallon container for waste isopropanol. No evidence of a spill or release was observed.	No	Low	None	None	33.48519 N -111.73083 W
	AZ	Plant 3, Building 10, Outside of Bay 1	55 gallon drum of hazardous waste with faded, unreadable label located on secondary containment situated on a 3' x 3' concrete pad with one wall and a roof. No evidence of a spill or release was observed.	No	Low	None	None	33.48512 N -111.73109W
	BA	Line 1 X-Ray Process and Research Wastewater Tank	An ~500 gallon tank located outside of the Plant 3, Line 1 research department. Lab sink water and x-ray process water are piped to the outside tank which is situated in a raised concrete containment area that is bermed on all sides. The wastewater is periodically collected by a vacuum truck and transported to the evaporator near Plant 1 for treatment. During the VSI the secondary containment was nearly full of what was presumably rain water from a recent storm event. Talley stated they typically empty secondary containment after storms, but had been unable to do so due to a flat tire on their vacuum truck. No evidence of a spill or release was observed.	No	Medium	Review Safety Data Sheets (SDSs) for chemicals that are discharged to this tank. Limited soil sampling immediately outside of the secondary containment is recommended in the event that compounds with Soil Remediation Levels (SRLs) per Arizona Administrative Code Title 18, Chapter 8, Appendix A are listed in SDSs.	None	33.48307 N -111.73164 W
Plant 1	BB	Onsite Evaporator	X-Ray process wastewater generated at Plants 2 and 3, plus the wastewater generated by the Plant 3 Testing department (and collected in 55 gallon drums) is collected by vacuum truck and transported to the evaporator for treatment. Sludge that accumulates in the evaporator is transferred to 55 gallon drums and sent to the main SAA building (Plant 2, Building 17) for storage and subsequent offsite disposal. The evaporator was not in operations at the time of the VSI. No evidence of a spill or release was observed.	No	Low	None	None	33.48835 N -111.70870 W
Northeast of Plant 4	BC	Stormwater Accumulation Area	Prior to implementation of current storm water controls, previous storm water runoff from the TTU collected in this area. Underlying soil may be impacted by low levels of perchlorate.	Yes	High	Potential remedial options to address residual levels of perchlorate in soil will be evaluated under a CMS to be performed by Nammo Talley.	Nammo Talley has characterized this unit and excavated perchlorate-impacted soils for off-site disposal.	33.49980 N -111.71552 W

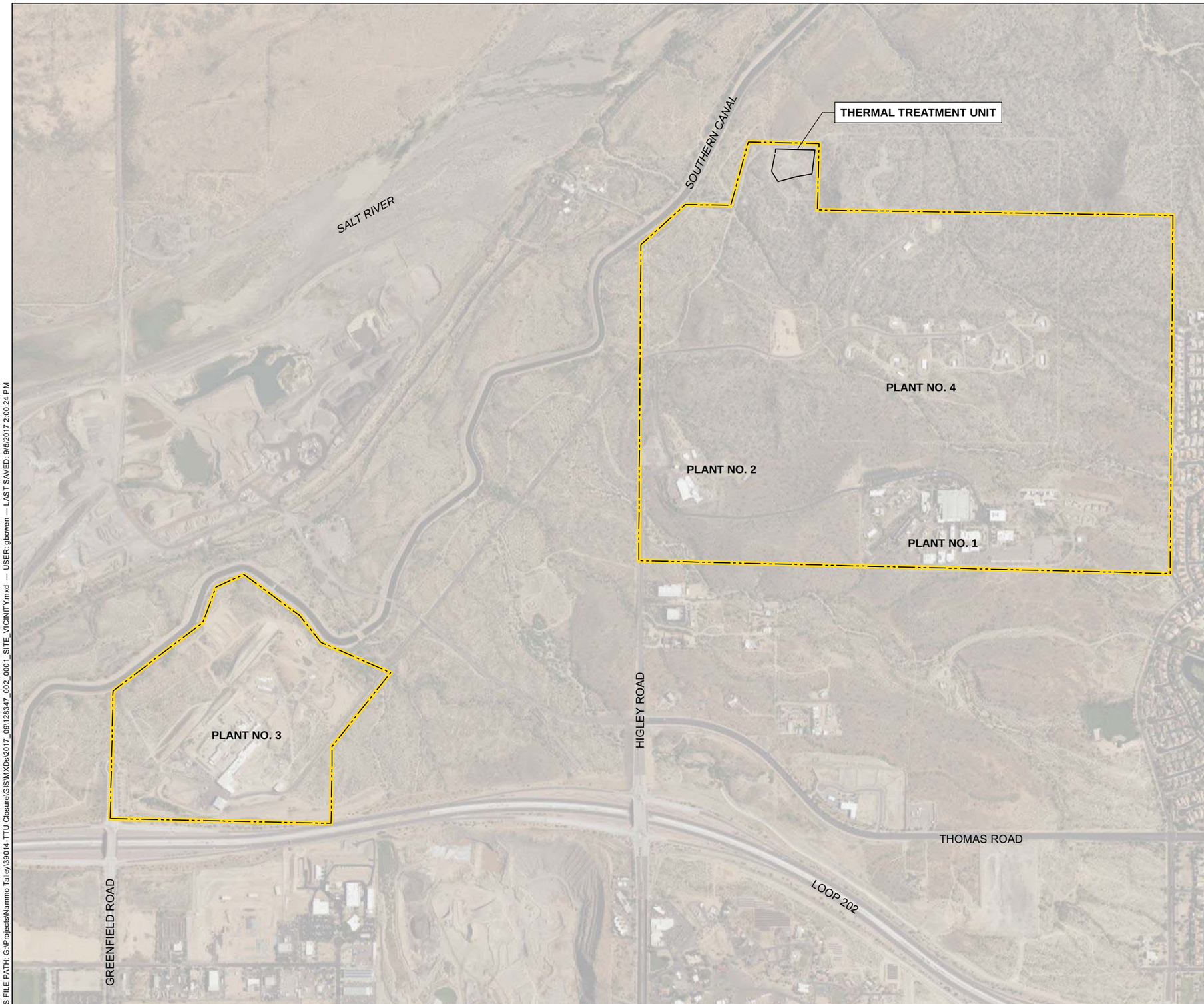
TABLE 3 - COMPILED LIST OF SWMUs
UPDATED RFA REPORT
NAMMO TALLEY, INC.

General Location	SWMU	Name
Plant 2	1	Paint Booth SAA
	2	Blast Residue SAA
	3	Area 29 SAA (drum between bays 44 and 45)
	7	East Hold HWAA Plant 2
	8	HWAA Bldg. 20 Plant 2
	9	HWAA Ignitor Bldg. Plant
	10	Water Bore-Out Ops. At Plant 2
	A	Plant 2, Building 1, Bay 45
	B	Plant 2, Building 1
	C	Plant 2, Building 1
	D	Plant 2, Building 1 X-Ray Process Wastewater Tank
	E	Plant 2, Building 1 Compressor Blowdown Oily Water
	F	Plant 2, Ignitor Building 6
	G	Plant 2,Ignitor Building 6
	H	Plant 2, Ignitor Building 6
	I	Plant 2, Building 17 Main Accumulation Area
Plant 3	11	Maintenance bay, indoor (Solvents, TCA, TCE)
	18	North end of line 1, outdoor on concrete (sand blast residue)
	19	HWAA Line 1 - Plant 3 (ERM)
	20	SAA Line 1 - Plant 3 (ERM)
	34	HWAA Bldg. 10
	39	Bay 4, outdoor (waste propellant)
	42	Former Water Bore Out Ops. Area
	N	Plant 3, Line 1, Bay DM
	O	Plant 3, Line 1, Bay 2 Day Can
	P	Plant 3, Line 1, outside of Bay 1
	Q	Plant 3, Line 1, Bay A4
	R	Plant 3, Line 1, Bay A3
	S	Plant 3, Line 1, Bay A2 Day Can
	T	Plant 3, Line 1, Bay 9 Day Can
	U	Plant 3, Line 1, Hallway FE
	V	Plant 3, Line 1, Bay 16
	W	Plant 3, Line 1, Bay 15
	X	Plant 3, Line 1, End of Line 1, outside of Bays 18 and 19 Day Can
	Y	Plant 3, Line 1, Bays 17A and 17B
	Z	Plant 3, Line 1, Fueling Area
	AA	Plant 3, Shipping and Receiving Building
	AB	Plant 3, Line 2, Bay 22 Day Can
	AC	Plant 3, Line 2, Bay 23
	AD	Plant 3, Line 2, Bay 24
	AE	Plant 3, Line 2, Outside of Bays HE and 28
	AF	Plant 3, Line 2, Bay 27 Day Can

TABLE 3 - COMPILED LIST OF SWMUs
UPDATED RFA REPORT
NAMMO TALLEY, INC.

General Location	SWMU	Name
Plant 3	AG	Plant 3, Line 2, Bay 25
	AH	Plant 3, Line 2, Bay HE Day Can
	AI	Plant 3, Line 2, Bay 30 Day Can
	AJ	Plant 3, Line 2, Bay 33
	AK	Plant 3, Line 2, Bay 38
	AL	Plant 3, Line 2, Outside of Bay 38
	AM	Plant 3, Line 2, Bay 43
	AN	Plant 3, Line 2, Sinks in Bays 44 and 45 (Test Department)
	AO	Plant 3, Line 2, Bay 45 (Test Department)
	AP	Plant 3, Line 2, Outside of Bay 46 (Test Department)
	AQ	Plant 3, Building 26, Bay A6
	AR	Plant 3, Building 26, Bay A5
	AS	Plant 3, Building 26, Bay A4
	AT	Plant 3, Building 10, Bay 10 Day Can
	AU	Plant 3, Building 10, Bay 9 Day Can
	AV	Plant 3, Building 10, Bay 7
	AW	Plant 3, Building 10, Bay 4 Day Can
	AX	Plant 3, Building 10, Bay 6 Day Can
	AY	Plant 3, Building 10, Bay 3 Day Cans
	AZ	Plant 3, Building 10, Outside of Bay 1
	BA	Line 1 X-Ray Process and Research Wastewater Tank
Plant 4	43	Plant 4 HWAA
	44	Bldg. 23 - Plant 4 Casting
	47	SAAs Bldg. 20 Plant 4
	48	SAA Bldg. 18 Plant 4
	J	Plant 4 Building 23
	K	Plant 4, Access Road Leading to Building 20
	L	Plant 4
	M	Plant 4 Magazine 42
TTU Vicinity	52	TTU (Burn Ground)
	BC	Stormwater Accumulation Area

FIGURES



LEGEND

TTU BOUNDARY

PROPERTY BOUNDARY

NOTE

ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.

N

0 1,000 2,000

SCALE IN FEET

HALEY ALDRICH

NAMMO TALLEY, INC.
THERMAL TREATMENT UNIT
MESA, ARIZONA

SITE VICINITY

Nammo Talley

SEPTEMBER 2017

FIGURE 1

GIS FILE PATH: G:\Projects\Nammo Talley\39014-TTU Closure\GIS\MXDs\2017_09\128347_002_0001_SITE_VICINITY.mxd — USER: gbowen — LAST SAVED: 9/5/2017 2:00:24 PM

LEGEND

SOLID WASTE MANAGEMENT UNIT (SWMU)

1994

2017

NOTES

1. ALL LOCATIONS ARE APPROXIMATE.
2. AERIAL IMAGERY SOURCE: ESRI

N

0 100 200

SCALE IN FEET

HALEY ALDRICH

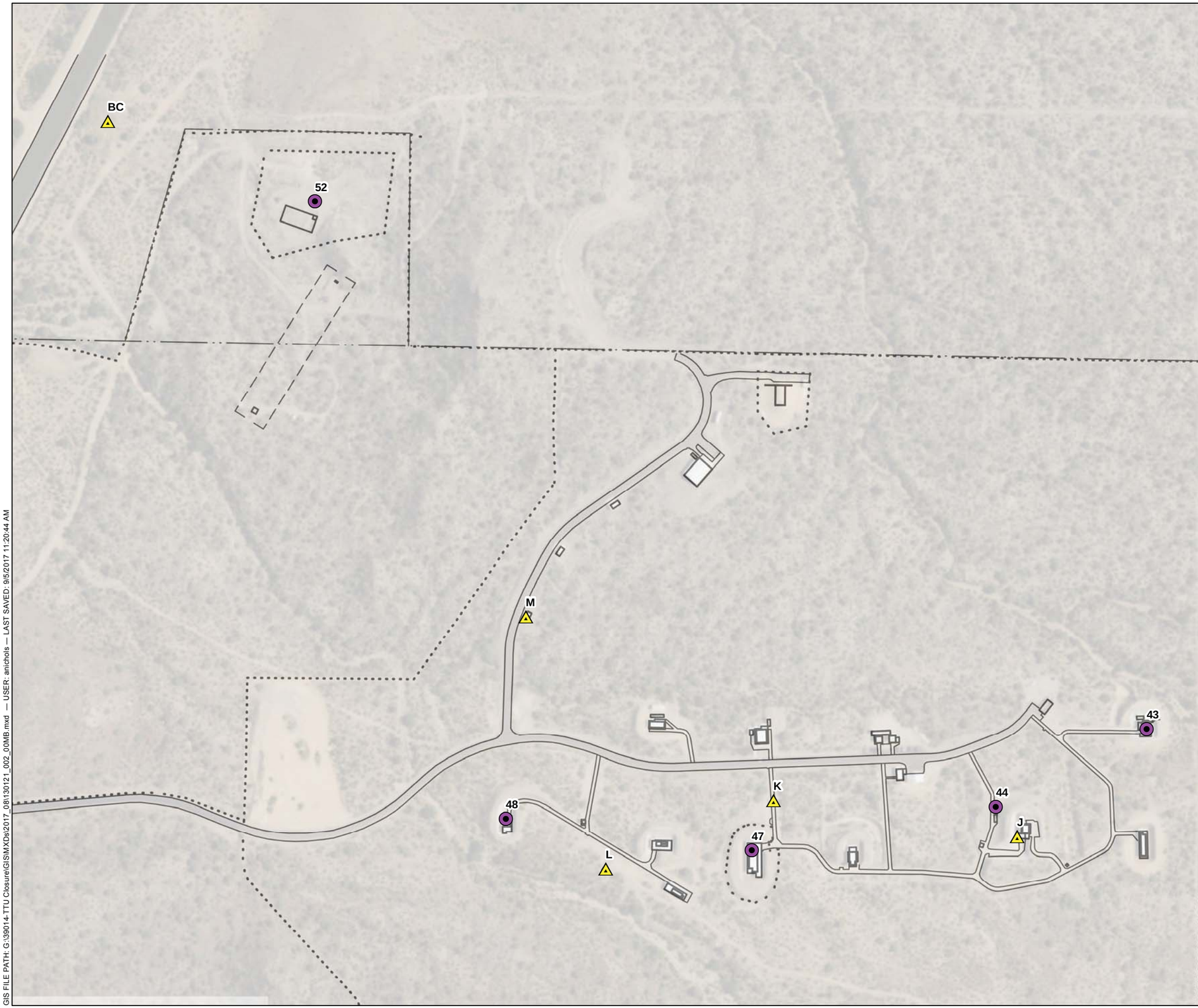
NAMMO TALLEY, INC.
MESA, AZ

SWMUS A THROUGH I, 1, 2, 3, 7, 8, 9, 10 (PLANT #2)

SEPTEMBER 2017

FIGURE 2

GIS FILE PATH: G:\39014-TTU Closure\GIS\MXDs\2017_08\130121_002_00MB.mxd — USER: anichols — LAST SAVED: 9/5/2017 11:20:44 AM



LEGEND

SOLID WASTE MANAGEMENT UNIT (SWMU)

1994

2017

NOTES

1. ALL LOCATIONS ARE APPROXIMATE.
2. AERIAL IMAGERY SOURCE: ESRI

N

0 300 600

SCALE IN FEET

HALEY ALDRICH

NAMMO TALLEY, INC.
MESA, AZ

SWMUS J, K, L, M, BC, 43, 44, 47, 48, 52 (PLANT #4)

SEPTEMBER 2017

FIGURE 3

GIS FILE PATH: G:\39014-TTU Closure\GIS\MXDs\2017_08\130121_002_00MB.mxd — USER: anichols — LAST SAVED: 9/5/2017 11:20:44 AM

LEGEND

SOLID WASTE MANAGEMENT UNIT (SWMU)

1994

2017

NOTES

1. ALL LOCATIONS ARE APPROXIMATE.
2. AERIAL IMAGERY SOURCE: ESRI

N

0 150 300

SCALE IN FEET

HALEY ALDRICH

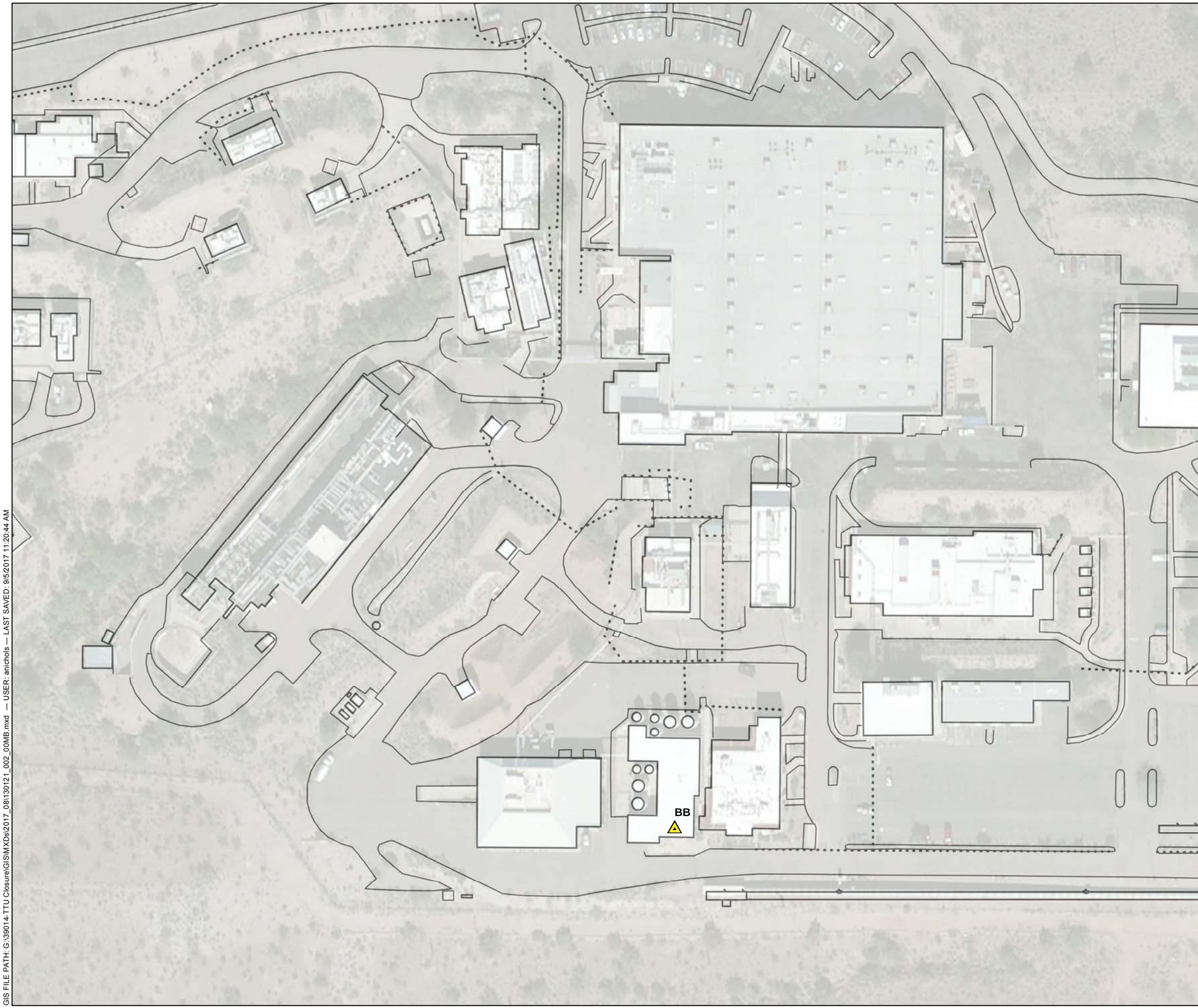
NAMMO TALLEY, INC.
MESA, AZ

SWMUS N THROUGH BA, 11, 18, 19, 20, 34, 39, 42 (PLANT #3)

SEPTEMBER 2017

FIGURE 4

GIS FILE PATH: G:\39014-TTU Closure\GIS\MXDs\2017_08\130121_002_00MB.mxd — USER: anichols — LAST SAVED: 9/5/2017 11:20:44 AM



LEGEND

SOLID WASTE MANAGEMENT UNIT (SWMU)

2017

NOTES

1. ALL LOCATIONS ARE APPROXIMATE.
2. AERIAL IMAGERY SOURCE: ESRI

N

0 100 200

SCALE IN FEET

HALEY ALDRICH

NAMMO TALLEY, INC.
MESA, AZ

SWMU BB (PLANT #1)

SEPTEMBER 2017

FIGURE 5

GIS FILE PATH: G:\39014-TTU Closure\GIS\MXDs\2017_08\130121_002_00MB.mxd — USER: anichols — LAST SAVED: 9/5/2017 11:20:44 AM

Geosyntec consultants

engineers | scientists | innovators

CONCEPTUAL SITE MODEL

NAMMO DEFENSE SYSTEMS INC. FACILITY MESA, ARIZONA

Prepared for

Nammo Defense Systems Inc.
4051 North Higley Road
Mesa, Arizona 85215

Prepared by
Geosyntec Consultants, Inc.
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REGISTERED GEOLOGIST
CERTIFICATE NO.
65652
FABRIZIO
MASCIONI
Date Signed: 05/06/2021
ARIZONA, U.S.A.

May 2021

TABLE OF CONTENTS

1. INTRODUCTION 1
1.1 Purpose 1
1.2 Organization of Document 1

2. FACILITY INFORMATION 3
2.1 Current and Historic Facilities 3
2.1.1 Current Facilities 3
2.1.2 Historic Facilities 4
2.2 Current and Historical Waste Management Practices 5
2.2.1 Plant 1 5
2.2.2 Plant 2 6
2.2.3 Plant 3 6
2.2.4 Plant 4 7
2.2.5 Former Plant 6 8
2.2.6 Former TTU 8

3. LAND USE AND EXPOSURE 10
3.1 Land Uses 10
3.2 Beneficial Resources 10
3.3 Resource Use Locations 11
3.4 Sensitive Populations 11
3.5 Exposure Scenarios 11
3.6 Complete Exposure Pathways Associated with the Former TTU 12
3.6.1 Soil 12
3.6.2 Soil Vapor 12
3.6.3 Groundwater 12
3.7 Complete Exposure Pathways Associated with Plant 3 12
3.7.1 Soil 13
3.7.2 Soil Vapor 13
3.7.3 Groundwater 13

4. PHYSICAL AND GEOLOGICAL FEATURES 14
4.1 Topography and Hydrology 14

4.2 Geologic and Hydrogeologic Conditions 15
4.2.1 Former TTU 15
4.2.2 Plant 3 17
4.2.3 Former TTU Groundwater Well Network 19
4.2.4 Plant 3 Groundwater Well Network 19

5. RELEASES OF CONTAMINANTS OF CONCERN 20
5.1 Sources of Releases 20
5.1.1 Former TTU 20
5.1.2 Plant 3 21
5.2 Delineation of Release Areas 21
5.2.1 Former TTU 21
5.2.2 Plant 3 24
5.3 Migration Pathways and Transport Mechanism 26
5.3.1 Former TTU 26
5.3.2 Plant 3 27

6. RISK MANAGEMENT PRACTICES 29
6.1 Former TTU 29
6.1.1 2002 – 2004 Voluntary Cleanup Action Plan 29
6.1.2 2004 – 2005 Additional Soil Assessment and Removal 29
6.1.3 2008 Removal of TTU Equipment and Structures 29
6.1.4 2011 – 2012 Storm Water Accumulation Area Soil Removal 30
6.1.5 2013 Closure Plan 30
6.1.6 2017 Interim Remedial Action Work Plan 31
6.2 Plant 3 31
6.2.1 1999 WBO Pit Closure – Metals 32
6.2.2 Revised Remedial Action Plan – 2013 to Present 32

7. REMEDIATION CONSIDERATIONS AND DATA GAPS 34
7.1 Former TTU 34
7.2 Plant 3 35

8. REFERENCES 37

LIST OF TABLES

Table 1: Former Thermal Treatment Unit 2021 Groundwater Well Network

Table 2: Plant 3 2021 Groundwater Well Network

LIST OF FIGURES

Figure 1: Site Vicinity Map

Figure 2: TTU Groundwater Elevation and Contour Map, December 2020

Figure 3: TTU Well Locations and Cross Section Plan View

Figure 4: TTU Cross Section A-A'

Figure 5: TTU Cross Section B-B'

Figure 6: Plant 3 Groundwater Elevation and Contour Map, December 2020

Figure 7: Plant 3 Well Locations and Cross Section Plan View

Figure 8: Plant 3 Cross Section C-C'

Figure 9: TTU Conceptual Site Model

Figure 10: Plant 3 Conceptual Site Model

Figure 11: TTU Perchlorate Groundwater Concentrations, December 2020

Figure 12: TTU VOC Groundwater Concentrations, December 2020

Figure 13: Plant 3 Perchlorate Groundwater Concentrations, November/December 2020

Figure 14: Plant 3 Trichloroethene (TCE) Groundwater Concentrations, November/December 2020

LIST OF APPENDICES

Appendix A: TTU and Plant 3 Stormwater Runoff Flow

TABLES

Chemical-terrorism Vulnerability Information
The information contained herein and all attachments thereto are considered PROPRIETARY INFORMATION and/or CONFIDENTIAL INFORMATION between Nammo Defense Systems Inc. and the U.S. Environmental Protection Agency and the Arizona Department of Environmental Quality. As such, all information must be safeguarded and used only on a need-to-know basis and for official use only. Should you receive any request under the Freedom of Information Act or decide otherwise to make the information contained or referenced herein publically available, please advise us in advance of taking any such action.

Geosyntec consultants

TABLE 1: FORMER THERMAL TREATMENT UNIT
2021 GROUNDWATER WELL NETWORK
NAMMO DEFENSE SYSTEMS INC.
MESA, ARIZONA
MAY 2021

Well Identification	Latitude	Longitude	Measuring Point Elevation (ft asml)	ADWR Number	Well Type/Use	Well Name/ Owner	Well Owner Information	Well Const	Well Diameter (in)	Casing Depth (ft bgs)	Screen Interval (ft bgs)
Plume Monitoring Wells											
TTU-3	33 29 57.98	-111 43 00.91	1308.03	N/A	Monitoring	Nammo Defense Systems Inc.	P.O. Box 34299 Mesa, AZ 85279	PVC	4	143.6	78.1-138.1
TTU-4	33 30 01.65	-111 42 59.09	1305.12	N/A	Monitoring	Nammo Defense Systems Inc.	P.O. Box 34299 Mesa, AZ 85280	PVC	4	104.9	39.5-99.5
TTU-5	33 29 52.48	-111 42 58.40	1314.93	N/A	Monitoring	Nammo Defense Systems, Inc.	P.O. Box 34299 Mesa, AZ 85281	PVC	4	169.5	59.5-164.5
TTU-6	33 29 57.57	-111 43 04.79	1300.84	N/A	Monitoring	Nammo Defense Systems Inc.	P.O. Box 34299 Mesa, AZ 85282	PVC	4	180	110-175
TTU-7	33 29 57.85	-111 43 05.18	1301.84	N/A	Monitoring	Nammo Defense Systems Inc.	P.O. Box 34299 Mesa, AZ 85282	Steel	8.5	282	282-410
								Open Borehole	8	None	
TTU-8	33 30 01.91	-111 43 05.31	1310.23	N/A	Monitoring	Nammo Defense Systems Inc.	P.O. Box 34299 Mesa, AZ 85282	PVC	4	190	135-185
TTU-9A	33 30 04.61	-111 42 51.19	1318.04	N/A	Monitoring	Nammo Defense SystemsInc.	P.O. Box 34299 Mesa, AZ 85282	PVC	4	104	24-99
TTU-10	33 29 54.60	-111 43 07.90	1302.42	N/A	Monitoring	Nammo Defense Systems Inc.	P.O. Box 34299 Mesa, AZ 85282	PVC	4	185	115-180
TTU-12	33 29 56.03	-111 42 58.38	1312.21	N/A	Monitoring	Nammo Defense Systems Inc.	P.O. Box 34299 Mesa, AZ 85282	Steel	5.5	30	30-180
								Open Borehole	5	None	
TTU-13	33 29 58.99	-111 42 56.85	1310.79	N/A	Monitoring	Nammo Defense Systems Inc.	P.O. Box 34299 Mesa, AZ 85283	Steel	5.5	30	30-80
								Open Borehole	5	None	
TTU-14	33 29 57.20	-111 42 57.46	1316.80	N/A	Monitoring	Nammo Defense Systems Inc.	P.O. Box 34299 Mesa, AZ 85284	Steel	5.5	45	45-100
								Open Borehole	5	None	
TTU-15	33 29 56.78	-111 42 47.03	1350.85	55-228014	Monitoring	Nammo Defense Systems Inc.	P.O. Box 34299 Mesa, AZ 85285	Steel	5	10	10-100
								Open Borehole	4.5	None	
TTU-16	33 29 56.18	-111 42 49.59	1338.55	55-231730	Monitoring	Nammo Defense Systems Inc.	P.O. Box 34299 Mesa, AZ 85286	Steel	8	20	20-95.6
								Open Borehole	8	None	
TTU-17	33 29 58.61	-111 42 45.69	1347.49	55-231735	Monitoring	Nammo Defense Systems Inc.	P.O. Box 34299 Mesa, AZ 85287	Steel	8	20	20-101
								Open Borehole	8	None	
TTU-18	33 29 47.20	-111 42 58.10	1320.25	55-231737	Monitoring	Nammo Defense Systems Inc.	P.O. Box 34299 Mesa, AZ 85288	Steel	8	21	21-140
								Open Borehole	8	None	
TTU-19	33 29 55.25	-111 42 51.50	1336.81	55-232969	Monitoring	Nammo Defense Systems Inc.	P.O. Box 34299 Mesa, AZ 85288	PVC	4	95	25-95
TTU-20	33 29 55.17	-111 42 51.58	1336.90	55-232968	Monitoring	Nammo Defense Systems Inc.	P.O. Box 34299 Mesa, AZ 85288	PVC	4	95	25-95

WARNING: This record contains Chemical-terrorism Vulnerability Information controlled by 6 CFR 27.400. Do not disclose to persons without a ''need to know'' in accordance with 6 CFR 27.400(e). Unauthorized release may result in civil penalties or other action. In any administrative or judicial proceeding, this information shall be treated as classified information in accordance with 6 CFR 27.400(h) and (i).

TABLE 1: FORMER THERMAL TREATMENT UNIT
2021 GROUNDWATER WELL NETWORK
NAMMO DEFENSE SYSTEMS INC.
MESA, ARIZONA
MAY 2021

Geosyntec consultants

Well Identification	Latitude	Longitude	Measuring Point Elevation (ft asml)	ADWR Number	Well Type/Use	Well Name/ Owner	Well Owner Information	Well Const	Well Diameter (in)	Casing Depth (ft bgs)	Screen Interval (ft bgs)
Extraction and Injection Wells											
TTU-1	33 29 59.14	-111 42 56.27	1312.73	55-914440	Extraction	Nammo Defense Systems Inc.	P.O. Box 34299 Mesa, AZ 85277	PVC	4	75	30-70
TTU-2	33 29 55.85	-111 42 57.85	1314.44	N/A	Extraction	Nammo Defense Systems Inc.	P.O. Box 34299 Mesa, AZ 85278	PVC	4	185	49.4-179.6
TTU-11	33 29 55.28	-111 42 51.47	1339.20	55-918534	Extraction/ Injection	Nammo Defense Systems Inc.	P.O. Box 34299 Mesa, AZ 85282	PVC	4	94	24.1-89.1
TTU-EX-1	33 29 58.42	-111 42 52.55	1321.69	55-231733	Extraction	Nammo Defense Systems Inc.	P.O. Box 34299 Mesa, AZ 85288	Steel	8	19	19-110.7
								Open Borehole	8	None	
TTU-EX-2	33 29 57.61	-111 42 53.79	1316.40	55-231734	Extraction	Nammo Defense Systems Inc.	P.O. Box 34299 Mesa, AZ 85289	Steel	8	20	20-110
								Open Borehole	8	None	
TTU-EX-3	33 29 56.29	-111 42 54.12	1316.85	55-231731	Extraction	Nammo Defense Systems Inc.	P.O. Box 34299 Mesa, AZ 85290	Steel	8	20	20-101.45
								Open Borehole	8	None	
TTU-EX-4	33 29 55.46	-111 42 54.39	1319.96	55-231732	Extraction	Nammo Defense Systems Inc.	P.O. Box 34299 Mesa, AZ 85291	Steel	8	20	20-110.7
								Open Borehole	8	None	
TTU-EX-5	33 29 54.68	-111 42 54.62	1319.50	55-231736	Extraction	Nammo Defense Systems Inc.	P.O. Box 34299 Mesa, AZ 85292	Steel	8	20	20-110.8
								Open Borehole	8	None	
Production Wells											
PF-1	33 29 56.60	-111 43 09.75	1295.99	N/A	Production	University of Washington	4202 N Higley Rd Mesa, AZ 85215	Unknown	Unknown	Unknown	Unknown
PF-2	33 29 56.65	-111 43 09.96	1296.35	N/A	Production	University of Washington	4202 N Higley Rd Mesa, AZ 85215	Unknown	Unknown	Unknown	Unknown

Abbreviations:

ft amsl = feet above mean sea level (NAVD88)
ADWR = Arizona Department of Water Resources
Const = construction
in = inches
ft bgs = feet below ground surface
N/A = Not applicable
PVC = polyvinyl chloride
TTU = Thermal Treatment Unit
EX = Extraction
PF = Primate Facility

Chemical-terrorism Vulnerability Information
The information contained herein and all attachments thereto are considered PROPRIETARY INFORMATION and/or CONFIDENTIAL INFORMATION between Nammo Defense Systems Inc. and the U.S. Environmental Protection Agency and the Arizona Department of Environmental Quality. As such, all information must be safeguarded and used only on a need-to-know basis and for official use only. Should you receive any request under the Freedom of Information Act or decide otherwise to make the information contained or referenced herein publically available, please advise us in advance of taking any such action.

TABLE 2: PLANT 3 2021 GOUNDWATER MONITOR WELL NETWORK

NAMMO DEFENSE SYSTEMS INC.
MESA, ARIZONA
MAY 2021

Geosyntec consultants

Well Identification	Latitude	Longitude	Measuring Point Elevation (ft amsl)	ADWR Number	Well Type/Use	Well Name/ Owner	Well Owner Information	Well Const	Well Diameter (in)	Casing Depth (ft bgs)	Screen Interval (ft btoc)
Plume Monitoring (MW) Wells											
NT-1	33 29 03.1	-111 43 41.3	1312.07	55-910226	Monitor	Nammo Defense Systems Inc.	P.O. Box 34299 Mesa, AZ 85277	PVC	6	258	107-257
NT-2	33 26 21.7	-111 42 24.3	1419.02	55-911007	Monitor	Nammo Defense Systems Inc.	P.O. Box 34299 Mesa, AZ 85277	PVC	4	365	215-365
NT-3	33 28 5.3	-111 42 31.9	1423.5	55-911773	Monitor	Nammo Defense Systems Inc.	P.O. Box 34299 Mesa, AZ 85277	PVC	4	358	208-358
NT-4	33 29 1.1	-111 42 58.1	1385.69	55-910266	Monitor	Nammo Defense Systems Inc.	P.O. Box 34299 Mesa, AZ 85277	PVC	4	313	153-313
NT-5	33 26 47.8	-111 43 44.3	1367.64	55-911687	Monitor	Nammo Defense Systems Inc.	P.O. Box 34299 Mesa, AZ 85277	PVC	4	311	161-311
NT-6	33 29 1.5	-111 45 42.7	1313.22	55-912177	Monitor	Nammo Defense Systems Inc.	P.O. Box 34299 Mesa, AZ 85277	PVC	6	261	115 - 260
NT-7	33 29 4.7	-111 43 39.8	1310.94	55-912178	Monitor	Nammo Defense Systems Inc.	P.O. Box 34299 Mesa, AZ 85277	PVC	6	260	109 - 259
NT-8	33 29 3.4	-111 44 6.5	1317.50	55-914414	Monitor	Nammo Defense Systems Inc.	P.O. Box 34299 Mesa, AZ 85277	PVC	4	311	161-311
NT-9	33 29 11.3	-111 43 46.4	1319.03	55-914074	Monitor	Nammo Defense Systems Inc.	P.O. Box 34299 Mesa, AZ 85277	PVC	4	311	161-311
NT-10	33 29 9.8	-111 44 0.3	1310.01	55-914075	Monitor	Nammo Defense Systems Inc.	P.O. Box 34299 Mesa, AZ 85277	PVC	4	311	161-311
NT-11	33 29 6.2	-111 43 54.2	1317.10	55-914420	Monitor	Nammo Defense Systems Inc.	P.O. Box 34299 Mesa, AZ 85277	PVC	4	311	161-311

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TABLE 2: PLANT 3 2021 GOUNDWATER MONITOR WELL NETWORK
NAMMO DEFENSE SYSTEMS INC.
MESA, ARIZONA
MAY 2021

Geosyntec consultants

Well Identification	Latitude	Longitude	Measuring Point Elevation (ft amsl)	ADWR Number	Well Type/Use	Well Name/ Owner	Well Owner Information	Well Const	Well Diameter (in)	Casing Depth (ft bgs)	Screen Interval (ft btoc)
NT-12D	33 29 3.8	-111.43 56.8	1324.38	55-917166	Monitor	Nammo Defense Systems Inc.	P.O. Box 34299 Mesa, AZ 85277	PVC	5	600	300-600
NT-14	33 29 2.08	-111 43 32.95	1317.973	55-230344	Monitor	Nammo Defense Systems Inc.	P.O. Box 34299 Mesa, AZ 85277	PVC	4	325	150-325
WBO-1	33 29 04.83	-111 43 43.4	1311.26	55-910345	Monitor	Nammo Defense Systems Inc.	P.O. Box 34299 Mesa, AZ 85277	PVC	5	198	135 - 195
HPA-1	33 29 06.35	-111 43 43.37	1311.30	55-910346	Monitor	Nammo Defense Systems Inc.	P.O. Box 34299 Mesa, AZ 85277	PVC	5	197	135 - 195
ADEQ Well No. 2	33 28 30.14	-111 43 44.64	1374.73	55-534577	Monitor	ADEQ	1110 W. Washington St. Phoenix, AZ 85007	Steel	8.625 & 4.5	459	380 - 444
ADEQ Well No. 3	33 28 25.14	-111 43 58.58	1372.49	55-534579	Monitor	ADEQ	1110 W. Washington St. Phoenix, AZ 85007	Steel	8.625 & 4.5	470	401 - 465

TABLE 2: PLANT 3 2021 GOUNDWATER MONITOR WELL NETWORK
NAMMO DEFENSE SYSTEMS INC.
MESA, ARIZONA
MAY 2021

Geosyntec consultants

Well Identification	Latitude	Longitude	Measuring Point Elevation (ft amsl)	ADWR Number	Well Type/Use	Well Name/ Owner	Well Owner Information	Well Const	Well Diameter (in)	Casing Depth (ft bgs)	Screen Interval (ft btoc)
ADEQ Well No. 4	33 28 19.23	-111 43 41.75	1373.61	55-534578	Monitor	ADEQ	1110 W. Washington St. Phoenix, AZ 85007	Steel	5	400	400 - 460
ADEQ Well No. 5[(1)]	33 28 44.25	-111 43 48.66	1370.19	55-544569	Monitor	ADEQ	1110 W. Washington St. Phoenix, AZ 85007	PVC Liner	2	320	240 - 320
								Steel	4	421	261 - 421
ADEQ Well No. 6	33 27 59.47	-111 43 26.07	1382.36	55-561851	Monitor	ADEQ	1110 W. Washington St. Phoenix, AZ 85007	PVC	5	450	320 - 440
ADEQ Well No. 7	33 28 52.87	-111 43 52.59	1326.98	55-561850	Monitor	ADEQ	1110 W. Washington St. Phoenix, AZ 85007	PVC	5	369	236 - 369
ADEQ Well No. 8	33 28 53.14	-111 43 46.04	1338.05	55-563131	Monitor	ADEQ	1110 W. Washington St. Phoenix, AZ 85007	PVC	5	367	240 - 360
FF-07	33 25 49.17	-111 43 26.20	1356.67	55-500994	Monitor	City of Mesa	P.O. Box 1466 Mesa, AZ 85201	Steel	18	1,202	698 - 913 1,058 - 1,098 1,158 - 1,198
Irrigation and Industrial Pumping Wells											
Alta Mesa Golf CC	33 27 6.02	-111 42 38.15	1425	55-610677	Irrigation	Alta Mesa Golf C.C.	1460 N. Alta Mesa Dr., Mesa, AZ 85205	Steel	20	700 or 1464	Unknown
Apache Wells Replacement Well	33 27 18.95	-111 42 31.36	1434	55-221426	Irrigation	Apache Well Country Club	5601 E. Hermosa Vista Drive, Mesa, AZ 85205	Steel	16	790	400 - 770
Longbow Golf Club	33 28 03.54	-111 43 05.75	1391	55-554072	Irrigation	McDonnell Douglas	4060 Lakewood Blvd. 6th FL., Long Beach, CA 90808	Unknown	12	708	400 - 708
Painted Mt. Golf CC	33 27 12.75	-111 42 01.01	1462	55-800719	Industrial	Painted Mt. Golf CC	6210 East McKellips Road, Mesa, AZ 85215	Steel	16	750	Unknown
SRP 32.8E-7.2N	33 29 3.48	-111 44 19.18	1305.24	55-607739	Irrigation	Salt River Project	Mail Station PAB352 PO Box 52025 Phoenix, AZ 85072	Steel	24	800	340 - 750
SRP 33.1E-7.3N	33 29 10.45	-111 44 3.67	1306.95	55-617109	Irrigation	Salt River Project	Mail Station PAB352 PO Box 52025 Phoenix, AZ 85072	Steel	20	687	350 - 687
SRP 33.3E-7.5N	33 29 16.61	-111 43 48.40	1309.38	55-607730	Irrigation	Salt River Project	Mail Station PAB352 PO Box 52025 Phoenix, AZ 85072	Steel	24	640	320 - 620

TABLE 2: PLANT 3 2021 GOUNDWATER MONITOR WELL NETWORK

NAMMO DEFENSE SYSTEMS INC.
MESA, ARIZONA
MAY 2021

Geosyntec consultants

Well Identification	Latitude	Longitude	Measuring Point Elevation (ft amsl)	ADWR Number	Well Type/Use	Well Name/ Owner	Well Owner Information	Well Const	Well Diameter (in)	Casing Depth (ft bgs)	Screen Interval (ft btoc)
Drake Materials East Well	33 28 31.02	-111 43 22.36	1377	55-624382	Industrial	Higley and 202 Investments, LLC.	PO Box 40730 Mesa, AZ 85274	Steel	16	645	460 - 560
Drake Materials West Well	33 28 29.0	-111 43 17.0	1361	55-624381	Industiral	Higley and 202 Investments, LLC.	PO Box 40730 Mesa, AZ 85274	Steel	15.5	1151	493-900
Drake Materials South Pond (2)	NA	NA	NA	NA	Industrial Pond	Higley and 202 Investments, LLC.	PO Box 40730 Mesa, AZ 85274	NA	NA	NA	NA
Habeeb Ranches	33 27 32.81	-111 43 37.89	1498	55-611913	Irrigation	Joseph J. Habeeb	PO Box 1464 Mesa, AZ 85211	Steel	16	766	460-740
FF-02	33 26 54.1	-111 43 53	1362	55-629609	Industrial/ Municipal	City of Mesa	P.O. Box 1466 Mesa, AZ 85201	Steel	20	926	550 - 925
Groundwater Extraction Wells											
EXT-1	33 29 4.15	-111 43 40.65	1312.84	55-223104	Extraction	Nammo Defense Systems, Inc.	P.O. Box 34299 Mesa, AZ 85277	Steel	12	350	190 - 350
EXT-2	33 29 2.62	-111 43 42.39	1314.47	55-223095	Extraction	Nammo Defense Systems, Inc.	P.O. Box 34299 Mesa, AZ 85277	Steel	12	350	190 - 350

Abbreviations:

ft amsl = feet above mean sea level (NAVD88)
Const = construction
in = inches
ft bgs = feet below ground surface
NA = Not applicable
ft btoc = feet below top of casing
PVC = polyvinyl chloride
WBO = water bore out
HPA = historical pond area
CC = Country Club
ADEQ = Arizona Department of Environmental Quality
No. = number
SRP = Salt River Project
NT = Nammo Talley
FF = Falcon Field

Notes:

(1) A 2 inch PVC liner was installed inside the steel casing with a screen interval from 240 to 320 ft bgs. This was initiated by ADEQ and installed by Yellow Jacket Drilling June 2017.

(2) Water from the Drake Materials South Pond is comprised of water extracted from the Drake Materials East Well and Drake Materials West Well. Drake Materials South Pond is sampled as part of the 2020 well network although it is not a well.

FIGURES

Chemical-terrorism Vulnerability Information
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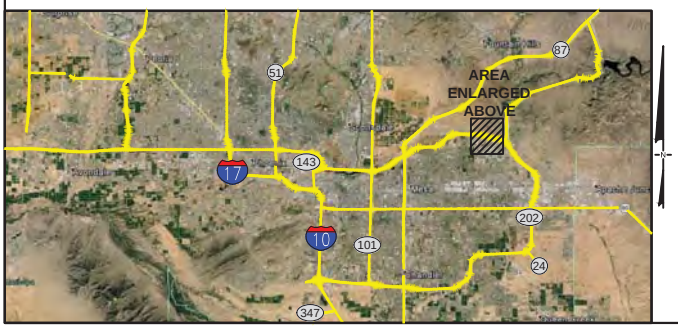
2010 AERIAL IMAGE FROM USDA: GEOSPATIAL GATEWAY

EXPLANATION:

APPROXIMATE PROPERTY BOUNDARY

2,000' 1,000' 0 2,000 Feet



SITE VICINITY MAP

Nammo Defense Systems Inc.
Plant No. 3 Mesa, Arizona

Geosyntec consultants

Phoenix, AZ | MAY 2021

Appendix A

A

N:\GEOSYNTEC\NAMMO TALLEY\VICINITY MAP\NT VICINITY MAP EXHIBIT

WARNING: This record contains Chemical-terrorism Vulnerability Information controlled by 6 CFR 27.400. Do not disclose to persons without a "need to know" in accordance with 6 CFR 27.400(e). Unauthorized release may result in civil penalties or other action. In any administrative or judicial proceeding, this information shall be treated as classified information in accordance with 6 CFR 27.400(h) and (i).

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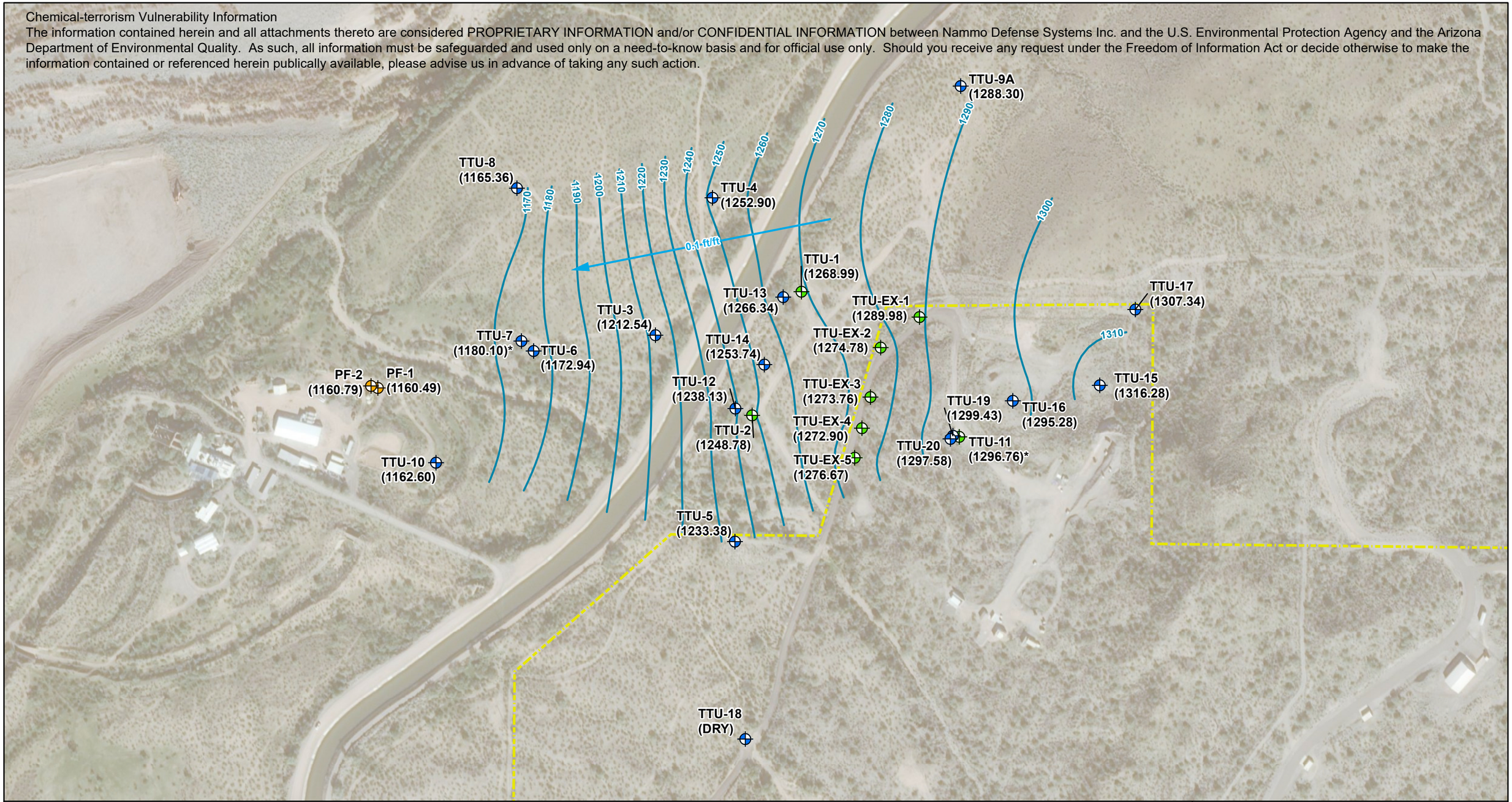

Legend

- Primate Well
- Extraction Well
- Monitoring Well
- Groundwater Elevation Contour (ft amsl)
- Flow Direction and Gradient

Notes

NM: Not Measured
All locations are approximate.
ft amsl: feet above mean sea level
*: not used to generate contours.
TTU-7 is a deep well.
TTU-19 and TTU-20 were used as monitoring wells for a In-Situ Treatment Pilot Test with TTU-11 as an injection point.
In December 2020, no mounding was observed at TTU-19 and -20 therefore these elevations were considered representative.
Groundwater elevation for TTU-11 was measured in October 2020 and the measurement was not used for contouring.

TTU-1 = Monitoring Well Location
1268.99 = Groundwater Elevation (ft. amsl)

N

0 250 Feet

Groundwater Elevations and Contours
December 2020
Nammo Defense Systems Inc.
Former Thermal Treatment Unit (TTU)
Mesa, Arizona

Geosyntec consultants

Phoenix, Arizona | May 2021

Figure 2

SantaBarbara-01\P:\GIS\SP0101 - Nammo\Projects\2020Q4 TTU Quarterly GW Monitoring\Fig02_2020Q4_Groundwater_Elevations_and_Contours.mxd 3/12/2021 (Author: MBradford) 12:58:58 PM

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MONITORING WELL
PRIMATE FACILITY WELL
EXTRACTION WELL
CROSS SECTION LINE
FENCE LINE, TTU BOUNDARY
APPROXIMATE RETENTION BASIN AREA
NAMMO DEFENSE SYSTEMS, INC. PROPERTY BOUNDARY

TTU: Thermal Treatment Unit

N

0 125 250 500
Feet

TTU Well Locations and Cross Section Plan View

Nammo Defense Systems Inc.
Mesa, Arizona

Geosyntec consultants

Phoenix, Arizona | May, 2021

Figure 3

\\SanDiego-01\Data\GIS_SanDiego01\SP0101_Nammo\MXD\TTU\TTU_XSECTION\NDS_TTU_XSection.mxd 4/1/2021 SWolfskill

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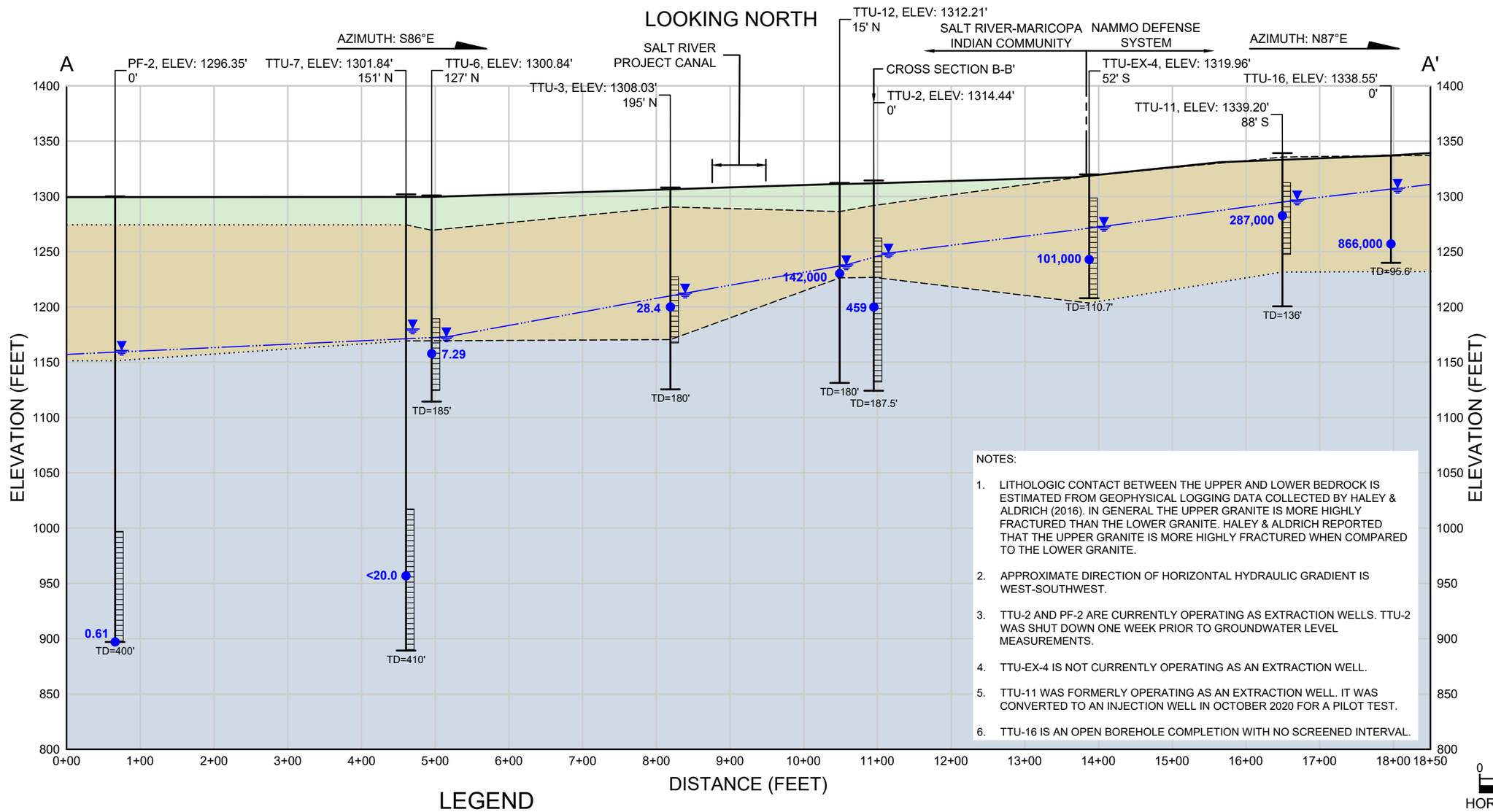


NOTES:

1. LITHOLOGIC CONTACT BETWEEN THE UPPER AND LOWER BEDROCK IS ESTIMATED FROM GEOPHYSICAL LOGGING DATA COLLECTED BY HALEY & ALDRICH (2016). IN GENERAL THE UPPER GRANITE IS MORE HIGHLY FRACTURED THAN THE LOWER GRANITE. HALEY & ALDRICH REPORTED THAT THE UPPER GRANITE IS MORE HIGHLY FRACTURED WHEN COMPARED TO THE LOWER GRANITE.
2. APPROXIMATE DIRECTION OF HORIZONTAL HYDRAULIC GRADIENT IS WEST-SOUTHWEST.
3. TTU-2 AND PF-2 ARE CURRENTLY OPERATING AS EXTRACTION WELLS. TTU-2 WAS SHUT DOWN ONE WEEK PRIOR TO GROUNDWATER LEVEL MEASUREMENTS.
4. TTU-EX-4 IS NOT CURRENTLY OPERATING AS AN EXTRACTION WELL.
5. TTU-11 WAS FORMERLY OPERATING AS AN EXTRACTION WELL. IT WAS CONVERTED TO AN INJECTION WELL IN OCTOBER 2020 FOR A PILOT TEST.
6. TTU-16 IS AN OPEN BOREHOLE COMPLETION WITH NO SCREENED INTERVAL.

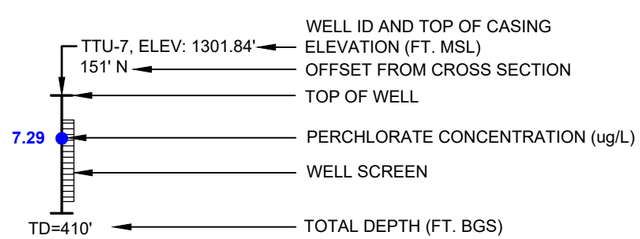
0 150
HORIZONTAL SCALE

0 100
VERTICAL SCALE

LEGEND

SYMBOLS

- EXISTING GROUND ELEVATION (FEET ABOVE MEAN SEA LEVEL (MSL))
- APPROXIMATE STATIC GROUNDWATER TABLE
- MEASURED GROUNDWATER LEVEL IN DECEMBER 2020
- ESTIMATED LITHOLOGIC CONTACT
- LITHOLOGIC CONTACT WAS NOT OBSERVED



GEOLOGIC UNITS

- OVERBURDEN
- UPPER GRANITE BEDROCK
- LOWER GRANITE BEDROCK

TUU Cross Section A-A'

Nammo Defense System Inc.
Mesa, Arizona

Geosyntec consultants

Phoenix, Arizona | May, 2021

Figure 4

P:\CADD\NN\AMMO DEFENSE SYSTEM\TTU\SP0101\NF\FIGURES\SP0101NF001 - Last Saved by: SBerdy on 4/1/21

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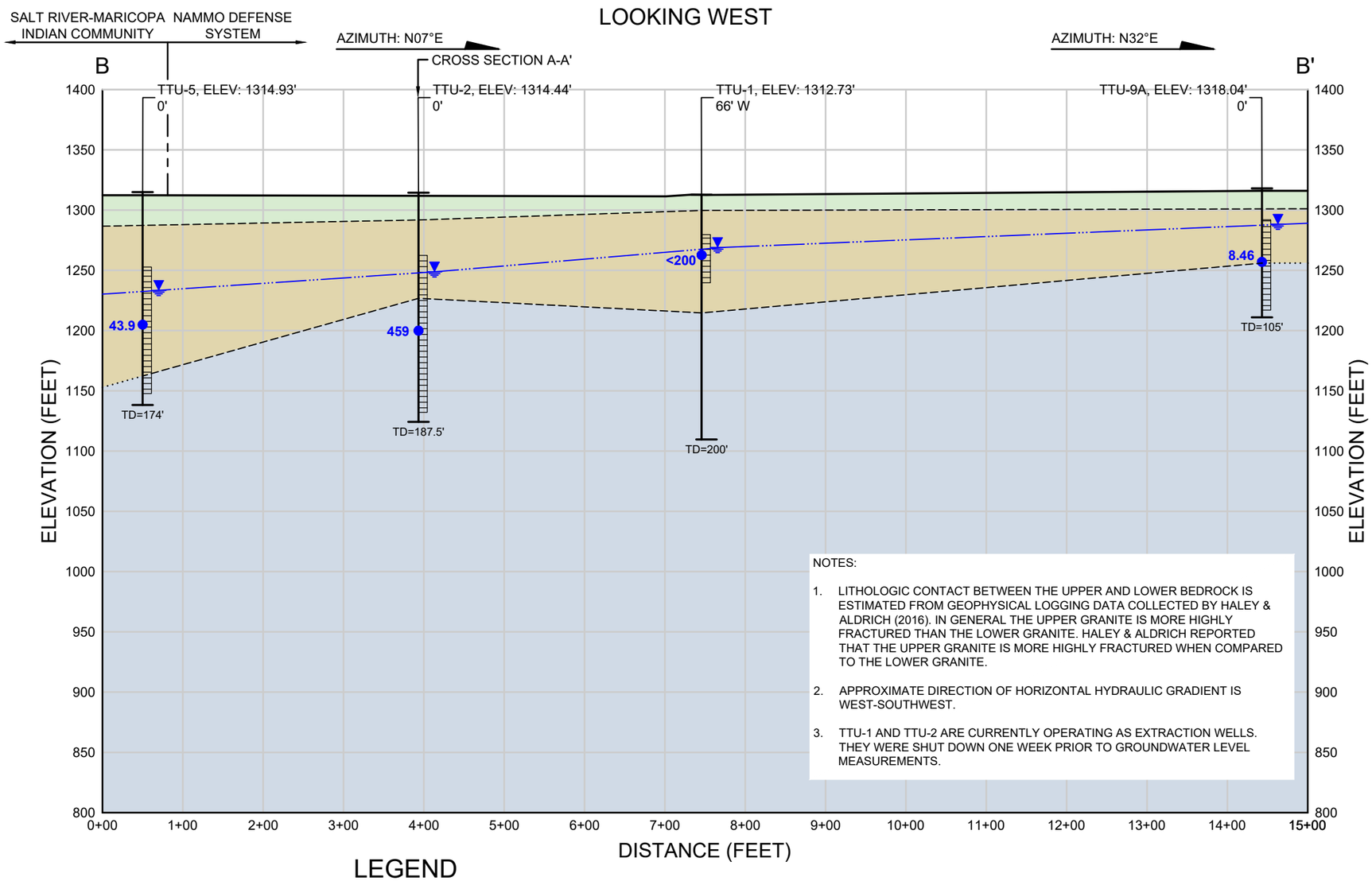

NOTES:

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2. APPROXIMATE DIRECTION OF HORIZONTAL HYDRAULIC GRADIENT IS WEST-SOUTHWEST.
3. TTU-1 AND TTU-2 ARE CURRENTLY OPERATING AS EXTRACTION WELLS. THEY WERE SHUT DOWN ONE WEEK PRIOR TO GROUNDWATER LEVEL MEASUREMENTS.

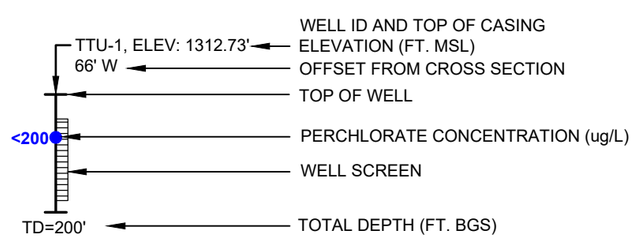
0 150
HORIZONTAL SCALE

0 100
VERTICAL SCALE

LEGEND

SYMBOLS

- EXISTING GROUND ELEVATION (FEET ABOVE MEAN SEA LEVEL (MSL))
- APPROXIMATE STATIC GROUNDWATER TABLE
- MEASURED GROUNDWATER LEVEL IN DECEMBER 2020
- ESTIMATED LITHOLOGIC CONTACT
- LITHOLOGIC CONTACT WAS NOT OBSERVED



GEOLOGIC UNITS

- OVERBURDEN
- UPPER GRANITE BEDROCK
- LOWER GRANITE BEDROCK

TUU Cross Section B-B'

Nammo Defense System Inc.
Mesa, Arizona

Geosyntec consultants

Phoenix, Arizona | May 2021

Figure 5

P:\CADD\NNAMMO DEFENSE SYSTEM\TTU\SP0101N\FIGURES\SP0101NF001 - Last Saved by: SBerdy on 4/1/21

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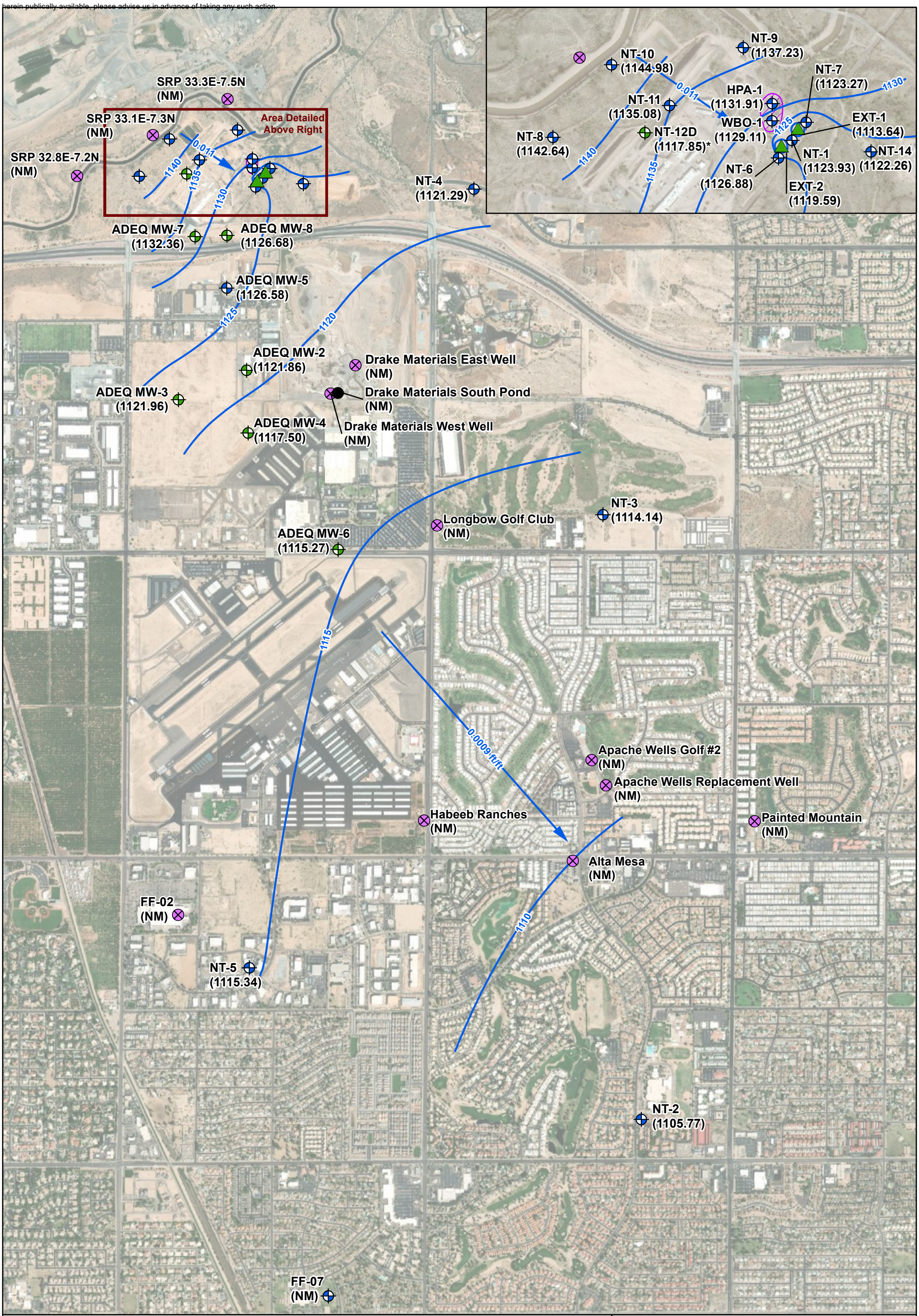

Legend

- Extraction Well
- Industrial/Irrigation Well
- Monitoring Well
- Monitoring Well with Submerged Screen Interval
- Drake Materials South Pond
- Groundwater Elevation Contour (ft amsl)
- Hydraulic Gradient (ft/ft) and Magnitude
- Approximate Perchlorate Source

NT-2 = Monitoring Well Location
1105.77 = Groundwater Elevation (ft amsl)

Notes:
ft amsl: feet above mean sea level
NDS: Nammo Defense Systems, Inc.
NM: Not Measured
NA: Not applicable, Drake Materials South Pond is a man-made surface body of water.
* : Not used for contouring
NT-12D is a deep well.
SRP 32.8E-7.2N, SRP 33.1E-7.3N, and SRP 33.3E-7.5 N are not currently operating.
Approximate perchlorate source area is within the vicinity of WBO-1 and HPA-1.

N

0 1,500 Feet

Plant 3 Groundwater Elevation and Contour Map, December 2020

Nammo Defense Systems Inc.
Mesa, Arizona

Geosyntec consultants

Phoenix, Arizona | May, 2021

Figure 6

SantaBarbara-01\P:\GIS\SP0101 - Nammo\Projects\2020Q4 WBO Quarterly GW Monitoring\Fig02_2020Q4_WBO_Groundwater_Contours_Shallow_Wells.mxd 3/30/2021 (Author: MBradford) 10:04:37 AM

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MONITORING WELL
MONITORING WELL WITH SUBMERGED SCREEN INTERVAL
INDUSTRIAL/IRRIGATION WELL
EXTRACTION WELL
OPEN WATER SAMPLE
CROSS SECTION LINE

N

0 750 1,500 3,000
Feet

Plant 3 Well Locations and Cross Section Plan View

Nammo Defense Systems Inc.
Mesa, Arizona

Geosyntec consultants

Phoenix, Arizona | May, 2021

Figure 7

\\SanDiego-01\Data\GIS_SanDiego01\SP0101_Nammo\MXD\WBO\WBO_XSECTION\NDS_WBO_XSection.mxd 3/29/2021 SWolfskill

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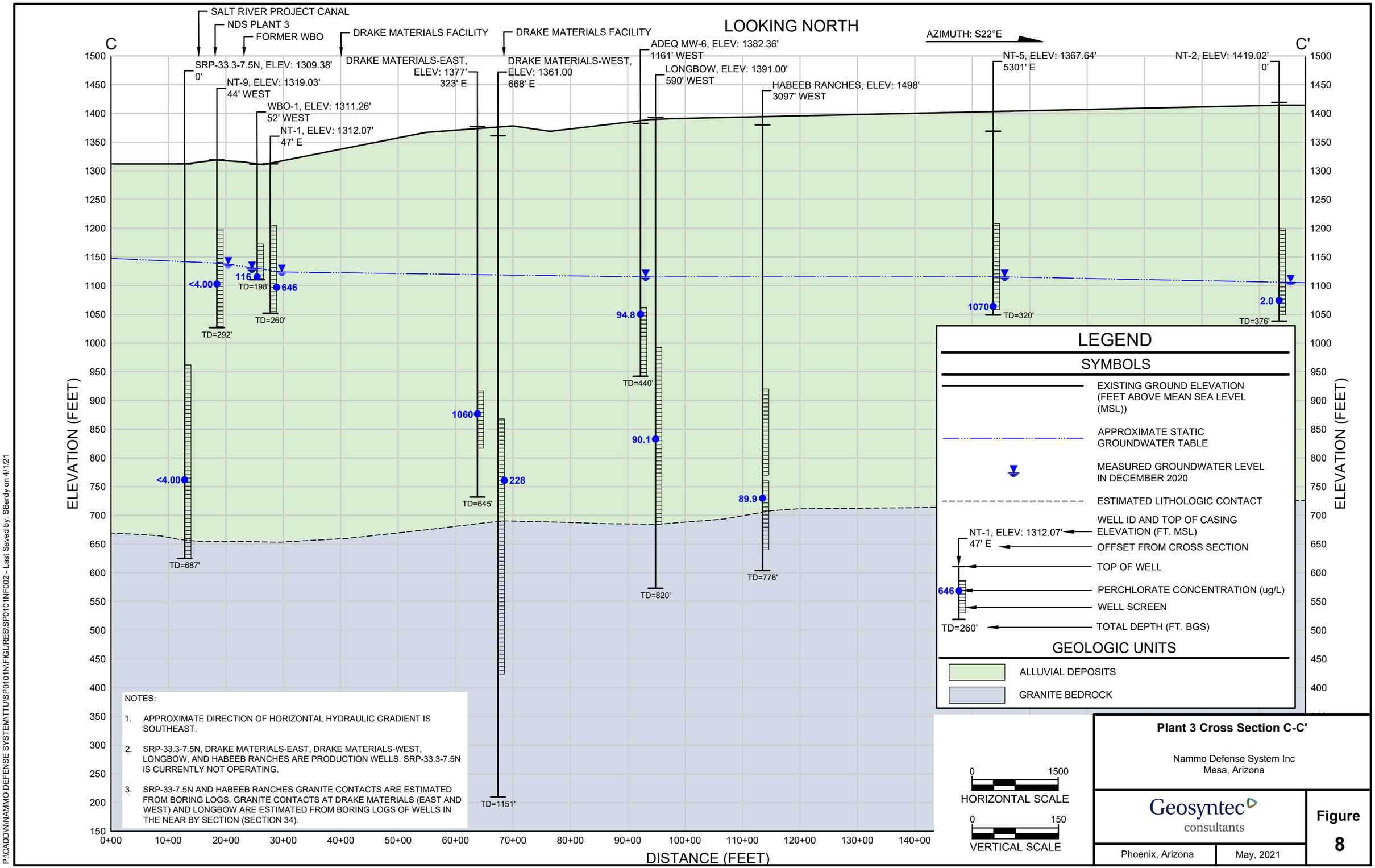

Plant 3 Cross Section C-C'

Nammo Defense System Inc
Mesa, Arizona

Geosyntec consultants

Phoenix, Arizona | May, 2021

Figure 8

P:\CADD\NAMMO DEFENSE SYSTEM\TTU\SP0101N\FIGURES\SP0101NF002 - Last Saved by: SBerdy on 4/1/21

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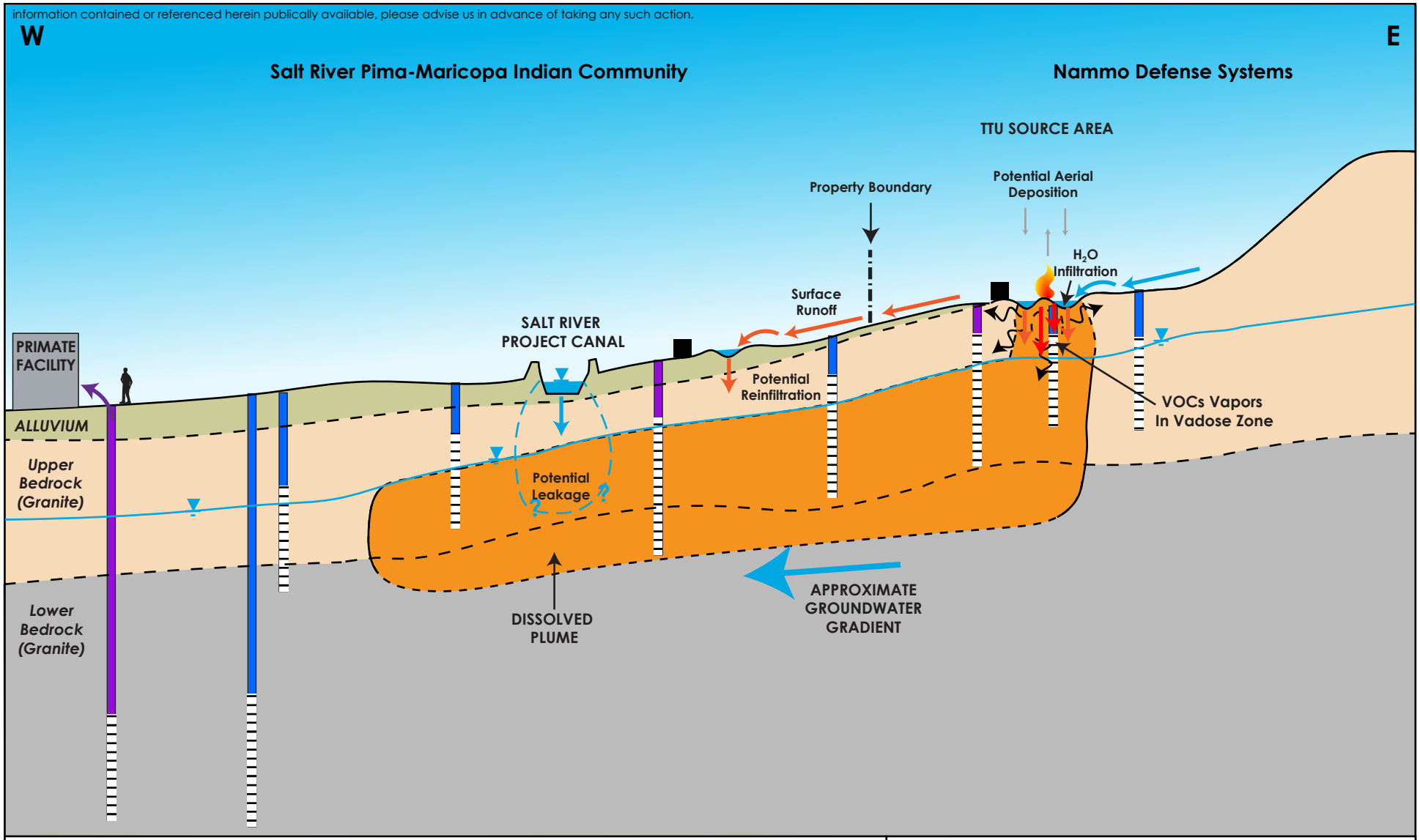

Legend

- Former TTU Burn Grounds
- Pump & Treat Capture System
- Storm Water Retention Basin
- Approximate Groundwater Table
- Monitoring Well
- Extraction Well

TTU Conceptual Site Model

Nammo Defense Systems, Inc.
Mesa, Arizona

Geosyntec consultants

Phoenix, AZ | May 2021

Figure 9

CSM_TTU_SP01011N-v3.ai

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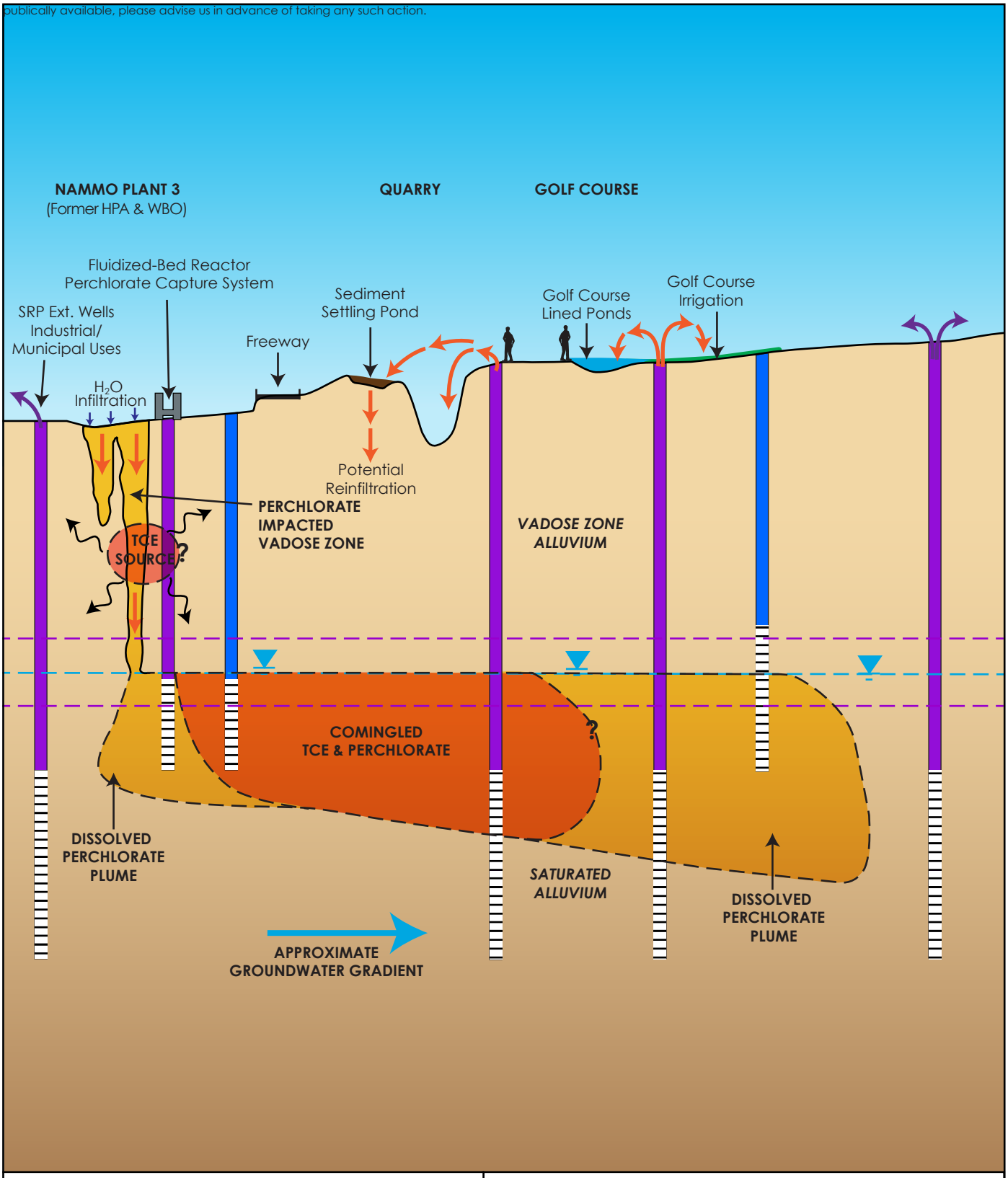

Legend

- Fluctuating Groundwater Level
- Approximate Groundwater Table
- Monitoring Well
- Extraction Well

Notes:
1. Alluvium is defined as: "Interbedded, sands, gravels, caliche with minor silt components. Representative boring logs provided from SRP 33.3E-7.5N, NT-12D, WBO-1, and Longbow Golf Course exploration boring No. 55-552879."
2. According to the golf course the ponds located at their course are lined.

Plant 3 Conceptual Site Model

Nanno Defense Systems, Inc.
Mesa, Arizona

Geosyntec consultants

Phoenix, AZ | May 2021

Figure 10

Plant 3 CSM_SP0101J.ai

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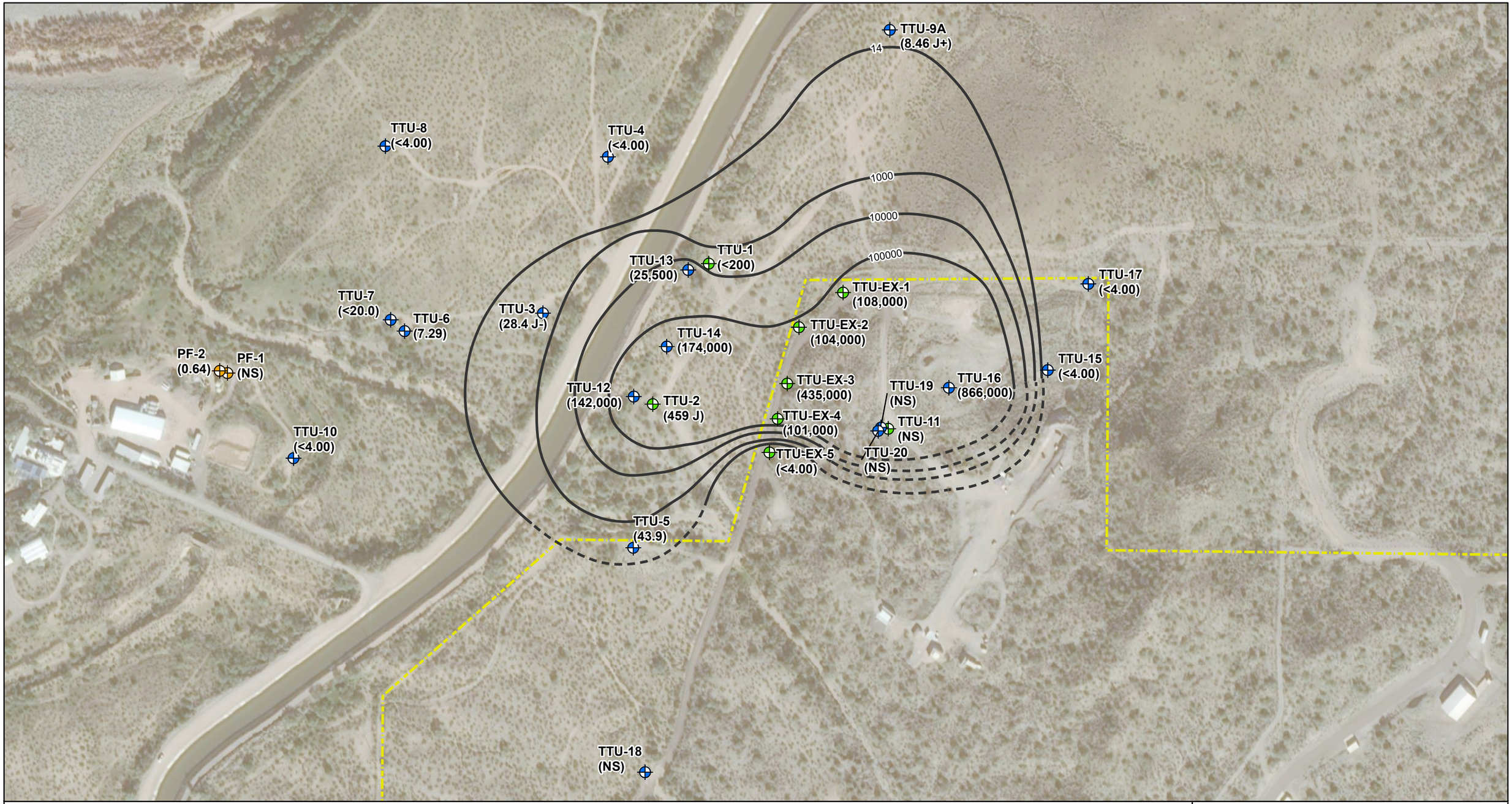

Legend

- Primate Well
- Extraction Well
- Monitoring Well
- Perchlorate Concentration Contour µg/L (Dashed Where Inferred)

Notes:
All locations are approximate.
NS: Not Sampled
J: estimated concentration.
J-: estimated concentration, actual concentration is likely lower than detected value.
J+: estimated concentration, actual concentration is likely higher than detected value.
Non-detect results are indicated by "<" followed by the laboratory reporting limit.
Maximum result is shown for duplicate detections.
TTU-18: This well is dry and has not been sampled since installation in 1Q 2020.
PF-1: The pump for this well is not operational and the well is not in use. Samples for this well were not collected during the 4Q 2020 monitoring period.
TTU-11, TTU-19 and TTU-20: Wells were sampled as part of a separate scope for the In-Situ Treatment Pilot Test.

TTU-5 = Monitoring Well Location
43.9 = Perchlorate Concentration in micrograms per liter (µg/L).

N

0 220 Feet

TTU Perchlorate Groundwater Concentrations, December 2020

Nammo Defense Systems Inc.
Mesa, Arizona

Geosyntec consultants

Phoenix, Arizona | May 2021

Figure 11

SantaBarbara-01\P:\GIS\SP0101 - Nammo\Projects\2020Q4 TTU Quarterly GW Monitoring\Fig03_2020Q4_Perchlorate_Detections_GW.mxd 3/12/2021 (Author: MBradford) 1:15:48 PM

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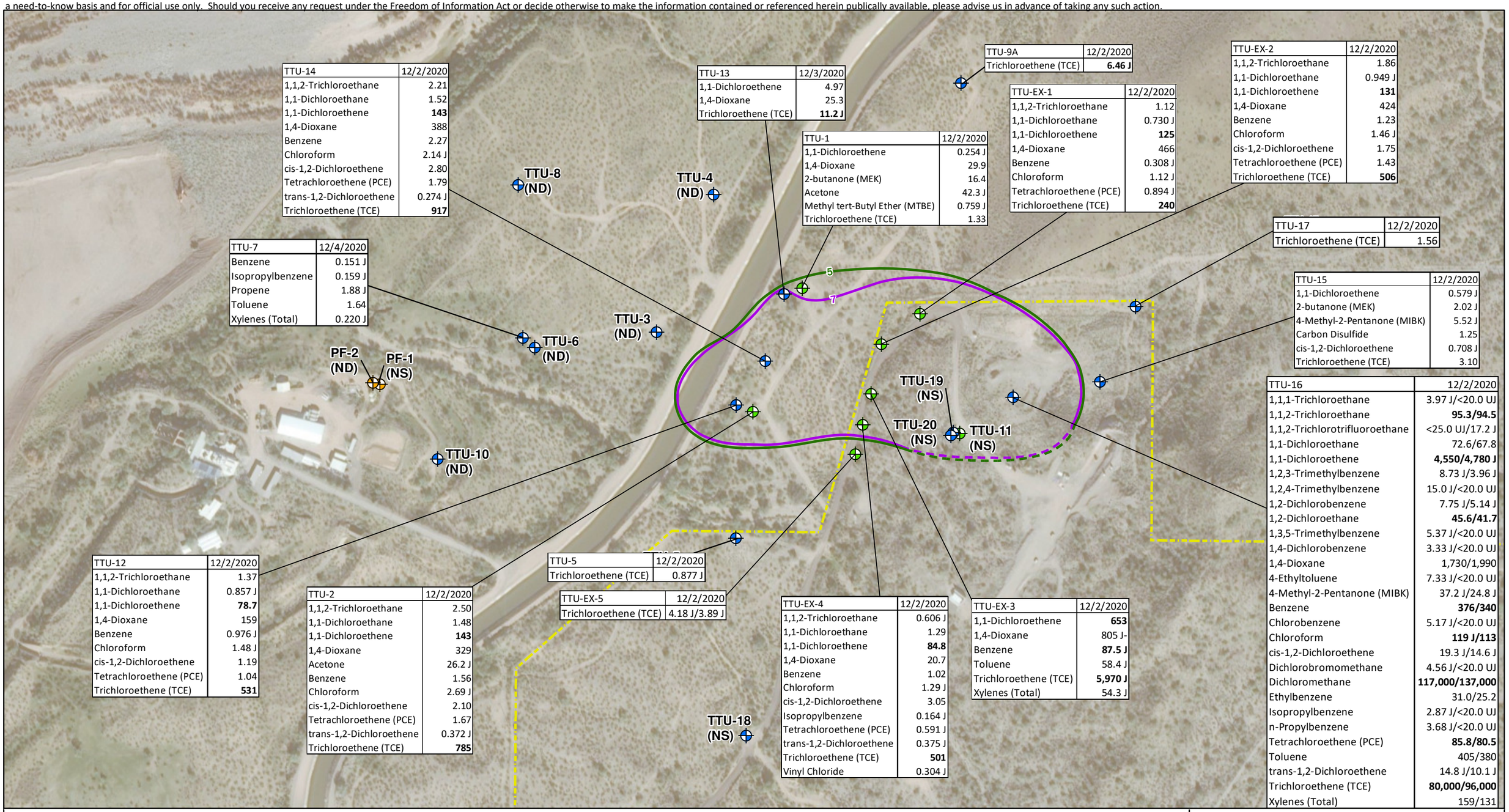

TTU-14	12/2/2020
1,1,2-Trichloroethane	2.21
1,1-Dichloroethane	1.52
1,1-Dichloroethene	**143**
1,4-Dioxane	388
Benzene	2.27
Chloroform	2.14 J
cis-1,2-Dichloroethene	2.80
Tetrachloroethene (PCE)	1.79
trans-1,2-Dichloroethene	0.274 J
Trichloroethene (TCE)	**917**

TTU-13	12/3/2020
1,1-Dichloroethene	4.97
1,4-Dioxane	25.3
Trichloroethene (TCE)	**11.2 J**

TTU-9A	12/2/2020
Trichloroethene (TCE)	**6.46 J**

TTU-EX-2	12/2/2020
1,1,2-Trichloroethane	1.86
1,1-Dichloroethane	0.949 J
1,1-Dichloroethene	**131**
1,4-Dioxane	424
Benzene	1.23
Chloroform	1.46 J
cis-1,2-Dichloroethene	1.75
Tetrachloroethene (PCE)	1.43
Trichloroethene (TCE)	**506**

TTU-EX-1	12/2/2020
1,1,2-Trichloroethane	1.12
1,1-Dichloroethane	0.730 J
1,1-Dichloroethene	**125**
1,4-Dioxane	466
Benzene	0.308 J
Chloroform	1.12 J
Tetrachloroethene (PCE)	0.894 J
Trichloroethene (TCE)	**240**

TTU-1	12/2/2020
1,1-Dichloroethene	0.254 J
1,4-Dioxane	29.9
2-butanone (MEK)	16.4
Acetone	42.3 J
Methyl tert-Butyl Ether (MTBE)	0.759 J
Trichloroethene (TCE)	1.33

TTU-17	12/2/2020
Trichloroethene (TCE)	1.56

TTU-7	12/4/2020
Benzene	0.151 J
Isopropylbenzene	0.159 J
Propene	1.88 J
Toluene	1.64
Xylenes (Total)	0.220 J

TTU-15	12/2/2020
1,1-Dichloroethene	0.579 J
2-butanone (MEK)	2.02 J
4-Methyl-2-Pentanone (MIBK)	5.52 J
Carbon Disulfide	1.25
cis-1,2-Dichloroethene	0.708 J
Trichloroethene (TCE)	3.10

TTU-16	12/2/2020
1,1,1-Trichloroethane	3.97 J/<20.0 UJ
1,1,2-Trichloroethane	**95.3/94.5**
1,1,2-Trichlorotrifluoroethane	<25.0 UJ/17.2 J
1,1-Dichloroethane	72.6/67.8
1,1-Dichloroethene	**4,550/4,780 J**
1,2,3-Trimethylbenzene	8.73 J/3.96 J
1,2,4-Trimethylbenzene	15.0 J/<20.0 UJ
1,2-Dichlorobenzene	7.75 J/5.14 J
1,2-Dichloroethane	**45.6/41.7**
1,3,5-Trimethylbenzene	5.37 J/<20.0 UJ
1,4-Dichlorobenzene	3.33 J/<20.0 UJ
1,4-Dioxane	1,730/1,990
4-Ethyltoluene	7.33 J/<20.0 UJ
4-Methyl-2-Pentanone (MIBK)	37.2 J/24.8 J
Benzene	**376/340**
Chlorobenzene	5.17 J/<20.0 UJ
Chloroform	**119 J/113**
cis-1,2-Dichloroethene	19.3 J/14.6 J
Dichlorobromomethane	4.56 J/<20.0 UJ
Dichloromethane	**117,000/137,000**
Ethylbenzene	31.0/25.2
Isopropylbenzene	2.87 J/<20.0 UJ
n-Propylbenzene	3.68 J/<20.0 UJ
Tetrachloroethene (PCE)	**85.8/80.5**
Toluene	405/380
trans-1,2-Dichloroethene	14.8 J/10.1 J
Trichloroethene (TCE)	**80,000/96,000**
Xylenes (Total)	159/131

TTU-12	12/2/2020
1,1,2-Trichloroethane	1.37
1,1-Dichloroethane	0.857 J
1,1-Dichloroethene	**78.7**
1,4-Dioxane	159
Benzene	0.976 J
Chloroform	1.48 J
cis-1,2-Dichloroethene	1.19
Tetrachloroethene (PCE)	1.04
Trichloroethene (TCE)	**531**

TTU-2	12/2/2020
1,1,2-Trichloroethane	2.50
1,1-Dichloroethane	1.48
1,1-Dichloroethene	**143**
1,4-Dioxane	329
Acetone	26.2 J
Benzene	1.56
Chloroform	2.69 J
cis-1,2-Dichloroethene	2.10
Tetrachloroethene (PCE)	1.67
trans-1,2-Dichloroethene	0.372 J
Trichloroethene (TCE)	**785**

TTU-5	12/2/2020
Trichloroethene (TCE)	0.877 J

TTU-EX-5	12/2/2020
Trichloroethene (TCE)	4.18 J/3.89 J

TTU-EX-4	12/2/2020
1,1,2-Trichloroethane	0.606 J
1,1-Dichloroethane	1.29
1,1-Dichloroethene	**84.8**
1,4-Dioxane	20.7
Benzene	1.02
Chloroform	1.29 J
cis-1,2-Dichloroethene	3.05
Isopropylbenzene	0.164 J
Tetrachloroethene (PCE)	0.591 J
trans-1,2-Dichloroethene	0.375 J
Trichloroethene (TCE)	**501**
Vinyl Chloride	0.304 J

TTU-EX-3	12/2/2020
1,1-Dichloroethene	**653**
1,4-Dioxane	805 J-
Benzene	**87.5 J**
Toluene	58.4 J
Trichloroethene (TCE)	**5,970 J**
Xylenes (Total)	54.3 J

Legend

- Primate Well
- Extraction Well
- Monitoring Well
- Extent of Estimated 1,1-Dichloroethene (1,1-DCE) concentration in Groundwater July 2020 (Dashed Where Inferred)
- Extent of Estimated Trichloroethene (TCE) Concentration in Groundwater July 2020 (Dashed Where Inferred)
- NDS Leased Property Boundary with SRP-MIC

Notes:
All locations are approximate.
Concentrations are in micrograms per liter (µg/L); only detected results are shown.
Primary/duplicate sample results.
ND: Not Detected; NS: Not Sampled
J: estimated concentration.
J-: estimated concentration, actual concentration is likely lower than detected value.
UJ: estimated quantitation limit.
TTU-18: This well is dry and has not been sampled since installation in 1Q 2020.
PF-1: The pump for this well is not operational and the well is not in use.
Samples for this well were not collected during the 4Q 2020 monitoring period.
TTU-11, TTU-19 and TTU-20: Wells were sampled as part of a separate scope for the In-Situ Treatment Pilot Test.

Contours represent the approximate extent of the TCE plume (green) and 1,1 DCE plume (purple) with concentrations above the Arizona Water Quality Standards (AWQS) for TCE and 1,1 DCE.
Concentrations exceeding the AWQS indicated in **bold.**

AWQS Screening Levels (µg/L):

1,1-DCE - 7	Total Trihalomethanes (including Chloroform) - 100
1,1,1-TCA - 200	Trans-1,2-Dichloroethene - 100
1,1,2-TCA - 5	Dichloromethane - 5
Benzene - 5	PCE - 5
Cis-1,2-DCE - 70	TCE - 5
	1,2-DCA - 5

N

0 250 Feet

TTU VOC Groundwater Concentrations, December 2020

Nammo Defense Systems Inc.
Mesa, Arizona

Geosyntec consultants

Phoenix, Arizona | May, 2021

Figure 12

SantaBarbara-01\P:\GIS\SP0101 - Nammo\Projects\2020Q4 TTU Quarterly GW Monitoring\Fig04_2020Q4_VOC_Detections_GW.mxd 3/12/2021 (Author: MBradford) 1:22:47 PM

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Legend

- Extraction Well
- Industrial/Irrigation Well
- Monitoring Well
- Monitoring Well with Submerged Screen Interval
- Drake Materials South Pond
- Estimated Perchlorate Concentration Contour (µg/l) - Dashed Where Inferred
- Approximate Perchlorate Source Area

Notes:
NDS: Nammo Defense Systems, Inc.
NS: Not Sampled for Perchlorate in this monitoring event
<: concentration was below the indicated laboratory reporting limit
J: estimated concentration
J+: estimated concentration, actual concentration is likely higher than detected value.
*: The casings conditions of ADEQ-MW-2, ADEQ-MW-3 and ADEQ-MW4 are greatly deteriorated (Geosyntec, 2020a), therefore the iso-contour near these wells has been inferred.
Samples from irrigation wells were collected from spigots during pumping. These samples consist of purged water from a pumping zone and may be representative of blended concentrations, whereas samples from monitor wells are considered depth specific. Therefore the iso-contour near irrigation wells has been inferred.
Maximum result is shown for duplicate detections.
Arizona Health Based Guidance Level for Perchlorate is 14 µg/l.
Approximate perchlorate source area is within the vicinity of WBO-1 and HPA-1.

Alta Mesa = Monitoring Well Location
12.9 = Perchlorate Concentration in micrograms per liter (µg/l)

N

0 1,480 Feet

Perchlorate Concentrations and Contours November/December 2020

Nammo Defense Systems, Inc. Plant #3
Mesa, Arizona

Geosyntec consultants

Phoenix, Arizona | May 2021

Figure 13

SantaBarbara-01\P:\GIS\SP0101 - Nammo\Projects\2020Q4 WBO Quarterly GW Monitoring\Fig04_2020Q4_WBO_Perchlorate_Detections_GW.mxd 4/29/2021 (Author: Mbradford) 4:06:15 PM

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Legend

- Extraction Well
- Industrial/Irrigation Well
- Monitoring Well
- Monitoring Well with Submerged Screen Interval
- Drake Materials South Pond
- Estimated TCE Concentration Contour in µg/l (Dashed Where Inferred)
- Approximate Perchlorate Source Area

Notes:
NDS: Nammo Defense Systems, Inc.
NS: Not Sampled for TCE in this monitoring event
<: concentration was below the indicated laboratory reporting limit
J: estimated concentration
*: The casings conditions of ADEQ-MW-2, ADEQ-MW-3 and ADEQ-MW4 are greatly deteriorated (Geosyntec, 2020a), therefore the iso-contour near these wells has been inferred.
Samples from irrigation wells were collected from spigots during pumping. These samples consist of purged water from a pumping zone and may be representative of blended concentrations, whereas samples from monitor wells are considered depth specific. Therefore the iso-contour near irrigation wells has been inferred.
Maximum result is shown for duplicate detections.
Arizona Water Quality Standard for TCE is 5 µg/l.

Alta Mesa = Monitoring Well Location
3.35 = TCE Concentration in micrograms per liter (µg/l)

N

0 1,500 Feet

Trichloroethene (TCE) Concentrations and Contours November/December 2020
Nammo Defense Systems, Inc. Plant #3
Mesa, Arizona

Geosyntec consultants

Phoenix, Arizona | May 2021

Figure 14

SantaBarbara-01\P:\GIS\SP0101 - Nammo\Projects\2020Q4 WBO Quarterly GW Monitoring\Fig05_2020Q4_WBO_TCE_Detections_GW.mxd 4/30/2021 (Author: Mbradford) 12:53:22 PM

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Plant 3 Documents

BASIN & RANGE HYDROGEOLOGISTS
AN ARIZONA CORPORATION

PRIVILEGED & CONFIDENTIAL -- PREPARED AT THE DIRECTION OF LEGAL COUNSEL

SITE ASSESSMENT PLAN
TALLEY DEFENSE SYSTEMS'
WATER BORE-OUT PITS

Prepared for

KIMBALL & CURRY, P.C.
2600 North Central Avenue, Suite 1600
Phoenix, Arizona 85004

Prepared by

BASIN & RANGE HYDROGEOLOGISTS, INC.
5080 North 40th Street, Suite 105
Phoenix, Arizona 85018

December 4, 1991

TABLE OF CONTENTS

	PAGE
TABLE OF CONTENTS	i
LIST OF EXHIBITS	iii
LIST OF TABLES	iv
LIST OF APPENDICES	iv
1.0 INTRODUCTION	1-1
1.1 SITE CHARACTERIZATION	1-1
1.1.1 Site Description	1-1
1.1.2 Environmental Setting	1-2
1.1.3 Adjacent Land Use	1-7
1.2 BACKGROUND	1-7
1.2.1 Chemical Usage, Handling, Storage, Treatment, and Disposal Practices	1-10
1.2.2 Waste Management Practices	1-11
1.2.3 Past Release/Spill History	1-12
1.2.4 Previous Soil Sampling and Analysis	1-12
1.2.5 Northeast Mesa Water Quality Assurance Revolving Fund Investigation	1-15
2.0 SAMPLING INVESTIGATION	2-1
2.1 RATIONALE FOR SAMPLING	2-1
2.1.1 Sample Locations and Depths	2-2
2.1.2 Rationale for Number of Samples	2-2
2.2 ANALYSIS OF SOIL SAMPLES	2-6
2.3 FIELD METHODS AND PROCEDURES	2-7
2.3.1 Sample Collection Procedures	2-9
2.3.1.1 Near-surface Soil Sampling Procedures	2-9
2.3.1.2 Hand Auger Procedures	2-10
2.3.1.3 Drilling Sampling Procedures	2-11
2.3.2 Disposal of Contaminated Materials	2-12
2.3.3 Sampling and Drilling Equipment Decontamination Procedures	2-13

TABLE OF CONTENTS, Continued

2.3.4 Sample Containers and Preservation 2-13
2.3.5 Sample Packaging and Shipment 2-16
2.3.6 Sample Documentation 2-16

2.3.6.1 Sample Labels 2-17
2.3.6.2 Sample Numbers 2-17
2.3.6.3 Field Log Book 2-18
2.3.6.4 Sample Record Form 2-18
2.3.6.5 Chain-of-custody Record and Sample Analysis Request Form 2-20
2.3.6.6 Photograph Log 2-22
2.3.6.7 Lithologic Borehole Log 2-22

2.3.7 Quality Control Samples 2-25

2.3.7.1 Background Samples 2-25
2.3.7.2 Duplicate Samples 2-26
2.3.7.3 Travel Blanks 2-26
2.3.7.4 Equipment Blanks 2-26
2.3.7.5 Field Blanks 2-26
2.3.7.6 Laboratory QA/QC Samples 2-27

2.3.8 Backfilling of Boreholes 2-27

2.4 QUALIFICATIONS OF SAMPLING AND ANALYTICAL PERSONNEL 2-27
2.5 NOTIFICATION OF ADEQ 2-28

3.0 SITE SAFETY PLAN 3-1

3.1 PURPOSE 3-1
3.2 HEALTH AND SAFETY RESPONSIBILITIES 3-1
3.3 HAZARD ASSESSMENT 3-2

3.3.1 Potential Chemical Exposure 3-2
3.3.2 Potential Physical Hazards 3-4
3.3.3 Heat Stress 3-4
3.3.4 "Blue Stake" Drilling Locations 3-5

3.4 SAFETY PROCEDURES 3-5

3.4.1 General Safety Practices 3-5
3.4.2 Personal Protective Equipment 3-6
3.4.3 Air Monitoring Guidelines 3-8
3.4.4 Recommended Drill Rig Safety Guidelines 3-8

TABLE OF CONTENTS, Continued

3.5 DESIGNATION OF WORK AREAS AT THE SITE 3-10
3.6 DECONTAMINATION PROCEDURES 3-11
3.7 EMERGENCY RESOURCES 3-13

3.7.1 Emergency Response Procedures 3-15
3.7.2 General Safety Equipment 3-16

4.0 SCHEDULE 4-1

5.0 PROVISIONS FOR AMENDMENT 5-1

6.0 REPORTING 6-1

7.0 REFERENCES 7-1

LIST OF EXHIBITS

Exhibit	Title	Page
1-1	GENERAL LOCATION MAP, TALLEY DEFENSE SYSTEMS, MESA, ARIZONA	1-3
1-2	FACILITY LOCATION MAP, TALLEY DEFENSE SYSTEMS, MESA, ARIZONA	1-4
1-3	WATER BORE-OUT PITS SITE PLAN, TALLEY DEFENSE SYSTEMS, MESA, ARIZONA	1-5
1-4	GROUND-WATER ELEVATION CONTOUR MAP IN THE VICINITY OF TALLEY DEFENSE SYSTEMS, MESA, ARIZONA	1-8
1-5	GENERALIZED LAND USE MAP IN VICINITY OF TALLEY DEFENSE SYSTEMS, MESA, ARIZONA	1-9
1-6	NORTHEAST MESA STUDY AREA	1-16
2-1	SAMPLE LOCATION MAP, WATER BORE-OUT PITS, TALLEY DEFENSE SYSTEMS, MESA, ARIZONA	2-3
2-2	SAMPLE RECORD	2-19
2-3	CHAIN-OF-CUSTODY RECORD	2-21
2-4	PHOTOGRAPH LOG	2-23

TABLE OF CONTENTS, Continued

2-5 LITHOLOGIC BOREHOLE LOG 2-24

3-1 CONTAMINATION REDUCTION SYSTEM 3-12

3-2 SITE LOCATION AND ROUTE TO THE NEAREST HOSPITAL 3-14

LIST OF TABLES

Table	Title	Page
1-1	SUMMARY OF ANALYTICAL RESULTS FOR WATER BORE-OUT PIT SOIL SAMPLES COLLECTED DURING NOVEMBER, 1990	1-14
2-1	SAMPLES PROPOSED FOR ASSESSMENT OF THE WATER BORE-OUT PITS	2-4
2-2	ANALYTICAL PARAMETERS AND METHODS FOR THE SAMPLING PROGRAM AT TALLEY'S WATER BORE-OUT PITS	2-8
2-3	SUMMARY OF EQUIPMENT CLEANING PROCEDURES	2-14
2-4	SAMPLE CONTAINER AND PRESERVATION REQUIREMENTS	2-15

LIST OF APPENDICES

Appendix	Title	Page
A	CHEMICAL COMPOUNDS TYPICALLY USED IN TALLEY'S AMMONIUM PERCHLORATE AND AMMONIUM NITRATE PROPELLANTS	A-1
B	TALLEY DEFENSE SYSTEMS' WASTE PROPELLANT COLLECTION AND BURNING PROCEDURES	B-1
C	ANALYTICAL RESULTS FROM PREVIOUS SAMPLING CONDUCTED AT THE WATER BORE-OUT PITS	
C-1	LABORATORY REPORT FOR SAMPLES COLLECTED DURING FEBRUARY, 1990	C-1
C-2	LABORATORY REPORT FOR SAMPLES COLLECTED DURING AUGUST, 1990	C-2
C-3	LABORATORY REPORT FOR SAMPLES COLLECTED DURING NOVEMBER, 1990	C-3

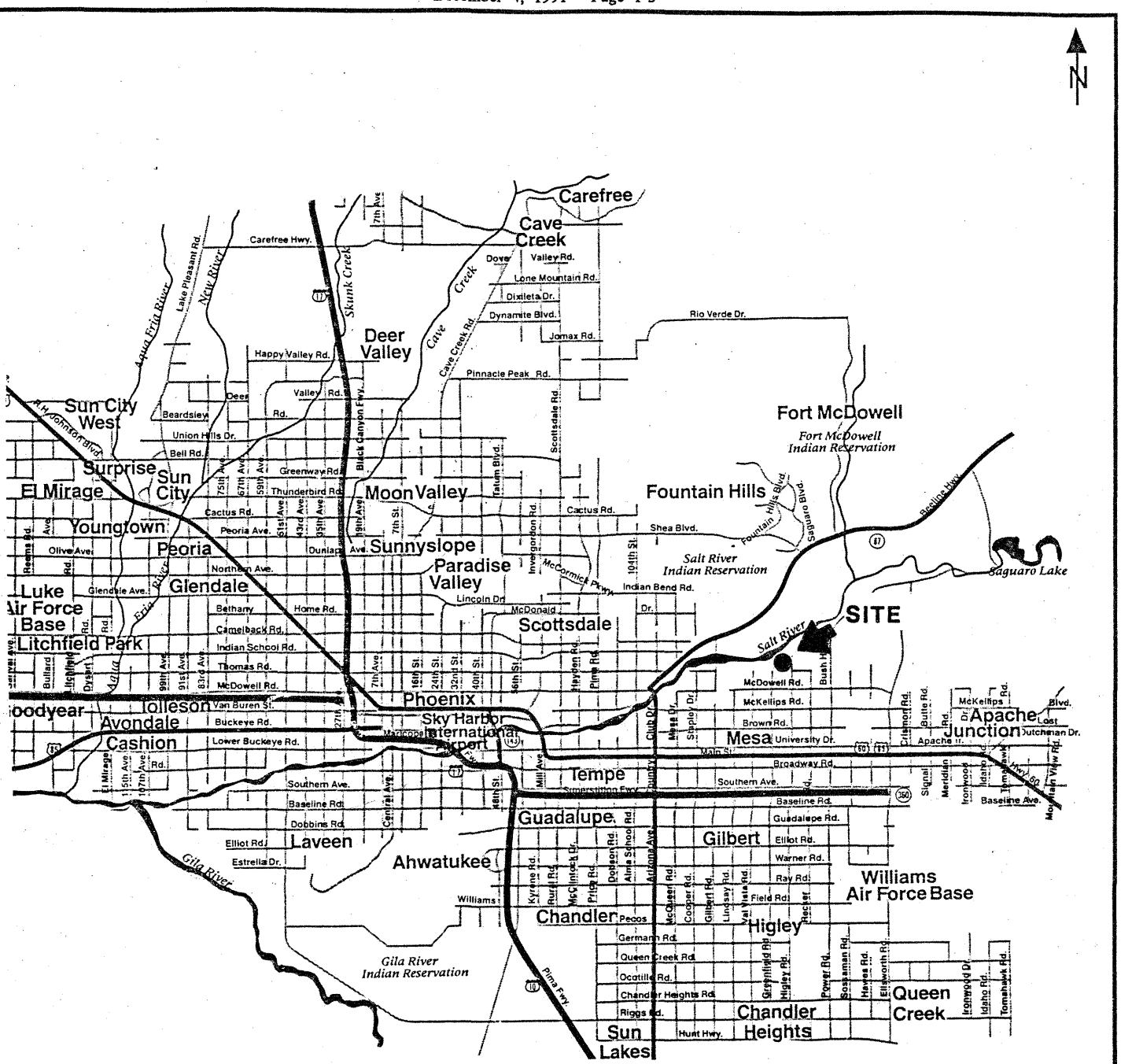
TABLE OF CONTENTS, Continued

C-4 LABORATORY REPORT FOR SAMPLES COLLECTED DURING DECEMBER, 1990 ..... C-4

D RESUMES OF SAMPLING AND ANALYTICAL PERSONNEL

D-1 BASIN & RANGE HYDROGEOLOGISTS, INC. D-1

D-2 TURNER/CAS LABORATORIES D-2


N
Carefree
Cave Creek
Carefree Hwy.
Dove Valley Rd.
Lone Mountain Rd.
Dixileta Dr.
Dynamite Blvd.
Jomax Rd.
Rio Verde Dr.
Deer Valley
Happy Valley Rd.
Pinnacle Peak Rd.
Sun City West
Beardsley
Union Hills Dr.
Bell Rd.
Surprise
Sun City
El Mirage
Greenway Rd.
Thunderbird Rd.
Moon Valley
Cactus Rd.
Youngtown
Peoria Ave.
Peoria
Dunlap Ave.
Sunnyslope
Olive Ave.
Northern Ave.
Paradise Valley
Glendale Ave.
Glendale
Luke Air Force Base
Lincoln Dr.
Indian Bend Rd.
Fort McDowell
Fort McDowell Indian Reservation
Fountain Hills
Shea Blvd.
Salt River Indian Reservation
Saguaro Lake
Bethany Home Rd.
Camelback Rd.
Indian School Rd.
Litchfield Park
Scottsdale
SITE
Salt River
Thomas Rd.
McDowell Rd.
Phoenix
Goodyear
Tolleson
Van Buren St.
Avondale
Buckeye Rd.
Sky Harbor International Airport
Cashion
Lower Buckeye Rd.
Mesa
University Dr.
Apache Junction
Tempe
Southern Ave.
Baseline Rd.
Guadalupe
Dobbins Rd.
Elliot Rd.
Laveen
Estrella Dr.
Gilbert
Warner Rd.
Ahwatukee
Ray Rd.
Williams Air Force Base
Williams
Chandler
Pecos
Higley
Germann Rd.
Queen Creek Rd.
Ocotillo Rd.
Chandler Heights Rd.
Riggs Rd.
Hunt Hwy.
Sun Lakes
Chandler Heights
Queen Creek
Gila River Indian Reservation
Gila River
Skunk Creek
Cave Creek
Aqua Fria River
New River
Lake Pleasant Rd.
Black Canyon Fwy.
Scottsdale Rd.
Tatum Blvd.
McDonald Dr.
McKellips Rd.
Brown Rd.
Main St.
Broadway Rd.
Southern Ave.
Baseline Rd.
Guadalupe Rd.
Elliot Rd.
Warner Rd.
Ray Rd.
Field Rd.
Pecos
Germann Rd.
Queen Creek Rd.
Ocotillo Rd.
Chandler Heights Rd.
Riggs Rd.
Hunt Hwy.
Pima Fwy.
Beeline Hwy.
Superstition Fwy.
Apache Tr.
Dutchman Dr.
Baseline Ave.
Mountain View Rd.
Hwy. 60
Signal Butte Rd.
Meridian Rd.
Ironwood Dr.
Idaho Rd.
Tomahawk Rd.
Greenfield Rd.
Power Rd.
Sossaman Rd.
Hawes Rd.
Ellsworth Rd.
Lindsay Rd.
Val Vista Rd.
Gilbert Rd.
Cooper Rd.
McQueen Rd.
Alma School Rd.
Dobson Rd.
Price Rd.
McClintock Dr.
Rural Rd.
Kyrene Rd.
Hayden Rd.
Pima Rd.
Mill Ave.
Central Ave.
Arizona Ave.
Country Club Dr.
Mesa Dr.
Sipple Dr.
Crismon Rd.
Bush Hwy.
Lost Dutchman Blvd.
McKellips Rd.
Apache Blvd.
Tatum Blvd.
Invergordon Rd.
McCormick Pkwy.
Scottsdale Rd.
Black Canyon Fwy.
Cave Creek Rd.
Skunk Creek
Cave Creek
Aqua Fria River
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New River
Reems Rd.
Olive Ave.
Bullard Ave.
Litchfield Rd.
Dysart Rd.
Avondale Blvd.
Cashion Rd.
El Mirage Rd.
Central Ave.
Dobbins Rd.
Baseline Rd.
Southern Ave.
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Main St.
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Tempe
Phoenix
Scottsdale
Glendale
Peoria
Youngtown
Surprise
El Mirage
Sun City West
Sun City
Moon Valley
Sunnyslope
Paradise Valley
Fountain Hills
Fort McDowell
Litchfield Park
Goodyear
Tolleson
Avondale
Cashion
Laveen
Ahwatukee
Guadalupe
Apache Junction
Williams Air Force Base
Luke Air Force Base
Salt River
Saguaro Lake
Fountain Hills Blvd.
Sequoia Blvd.
McDowell Rd.
McKellips Rd.
Brown Rd.
University Dr.
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Southern Ave.
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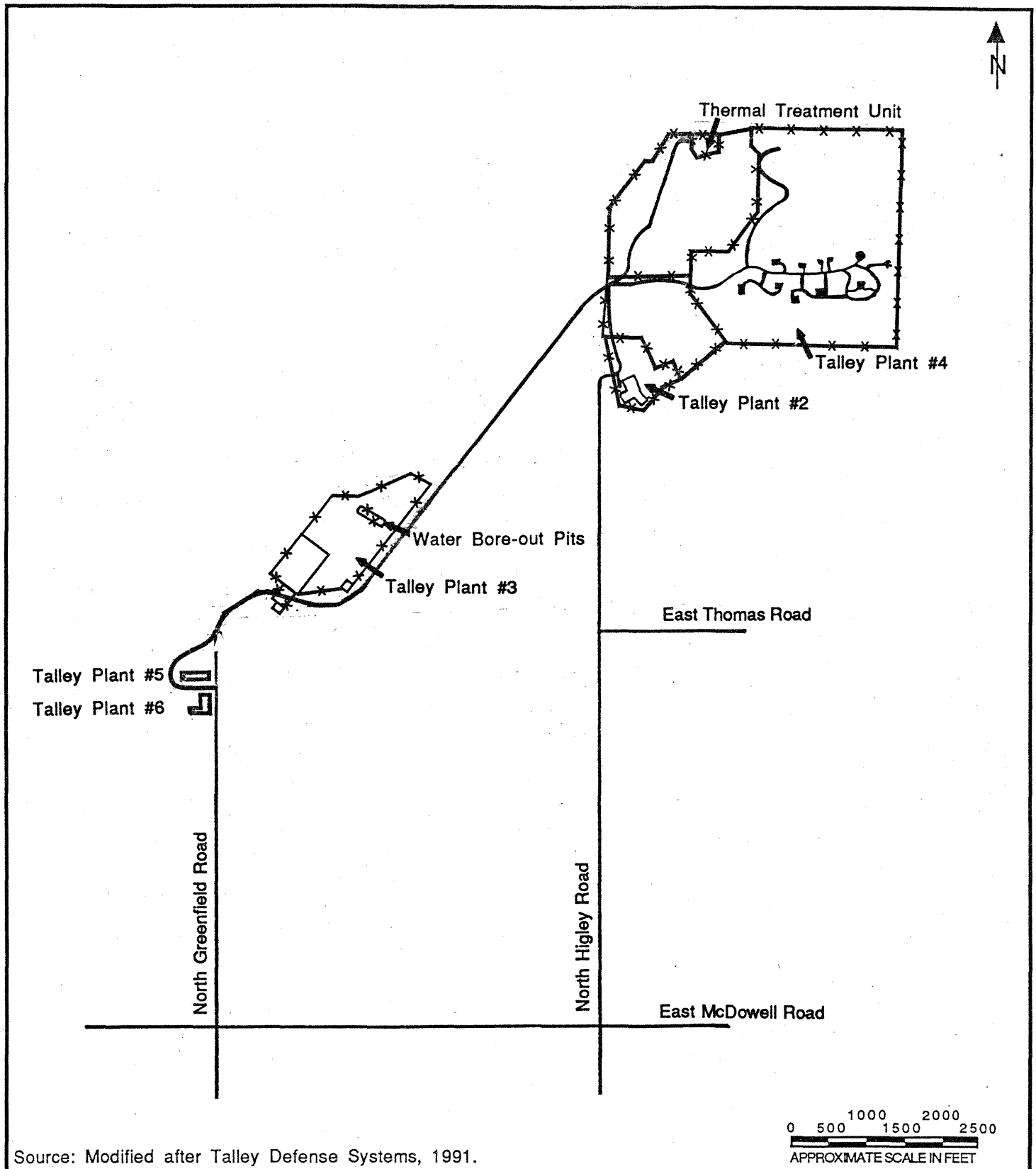
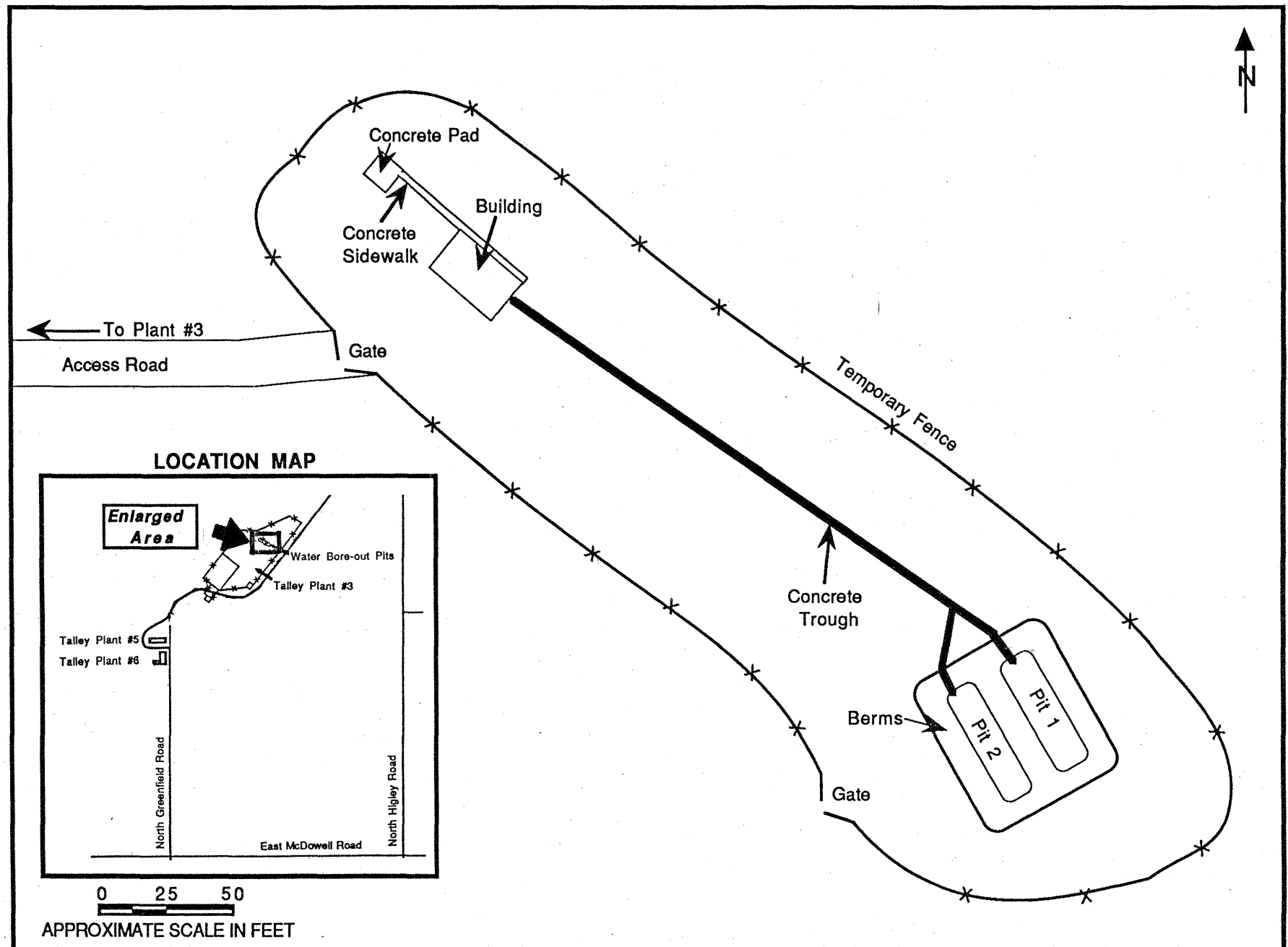
Hunt H



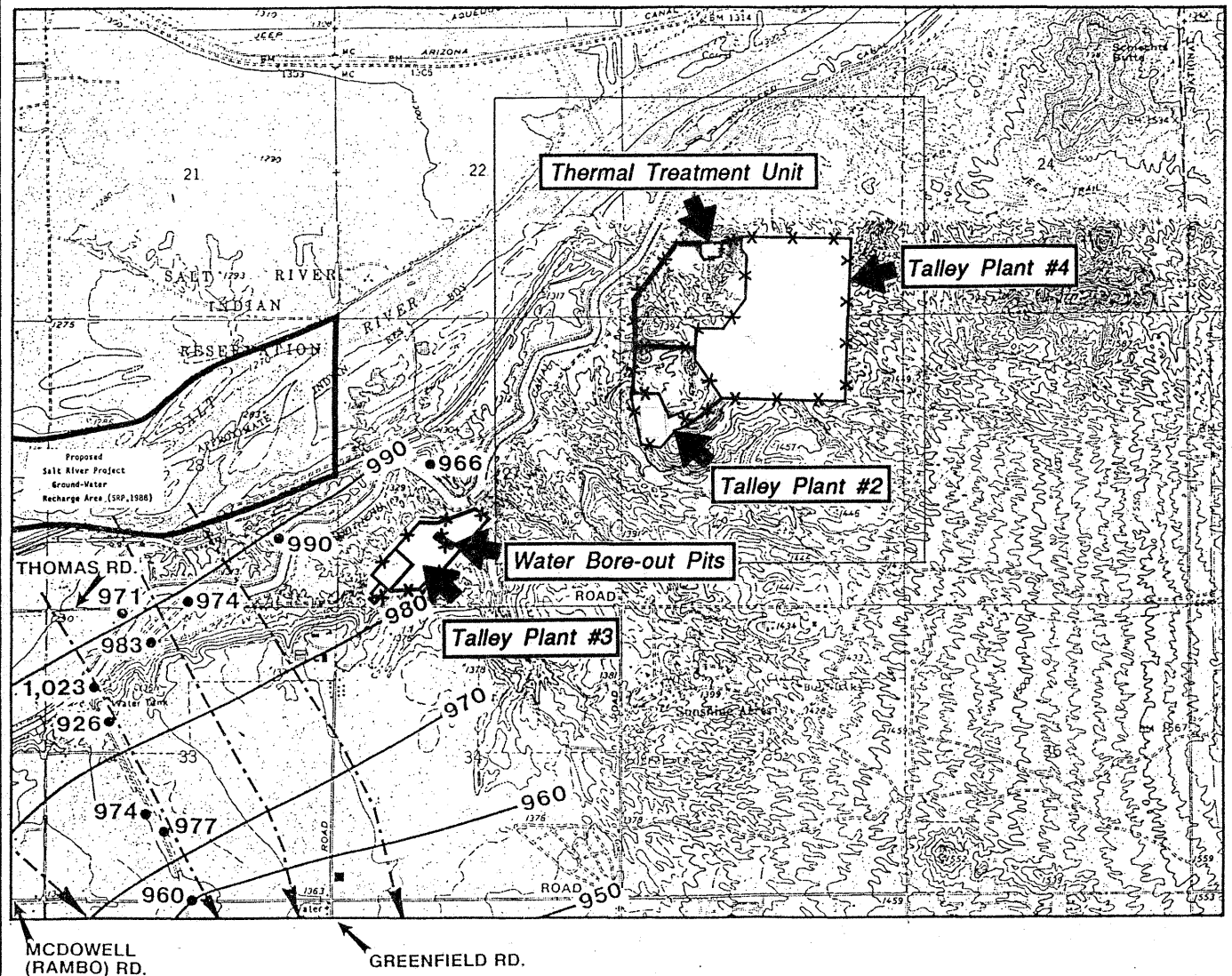
Source: Modified after Talley Defense Systems, 1991.

BASIN & RANGE HYDROGEOLOGISTS, INC. PHOENIX, ARIZONA	FACILITY LOCATION MAP TALLEY DEFENSE SYSTEMS MESA, ARIZONA	EXHIBIT 1 - 2
FILE NO.: 91-108-001	BASIN & RANGE	DATE: DECEMBER 4, 1991



BASIN & RANGE

BASIN & RANGE HYDROGEOLOGISTS, INC., PHOENIX, ARIZONA		WATER BORE-OUT PITS SITE PLAN TALLEY DEFENSE SYSTEMS MESA, ARIZONA	EXHIBIT 1 - 3
DATE: DECEMBER 4, 1991	FILE NO.: 91-108-001		



BASE MAP: U.S. G.S. 7-1/2 MINUTE SERIES - GRANITE REEF AND BUCKHORN QUADRANGLES, 1982.

EXPLANATION

990• Measured well and water-level elevation in feet above mean sea level

920 Water-level elevation contour in feet above mean sea level as interpreted by SRP, 1988

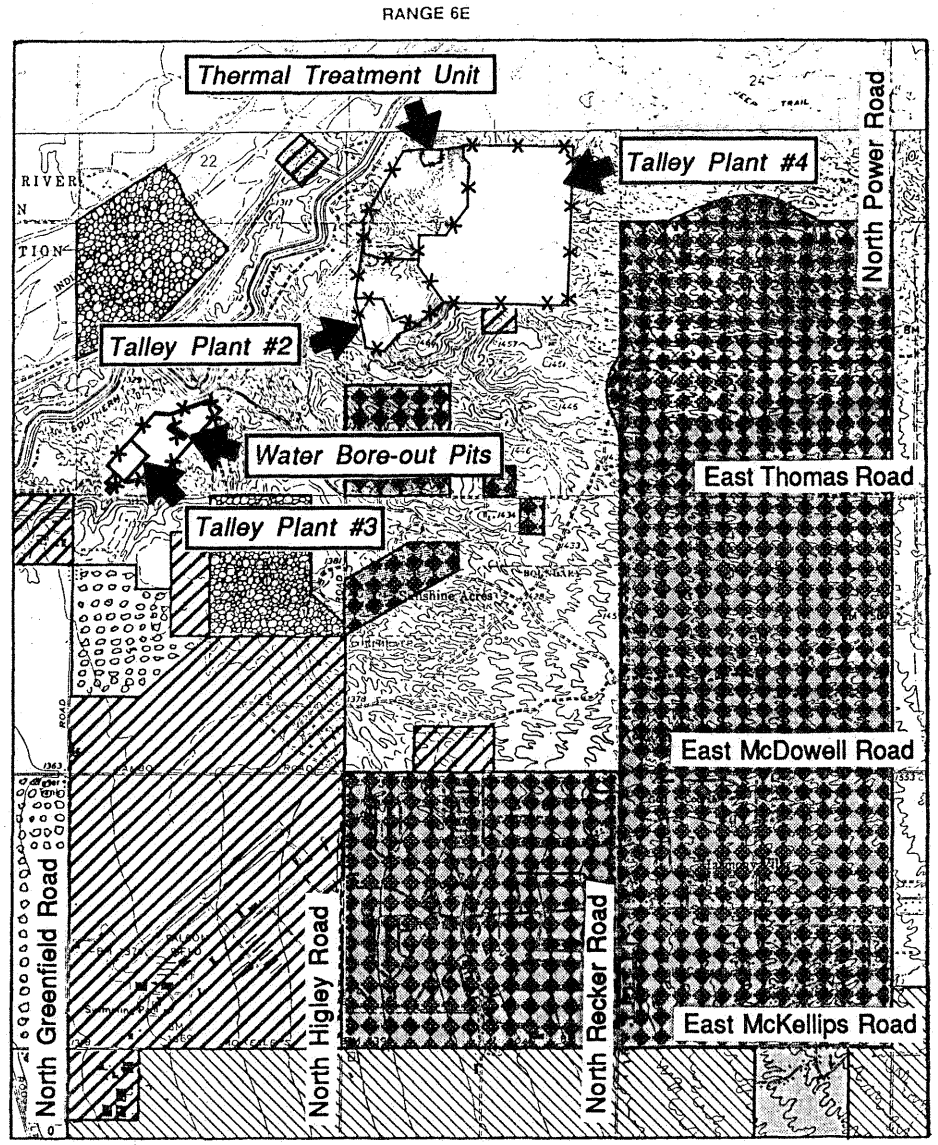
Direction of ground-water flow

0 2000 4000
APPROXIMATE SCALE IN FEET

Source: Modified after Salt River Project, 1988.

BASIN & RANGE

BASIN & RANGE HYDROGEOLOGISTS, INC., PHOENIX, ARIZONA	GROUND-WATER ELEVATION CONTOUR MAP IN THE VICINITY OF TALLEY DEFENSE SYSTEMS MESA, ARIZONA	EXHIBIT 1 - 4
DATE: DECEMBER 4, 1991 / FILE NO.: 91-108-001		



BASE MAP SOURCE: U.S. GEOLOGICAL SURVEY, 7-1/2 MINUTE SERIES
GRANITE REEF AND BUCKHORN QUADRANGLES, 1982

N

EXPLANATION

- Industrial
- Sand and Gravel Operations
- Agriculture (Citrus)
- Residential / Private
- Undeveloped or vacant
- Commercial / Services

0 2000 4000
APPROXIMATE SCALE IN FEET

Source: Modified after Basin & Range Hydrogeologists, Inc., 1988.

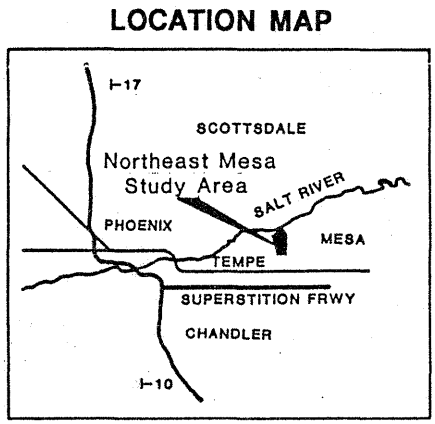
BASIN & RANGE

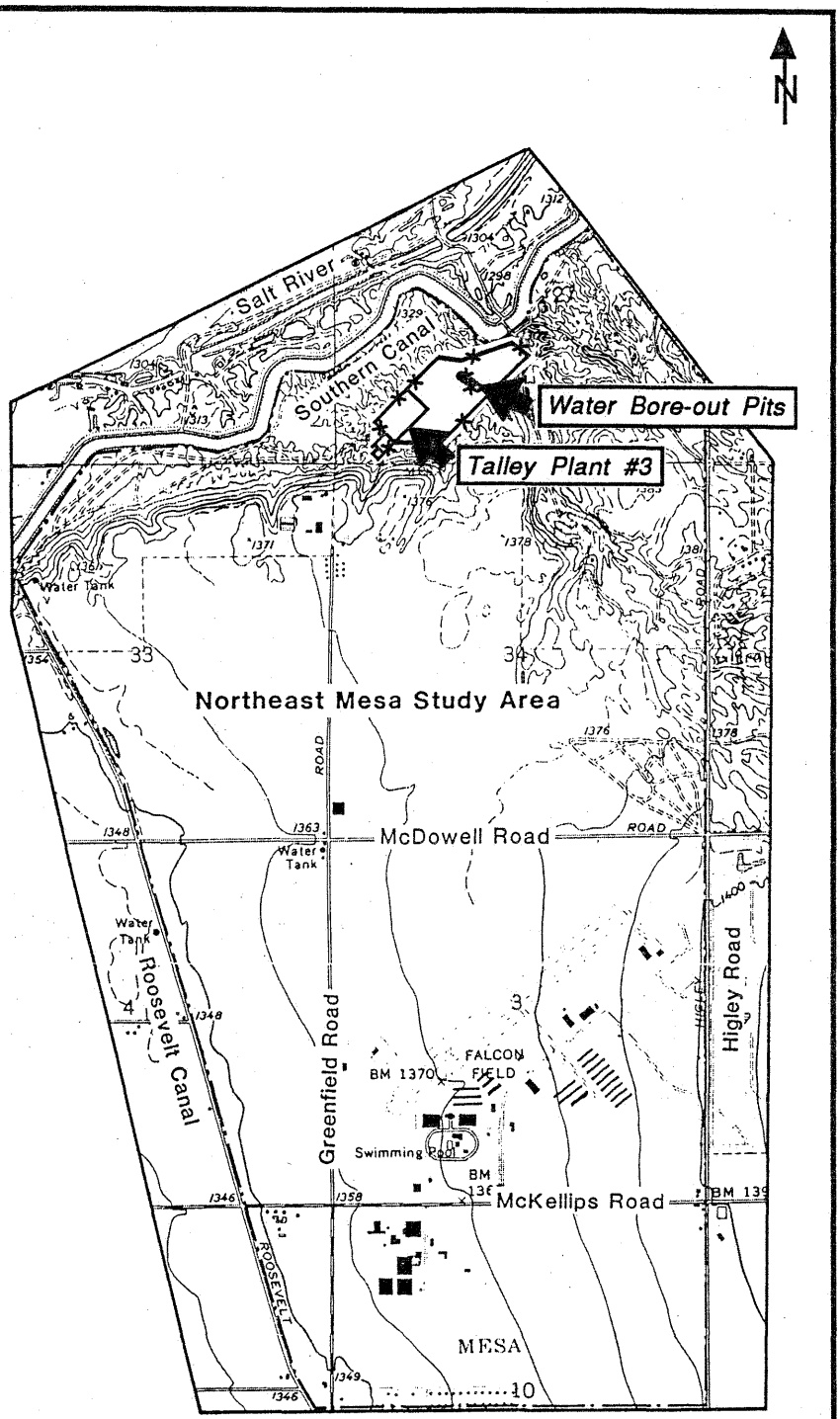
BASIN & RANGE HYDROGEOLOGISTS, INC., PHOENIX, ARIZONA	GENERALIZED LAND USE MAP IN VICINITY OF TALLEY DEFENSE SYSTEMS MESA, ARIZONA	EXHIBIT 1 - 5
DATE: DECEMBER 4, 1991 / FILE NO.: 91-108-001		

TABLE 1-1. SUMMARY OF ANALYTICAL RESULTS FOR WATER BORE-OUT PIT SOIL SAMPLES COLLECTED DURING NOVEMBER, 1990

Location	Sample No.	Depth (ft)	Analytical Results (total concentration in mg/kg)				
			Ammonium Perchlorate	Cadmium	Chromium	Lead	Nitrate
Pit # 1	TDS3-11/9/90-LJ-1-1	0	4,400	<4 (1)	6	12	151
Pit # 1	TDS3-11/9/90-LJ-1-2	1	18,000	6	9	210	97
Pit # 1	TDS3-11/9/90-LJ-1-3	2	1,830	<4	3	39	64
Pit # 1	TDS3-11/9/90-LJ-1-4	3	615	<4	5	7	55
Pit # 2	TDS3-11/9/90-LJ-2-1	0	705	7	13	192	123
Pit # 2	TDS3-11/9/90-LJ-2-2	1	105	26	9	6	98
Pit # 2	TDS3-11/9/90-LJ-2-3	2	152	22	8	6	51
Pit # 2	TDS3-11/9/90-LJ-2-4	3	170	17	7	15	63
Background	TDS3-11/9/90-LJ-3-1	0	NA(2)	<4	7	12	32
Background	TDS3-11/9/90-LJ-3-2	1	NA	<4	7	6	19
ADEQ's Draft Health Based Guidance Level for Soil			NE(3)	100	2,000	400	200,000

NOTES:
(1) Constituent not detected at the indicated detection limit
(2) NA - Not Analyzed
(3) NE - Not Established

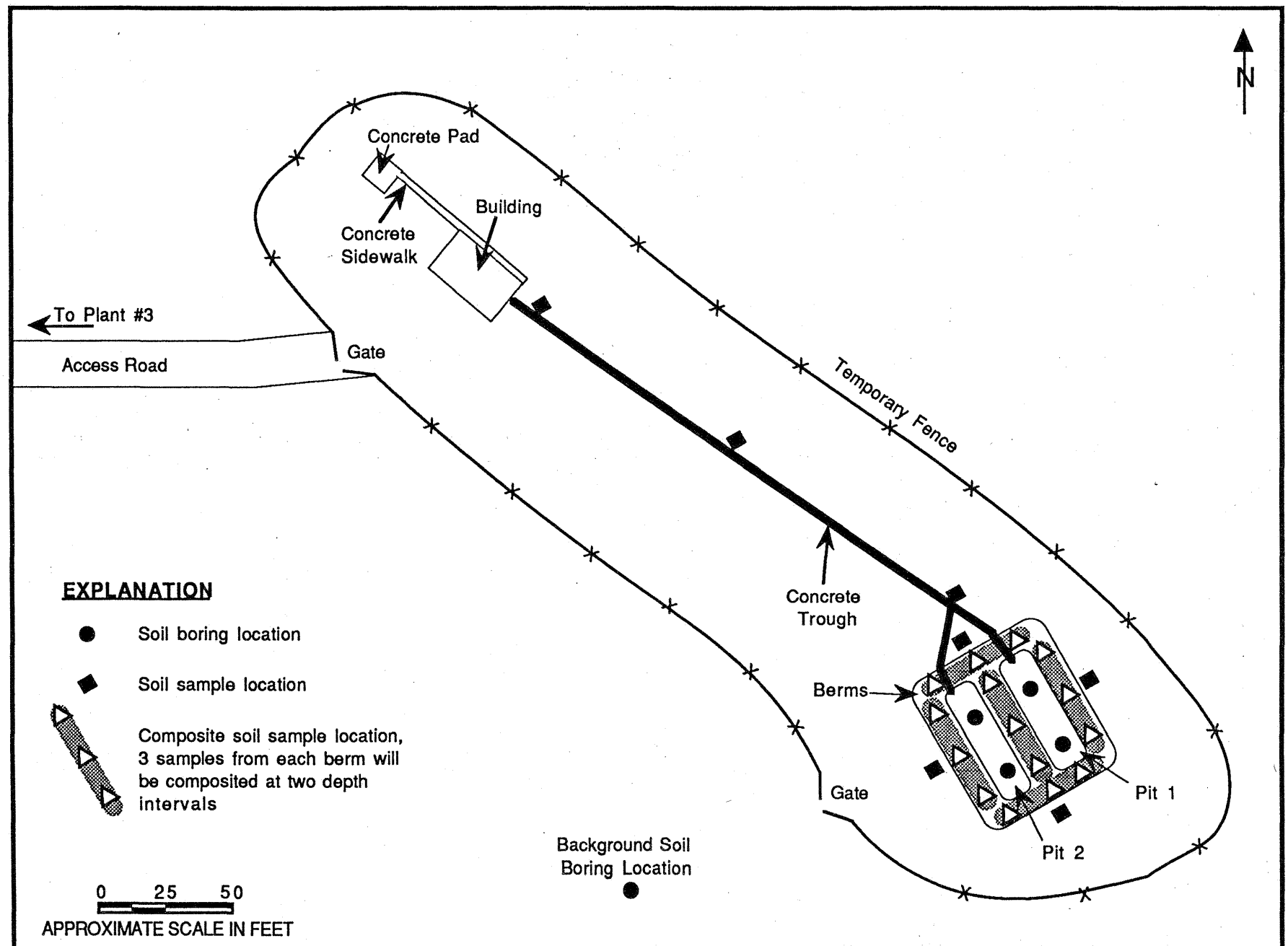




0 1000 2000 3000 4000 5000
APPROXIMATE SCALE IN FEET

Source: Modified after The Earth Technology Corporation, 1988.

BASIN & RANGE HYDROGEOLOGISTS, INC. PHOENIX, ARIZONA	NORTHEAST MESA STUDY AREA	EXHIBIT 1 - 6
FILE NO.: 91-108-001	BASIN & RANGE	DATE: DECEMBER 4, 1991



BASIN & RANGE

BASIN & RANGE HYDROGEOLOGISTS, INC., PHOENIX, ARIZONA	SAMPLE LOCATION MAP WATER BORE-OUT PITS TALLEY DEFENSE SYSTEMS MESA, ARIZONA	EXHIBIT 2 - 1
DATE: DECEMBER 4, 1991 / FILE NO.: 91-108-001		

TABLE 2-1. SAMPLES PROPOSED FOR ASSESSMENT OF THE WATER BORE-OUT PITS

	Depth Interval (feet below grade)							Total
	0	0.5	2.5	5	10	15	20	
Bore-out Pits	4	0	4	4	4	4	4	24
Berms	5	5	0	0	0	0	0	10
Surrounding Area	4	4	0	0	0	0	0	8
Trough Joints	3	3	0	0	0	0	0	6
Duplicates	5	0	0	0	0	0	0	5
Background	1	1	1	1	1	1	1	7
Blanks								
Field	NA	NA	NA	NA	NA	NA	NA	2
Equipment	NA	NA	NA	NA	NA	NA	NA	2
Trip	NA	NA	NA	NA	NA	NA	NA	2
Total	22	13	5	5	5	5	5	66

SITE ASSESSMENT REPORT
WATER BORE-OUT PITS
TALLEY DEFENSE SYSTEMS
MESA, ARIZONA

Prepared for

TALLEY DEFENSE SYSTEMS
3500 North Greenfield Road
P.O. Box 849
Mesa, Arizona 85211-0849

by

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REGISTERED GEOLOGIST
CERTIFICATE NO.
26390
DAVID L.
KIRCHNER
Date Signed 3/3/97
ARIZONA U.S.A.

March 3, 1997

TABLE OF CONTENTS

		Page
TABLE OF CONTENTS		i
LIST OF EXHIBITS		i
LIST OF TABLES		ii
LIST OF APPENDICES		ii
1.0	INTRODUCTION	1
1.1	SITE DESCRIPTION	1
1.2	ENVIRONMENTAL SETTING	1
2.0	FIELD INVESTIGATION	2
3.0	ANALYTICAL RESULTS	4
3.1	SOIL SAMPLES	4
3.2	QUALITY CONTROL SAMPLES	5
3.3	DECONTAMINATION RINSATES	6
4.0	SUMMARY AND CONCLUSIONS	6
5.0	REFERENCES	7

LIST OF EXHIBITS

Exhibit	Title
1	SITE LOCATION AND VICINITY MAP, WATER BORE-OUT PITS, TALLEY DEFENSE SYSTEMS, MESA, ARIZONA
2	PLANT LOCATION MAP, TALLEY DEFENSE SYSTEMS
3	SITE PLAN, WATER BORE-OUT PITS
4	GEOLOGIC MAP
5	LOCATIONS OF WELLS IN THE VICINITY OF THE WATER BORE-OUT PITS
6	SAMPLE LOCATION MAP, WATER BORE-OUT PITS

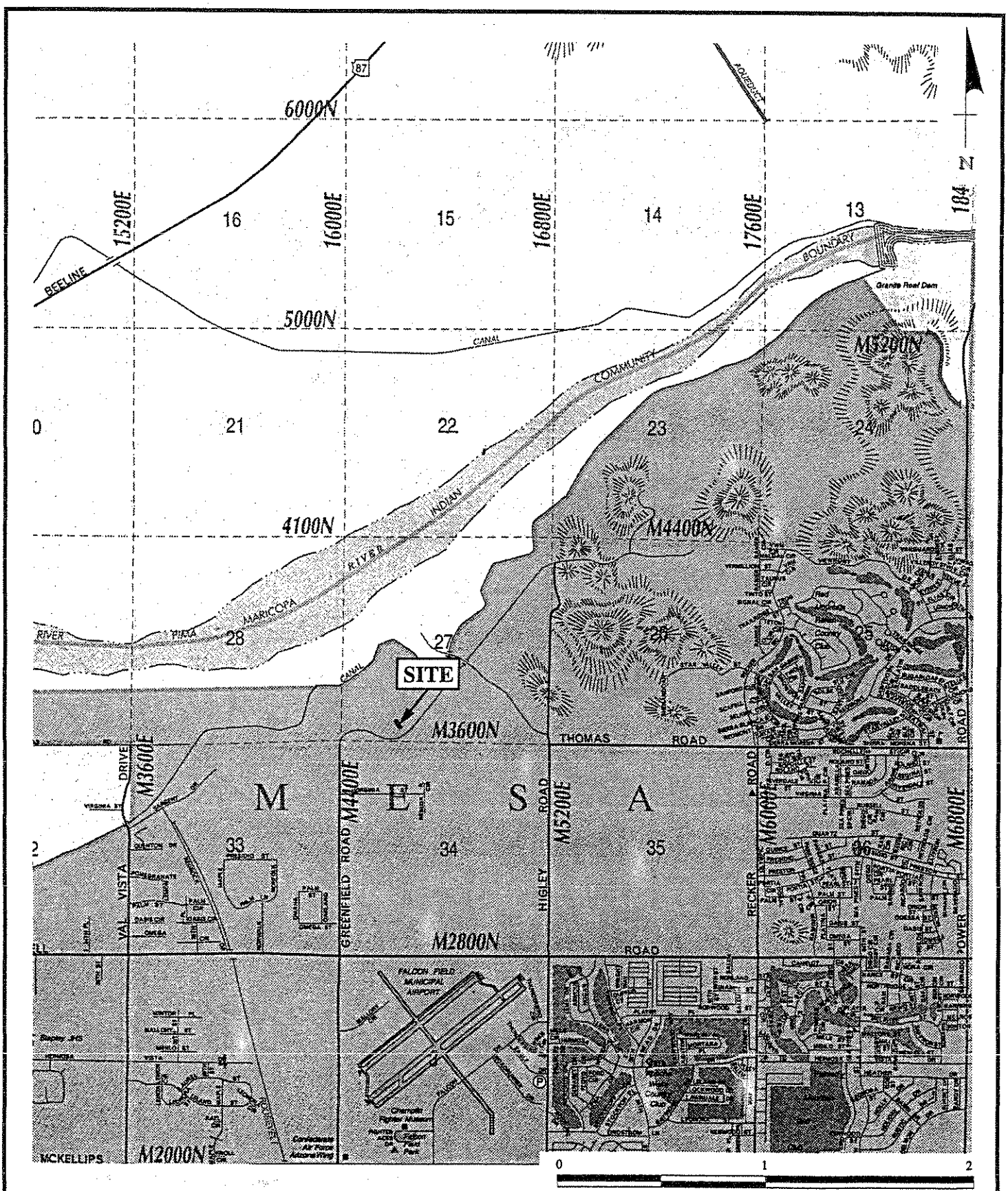
LIST OF TABLES

Table	Title
1	SUMMARY OF SOIL SAMPLES COLLECTED DURING THE SITE ASSESSMENT
2	ANALYTICAL RESULTS OF TESTS FOR METALS
3	ANALYTICAL RESULTS OF TESTS FOR TOTAL PERCHLORATE

LIST OF APPENDICES

Appendix	Title
A	LITHOLOGIC BOREHOLE LOGS
B	LABORATORY REPORTS

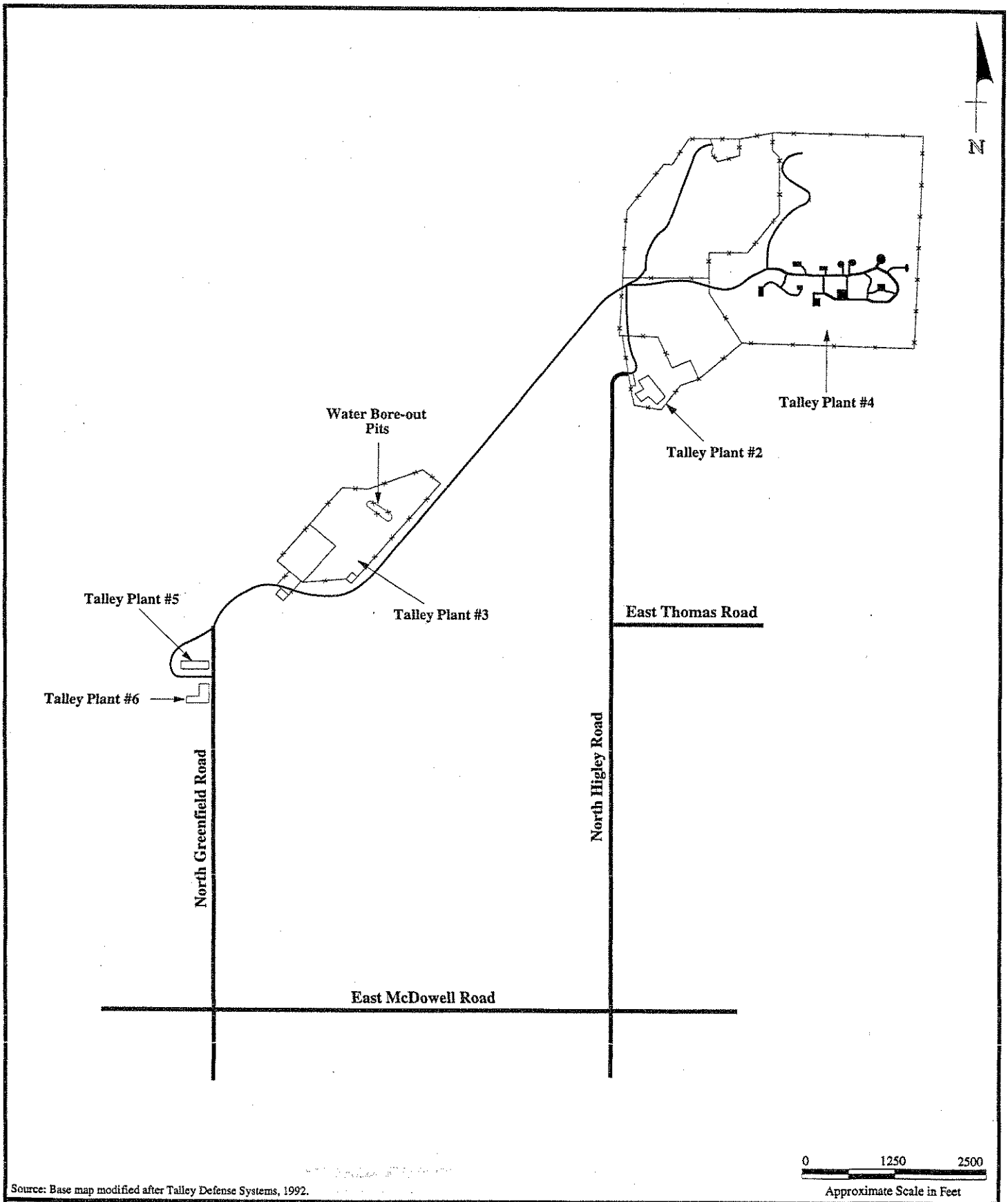
94447/WBO RPT/030297



Source: Base map modified after Wide World of Maps, Inc., 1996. Reproduced with Permission No. 970204-A.

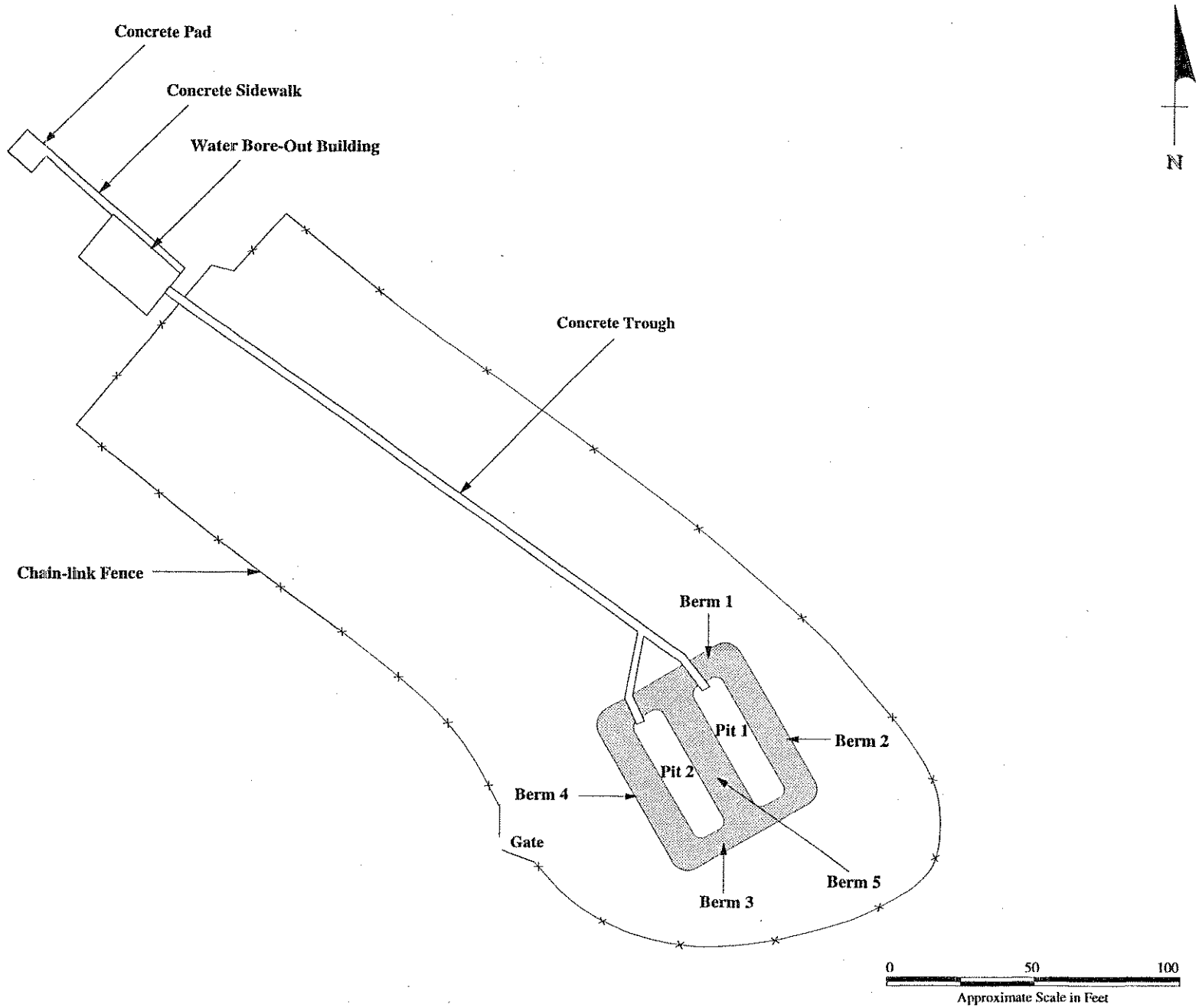
CLIENT: TALLEY DEFENSE SYSTEMS	BASIN & RANGE	SITE LOCATION AND VICINITY MAP WATER BORE-OUT PITS TALLEY DEFENSE SYSTEMS MESA, ARIZONA	EXHIBIT 1

94447/EXH1/022597



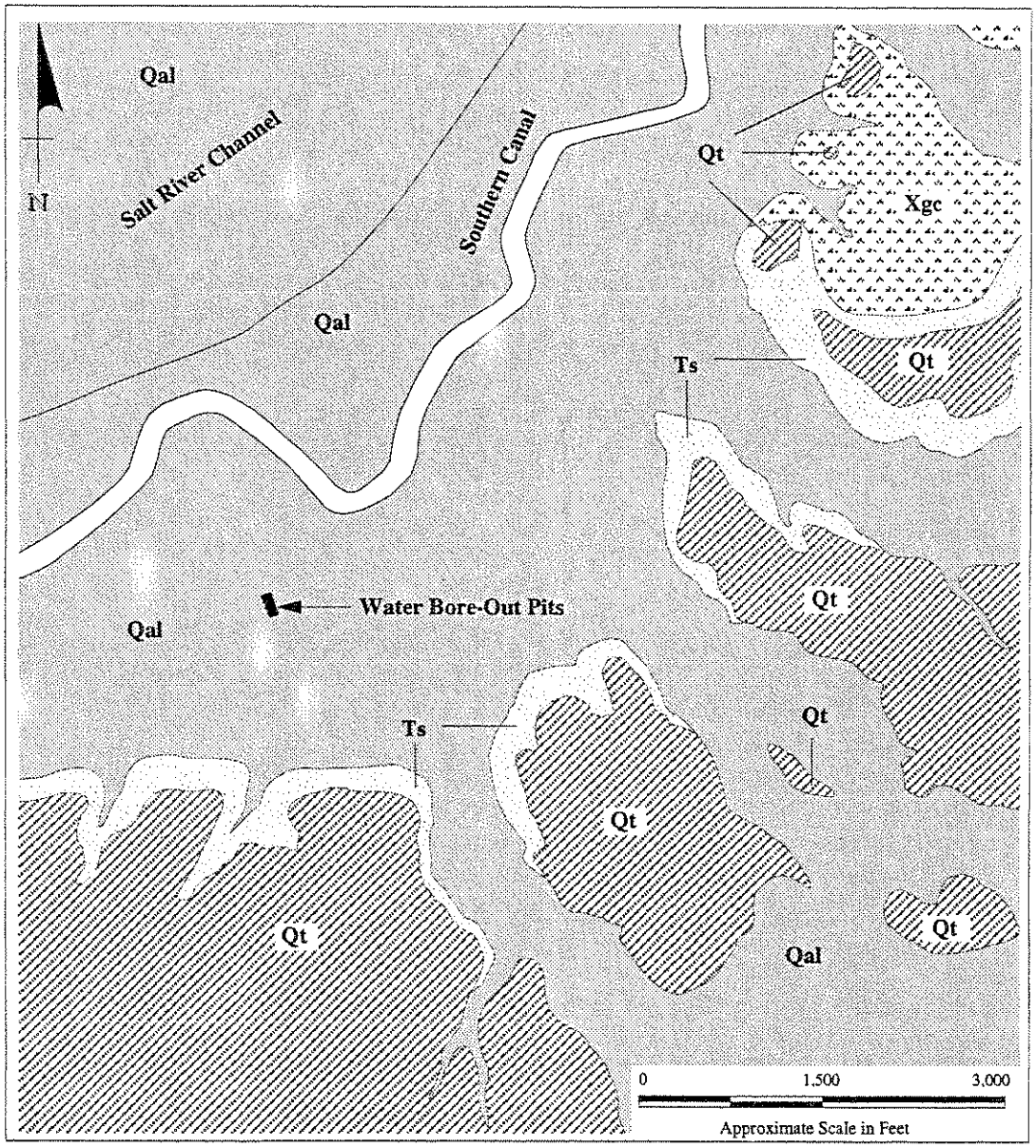
Source: Base map modified after Talley Defense Systems, 1992.

CLIENT: TALLEY DEFENSE SYSTEMS	BASIN & RANGE	PLANT LOCATION MAP TALLEY DEFENSE SYSTEMS	EXHIBIT 2



CLIENT: TALLEY DEFENSE SYSTEMS	BASIN & RANGE	SITE PLAN WATER BORE-OUT PITS	EXHIBIT 3

96777/EXH3AA022597

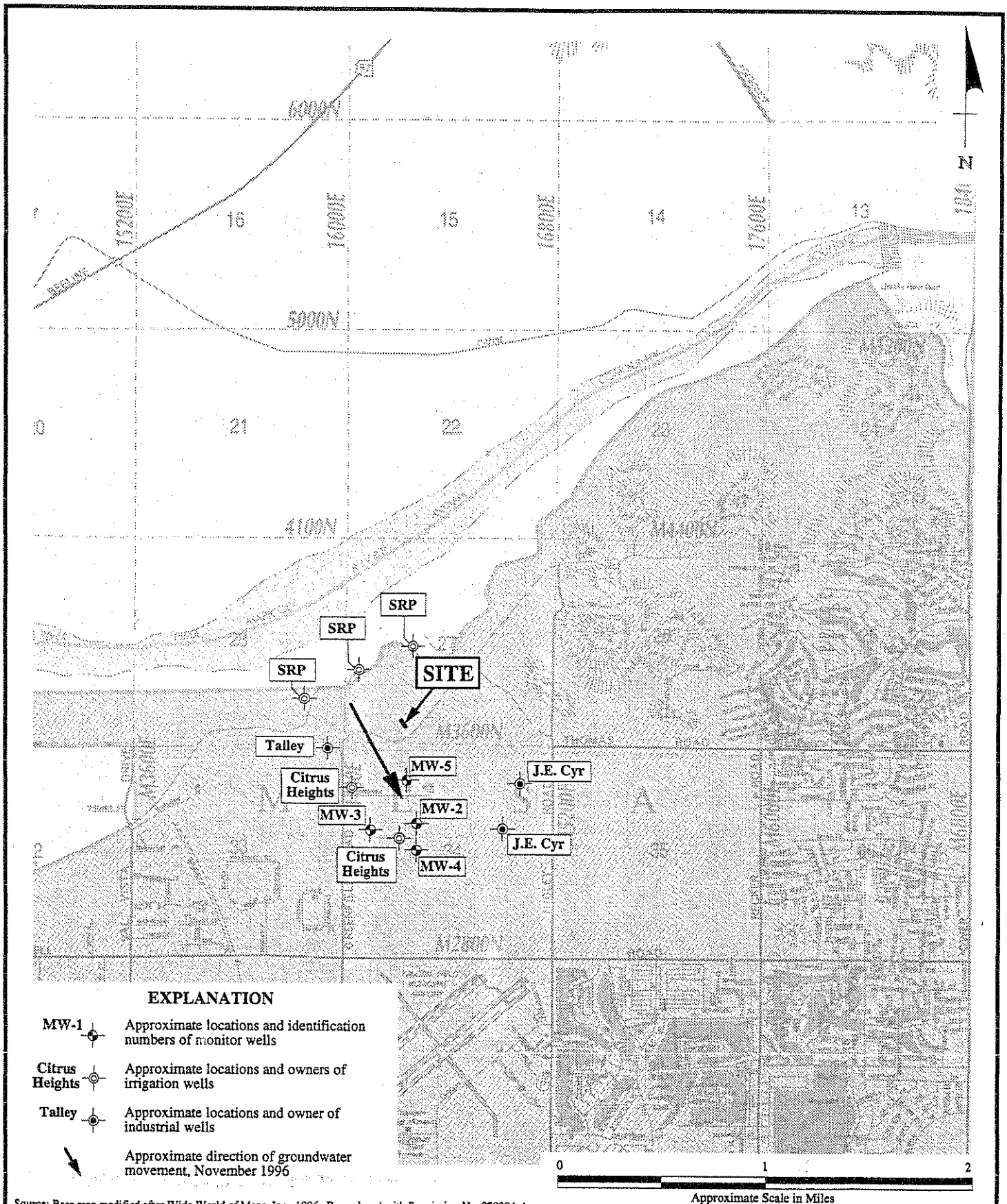


EXPLANATION

- Qal: Quaternary alluvium
- Qt: Quaternary river terrace deposits, undifferentiated
- Ts: Tertiary basin fill deposits
- Xgc: Precambrian medium- to coarse-grained granite

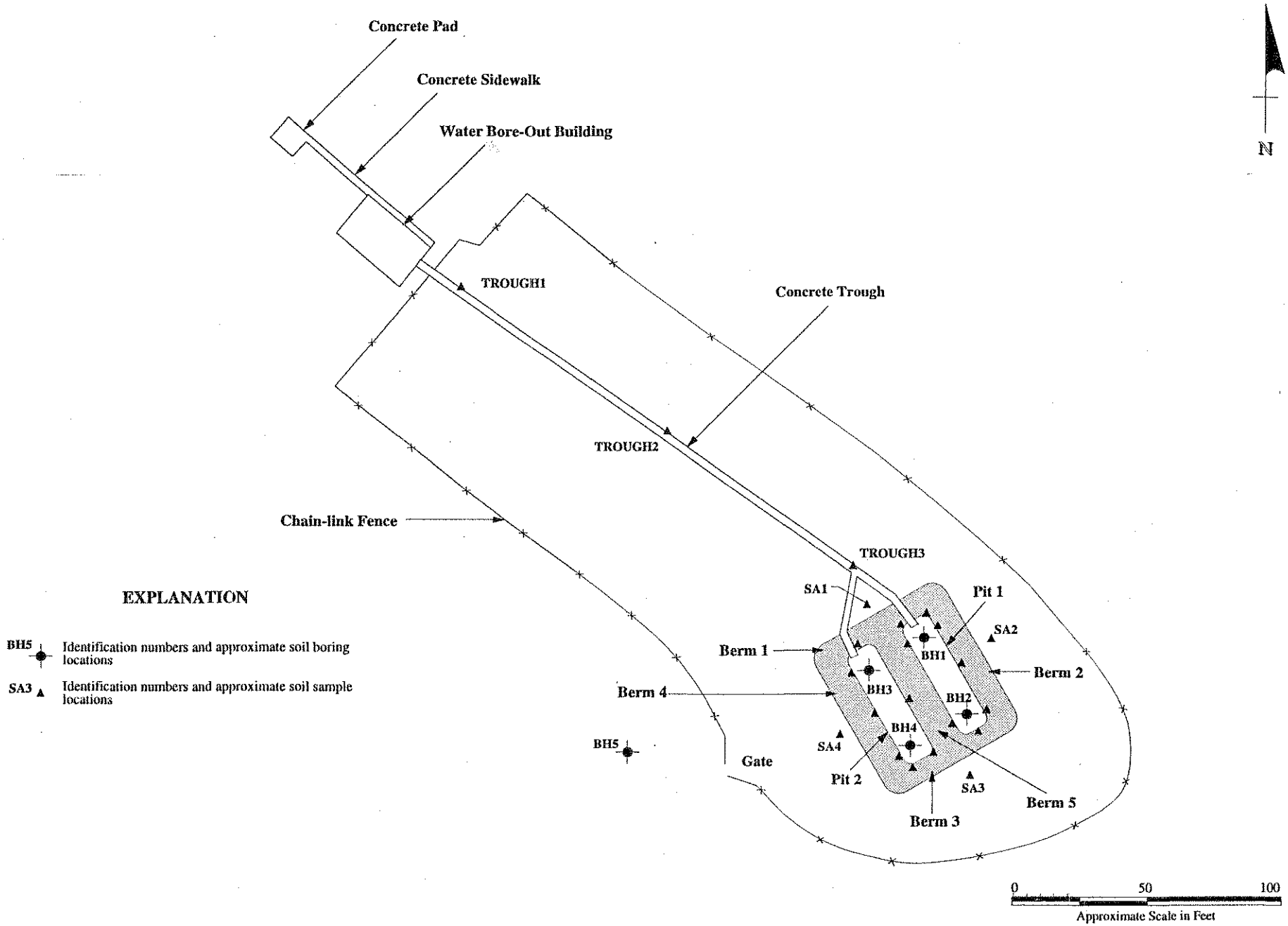
Source: Modified after Skotnicki (1995), Skotnicki and Ferguson (1996).

CLIENT: TALLEY DEFENSE SYSTEMS	BASIN & RANGE	GEOLOGIC MAP	EXHIBIT 4



Source: Base map modified after Wide World of Maps, Inc., 1996. Reproduced with Permission No. 970204-A.

CLIENT: TALLEY DEFENSE SYSTEMS	BASIN & RANGE	LOCATIONS OF WELLS IN THE VICINITY OF THE WATER BORE-OUT PITS TALLEY DEFENSE SYSTEMS	EXHIBIT 5



CLIENT: TALLEY DEFENSE SYSTEMS	BASIN & RANGE	SAMPLE LOCATION MAP WATER BORE-OUT PITS	EXHIBIT 6

96777/EXH6A/022597

TABLE 1. SUMMARY OF SOIL SAMPLES COLLECTED DURING THE SITE ASSESSMENT

Sample Identification[1]	Sample Depth[2] (feet)	Date Collected	Analyses Requested					
			Total Cd, Cr, Pb	TCLP Pb	S-VOCs	VOCs	Total Perchlorate	HOLD
PIT 1								
WBO-BH1/2-0.2[3]	0.2	12/03/96	X	X			X	
WBO-BH1/2-0.3[3] [4]	0.2	12/03/96	X				X	
WBO-BH1/2-2.5[3]	2.5	12/04/96					X	
WBO-BH1-2.5	2.5	12/04/96			X	X		
WBO-BH1-5	5	12/04/96	X					
WBO-BH1/2-10[3]	10	12/04/96					X	
WBO-BH1-10	10	12/04/96						X
WBO-BH2-2.5	2.5	12/04/96				X		
WBO-BH2-3	2.5	12/04/96						X
WBO-BH2-5	5	12/04/96	X					
WBO-BH2-8	8	12/04/96						X
PIT 2								
WBO-BH3/4-0.2[3]	0.2	12/03/96	X				X	
WBO-BH3/4-2.5[3]	2.5	12/04/96					X	
WBO-BH3-2.5	2.5	12/04/96			X	X		
WBO-BH3-5	5	12/04/96						X
WBO-BH3/4-10[3]	10	12/04/96					X	
WBO-BH3-10	10	12/04/96						X
WBO-BH4-2.5	2.5	12/04/96				X		
WBO-BH4-3[4]	2.5	12/04/96						X
WBO-BH4-5	5	12/04/96						X
WBO-BH4-9	9	12/04/96						X
BERMS								
WBO-Berm1-0.2[3]	0.2	12/03/96	X	X				
WBO-Berm1-0.3[3] [4]	0.2	12/03/96	X					
WBO-Berm1-1[3]	1	12/03/96						X
WBO-Berm2-0.2[3]	0.2	12/03/96	X	X				
WBO-Berm2-1[3]	1	12/03/96						X
WBO-Berm3-0.2[3]	0.2	12/03/96	X					
WBO-Berm3-1[3]	1	12/03/96						X
WBO-Berm4-0.2[3]	0.2	12/03/96	X					
WBO-Berm4-1[3]	1	12/03/96						X
WBO-Berm5-0.2[3]	0.2	12/03/96	X					
WBO-Berm5-1[3]	1	12/03/96						X
TROUGHS								
WBO-Trough1-0.2	0.2	12/03/96	X					
WBO-Trough1-1	1	12/03/96						X
WBO-Trough2-0.2	0.2	12/03/96	X					
WBO-Trough2-1	1	12/03/96						X
WBO-Trough3-0.2	0.2	12/03/96	X					
WBO-Trough3-1	1	12/03/96						X
SURROUNDING AREA								
WBO-SA1-0.2	0.2	12/03/96	X					
WBO-SA1-1	1	12/03/96						X
WBO-SA2-0.2	0.2	12/03/96	X					
WBO-SA2-2	1	12/03/96						X
WBO-SA3-0.2	0.2	12/03/96	X					

TABLE 1. SUMMARY OF SOIL SAMPLES COLLECTED DURING THE SITE ASSESSMENT (Continued)

Sample Identification[1]	Sample Depth[2] (feet)	Date Collected	Analyses Requested					
			Total Cd, Cr, Pb	TCLP Pb	S-VOCs	VOCs	Total Perchlorate	HOLD
WBO-SA3-1	1	12/03/96						X
WBO-SA4-0.2	0.2	12/03/96	X					
WBO-SA4-1	1	12/03/96						X
BACKGROUND								
WBO-BH5-0.2	0.2	12/03/96	X				X	
WBO-BH5-2.5	2.5	12/04/96			X	X		
WBO-BH5-5	5	12/04/96						X
WBO-BH5-10	10	12/04/96					X	
QUALITY ASSURANCE/QUALITY CONTROL								
WBO-EB1	Water	12/03/96	X				X	
WBO-EB2	Water	12/04/96	X			X	X	
WBO-FB1	Water	12/03/96						X
WBO-FB2	Water	12/04/96				X		
WBO-TB1	Water	12/04/96						X
WBO-TB2	Water	12/04/96				X		
WBO-MB	Methanol	12/04/96				X		
DECONTAMINATION RINSATES								
WBO-DR	Water	12/04/96		X	X	X	X	

NOTES:
(1) Approximate locations of soil samples are shown on *Exhibit 6.*
(2) Vertical depth in feet below ground surface.
(3) Composite sample
(4) Duplicate sample

94447/WBO Tbl 1/022897

TABLE 2. ANALYTICAL RESULTS OF TESTS FOR METALS

Sample Identification[1]	Sample Depth[2] (feet)	Total Cadmium (mg/kg)[3]	Total Chromium (mg/kg)	Total Lead (mg/kg)	TCLP Lead (mg/L)[4]
Non-Residential HBGLs[5]		244	5,950	1,400	–
RCRA Regulatory Levels[6]		–	–	–	5.0
20xRCRA Regulatory Levels[7]		20	100	100	–
PIT 1					
WBO-BH1/2-0.2[8]	0.2	11.6	10.6	1,100	0.45
WBO-BH1/2-0.3[8][9]	0.2	10.9	13.4	1,270	NA[10]
WBO-BH1-5	5	NA	NA	5.96	NA
WBO-BH2-5	5	NA	NA	<3.29[11]	NA
PIT 2					
WBO-BH3/4-0.2[8]	0.2	5.91	4.72	19.8	NA
BERMS					
WBO-Berm1-0.2[8]	0.2	2.19	4.45	78.4	0.12
WBO-Berm1-0.3[8][9]	0.2	2.00	6.00	90.0	NA
WBO-Berm2-0.2[8]	0.2	3.50	3.33	91.0	0.17
WBO-Berm3-0.2[8]	0.2	0.598	6.44	21.6	NA
WBO-Berm4-0.2[8]	0.2	<0.166	6.74	12.0	NA
WBO-Berm5-0.2[8]	0.2	0.300	4.20	6.67	NA
TROUGHS					
WBO-Trough1-0.2	0.2	4.68	5.51	48.2	NA
WBO-Trough2-0.2	0.2	0.200	2.83	<3.33	NA
WBO-Trough3-0.2	0.2	0.733	5.50	10.3	NA
SURROUNDING AREA					
WBO-SA1-0.2	0.2	<0.167	2.27	<3.33	NA
WBO-SA2-0.2	0.2	0.233	5.27	5.33	NA
WBO-SA3-0.2	0.2	0.266	4.92	4.65	NA
WBO-SA4-0.2	0.2	0.397	7.98	8.61	NA
BACKGROUND					
WBO-BH5-0.2	0.2	0.233	4.07	7.33	NA
QUALITY CONTROL (Concentration as mg/L)					
WBO-EB1	Water	<0.004	<0.005	<0.005	NA
WBO-EB2	Water	0.034	0.027	<0.005	NA
DECONTAMINATION RINSATES (Concentration as mg/L)					
WBO-DR	Water	<0.004	0.030	0.059	NA

NOTES:
(1) Approximate locations of soil samples are shown on *Exhibit 6.*
(2) Vertical depth in feet below ground surface.
(3) mg/kg = milligrams per kilogram
(4) mg/L = milligrams per liter
(5) Non-residential HBGLs = Non-residential health based guidance levels for the ingestion of contaminants in soil as listed in Arizona Administrative Code R18-7-201 et seq.
(6) RCRA Regulatory Levels = Resource Conservation and Recovery Act regulatory levels listed in 40 CFR 261.24 for the hazardous waste characteristic of toxicity.
(7) 20xRCRA Regulatory Levels = Twenty times the RCRA regulatory levels.
(8) Composite sample
(9) Duplicate sample
(10) NA = Not Analyzed
(11) <3.29 = Not detected at concentrations greater than or equal to the indicated laboratory reporting limit.

TABLE 3. ANALYTICAL RESULTS OF TESTS FOR TOTAL PERCHLORATE

Sample Identification[1]	Sample Depth[2] (feet)	Total Perchlorate (Concentration as mg/kg[3])
PIT 1		
WBO-BH1/2-0.2[4]	0.2	140
WBO-BH1/2-0.3[4] [5]	0.2	141
WBO-BH1/2-2.5[4]	2.5	59.7
WBO-BH1/2-10[4]	10	215
PIT 2		
WBO-BH3/4-0.2[4]	0.2	15.9
WBO-BH3/4-2.5[4]	2.5	74.9
WBO-BH3/4-10[4]	10	46
BACKGROUND		
WBO-BH5-0.2	0.2	<0.025[6]
WBO-BH5-10	10	<0.125
QUALITY CONTROL (Concentration as mg/L[7])		
WBO-EB1	Water	<0.025
WBO-EB2	Water	<0.025
DECONTAMINATION RINSATES		
WBO-DR	Water	59.1

NOTES:
(1) Approximate locations of soil samples are shown on *Exhibit 6.*
(2) Vertical depth in feet below ground surface.
(3) mg/kg = milligrams per kilogram
(4) Composite sample
(5) Duplicate sample
(6) <0.025 = Not detected at concentrations greater than or equal to the indicated laboratory reporting limit.
(7) mg/L = milligrams per liter

94447/WBO Tbl 3/022897

DRAFT

SOIL INVESTIGATION REPORT
TALLEY DEFENSE SYSTEM PLANT #3
FORMER WATER BORE-OUT PITS
MESA, ARIZONA

Prepared for

Talley Defense Systems

October 19, 2007

TABLE OF CONTENTS

TABLE OF CONTENTS I

LIST OF FIGURES II

LIST OF TABLES II

LIST OF APPENDICES II

LIST OF ACRONYMS III

1. INTRODUCTION 1-1
   - 1.1 Site Description 1-1
   - 1.2 Historical Operations 1-1
   - 1.3 Hydrogeologic Setting 1-2
   - 1.4 Previous Investigations 1-3
   - 1.5 Project Objectives 1-4

2. LATERAL CHARACTERIZATION ACTIVITIES 2-1
   - 2.1 Soil Investigation Activities 2-1
     - 2.1.1 Soil Boring and Sampling Methodology 2-2
     - 2.1.2 Soil Boring Depths 2-3
     - 2.1.3 Soil Boring Sampling Frequency 2-3
   - 2.2 Field Quality Control Procedures 2-4
   - 2.3 Decontamination Procedures 2-4

3. INVESTIGATION RESULTS 3-1
   - 3.1 Field Observations 3-1
   - 3.2 Site Specific Geology 3-1
   - 3.3 Sample Management 3-2
   - 3.4 Soil Sample Analytical Results 3-2
   - 3.5 Field Quality Control Analyses 3-3

4. DATA EVALUATION 4-1
   - 4.1 Field Data Verification 4-1
   - 4.2 Laboratory Data Verification 4-1
   - 4.3 Laboratory Data Validation 4-2
     - 4.3.1 Validation Methods 4-2
     - 4.3.2 Laboratory Validation Criteria 4-2
     - 4.3.3 Laboratory Data Validation 4-2
     - 4.3.4 Primary and Field Duplicate Comparisons 4-3
   - 4.4 Reconciliation With User Requirements 4-3

5. WASTE MANAGEMENT 5-1

6. HUMAN HEALTH RISK ASSESSMENT 6-1

6.1.1 Data Evaluation 6-1
6.1.2 Exposure Assessment 6-1
6.1.3 Toxicity Assessment 6-2
6.1.4 Risk Characterization 6-3
6.1.5 Uncertainty Analysis and Conclusions 6-3

7. CONCLUSIONS AND RECOMMENDATIONS 7-1
7.1 Conclusions 7-1
7.2 Recommendations 7-2

8. REFERENCES 1

LIST OF FIGURES

Figure 1 Vicinity Map
Figure 2 Site Plan – Soil Boring and Pot Holing Locations
Figure 3 Boring Logs for SB-1 / SB-2 with Perchlorate Concentrations
Figure 4 Section A-A' Boring Logs with Perchlorate Concentrations
Figure 5 Section B-B' Boring Logs with Perchlorate Concentrations
Figure 6 Site Plan – Lateral Extent of Perchlorate Concentration to Residential SRL

LIST OF TABLES

Table 1 Vertical Characterization Soil Boring Sample Perchlorate Results
Table 2 Lateral Characterization Soil Boring Perchlorate Results
Table 3 Perchlorate Results in Soil Used for Human Health Risk Assessment

LIST OF APPENDICES

Appendix A Geomatrix 2006 Final Soil Sampling Report
Appendix B Copies of Daily Site Safety Meeting Records
Appendix C Geologic Logs of Soil Borings
Appendix D Soil Sampling and Chain of Custody Records
Appendix E Laboratory Analytical Reports for Soil Boring Samples
Appendix F Data Validation Report
Appendix G ProUCL Output for HHRA

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Use of data contained on this sheet is subject to the limitations specified at the end of this document.
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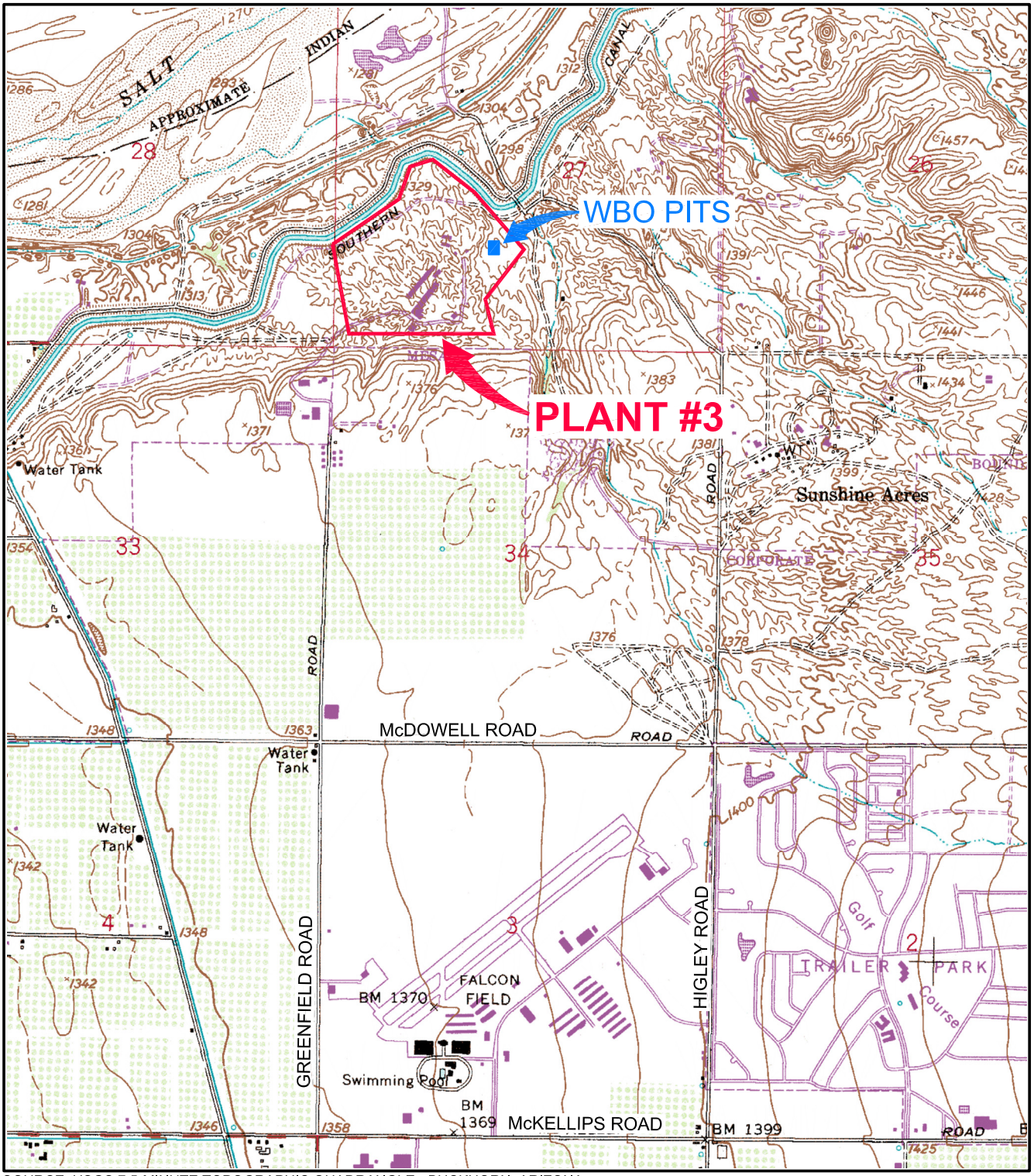

SOURCE: USGS 7.5-MINUTE TOPOGRAPHIC QUADRANGLE - BUCKHORN, ARIZONA

0 1000 2000

APPROXIMATE SCALE IN FEET

BROWN AND CALDWELL

Figure 1

VICINITY MAP
WATER BORE-OUT PITS

TALLEY DEFENSE SYSTEMS
MESA, ARIZONA

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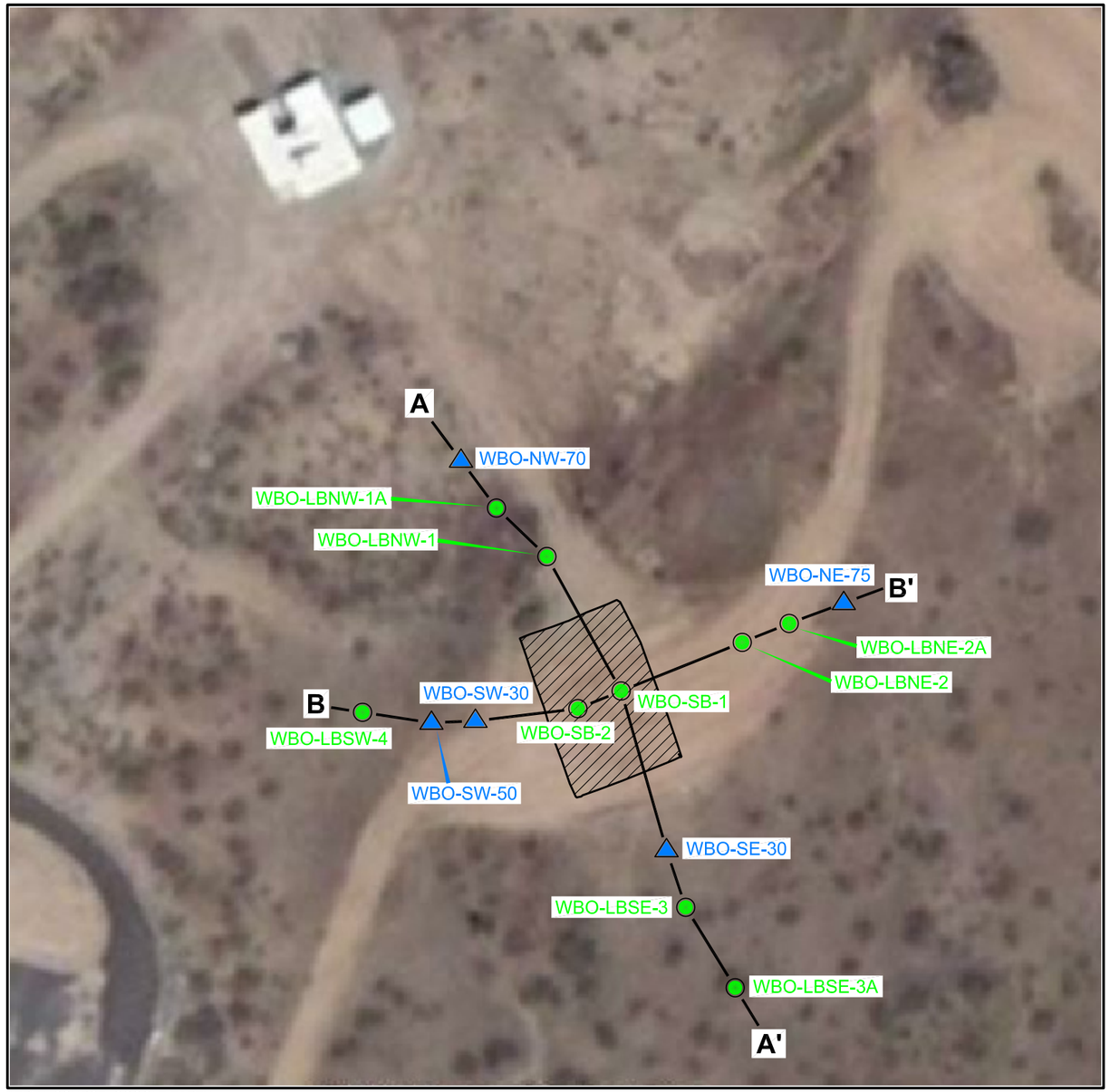

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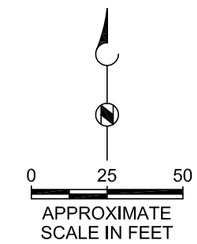

EXPLANATION

WBO-SB-1 BORING LOCATION

WBO-SW-30 SAMPLE LOCATION

WATER BORE OUT PITS

BROWN AND CALDWELL

Figure 2

SITE PLAN
SOIL BORING AND
POT HOLING LOCATIONS

TALLEY DEFENSE SYSTEMS
MESA, ARIZONA

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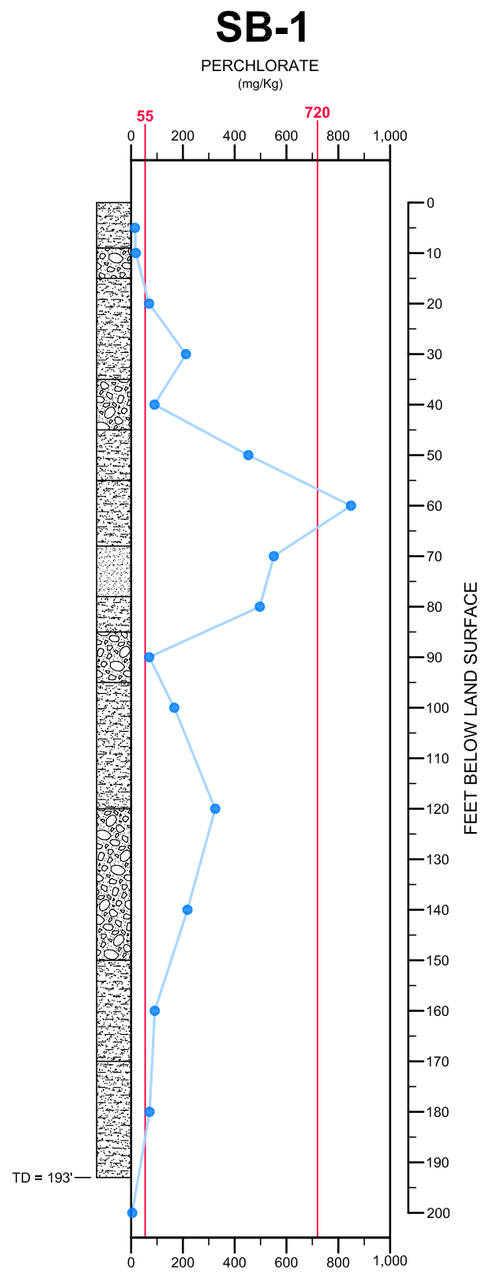
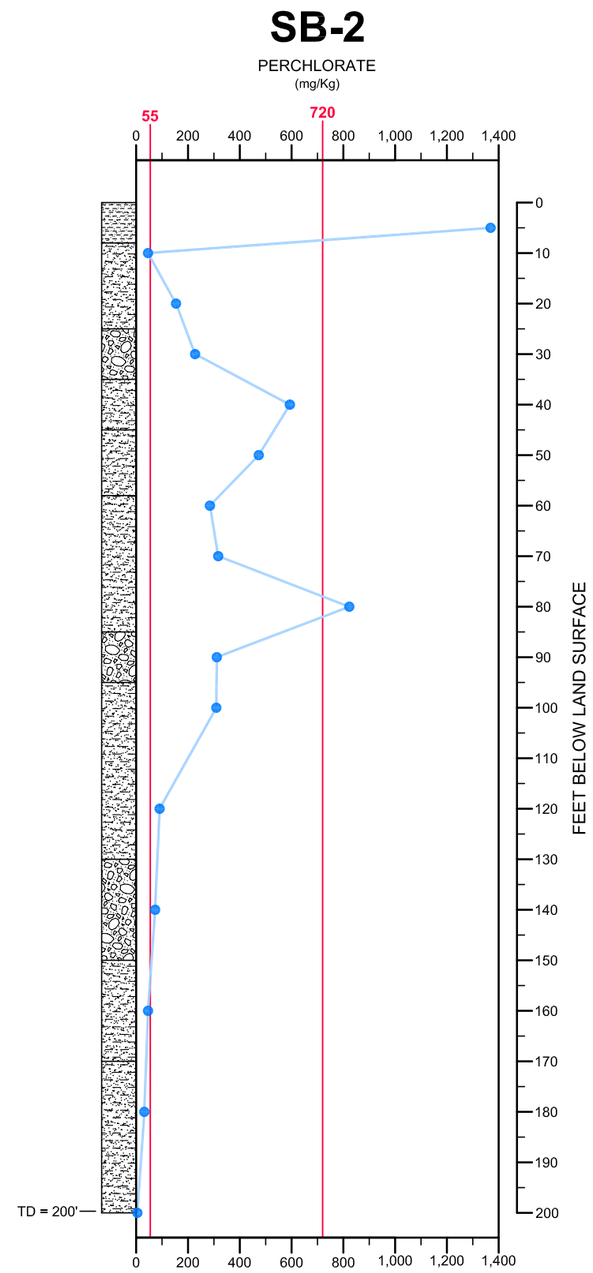




EXPLANATION

- GRAVEL / GRAVEL MIXTURES
- SAND
- SAND / FINES MIXTURES
- CLAY

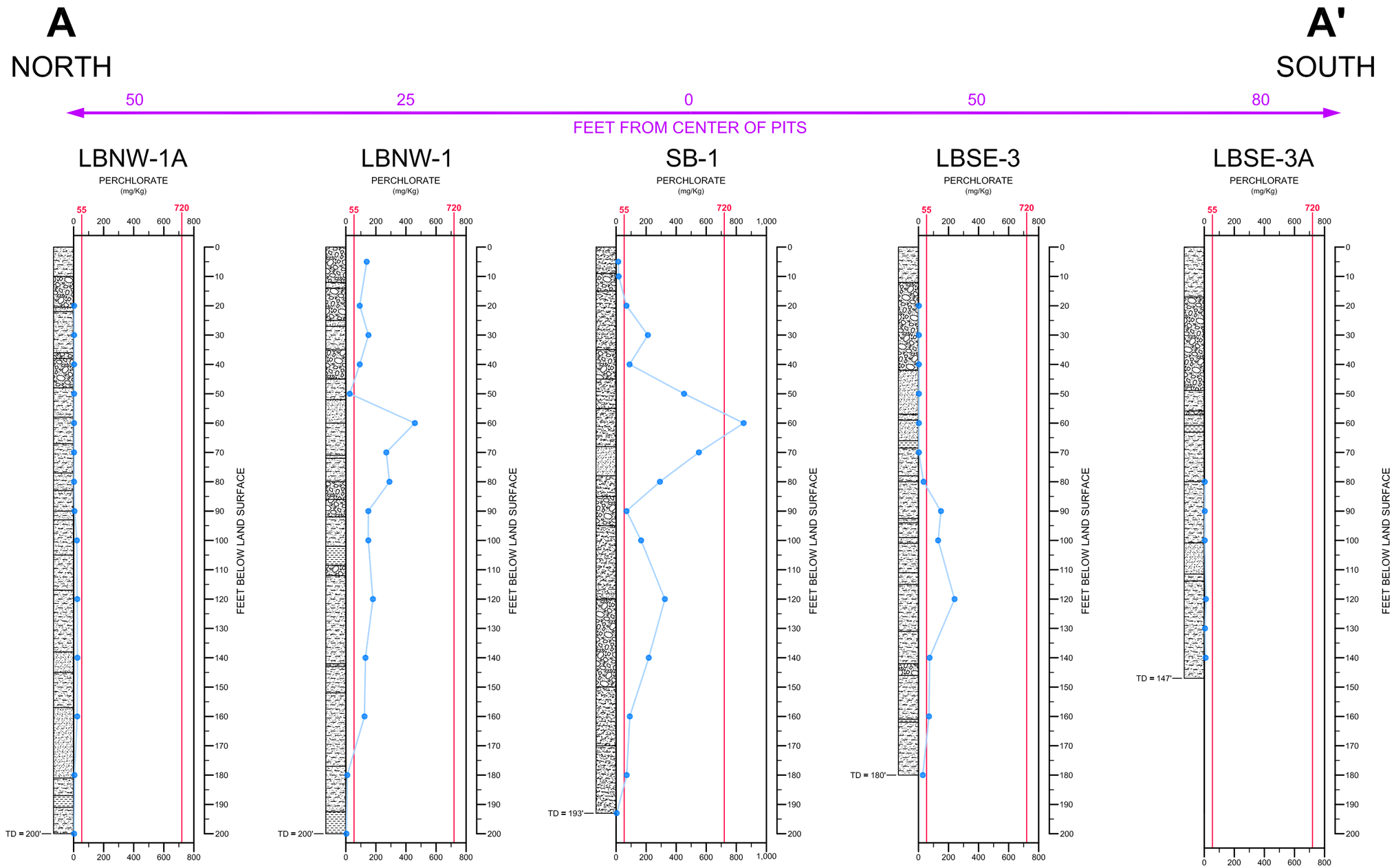
BROWN AND CALDWELL

Figure 3

BORING LOGS FOR SB-1/SB-2 WITH PERCHLORATE CONCENTRATIONS

TALLEY DEFENSE SYSTEMS
MESA, ARIZONA

P:\Bryan Cave\133767 - Talley APP Boreout Pit Closure\Drawings\ES\133767003.dwg Oct 18, 2007 - 2:00pm jcollier



EXPLANATION

- GRAVEL / GRAVEL MIXTURES
- SAND
- SAND / FINES MIXTURES
- CLAY

BROWN AND CALDWELL

Figure 4

SECTION A-A' BORING LOG WITH PERCHLORATE CONCENTRATIONS

TALLEY DEFENSE SYSTEMS
MESA, ARIZONA

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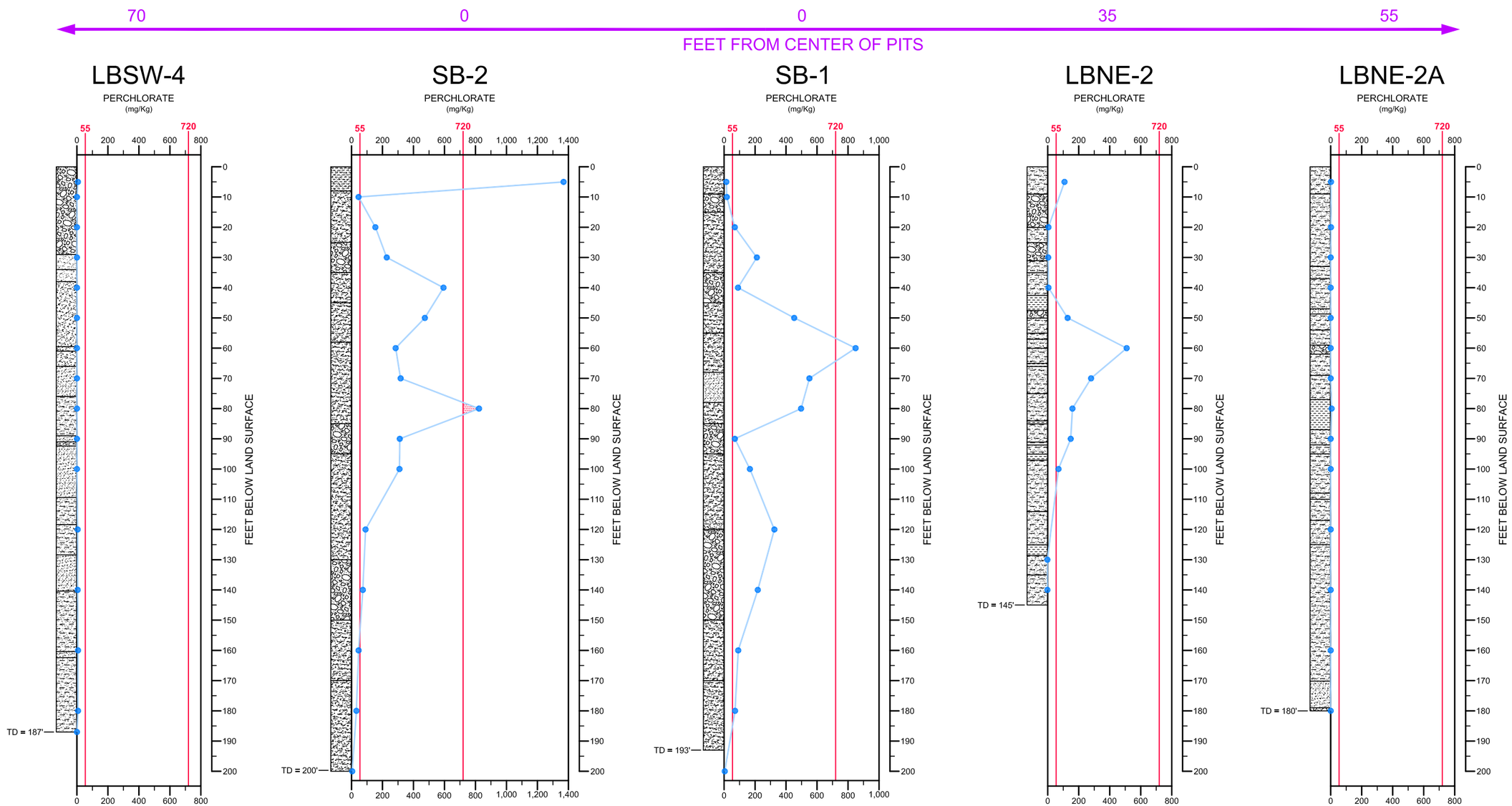

EXPLANATION

- GRAVEL / GRAVEL MIXTURES
- SAND
- SAND / FINES MIXTURES
- CLAY

BROWN AND CALDWELL

Figure 5

SECTION B-B' BORING LOG WITH PERCHLORATE CONCENTRATIONS

TALLEY DEFENSE SYSTEMS
MESA, ARIZONA

P:\Bryan Cave\133767 - Talley APP Boreout Pit Closure\Drawings\ES\133767008.dwg Oct 18, 2007 - 2:01pm jcollier

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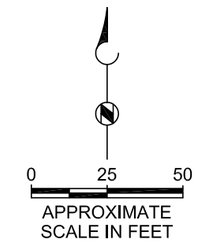

EXPLANATION

- WBO-SB-1 BORING LOCATION
- WBO-SW-30 SAMPLE LOCATION
- WATER BORE OUT PITS

BROWN AND CALDWELL

Figure 6

SITE PLAN
LATERAL EXTENT OF PERCHLORATE
CONCENTRATION TO RESIDENTIAL SRL

TALLEY DEFENSE SYSTEMS
MESA, ARIZONA

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Table 1. Vertical Characterization Soil Boring Sample Perchlorate Results

WEST WBO BASIN				EAST WBO BASIN			
Boring ID	Sample Collection Date	Sample Interval (feet)	Perchlorate Concentration (mg/kg)	Boring ID	Sample Collection Date	Sample Interval (feet)	Perchlorate Concentration (mg/kg)
WBO-SB-1	7/21/2005	5	7.85	WBO-SB-2	7/26/2005	5	1,370.0
"	7/21/2005	10	9.27	"	7/26/2005	10	42.3
"	7/21/2005	10 DUP	7.18	"	7/27/2005	10 DUP	46.0
"	7/21/2005	20	69.40	"	7/27/2005	20	158.0
"	7/21/2005	30	208.00	"	7/27/2005	30	221.0
"	7/21/2005	40	88.70	"	7/27/2005	40	594.0
"	7/21/2005	50	456.00	"	7/27/2005	50	474.0
"	7/21/2005	60	846.00	"	7/27/2005	60	284.0
"	7/21/2005	70	554.00	"	7/27/2005	70	320.0
"	7/25/2005	80	297.00	"	7/27/2005	80	820.0
"	7/25/2005	90	68.20	"	7/28/2005	90	317.0
"	7/25/2005	100	168.00	"	7/28/2005	100	311.0
"	7/25/2005	120	322.00	"	7/28/2005	120	90.5
"	7/25/2005	140	217.00	"	7/28/2005	140	76.5
"	7/26/2005	160	88.50	"	7/28/2005	160	43.8
"	7/26/2005	180	76.10	"	7/28/2005	180	34.4
"	7/26/2005	200	1.53	"	7/28/2005	200	0.269
"	7/26/2005	200 DUP	1.47				--
Residential Soil Remediation Level			55	Residential Soil Remediation Level			55
Non-Residential Soil Remediation Level			720	Non-Residential Soil Remediation Level			720

Table 2. Lateral Characterization Soil Boring Perchlorate Results

Northwest (NW) Direction					Northeast (NE) Direction					Southeast (SE) Direction					Southwest (SW) Direction				
Sample ID	Date	Distance (feet)	Depth (feet)	Perchlorate Results (mg/kg)	Sample ID	Date	Distance (feet)	Depth (feet)	Perchlorate Results (mg/kg)	Sample ID	Date	Distance (feet)	Depth (feet)	Perchlorate Results (mg/kg)	Sample ID	Date	Distance (feet)	Depth (feet)	Perchlorate Results (mg/kg)
WBO-LBNW-1	02/05/07	25	5.00	140	WBO-LBNE-2	02/20/07	35	5.00	110	WBO-SE-30	03/07/07	30	5.00	4.200	WBO-SW-30	03/07/07	30.00	5.00	2.10
	02/05/07	"	20.00	93		02/20/07	"	20.00	5.2		03/07/07	"	10.00	0.660		03/07/07	"	10.00	14.00/21.00*
	02/05/07	"	30.00	150		02/20/07	"	30.00	0.13										
	02/05/07	"	40.00	91		02/20/07	"	40.00	10										
	02/05/07	"	50.00	23		02/20/07	"	50.00	130										
	02/05/07	"	60.00	460.00/280.00*		02/21/07	"	60.00	510										
	02/05/07	"	D1**	430		02/21/07	"	210**	420										
	02/05/07	"	70.00	270		02/21/07	"	70.00	280										
	02/05/07	"	80.00	290.00/200.00*		02/21/07	"	80.00	160										
	02/05/07	"	90.00	150		02/21/07	"	90.00	150										
	02/05/07	"	100.00	150		02/21/07	"	100.00	71										
	02/05/07	"	120.00	180		02/21/07	"	220**	84										
	02/05/07	"	D2**	210		02/22/07	"	130.00	0.51										
	02/06/07	"	140.00	130		02/22/07	"	140.00	0.45										
	02/06/07	"	160.00	120															
	02/07/07	"	180.00	7.6															
	02/07/07	"	200.00	0.021															
WBO-NW-50	03/07/07	50	5.00	0.52	WBO-NE-55	03/07/07	55	5.00	0.14	WBO-SE-50	03/07/07	50	5.00	0.088	WBO-SW-50	03/07/07	50.00	5.00	40.00/47.00*
	03/07/07	"	10.00	1.30		03/07/07	"	10.00	0.14		03/07/07	"	10.00	0.099		03/07/07	"	10.00	23.00/29.00*
WBO-LBNW-1A	04/23/07	50	20.00	0.19	WBO-LBNE-2A	04/25/07	55	20.00	0.05	WBO-LBSE-3	04/27/07	50	20.00	<0.020					
	04/23/07	"	30.00	0.20		04/25/07	"	40.00	<0.020		04/27/07	"	30.00	<0.020					
	04/23/07	"	40.00	0.22		04/25/07	"	50.00	<0.020		04/27/07	"	40.00	<0.020					
	04/24/07	"	50.00	0.66		04/25/07	"	30.00	<0.020		04/27/07	"	50.00	<0.020					
	04/24/07	"	60.00	1.80		04/26/07	"	60.00	<0.020		04/27/07	"	60.00	<0.020					
	04/23/07	"	220**	1.40		04/26/07	"	220**	<0.020		04/27/07	"	220**	<0.020					
	04/24/07	"	70.00	0.98		04/26/07	"	70.00	<0.020		04/27/07	"	70.00	<0.020					
	04/24/07	"	80.00	5.40		04/26/07	"	80.00	6.00		04/27/07	"	80.00	36.000					
	04/24/07	"	90.00	29.00		04/26/07	"	90.00	0.69		04/27/07	"	90.00	150.000					
	04/24/07	"	100.00	22.00		04/26/07	"	100.00	0.35		04/30/07	"	100.00	130.000					
	04/24/07	"	120.00	28.00 J		04/26/07	"	120.00	0.83 J		04/30/07	"	120.00	240.000					
	04/24/07	"	240**	51.00 J		04/26/07	"	240**	1.3 J		04/30/07	"	240**	240.000					
	04/24/07	"	140.00	30.00		04/26/07	"	140.00	0.53		04/30/07	"	140.00	76.000					
	04/25/07	"	160.00	23.00		04/27/07	"	160.00	0.63		04/30/07	"	160.00	70.000					
	04/25/07	"	180.00	1.10		04/27/07	"	180.00	0.290		04/30/07	"	180.00	28.000					
	04/25/07	"	200.00	<0.020															

Table 2. Lateral Characterization Soil Boring Perchlorate Results

Northwest (NW) Direction					Northeast (NE) Direction					Southeast (SE) Direction					Southwest (SW) Direction				
Sample ID	Date	Distance (feet)	Depth (feet)	Perchlorate Results (mg/kg)	Sample ID	Date	Distance (feet)	Depth (feet)	Perchlorate Results (mg/kg)	Sample ID	Date	Distance (feet)	Depth (feet)	Perchlorate Results (mg/kg)	Sample ID	Date	Distance (feet)	Depth (feet)	Perchlorate Results (mg/kg)
WBO-NW-70	03/07/07	70	5.00	49.00/31.00*	WBO-NE-75	03/07/07	75	5.00	0.043	WBO-LBSE-3-A	07/20/07	80	80.00	0.034	WBO-LBSW-4	04/30/07	70.00	5.00	4.60
											07/23/07	"	90.00	0.580		04/30/07	"	10.00	<0.020
											07/23/07	"	100.00	0.075		04/30/07	"	20.00	<0.020
											07/23/07	"	120.00	6.500		04/30/07	"	30.00	<0.020
											07/23/07	"	130.00	1.500		05/01/07	"	40.00	<0.020
											07/23/07	"	140.00	7.600		05/01/07	"	50.00	<0.020
																05/01/07	"	60.00	<0.020
																05/01/07	"	220**	<0.020
																05/01/07	"	70.00	<0.020
																05/01/07	"	80.00	<0.020
																05/01/07	"	90.00	<0.020
																05/01/07	"	100.00	0.066
																05/01/07	"	120.00	0.14
																05/01/07	"	240**	0.17
																05/01/07	"	140.00	1.20
																05/01/07	"	160.00	2.30
																05/01/07	"	180.00	2.50
																05/01/07	"	187.00	0.56
			ESTIMATED GPL	143.52				ESTIMATED GPL	143.52				ESTIMATED GPL	143.52				ESTIMATED GPL	143.52
			RESIDENTIAL SRL	55.00				RESIDENTIAL SRL	55.00				RESIDENTIAL SRL	55.00				RESIDENTIAL SRL	55.00
			NON-RESIDENTIAL SRL	720.00				NON-RESIDENTIAL SRL	720.00				NON-RESIDENTIAL SRL	720.00				NON-RESIDENTIAL SRL	720.00

Notes
* Sample Reanalyzed for Perchlorate using IC/MS/MS Test Method
** Duplicate Field Sample of Original Immediately Above
GPL = Groundwater Protection Level
J = Estimated value; the RPD between primary and field duplicate sample detected results exceeded 35 percent
RPD = Relative Percent Difference
SRL = Soil Remediation Level

Table 3. Perchlorate Results in Soil Used for Human Health Risk Assessment

				ESTIMATED GPL	143.52
				RESIDENTIAL SRL	55.00
				NON-RESIDENTIAL SRL	720.00
Sample ID	Date	Direction	Distance (feet)	Depth (feet)	Perchlorate Results (mg/kg)
WBO-SB-1-5	07/21/05	WEST PIT	0	5	7.85
WBO-SB-2-5	07/26/05	EAST PIT	0	5	1370.00
WBO-LBNW-1	02/05/07	NW	25	5	140.00
WBO-SE-30	03/07/07	SE	30	5	4.20
WBO-SW-30	03/07/07	SW	30	5	2.10
WBO-LBNE-2	02/20/07	NE	35	5	110.00
WBO-NW-50	03/07/07	NW	50	5	0.52
WBO-SE-50	03/07/07	SE	50	5	0.09
WBO-SW-50	03/07/07	SW	50	5	40.00/47.00*
WBO-NE-55	03/07/07	NE	55	5	0.14
WBO-LBSW-4	04/30/07	SW	70	5	4.60
WBO-NW-70	03/07/07	NW	70	5	49.00/31.00*
WBO-NE-75	03/07/07	NE	75	5	0.04
WBO-SB-1-10	07/21/05	WEST PIT	0	10	9.27
WBO-SB-2-10	07/26/05	EAST PIT	0	10	46.00
WBO-SE-30	03/07/07	SE	30	10	0.66
WBO-SW-30	03/07/07	SW	30	10	14.00/21.00*
WBO-NW-50	03/07/07	NW	50	10	1.30
WBO-SE-50	03/07/07	SE	50	10	0.10
WBO-SW-50	03/07/07	SW	50	10	23.00/29.00*
WBO-NE-55	03/07/07	NE	55	10	0.14
WBO-LBSW-4	04/30/07	SW	70	10	<0.020

Notes

* Sample Reanalyzed for Perchlorate using IC/MS/MS Test Method

GPL = Groundwater Protection Level

SRL = Soil Remediation Level

Prepared for

Nammo Talley, Inc.
4051 North Higley Road
Mesa, Arizona 85215

REVISED PERCHLORATE SOURCE AREA REMEDIAL ACTION WORK PLAN PLANT NO. 3, NAMMO TALLEY, INC. MESA, ARIZONA

August 2013

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Project Number: SP0101

TABLE OF CONTENTS

Page

1.0 INTRODUCTION AND REMEDIAL OBJECTIVES 1
2.0 BACKGROUND AND HISTORICAL INVESTIGATIONS 3
2.1 Site Location and Historical Facility Operations 3
2.2 Historical Investigations and Closure Activities Associated with the Plant #3 Former WBO Pits Perchlorate Source Area 3
2.2.1 November 1990 Soil Sampling - Metals, Nitrate 4
2.2.2 1996 Site Assessment - Metals 4
2.2.3 1999 WBO Pit Closure - Metals 5
2.2.4 2005 Soil Sampling - Perchlorate 5
2.2.5 January 2007 Well Survey 6
2.2.6 2007 Soil Investigation - Perchlorate 6
2.2.7 2007 Well Sampling Effort 8
2.2.8 2009 Perchlorate Source Area Investigation 9
2.2.9 Supplemental Perchlorate Source Area Investigation - 2010 10
2.3 Discharge Impact Area and Pollutant Management Areas 11
2.4 Geologic and Hydrogeologic Conditions 11
2.5 Soil Impacts 13
2.6 Groundwater Impacts 14
2.7 Perchlorate Biotreatability Evaluation 14
2.8 Aquifer Testing 15
2.9 Infiltration Testing 16
2.9.1 WBO pits and HPA Infiltration Results 16
2.9.2 Discharge Area Infiltration Results 17
3.0 REMEDIAL PROCESS DESCRIPTION 19
4.0 PREVIOUS CAPTURE ZONE ANALYSIS 20
5.0 EVALUATION OF BADCT 21
5.1 Source Area Hydraulic Containment and Capture Zone Analysis 21
5.1.1 Systematic Capture Zone Evaluation 21
5.1.2 Termination of Phase II ISB 22
5.2 Treatment of Extracted Groundwater 22
5.3 In-Situ Vadose Zone Treatment 24
6.0 PHASE I - PERCHLORATE SOURCE AREA HYDRAULIC CONTAINMENT, TREATMENT, DISCHARGE AND INFILTRATION 25
6.1 Groundwater Extraction Wells 25
6.1.1 Proposed Locations 25
6.1.2 Preliminary Design and Installation 25
6.1.3 Permitting of the Groundwater Extraction Wells 26
6.2 Groundwater Treatment System 26

6.2.1 Design of the Groundwater Treatment System 26
6.2.2 Permitting & Installation of the Groundwater Treatment System .. 28
6.2.3 Startup & Operation of the Groundwater Treatment System..... 29
6.2.4 Performance Monitoring of the Groundwater Treatment System... 30
6.3 Treated Effluent Discharge & Infiltration..... 31
6.3.1 Design of the Discharge & Infiltration System..... 31
6.3.2 Permitting & Installation of the Discharge & Infiltration System .. 31
6.3.3 Performance & Monitoring of the Discharge & Infiltration System 32
6.4 Point of Compliance Wells 32
7.0 PHASE II - VADOSE ZONE IN-SITU BIOREMEDIATION.....34
7.1 Preliminary Design of the ISB System 34
7.2 Permitting and Installation of ISB 36
7.3 Startup & Operation of ISB System..... 37
7.4 Performance Monitoring of ISB System..... 38
8.0 WASTE MANAGEMENT.....40
9.0 DATA INTERPRETATION & REPORTING.....41
10.0 CONTINGENCY PLAN PREPARATION 42
11.0 PRELIMINARY IMPLEMENTATION SCHEDULE 43
12.0 REFERENCES 44

TABLES

1 Summary of Groundwater Depths and Elevations
2 WBO-1 Soil Data
3 Summary of Perchlorate in On-Site Groundwater Monitor Wells
4 Summary of Groundwater Chemistry Analytical Results
5 Former Water Bore-Out pits Infiltration Test Data and Calculations
6 Potential Discharge Area Infiltration Test Data and Calculations
7 Anticipated Performance Monitoring Program
8 Summary of Laboratory Analytical Details

FIGURES

1 Site Vicinity and Location Map
2 Approximate Locations of Infiltration Tests, Surface Impacts & Remedial System Layout
3 Infiltration Basin Design

FIGURES (continued)

4 Groundwater Elevation and Flow Direction 16 July 2012

5 Location of Vadose Zone Injection Wells and Target Treatment Area

6 Perchlorate Source Area Treatment System Discharge Impact Area

7 Perchlorate Source Area Treatment System Pollution Management Areas

8 Representative On-Site and Off-Site Groundwater Monitor Well Hydrographs

9 Soil Concentration versus Depth for Perchlorate, Ammonium, Nitrate, and pH at WBO-1

10a Microcosm Trend Plots for Treatment #1 (Control) - Perchlorate and Nitrate

10b Microcosm Trend Plots for Treatment #2 (High NH_4) - Perchlorate and Nitrate

10c Microcosm Trend Plots for Treatment #3 (High ClO_4) - Perchlorate and Nitrate

11 Schematic Cross-Section of Model Domain Showing Well Screens

12 Former Water Bore-Out Pits Infiltration Test - Head Pressure vs. Surface Infiltration Rate per Square Foot

13 Potential Discharge Area Infiltration Test - Head Pressure vs. Surface Infiltration Rate per Square Foot

14 Groundwater Model Output Showing Hydraulic Containment of the Perchlorate Source Area with 200 GPM Extraction per Well

15 ISB Conceptual Design

16 Conceptual Extraction Well Design

17 Groundwater Treatment System Process Flow Diagram

APPENDICES

Appendix A: Figure 2 – *Aerial Map with GPS Points and Cross Section Lines* from the 2007 Draft Soil Investigation Report

Appendix B: Conditional Acceptance of Biological Treatment (Fluidized Bed Reactors) for the Removal of Perchlorate during Drinking Water Production

Appendix C: City of Mesa Administrative Review Request Approval Letter

Tables

Geosyntec consultants

Monitor Well ID	TOC (feet AMSL)	Screened Interval (feet btoc)	Screened Interval (AMSL)	Transducer (feet btoc)	Date	Depth to Water (btoc)	Groundwater Elevation (feet AMSL)
NT-1	1312.07	107-257	1205.07-1055.07	NA	2/3/2009 (1)	183.24	1128.83
					2/29/2009 (2)	181.93	1130.14
					7/28/2009 (3)	178.11	1133.96
					5/26/2010 (3)	170.65	1141.42
					7/12/2010 (4)	168.32	1143.75
					3/22/2011 (5)	167.75	1144.32
					10/6/2011 (6)	169.87	1142.20
					12/13/2011	173.13	1138.94
					12/15/2011	172.98	1139.09
					1/19/2012	174.06	1138.01
					2/20/2012	177.33	1134.74
					3/19/2012	178.58	1133.49
					4/16/2012	178.89	1133.18
					5/21/2012	180.20	1131.87
					6/18/2012	181.10	1130.97
					7/16/2012	181.92	1130.15
					8/20/2012	183.24	1128.83
					9/20/2012	185.85	1126.22
					10/15/2012	186.45	1125.62
					11/19/2012	187.24	1124.83
					12/17/2012	186.32	1125.75
					3/18/2013	187.60	1124.47
					6/17/2013	189.30	1122.77
NT-2	1419.02	215-365	1204.02-1054.02	NA	9/16/2009 (3)	332.35	1086.67
					12/12/2011	307.65	1111.37
					1/19/2012	306.92	1112.10
					2/20/2012	306.70	1112.32
					3/19/2012	306.92	1112.10
					4/16/2012	307.11	1111.91
					5/21/2012	307.02	1112.00
					6/18/2012	307.30	1111.72
					7/16/2012	308.05	1110.97
					8/20/2012	308.67	1110.35
					9/17/2012	309.74	1109.28
					10/15/2012	310.75	1108.27
					11/19/2012	311.00	1108.02
					12/17/2012	312.05	1106.97
					3/18/2013	311.90	1107.12
				323	6/17/2013	313.00	1106.02

Monitor Well ID	TOC (feet AMSL)	Screened Interval (feet btoc)	Screened Interval (AMSL)	Transducer (feet btoc)	Date	Depth to Water (btoc)	Groundwater Elevation (feet AMSL)
NT-3	1423.50	208-358	1215.50-1065.50	NA	5/21/2010 (3)	306.21	1117.29
					5/26/2010 (3)	306.4	1117.10
					3/23/2011 (5)	297.55	1125.95
					12/12/2011	296.55	1126.95
					12/15/2011	296.62	1126.88
					1/19/2012	296.48	1127.02
					2/20/2012	297.64	1125.86
					3/19/2012	298.35	1125.15
					4/16/2012	299.12	1124.38
					5/21/2012	299.84	1123.66
					6/18/2012	300.64	1122.86
					7/16/2012	301.40	1122.10
					8/20/2012	302.19	1121.31
					9/17/2012	303.11	1120.39
					10/15/2012	303.73	1119.77
					11/19/2012	305.57	1117.93
					12/17/2012	305.83	1117.67
					3/18/2013	306.65	1116.85
				319	6/17/2013	309.02	1114.48
NT-4	1385.69	153-313	1232.69-1072.69	NA	2/3/2009 (1)	263.9	1121.79
					7/28/2009 (3)	258.77	1126.92
					5/26/2010 (3)	250.3	1135.39
					3/23/2011 (5)	286.75	1098.94
				268	12/12/2011	250.70	1134.99
					12/15/2011	250.20	1135.49
					1/19/2012	251.62	1134.07
					2/20/2012	255.57	1130.12
				NA	3/19/2012	255.86	1129.83
					4/16/2012	255.42	1130.27
					5/21/2012	256.42	1129.27
					6/18/2012	257.53	1128.16
					7/16/2012	258.10	1127.59
					8/20/2012	259.85	1125.84
					9/17/2012	262.84	1122.85
					10/15/2012	262.68	1123.01
					11/19/2012	263.65	1122.04
					12/17/2012	262.38	1123.31
					3/18/2013	264.43	1121.26
					6/17/2013	266.70	1118.99

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Monitor Well ID	TOC (feet AMSL)	Screened Interval (feet btoc)	Screened Interval (AMSL)	Transducer (feet btoc)	Date	Depth to Water (btoc)	Groundwater Elevation (feet AMSL)
NT-5	1367.64	161-311	1206.64-1056.64	NA	5/21/2010 (3)	256.03	1111.61
					3/23/2011 (5)	247.1	1120.54
					12/12/2011	244.96	1122.68
					12/15/2011	245.15	1122.49
					1/19/2012	244.55	1123.09
					2/20/2012	246.9	1120.74
					3/19/2012	248.68	1118.96
					4/16/2012	249.05	1118.59
					5/21/2012	249.42	1118.22
					6/18/2012	250.29	1117.35
					7/16/2012	251.72	1115.92
					8/20/2012	253.45	1114.19
					9/17/2012	255.90	1111.74
					10/15/2012	257.78	1109.86
				267.78	11/19/2012	259.15	1108.49
					12/17/2012	259.47	1108.17
					3/18/2013	259.92	1107.72
					6/17/2013	261.70	1105.94
NT-6	1313.22	115 - 260	1198.22-1053.22	NA	7/12/2010 (4)	169.00	1144.22
					3/22/2011 (5)	168.33	1144.89
					10/6/2011 (6)	170.63	1142.59
				183	12/13/2011	173.60	1139.62
					12/15/2011	173.48	1139.74
					1/19/2012	174.44	1138.78
					2/20/2012	177.46	1135.76
					3/19/2012	178.88	1134.34
					4/16/2012	179.55	1133.67
					5/21/2012	180.76	1132.46
				193	6/18/2012	181.65	1131.57
					7/16/2012	182.57	1130.65
					8/20/2012	183.69	1129.53
					9/18/2012	185.89	1127.33
					10/15/2012	186.8	1126.42
					11/19/2012	187.57	1125.65
					12/17/2012	186.94	1126.28
					3/18/2013	187.96	1125.26
				198	6/17/2013	189.38	1123.84

Geosyntec consultants

Monitor Well ID	TOC (feet AMSL)	Screened Interval (feet btoc)	Screened Interval (AMSL)	Transducer (feet btoc)	Date	Depth to Water (btoc)	Groundwater Elevation (feet AMSL)
NT-7	1310.94	109 - 259	1201.94-1051.94	NA	7/12/2010 (4)	168.39	1142.55
					3/22/2011 (5)	168.00	1142.94
					10/6/2011 (6)	169.51	1141.43
				183	12/13/2011	173.13	1137.81
					12/15/2011	172.90	1138.04
					1/19/2012	174.26	1136.68
					2/20/2012	177.78	1133.16
					3/19/2012	178.68	1132.26
					4/16/2012	178.84	1132.10
					5/21/2012	179.98	1130.96
				193	6/18/2012	181.01	1129.93
					7/16/2012	181.63	1129.31
					8/20/2012	183.15	1127.79
					9/18/2012	185.65	1125.29
					10/15/2012	186.35	1124.59
					11/19/2012	186.92	1124.02
					12/17/2012	185.84	1125.10
					3/18/2013	187.35	1123.59
				198	6/17/2013	189.22	1121.72
NT-8	1317.50	130-300	1187.50-1017.50	NA	7/16/2012	179.38	1138.12
				189.4	8/20/2012	179.40	1138.10
					9/18/2012	181.01	1136.49
					10/15/2012	181.88	1135.62
					11/19/2012	181.68	1135.82
					12/17/2012	180.87	1136.63
					3/18/2013	180.92	1136.58
					6/17/2013	181.40	1136.10
NT-9	1319.03	120-290	1199.03-1029.03	204	3/19/2012	183.65	1135.38
					4/16/2012	185.39	1133.64
					5/21/2012	186.80	1132.23
					6/18/2012	187.98	1131.05
					7/16/2012	188.39	1130.64
					8/20/2012	190.17	1128.86
					9/18/2012	192.62	1126.41
					10/15/2012	193.18	1125.85
					11/19/2012	193.50	1125.53
					12/17/2012	192.03	1127.00
					3/18/2013	193.69	1125.34
					6/17/2013	195.55	1123.48

Monitor Well ID	TOC (feet AMSL)	Screened Interval (feet btoc)	Screened Interval (AMSL)	Transducer (feet btoc)	Date	Depth to Water (btoc)	Groundwater Elevation (feet AMSL)
NT-10	1310.01	110-296	1200.01-1014.01	188	3/19/2012	167.45	1142.56
					4/16/2012	168.70	1141.31
					5/21/2012	169.77	1140.24
					6/18/2012	170.32	1139.69
					7/16/2012	170.75	1139.26
					8/20/2012	171.04	1138.97
					9/18/2012	172.43	1137.58
					10/15/2012	173.16	1136.85
					11/19/2012	172.68	1137.33
					12/17/2012	171.74	1138.27
					3/18/2013	171.89	1138.12
					6/17/2013	172.25	1137.76
NT-11	1317.10	130-300	1187.10-1017.10	NA	7/16/2012	183.44	1133.66
				194.77	8/20/2012	184.77	1132.33
					9/18/2012	186.98	1130.12
					10/15/2012	186.79	1130.31
					11/19/2012	187.89	1129.21
					12/17/2012	186.60	1130.50
					3/18/2013	187.85	1129.25
					6/17/2013	189.38	1127.72
WBO-1 (11)	1311.26	135 - 195	1176.26-1116.26	NA	2/26/2009 (2)	175.00	1136.26
					2/27/2009 (2)	177.16	1134.10
					7/28/2009 (3)	172.86	1138.40
					5/26/2010 (3)	167.2	1144.06
					7/12/2010 (4)	164.41	1146.85
					3/22/2011 (5)	164.13	1147.13
				180(1)	12/13/2011	169.79	1141.55
					12/15/2011	169.85	1141.41
					1/19/2012	170.5	1140.76
					2/20/2012	173.20	1138.06
					3/19/2012	175.15	1136.11
					4/16/2012	176.30	1134.96
					5/21/2012	177.25	1134.01
				190	6/18/2012	178.13	1133.13
					7/16/2012	179.20	1132.06
					8/20/2012	180.09	1131.17
					9/17/2012	181.87	1129.39
					10/15/2012	183.12	1128.14
					11/19/2012	184.05	1127.21
					12/17/2012	183.72	1127.54
					3/18/2013	184.30	1126.96
				195	6/17/2013	185.30	1125.96

Monitor Well ID	TOC (feet AMSL)	Screened Interval (feet btoc)	Screened Interval (AMSL)	Transducer (feet btoc)	Date	Depth to Water (btoc)	Groundwater Elevation (feet AMSL)
HPA-1	1311.30	135 - 195	1176.30-1116.30	NA	2/16/2009 (7)	173.20	1138.10
					2/27/2009 (2)	175.57	1135.73
					7/28/2009 (3)	171.13	1140.17
					5/26/2010 (3)	166.32	1144.98
					7/12/2010 (4)	163.23	1148.07
					3/22/2011 (5)	163.13	1148.17
					12/13/2011	168.75	1142.55
					12/15/2011	168.86	1142.44
					1/19/2012	169.54	1141.76
					2/20/2012	171.90	1139.40
					3/19/2012	174.04	1137.26
					4/16/2012	175.25	1136.05
					5/21/2012	176.44	1134.86
					6/18/2012	177.31	1133.99
					7/16/2012	178.40	1132.90
					8/20/2012	179.29	1132.01
					9/17/2012	180.98	1130.32
				191.23	10/15/2012	182.29	1129.01
					11/19/2012	183.29	1128.01
					12/17/2012	183.10	1128.20
					3/18/2013	183.55	1127.75
					6/17/2013	184.30	1127.00
ADEQ Well No. 2	1374.73	380 - 444	994.73-930.73	NA	12/15/1992 (8)	365.07	1009.66
					6/28/1995 (8)	332.12	1042.61
					6/25/1996 (8)	320.48	1054.25
					10/17/1996 (8)	327.38	1047.35
					11/8/1996 (8)	317.35	1057.38
					5/13/1997 (8)	314.36	1060.37
					2/26/1998 (8)	298.42	1076.31
					8/20/1998 (8)	296.66	1078.07
					9/10/2001 (8)	287	1087.73
					1/31/2003 (8)	298.29	1076.44
					6/8/2007 (9)	270.3	1104.43
				250	12/12/2011	239.42	1135.31
					12/15/2011	238.48	1136.25
					1/19/2012	242.18	1132.55
					2/20/2012	246.82	1127.91
					3/19/2012	246.75	1127.98
					4/16/2012	246.01	1128.72
					5/21/2012	247.19	1127.54
				260	6/18/2012	248.54	1126.19
					7/16/2012	248.32	1126.41
					8/20/2012	251.40	1123.33
				NA	9/17/2012	254.09	1120.64
					10/15/2012	253.09	1121.64
					11/19/2012	253.99	1120.74
					12/17/2012	252.36	1122.37
					3/18/2013	254.82	1119.91
					6/17/2013	257.57	1117.16

Monitor Well ID	TOC (feet AMSL)	Screened Interval (feet btoc)	Screened Interval (AMSL)	Transducer (feet btoc)	Date	Depth to Water (btoc)	Groundwater Elevation (feet AMSL)
ADEQ Well No. 3	1372.49	401 - 465	971.49-907.49	NA	12/15/1992 (8)	365.11	1007.38
					2/14/1995 (8)	329.38	1043.11
					6/25/1996 (8)	315.9	1056.59
					10/16/1996 (8)	344.7	1027.79
					11/8/1996 (8)	317.08	1055.41
					5/13/1997 (8)	312.18	1060.31
					2/26/1998 (8)	298.33	1074.16
					8/19/1998 (8)	297.78	1074.71
					9/10/2001 (8)	283	1089.49
					1/31/2003 (8)	294.68	1077.81
					6/8/2007 (9)	266.8	1105.69
				250	12/12/2011	237.70	1134.79
					12/15/2011	237.45	1135.04
					1/19/2012	239.32	1133.17
					2/20/2012	244.12	1128.37
					3/19/2012	245.86	1126.63
					4/16/2012	245.61	1126.88
					5/21/2012	246.10	1126.39
				260	6/18/2012	246.94	1125.55
					7/16/2012	247.20	1125.29
					8/20/2012	249.05	1123.44
				NA	9/17/2012	251.85	1120.64
					10/15/2012	252.01	1120.48
					11/19/2012	252.93	1119.56
					12/17/2012	252.27	1120.22
					3/18/2013	253.65	1118.84
					6/17/2013	255.30	1117.19
ADEQ Well No. 4	1373.61	400 - 460	973.61-913.61	NA	12/15/1992 (8)	379.57	994.04
					2/14/1995 (8)	324.5	1049.11
					6/25/1996 (8)	330.4	1043.21
					10/16/1996 (8)	334.26	1039.35
					11/8/1996 (8)	331.6	1042.01
					5/13/1997 (8)	323.36	1050.25
					2/26/1998 (8)	312.33	1061.28
					8/19/1998 (8)	310.15	1063.46
					9/10/2001 (8)	293	1080.61
					1/31/2003 (8)	305.75	1067.86
					6/8/2007 (9)	273.2	1100.41
				260	12/12/2011	242.55	1131.06
					12/15/2011	242.41	1131.20
					1/19/2012	243.60	1130.01
					2/20/2012	247.62	1125.99
				NA	3/19/2012	249.16	1124.45
					4/16/2012	249.30	1124.31
					5/21/2012	249.90	1123.71
					6/18/2012	250.84	1122.77
					7/16/2012	251.16	1122.45
					8/20/2012	253.05	1120.56
					9/17/2012	255.20	1118.41
					10/15/2012	255.29	1118.32
					11/19/2012	256.83	1116.78
					12/17/2012	256.34	1117.27
					3/18/2013	257.63	1115.98
					6/17/2013	259.90	1113.71

Monitor Well ID	TOC (feet AMSL)	Screened Interval (feet btoc)	Screened Interval (AMSL)	Transducer (feet btoc)	Date	Depth to Water (btoc)	Groundwater Elevation (feet AMSL)
ADEQ Well No. 5	1375.57	261 - 421	1114.57-954.57	NA	2/14/1995 [8]	325.24	1050.33
					7/7/1995 [8]	318.4	1057.17
					6/25/1996 [8]	307.7	1067.87
					10/17/1996 [8]	313.64	1061.93
					11/8/1996 [8]	312.08	1063.49
					5/12/1997 [8]	306.12	1069.45
					2/25/1998 [8]	295.73	1079.84
					8/20/1998 [8]	288.35	1087.22
					9/10/2001 [8]	279	1096.57
					1/29/2003 [8]	291.1	1084.47
					6/8/2007 [9]	265.8	1109.77
					2/6/2008 [10]	258.1	1117.47
					2/20/2008 [10]	257.21	1118.36
				245	12/13/2011	235.43	1140.14
					12/15/2011	235.32	1140.25
	1372.33 [11]				1/19/2012	237.10	1135.23
					2/20/2012	241.08	1131.25
					3/19/2012	242.15	1130.18
					4/16/2012	242.23	1130.10
					5/21/2012	243.22	1129.11
				255	6/18/2012	244.25	1128.08
					7/16/2012	244.50	1127.83
					8/20/2012	246.25	1126.08
				NA	10/3/2012	249.45	1122.88
					10/15/2012	249.15	1123.18
				259.15	11/19/2012	249.84	1122.49
					12/17/2012	248.68	1123.65
					6/17/2013	252.14	1120.19
ADEQ Well No. 6	1382.36	320 - 440	1062.36-942.36	NA	5/13/1997 [8]	338.75	1043.61
					2/26/1998 [8]	321.7	1060.66
					8/19/1998 [8]	325.88	1056.48
					9/10/2001 [8]	308	1074.36
					1/31/2003 [8]	318.78	1063.58
					6/8/2007 [9]	286.2	1096.16
					2/6/2008 [10]	287.07	1095.29
					2/20/2008 [10]	286.01	1096.35
					12/12/2011	254.11	1128.25
					12/15/2011	253.82	1128.54
					1/19/2012	254.48	1127.88
					2/20/2012	257.85	1124.51
					3/19/2012	259.00	1123.36
					4/16/2012	253.30	1129.06
					5/21/2012	260.35	1122.01
					6/18/2012	261.27	1121.09
					7/16/2012	261.60	1120.76
					8/20/2012	263.49	1118.87
					9/17/2012	264.98	1117.38
					10/15/2012	265.24	1117.12
					11/19/2012	267.08	1115.28
					12/17/2012	266.83	1115.53
					3/18/2013	268.01	1114.35
					6/17/2013	270.60	1111.76

Monitor Well ID	TOC (feet AMSL)	Screened Interval (feet btoc)	Screened Interval (AMSL)	Transducer (feet btoc)	Date	Depth to Water (btoc)	Groundwater Elevation (feet AMSL)
ADEQ Well No. 7	1326.98	236 - 369	1090.98-957.98	NA	5/12/1997 (8)	243.44	1083.54
					2/25/1998 (8)	239.19	1087.79
					8/20/1998 (8)	227.72	1099.26
					9/10/2001 (8)	218	1108.98
					2/6/2003 (8)	228.78	1098.20
					6/7/2007 (9)	206.7	1120.28
					3/22/2011 (5)	180.17	1146.81
				195	12/13/2011	185.24	1148.76
					12/15/2011	185.23	1141.75
					1/19/2012	186.88	1140.10
					2/20/2012	189.10	1137.88
					3/19/2012	191.24	1135.74
					4/16/2012	192.34	1134.64
					5/21/2012	193.30	1133.68
				205	6/18/2012	193.90	1133.08
					7/16/2012	194.78	1132.20
					8/20/2012	195.40	1131.58
					9/17/2012	197.29	1129.69
					10/15/2012	198.52	1128.46
					11/19/2012	199.10	1127.88
					12/17/2012	198.60	1128.38
					3/18/2013	199.25	1127.73
				215	6/17/2013	200.10	1126.88

Monitor Well ID	TOC (feet AMSL)	Screened Interval (feet btoc)	Screened Interval (AMSL)	Transducer (feet btoc)	Date	Depth to Water (btoc)	Groundwater Elevation (feet AMSL)
ADEQ Well No. 8	1338.05	240 - 360	1098.05-978.05	NA	2/25/1998 (8)	259.18	1078.87
					8/20/1998 (8)	250.82	1087.23
					9/10/2001 (8)	242	1096.05
					2/6/2003 (8)	252.85	1085.20
					6/7/2007 (9)	228.9	1109.15
					2/4/2008 (10)	221.82	1116.23
					2/6/2008 (10)	222	1116.05
					2/20/2008 (10)	220.51	1117.54
					3/22/2011 (5)	194.42	1143.63
				210	12/13/2011	199.29	1127.52
					12/15/2011	198.98	1139.07
					1/19/2012	200.56	1137.49
					2/20/2012	204.11	1133.94
					3/19/2012	205.34	1132.71
					4/16/2012	205.74	1132.31
					5/21/2012	206.78	1131.27
				220	6/18/2012	207.68	1130.37
					7/16/2012	208.21	1129.84
					8/20/2012	209.50	1128.55
					9/17/2012	211.85	1126.20
					10/15/2012	212.68	1125.37
					11/19/2012	213.18	1124.87
					12/17/2012	212.30	1125.75
					3/18/2013	213.65	1124.40
					6/17/2013	215.20	1122.85

Abbreviations:

ID - identification
AMSL - above mean sea level
btoc - below top of casing (measuring point recorded on the north side of the casing)
NT - Nammo Talley
ADEQ - Arizona Department of Environmental Quality
NA - not applicable
WBO - Water Bore Out
HPA - Historical Pond Area

Notes:

(1) August 24, 2009 Brown & Caldwell MW Status Report
(2) July 2009 Geosyntec ISB Status Update report
(3) September 3, 2010 Brown & Caldwell GW Investigation MW Summary Report
(4) October 2010, Geosyntec Well Installation and Aquifer Test Report
(5) March 2011 ASU Grad Student ISMA Project
(6) Data provided by Nammo Talley Inc.
(7) June 2009 Geosyntec Perchlorate Source Investigation Report
(8) ADEQ Various WQARF Sampling Events
(9) July 2007 Terranext GW Monitoring Report for ADEQ
(10) April 15, 2008 Geomatrix Depth Specific Sampling Report
(11) Resurveyed on March 8, 2012. This survey resulted in an elevation difference of 3.24 feet.

Geosyntec consultants

Table 2
WBO-1 Soil Data
Nammo Talley Inc.
Mesa, Arizona

					Anions						
Depth (ft bgs)	**pH (SI units)**	**EC (µS/cm)**	**Perchlorate (mg/kg)**	**Ammonium-N (mg/kg)**	**Nitrate-N (mg/kg)**	**Nitrite-N (mg/kg)**	**Sulfate (mg/kg)**	**Phosphate (mg/kg)**	**Chlorate (mg/kg)**	**Chloride (mg/kg)**	**Bromide (mg/kg)**
0.5	7.86	698	6.6	0.86	--	--	--	--	--	--	--
5	5.72	166	0.47	--	17	<0.12	16	10	<0.32	2	0.99
6	8.61	340	< 0.4	--	--	--	--	--	--	--	--
10	7.55	116	1.1	1.8	3.4	<0.12	15.6	2.9	<0.32	2.6	< 0.39
15	6.91	242	3.9	--	22	<0.12	27.5	1.3	<0.32	6.2	< 0.39
20	6.70	404	13	222	40	<0.12	35.2	< 0.57	<0.32	6.6	1.07
25	8.18	340	12	--	14	<0.12	41.6	1.2	<0.32	12.2	2.46
30	7.66	400	23	232	31	<0.12	37.4	< 0.57	<0.32	8.8	1.08
35	7.36	786	103	--	67	<0.12	58.5	1.5	<0.32	13.9	0.89
40	6.13	2552	429	2,020	279	<0.12	79.2	1.6	<0.32	33.3	< 0.39
45	6.50	2794	325	--	360	<0.12	41.5	< 0.57	<0.32	30.2	< 0.39
49.5	6.83	2630	290	1,870	324	<0.12	60.5	< 0.57	<0.32	16.1	1.11
55	7.59	2518	376	--	296	<0.12	36.6	< 0.57	<0.32	14.6	0.68
60	7.72	2802	1,525	2,220	204	<0.12	37.6	< 0.57	<0.32	20.3	< 0.39
64	7.09	886	502	--	49	<0.12	33.2	< 0.57	<0.32	22.1	8.07
70	6.64	976	862	76	37	<0.12	10.0	< 0.57	<0.32	10.2	< 0.39
75	6.85	714	661	--	21	<0.12	5.7	< 0.57	<0.32	6.5	< 0.39
80	7.33	1324	1,245	13.2	--	--	--	--	--	--	--
85	7.65	1284	1,118	--	58	<0.12	25	< 0.57	<0.32	23	< 0.39
89	7.42	886	776	2.4	--	--	--	--	--	--	--
100	8.42	640	441	104	4.4	<0.12	35.7	< 0.57	<0.32	24.8	1.16
105	7.67	560	367	--	--	--	--	--	--	--	--
110	7.96	610	542	--	--	--	--	--	--	--	--
115	7.99	576	437	--	--	--	--	--	--	--	--
119	7.75	554	406	3.4	13	<0.12	9	< 0.57	<0.32	28	< 0.39
125	7.88	842	636	--	--	--	--	--	--	--	--
130	8.13	628	428	--	--	--	--	--	--	--	--
135	8.24	646	469	--	--	--	--	--	--	--	--
139	8.57	446	267	0.66	12	<0.12	25	< 0.57	<0.32	17	< 0.39
144	8.57	514	319	--	--	--	--	--	--	--	--
150	8.53	412	250	--	--	--	--	--	--	--	--
155	8.41	414	235	--	--	--	--	--	--	--	--
159	8.66	420	231	0.67	11	<0.12	4.8	< 0.57	<0.32	15.5	< 0.39
164	8.63	432	227	--	--	--	--	--	--	--	--
170	8.41	492	240	--	--	--	--	--	--	--	--
175	8.89	324	48.4	--	--	--	--	--	--	--	--
180	8.94	244	1.15	0.10	0.97	<0.12	7.34	< 0.57	<0.32	22.47	< 0.39
185	8.87	214	< 0.4	--	--	--	--	--	--	--	--
189	7.84	624	7.4	--	--	--	--	--	--	--	--
195	9.12	204	< 0.4	--	--	--	--	--	--	--	--
197	9.04	280	0.06	0.10	0.77	<0.12	8.62	< 0.57	<0.32	32.99	< 0.39

Abbreviations

"--" sample not analyzed
µS/cm - microsiemens per centimeter
ft bgs - feet below ground surface
EC - electrical conductivity
N - Nitrogen
mg/kg - milligrams per kilogram (dry weight basis)
SI - International System of Units
< - Laboratory method detection limit

Analytical Methods

Perchlorate	Modified EPA 314 Method (SiREM SOP # 025)
Anions	Modified EPA 300.1 Method (SiREM SOP #025)
Ammonium-N	Method SNL-035 (University of Guelph Laboratory Services)
	- M4500-NH3 D; KCl extractable NH4-N and NO3-N

Monitor Well ID	Sample Depth Interval (feet btoc)[1]	Sample Date	Perchlorate Analytical Results (µg/L)
NT-1	~200	2/3/2009 [2]	9400
	~195	7/28/2009 [3]	20000
	328	3/30/2010 [4]	6400
	185	3/30/2010 [4]	30000
	Grab	8/4/2010 [5]	11000
	Grab	3/22/2011 [6]	13972
	188-190	12/15/2011	4400
		3/19/2012	3300
		6/18/2012	1500
	198.24-200.24	9/18/2012	1100
		12/17/2012	140
		3/18/2013	140
		6/17/2013	110
NT-6	Grab	6/18/2010 [5]	4400
	~189	7/12/2010 [5]	2700
	Unknown	3/22/2011 [6]	15956
	186-188	12/15/2011	1400
		3/19/2012	390
		6/18/2012	390
	198.69-200.69	9/18/2012	180
		12/17/2012	34
		3/18/2013	3.9
		6/17/2013	19
NT-7	Grab	6/23/2010 [5]	99
	~188	7/12/2010 [5]	100
	Unknown	3/22/2011 [6]	50.8
	186-188	12/15/2011	32
		3/19/2012	4.0
		6/18/2012	3.7
	198-200	9/18/2012	5.0
		12/17/2012	8.4
		3/18/2013	12
		6/17/2013	9.0

Monitor Well ID	Sample Depth Interval (feet btoc)[1]	Sample Date	Perchlorate Analytical Results (µg/L)
NT-8	194.4-196.4	9/18/2012	<2.0
		10/3/2012	<2.0
		12/17/2012	<2.0
NT-9	199-201	6/18/2012	<2.0
		9/18/2012	<2.0
NT-10	183-185	6/18/2012	<2.0
		9/18/2012	<2.0
NT-11	199.77-201.77	9/19/2012	2.8
	202.89-204.89	12/17/2012	<2.0
		3/18/2013	<2.0
WBO-1	Grab MS	2/26/2009 [7]	1900-3000
	~190	7/28/2009 [3]	7900
	Grab	3/22/2011 [6]	5949
	183-185	12/15/2011	1800
		3/19/2012	810
		6/18/2012	860
	195.09-197.09	9/17/2012	320
		12/17/2012	68
		3/18/2013	68
		6/17/2013	76
HPA-1	~183	2/16/2009 [8]	39
	~188	7/28/2009 [3]	270
	Grab	3/22/2011 [6]	5.5
	182-184	12/15/2011	4.0
		3/19/2012	<2.0
		6/18/2012	<2.0
		9/17/2012	2.6
	197.29-199.29	12/17/2012	<2.0
		3/18/2013	2.8
		6/17/2013	<2.0
ADEQ Well No. 7	Grab MS	6/7/2007 [9]	ND/0.57
	249-251	12/15/2011	< 2.0
		9/17/2012	< 2.0

Monitor Well ID	Sample Depth Interval (feet btoc)[1]	Sample Date	Perchlorate Analytical Results (µg/L)
ADEQ Well No. 8	Grab MS	6/7/2007 [9]	600/ 570
	Grab MS	6/7/2007 [9]	530/ 590
	235-375 MS	2/20/2008 [10]	230-1200
	Unknown	3/22/2011 [6]	340
	253-255	12/15/2011	210
		3/19/2012	210
		6/18/2012	160
		9/17/2012	150
		12/17/2012	61
		3/18/2013	81
		6/17/2013	34

Abbreviations:

ID - identification
btoc - below top of casing
µg/L - micrograms per Liter
NT - Nammo Talley
WBO - Water Bore Out
HPA - Historical Pond Area
ADEQ - Arizona Department of Environmental Quality
~ - approximate
Grab - Grab Sample
MS - multiple samples
NS - no sample collected
ND - not detected above the laboratory reporting limit
"<" - less than the laboratory reporting limit of 2.0 µg/L

Notes:

There is currently no Maximum Contaminant Level for perchlorate. The Arizona Health Based Guidance Level for perchlorate is 14 µg/L.
(1) The HydraSleeve® groundwater samples are collected over an approximate 24 inch depth interval
(2) August 24, 2009 Brown & Caldwell MW Status Report
(3) September 3, 2010 Brown & Caldwell GW Investigation MW Summary Report
(4) Data provided by Nammo Talley Inc.
(5) October 2010, Geosyntec Well Installation and Aquifer Test Report
(6) March 2011 ASU Grad Student ISMA Project
(7) July 2009 Geosyntec ISB Status Update report
(8) June 2009 Geosyntec Perchlorate Source Investigation Report
(9) July 2007 Terranext GW Monitoring Report for ADEQ
(10) No sample was collected because the pump was not working.

Table 4
Summary of Groundwater Chemistry Analytical Results
Nammo Talley Defense
Mesa, Arizona

	Units	RL	MCL	NT-1	NT-6	NT-7
				2/4/2009	7/12/2010	7/12/2010
General Chemistry Parameters						
Alkalinity (as CaCO3)	mg/L	6.0	NE	180	190	190
Alkalinity (Phenolphthalein)	mg/L	6.0	NE	-	-	-
Bicarbonate (as CaCO3)	mg/L	6.0	NE	180	190	190
Carbonate (as CaCO3)	mg/L	6.0	NE	-	-	-
Chloride	mg/L	2.0	250.0	180	180	190
Conductivity*	µS/cm	NE	NE	1080	1017	1040
DO*	mg/L	NE	NE	NA	8.65	6.95
Fluoride	mg/L	0.40	4.00	0.41	0.40	0.44
Hydroxide Alkalinity (as CaCO3)	mg/L	6.0	NE	-	-	-
Nitrate (as N)	mg/L	0.20	10.00	3.0	2.2	3.0
ORP*	mV	NE	NE	NA	-18.0	21.0
pH*	pH Units	NE	6.5 to 8.5	7.48	7.10	7.08
Sulfate	mg/L	2.0	250.0			
Total Dissolved Solids (TDS)	mg/L	20	500	**560**	**510**	**570**
Temperature*	^{o}C	NE	NE	22.6	27.46	27.60
Turbidity*	NTU	NE	NE	0.4	1.49	0.39
Metals Parameters						
Calcium	mg/L	2.0	NE	38	36	36
Magnesium	mg/L	2.0	NE	14	14	14
Potassium	mg/L	2.0	NE	4.5	4.3	3.9
Sodium	mg/L	2.0	NE	160	150	140
Perchlorate						
Perchlorate	µg/L	2.0	NE	9,400	2,700	100

Notes:

Bold values exceed the United States Environmental Protection Agency Primary (MCL) or Secondary Drinking Water Standard
MCL - Maximum Contaminant Level for drinking water
NE - Not Established
NA - Not Analyzed
"-" Not detected at concentrations greater than or equal to the laboratory RL
ORP - Oxidation Reduction Potential
DO - Dissolved Oxygen
RL - Laboratory reporting limit
mg/L - milligrams per liter
µg/L - micrograms per liter
µS/cm - microsiemens per centimeter
*pH, temperature, conductivity, turbidity, ORP, and DO were measured in the field.
CACO3 - Calcium carbinate
N - Nitrigen
mV - Millivolt
NT - Nammo Talley

Table 5
Former Water Bore-Out Pits Infiltration Test Data and Calculations
Nammo Talley, Inc.
Mesa Arizona

Geosyntec consultants

12-Inch Head Test

Date & Time	Approx. Head (inches)	Duration (min)	Flow Rate (gpm)	Time Interval Gallons	Total Gallons
10/20/10 8:28 AM	12.00	0	0.60	0.00	0.00
10/20/10 8:31 AM	12.06	3	0.80	2.40	2.40
10/20/10 8:34 AM	12.13	3	1.20	3.60	6.00
10/20/10 8:35 AM	12.13	1	1.00	1.00	7.00
10/20/10 8:39 AM	12.19	4	0.90	3.60	10.60
10/20/10 8:54 AM	12.19	15	0.85	12.75	23.35
10/20/10 8:57 AM	12.22	3	0.80	2.40	25.75
10/20/10 9:04 AM	12.25	7	0.75	5.25	31.00
10/20/10 9:07 AM	12.25	3	0.70	2.10	33.10
10/20/10 9:28 AM	12.25	21	0.70	14.70	47.80
	Total	60			47.80

Approx. Actual Tank Infiltration Rate = 0.70 gpm
Infiltration Surface Diameter = 5.25 feet
Infiltration Surface Area = 21.65 square feet
Approx. Actual Infiltration per sq foot = 0.03 gpm

Approximate WBO Infiltration Area = 22,888 square feet
Maximum Infiltration Rate at 12" of Head = 686.64 gpm
Approx. Infiltration Rate at 4" of Head(1) = 228.88 gpm
Approx. Infiltration Rate at 2" of Head(1) = 114.44 gpm
Approx. Infiltration Rate at 1" of Head(1) = 57.22 gpm

Approximate HPA Infiltration Area = 20,082 square feet
Maximum Infiltration Rate at 12" of Head = 602.46 gpm
Approx. Infiltration Rate at 4" of Head(1) = 200.82 gpm
Approx. Infiltration Rate at 2" of Head(1) = 100.41 gpm
Approx. Infiltration Rate at 1" of Head(1) = 50.21 gpm

36-Inch Head Test

Date & Time	Approx. Head (inches)	Duration (min)	Flow Rate (gpm)	Time Interval Gallons	Total Gallons
10/20/10 9:46 AM	36.00	0	1.30	0.00	0.00
10/20/10 9:51 AM	35.94	5	1.40	7.00	7.00
10/20/10 9:53 AM	35.88	2	1.50	3.00	10.00
10/20/10 9:55 AM	35.81	2	1.70	3.40	13.40
10/20/10 9:59 AM	35.75	4	1.80	7.20	20.60
10/20/10 10:22 AM	35.75	23	1.90	43.70	64.30
10/20/10 10:55 AM	35.75	33	1.90	62.70	127.00
	Total	69			127.00

Approx. Actual Tank Infiltration Rate = 1.90 gpm
Infiltration Surface Diameter = 5.25 feet
Infiltration Surface Area = 21.65 square feet
Approx. Actual Infiltration per sq foot = 0.09 gpm

48-Inch Head Test

Date & Time	Approx. Head (inches)	Duration (min)	Flow Rate (gpm)	Time Interval Gallons	Total Gallons
10/20/10 11:53 AM	48.13	0	2.72	0.00	0.00
10/20/10 12:03 PM	48.00	10	2.72	27.17	27.17
10/20/10 12:13 PM	47.88	10	2.72	27.17	54.33
10/20/10 12:23 PM	47.76	10	2.72	27.17	81.50
10/20/10 12:33 PM	47.63	10	2.72	27.17	108.67
10/20/10 12:43 PM	47.50	10	2.72	27.17	135.83
- Ruptured hose at flow meter at 12:43. Test terminated.					
- 2.72 gpm was maximum allowable flow at available pressure.					
	Total	50			135.83

Approx. Actual Tank Infiltration Rate = 2.72 gpm
Infiltration Surface Diameter = 5.25 feet
Infiltration Surface Area = 21.65 square feet
Approx. Actual Infiltration per sq foot = 0.13 gpm

Abbreviations: Approx. - Approximate; " - inches; min - minutes; WBO - Former Water Bore-Out Pits; gpm - gallons per minutes; HPA - Historical Pond Area

Equations: Infiltration Surface Diameter = Diameter of the bottomless 1,000-gallon polyethylene storage tank.

Infiltration Surface Area = pi x $(\text{Diameter}/2)^2$
Infiltration per square foot = Tank Infiltration Rate/Infiltration Surface Area
Maximum Infiltration Rate at 12" of Head = Infiltration Area x Infiltration per square foot
Approximate Infiltration Rate at X" of Head = Infiltration Area x Infiltration per sq foot/(12"/X")

Notes: (1) Assumes a 1:1 relationship between the infiltration rate per sq foot and head pressure

Table 6
Potential Discharge Area Infiltration Test Data and Calculations
Nammo Talley, Inc.
Mesa Arizona

Geosyntec consultants

12-Inch Head Test						36-Inch Head Test						48-Inch Head Test					
Date & Time	Approx. Head (inches)	Duration (min)	Flow Rate (gpm)	Time Interval Gallons	Total Gallons	Time	Approx. Head (inches)	Duration (min)	Flow Rate (gpm)	Time Interval Gallons	Total Gallons	Time	Approx. Head (inches)	Duration (min)	Flow Rate (gpm)	Time Interval Gallons	Total Gallons
10/21/10 10:49 AM	12.00	0	0.70	0.00	0.00	10/21/10 12:28 PM	36.00	0	1.90	0.00	0.00	10/21/10 2:10 PM	48.00	0	2.42	0.00	0.00
10/21/10 11:49 AM	12.25	60	0.70	42.00	42.00	10/21/10 12:32 PM	36.13	4	1.70	6.80	6.80	10/21/10 2:12 PM	48.17	2	2.00	4.00	4.00
						10/21/10 12:37 PM	36.25	5	1.60	8.00	14.80	10/21/10 2:19 PM	48.33	7	1.80	12.60	16.60
						10/21/10 12:40 PM	36.38	3	1.50	4.50	19.30	10/21/10 2:30 PM	48.50	11	1.70	18.70	35.30
						10/21/10 12:47 PM	36.50	7	1.30	9.10	28.40	10/21/10 3:19 PM	48.50	49	1.70	83.30	118.60
						10/21/10 1:28 PM	36.50	41	1.30	53.30	81.70						
	Total	60			42.00		Total	60			81.70		Total	69			118.60

12-Inch Head Test			36-Inch Head Test			48-Inch Head Test		
Approx. Actual Tank Infiltration Rate =	0.70	gpm	Approx. Actual Tank Infiltration Rate =	1.30	gpm	Approx. Actual Tank Infiltration Rate =	1.70	gpm
Infiltration Surface Diameter =	5.25	feet	Infiltration Surface Diameter =	5.25	feet	Infiltration Surface Diameter =	5.25	feet
Infiltration Surface Area =	21.65	square feet	Infiltration Surface Area =	21.65	square feet	Infiltration Surface Area =	21.65	square feet
Approx. Actual Infiltration per sq foot =	0.03	gpm	Approx. Actual Infiltration per sq foot =	0.06	gpm	Approx. Actual Infiltration per sq foot =	0.08	gpm
Min. Total Flow Required =	350	gpm	Min. Total Flow Required =	350	gpm	Min. Total Flow Required =	350	gpm
Required Size of Infiltration Basin =	11,667	sq. feet	Required Size of Infiltration Basin =	5,829	square feet	Required Size of Infiltration Basin =	4,375	square feet
Required Size of Infiltration Basin =	0.27	acres	Required Size of Infiltration Basin =	0.13	acres	Required Size of Infiltration Basin =	0.10	acres
Max. Total Flow Required =	500	gpm	Max. Total Flow Required =	500	gpm	Max. Total Flow Required =	500	gpm
Required Size of Infiltration Basin =	16,667	square feet	Required Size of Infiltration Basin =	8,327	square feet	Required Size of Infiltration Basin =	6,250	square feet
Required Size of Infiltration Basin =	0.38	acres	Required Size of Infiltration Basin =	0.19	acres	Required Size of Infiltration Basin =	0.14	acres

Abbreviations: Approx. - Approximate
min - minutes
gpm - gallons per minutes

Equations: Infiltration Surface Diameter = Diameter of the bottomless 1,000-gallon polyethylene storage tank.
Infiltration Surface Area = pi x $(\text{Diameter}/2)^2$
Infiltration per square foot = Tank Infiltration Rate/Infiltration Surface Area
Size of Infiltration Basin = Flow Required/Infiltration per square foot

Table 7
Anticipated Performance Monitoring Program
Nammo Talley Inc.
Mesa, Arizona

Parameter	Sampling Location & Frequency[1]						
	WBO-1	Influent/Effluent[2]	Extraction Wells	HPA-1	NT-1, 6, 7, 8, 10, 11	IW[2]	Soil Verification[3]
Phase I - Hydraulic Containment & ESB							
Water Levels	T	--	T	T	T	--	--
Field Parameters[4]	B,Q	W/M	B,Q	B,Q	B,Q	--	--
Perchlorate	B,Q	W/M	B,Q	B,Q	B,Q	--	--
Chlorate	B,A	Q	B,A	B,A	B,A	--	--
Anions (nitrate, nitrite, chloride, sulfate)	B,Q	W/M	B,Q	B,Q	B,Q	--	--
Ammonia/Ammonium	B,A	Q	B,A	B,A	B,A	--	--
Dissolved Organic Carbon (DOC)	B,A	Q	B,A	B,A	B,A	--	--
Sulfide	B,A	Q	B,A	B,A	B,A	--	--
Methane	B,A	Q	B,A	B,A	B,A	--	--
13 Priority Pollutant	--	Q	--	--	B,Q	--	--
Phase II - ISB							
Water Levels	--	--	--	--	--	T	--
Field Parameters[4]	--	--	--	--	--	--	--
Perchlorate	--	--	--	--	--	--	Bi
Chlorate	--	--	--	--	--	--	Bi
Anions (nitrate, nitrite, chloride, sulfate)	--	--	--	--	--	--	Bi
Tracers (bromide, iodide)	B,M	--	B,M	Q	Q	--	Bi
Ammonia/Ammonium	--	--	--	--	--	--	Bi
Soil pH	--	--	--	--	--	--	Bi

Abbreviations:

IW - Injection Wells

ESB - ex-situ bioremediation

ISB - in-situ bioremediation

Notes:

1 - Frequency: T = Transducer; B = Baseline; W = Weekly; M = Monthly; Q = Quarterly; A = annually; Bi = Biennially; and W/M = Weekly for the first 3 months, Monthly thereafter.

* Groundwater sampling frequency may be modified during the remedial program depending on observed concentration trends.

2 - Location: Influent/Effluent - from ESB System

3 - Soil verification sampling will occur approximately on a biennial basis, depending on groundwater concentration trends and tracer infiltration results.

4 - Field Parameters = pH, dissolved oxygen, oxidation-reduction potential, specific conductance, temperature

Table 8
Summary of Laboratory Analytical Details
Nammo Talley Inc.
Mesa, Arizona

Geosyntec consultants

Parameter	Media	Analytical Method	Method Number	Analytical Laboratory	Quantitation Limit	Sample Container	Preservative	Holding Time
Field Parameters (pH, DO, ORP, specific conductance, temperature)	GW	FE	Field	NA	Varies	NA	NA	NA
Perchlorate	GW	IC	EPA 314.0	AZ Certified	2 µg/L	120 mL plastic	cool to 4°C	28 days
	S	IC	EPA 314.0	AZ Certified	0.02 mg/kg	4 oz jar	cool to 4°C	28 days
Chlorate	GW	IC	EPA 300.1	AZ Certified	20 µg/L	120 mL plastic	cool to 4°C	28 days
	S	IC	EPA 300.1 (mod)	AZ Certified	0.20 mg/kg	4 oz jar	cool to 4°C	28 days
Anions[1] and Tracers[2]	GW	IC	EPA 300.0	AZ Certified	Varies	120 mL plastic	cool to 4°C	2 to 28 days (48 hrs. for nitrate/nitrite)
	S	IC	EPA 9056	AZ Certified	Varies	4 oz jar	cool to 4°C	28 days
Metals[3]	GW	IC, field filter for dissolved	SW 6010	AZ Certified	Varies	500 mL plastic	nitric acid to pH<2, cool to 4°C	6 months
Ammonia/Ammonium	GW	ISE	EPA 350.3	AZ Certified	0.60 mg/L	500 mL plastic	H2SO4 to pH <2, cool to 4°C	28 days
	S	ISE	SM 4500-NH3D	AZ Certified	6.0 mg/kg	4 oz jar	cool to 4°C	28 days
Dissolved Organic Carbon	GW	TOC Analyzer	SM 5310B	AZ Certified	1.0 mg/L	250 mL amber glass	cool to 4°C	14 days
Sulfide	GW	Color/Spec	SM 4500-S C,D	AZ Certified	0.04 mg/L	500 mL plastic	zinc acetate, sodium hydroxide to pH>12, cool to 4°C	7 days
Methane	GW	GC/FID	RSK-175	AZ Certified	5 µg/L	3 x 40 mL VOA vile	HCl to pH < 2, cool to 4°C	14 days
pH	S	FE	Field	NA	NA	NA	NA	NA

Abbreviations:

DO - Dissolved Oxygen
ORP - Oxidation/Reduction Potential
FE - Field Electrode
FID - Flame Ionizing Detector
IC - Ion Chromatography
ISE - Ion Specific Electrode
GC - Gas Chromatography
GW - Groundwater
NA - Not Applicable
S - Soil
TOC - Total Organic Carbon
Color/Spec - Colorometric/Spectrometer
mL - milliliter
µg/L - micorgrams per liter
VOA - Volatile Organic Analysis
VOA - volatile organic analysis
°C - dgree centigrade
> - greater than
< - less than
HCL - hydrochloric acid
H2SO4 - Sulfuric acid
hrs - hours
mg/kg - milligrams per kilogram

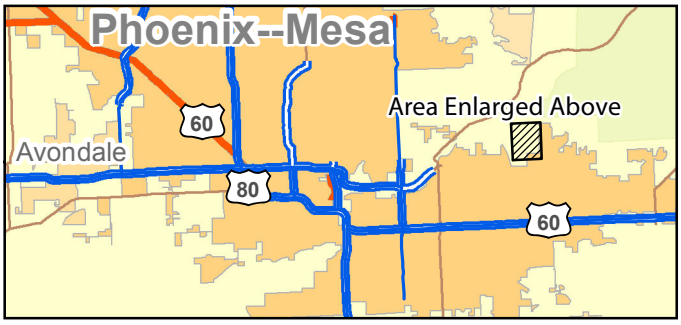
Notes:

1 - Anions = chloride, nitrate, nitrite, sulfate
2 - Tracers = bromide, iodide. Iodide will be subcontracted to TA-STL
3 - Metals - arsenic, barium, beryllium, cadmium, chromium, copper, iron, lead, manganese, nickel, selenium, silver, thallium

Figures

Legend

Approximate Boundary of Nammo Talley Inc. Plant #3



2,000 1,000 0 2,000 Feet

Site Vicinity and Location Map

Nammo Talley Inc. Plant #3
Mesa, Arizona

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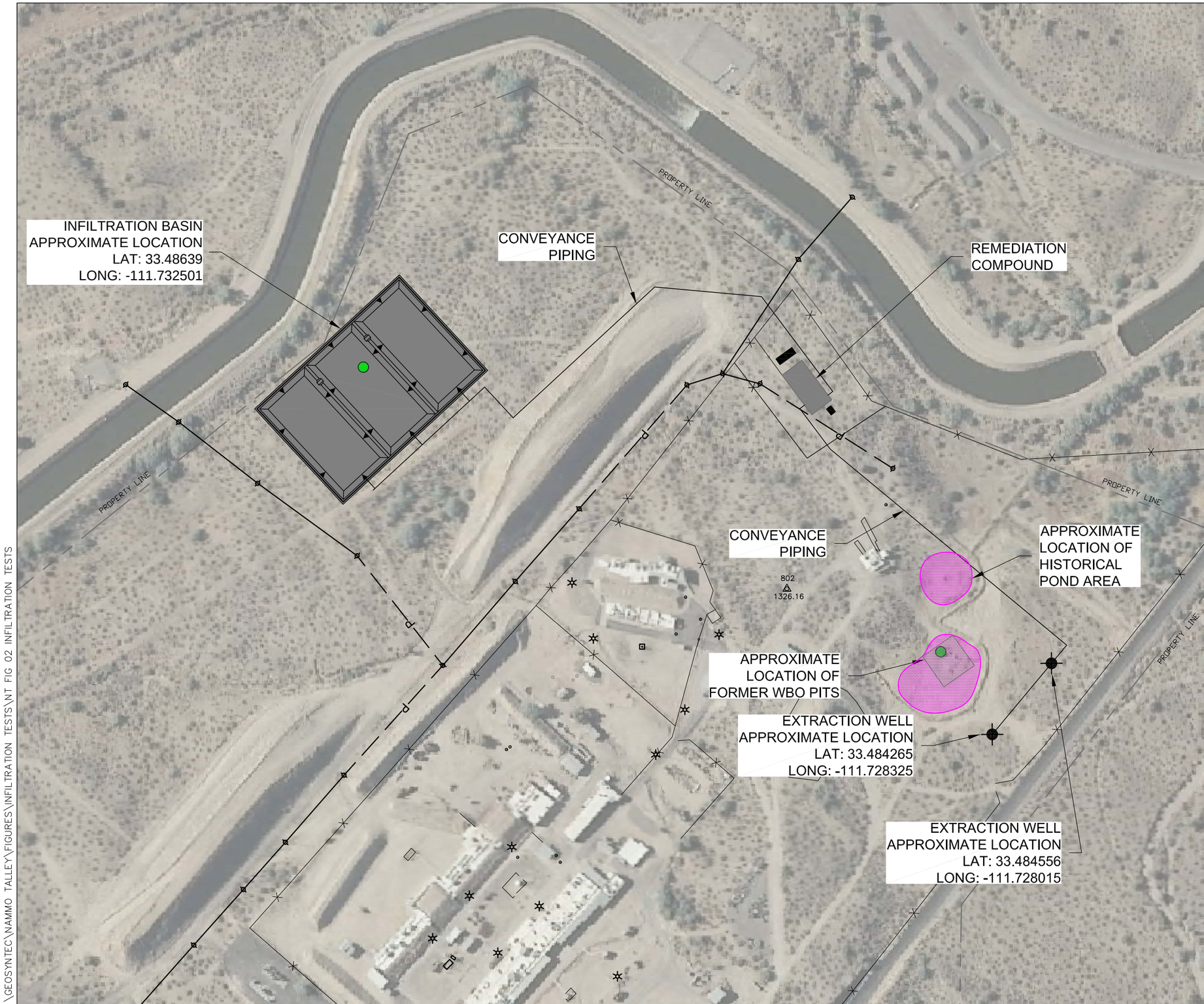
San Diego | October 2010

Figure 1

P:\GIS\SC0475_Mesa\P:\GIS\Talley\SiteVicinityPlant3.mxd



EXPLANATION

Approximate Infiltration Test Locations

Estimated Extent of Maximum ISB Infiltration

200 100 0 200 Feet

Approximate Locations of Infiltration Tests, Surface Impacts & Remedial System Layout

Nammo Talley Inc. Plant #3
Mesa, Arizona

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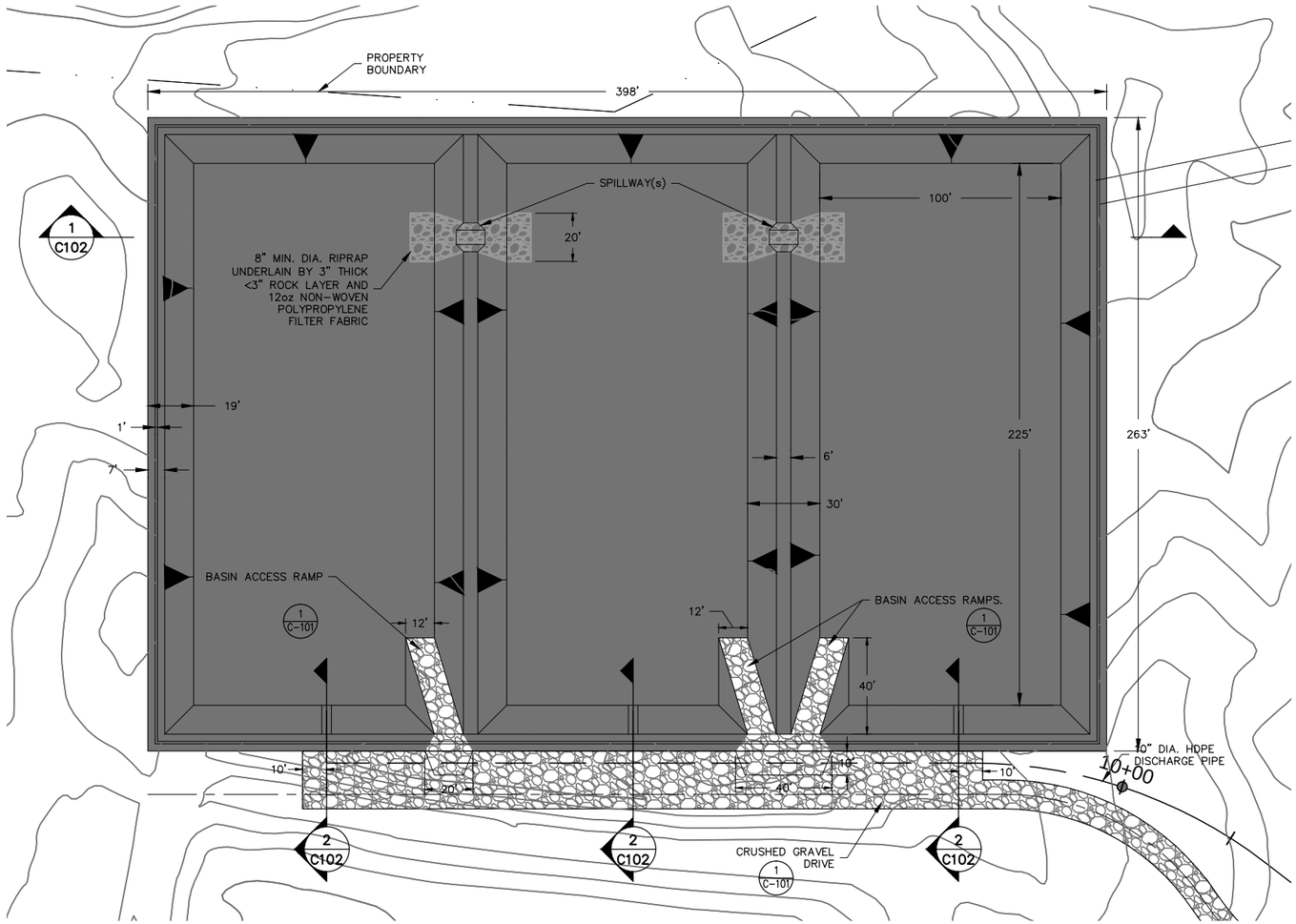
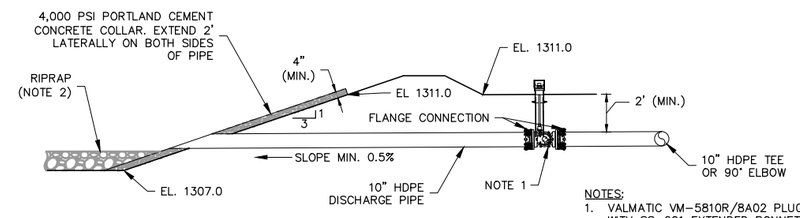
Figure 2

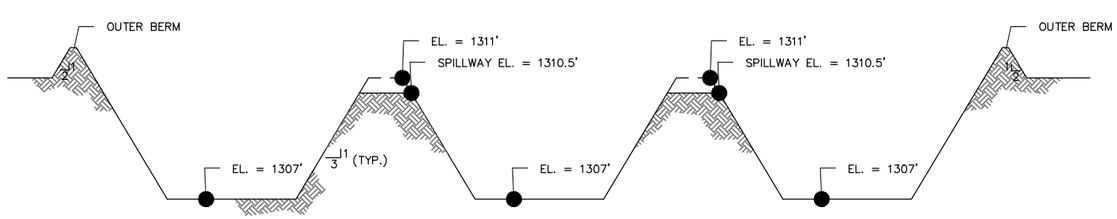
N:\GEOSYNTEC\NAMMO TALLEY\FIGURES\INFILTRATION TESTS\NT FIG 02 INFILTRATION TESTS





2 C102 SECTION
PIPE SIDESLOPE DISCHARGE
NTS

NOTES:
1. VALMATIC VM-5810R/8A02 PLUG VALVE WITH SS-601 EXTENDED BONNET WITH GEAR ACTUATOR OR APPROVED EQUAL.
2. RIPRAP SHALL BE 1' DIA. MIN. ROCK UNDERLAIN BY 3" THICK, <3" ROCK LAYER AND 12oz./SY NON-WOVEN POLYPROPYLENE FILTER FABRIC



1 C102 SECTION
INFILTRATION BASINS
NTS

Infiltration Basin Design

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Mesa, Arizona

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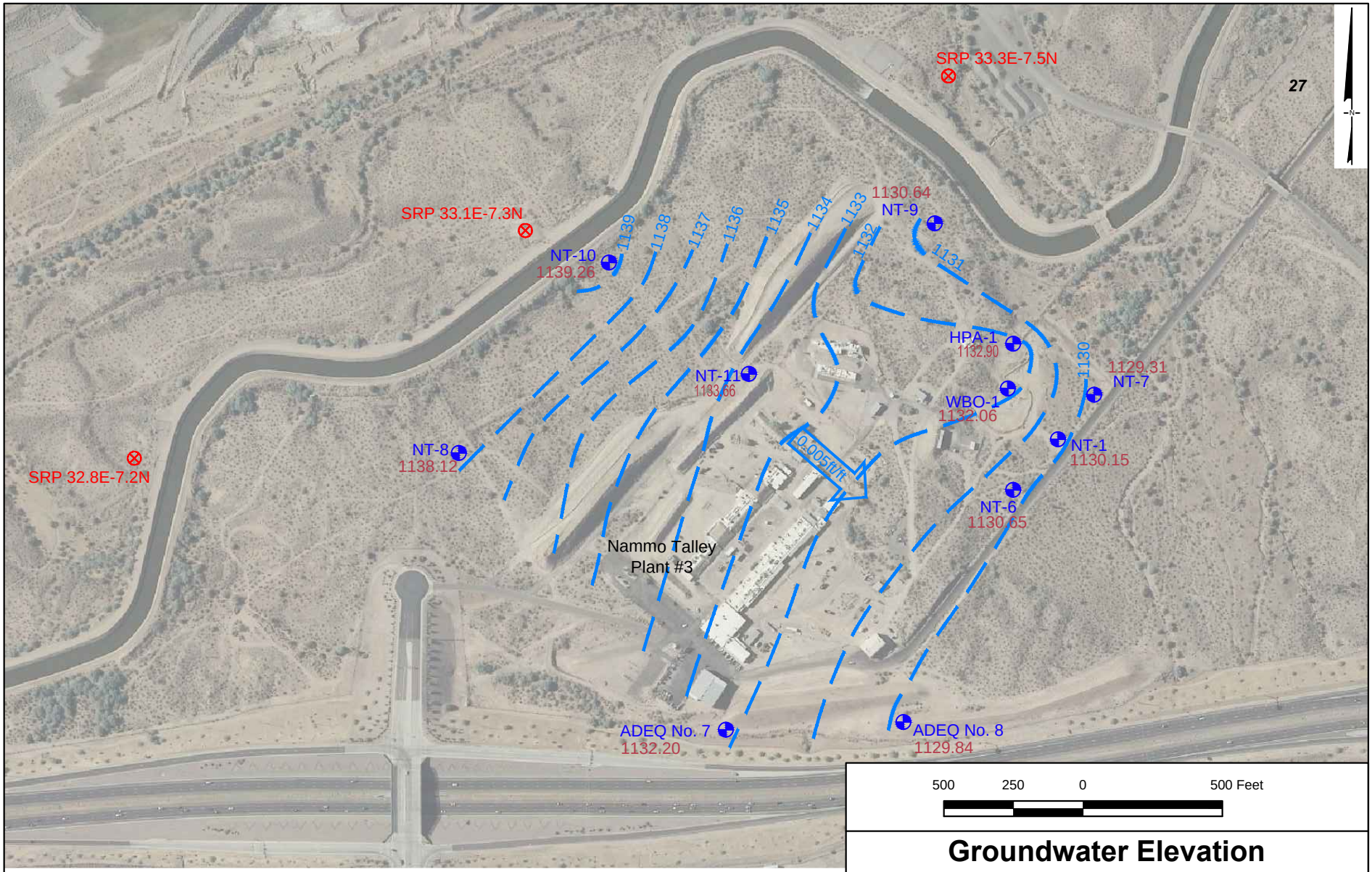
Figure 3

N:\GEOSYNTEC\NAMMO TALLEY\FIGURES\INFILTRATION TESTS\NT FIG 03 INFILTRATION LOCATIONS



500 250 0 500 Feet

EXPLANATION

Monitor Well

Industrial / Irrigation

1130 Groundwater Elevation (1 foot Contour Interval)

0.005ft/ft Approximate Groundwater Flow Direction and Hydraulic Gradient (feet/foot)

Note:
Groundwater contours differ near HPA-1and WBO-1 possibly due to shallower screened interval for these monitor wells.

Groundwater Elevation and Flow Direction 16 July 2012

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Mesa, Arizona

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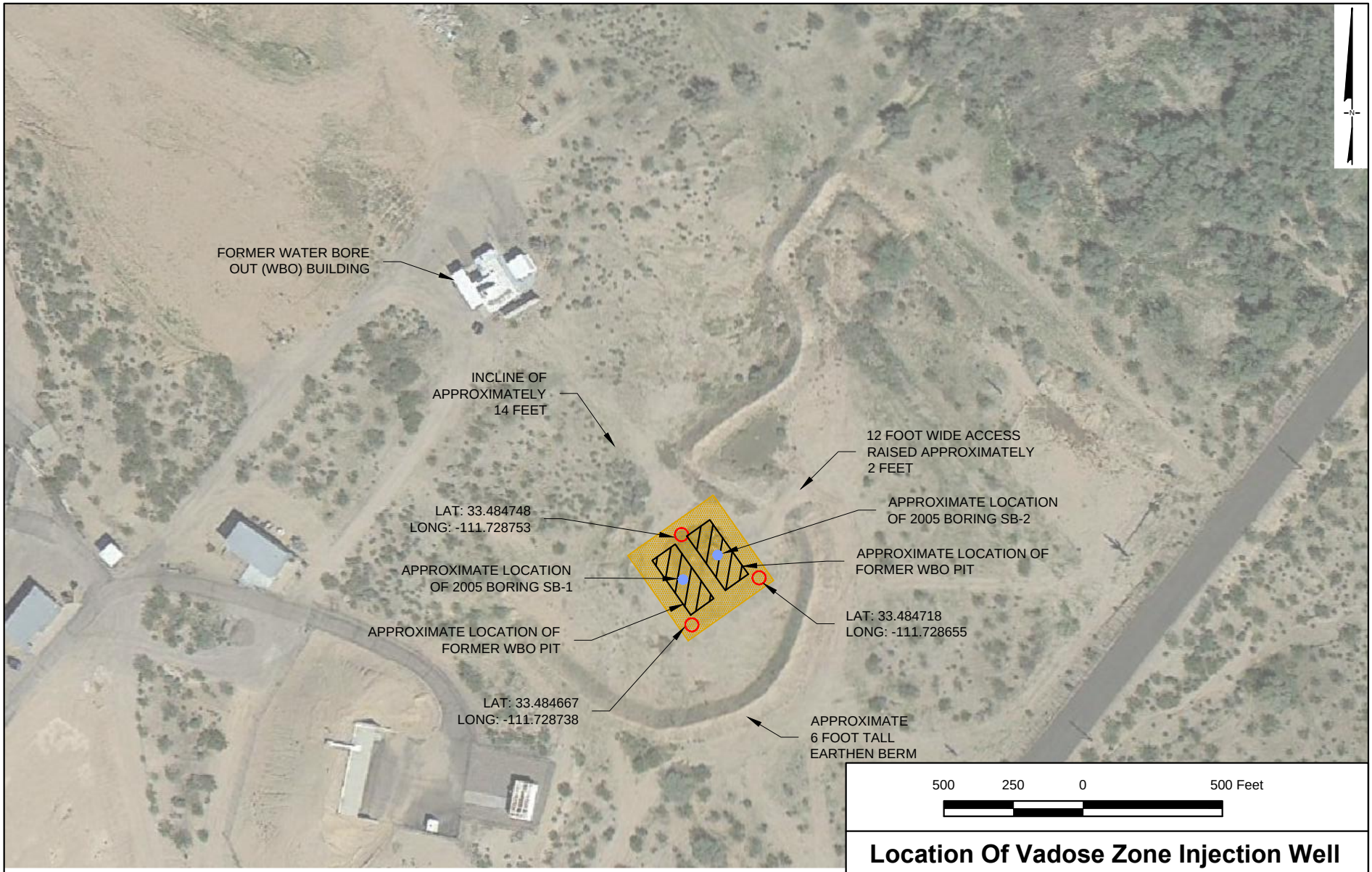
Phoenix, Az | October 2012

Figure 4

N:\GEOSYNTEC\NAMMO TALLEY\FIGURES\INFILTRATION TESTS\NT FIG 4 SITE GW JULY 2012



EXPLANATION

In-Situ Bioremediation Vadose Zone Injection Wells

Former WBO Pits Target Treatment Area
(Lat: 33.484684, Long: -111.728713)

Note:
The Latitude and Longitude of the Vadose Zone Injection Wells is approximate. The actual location of the wells will be based on survey data following well completion.

Location Of Vadose Zone Injection Well And Target Treatment Area

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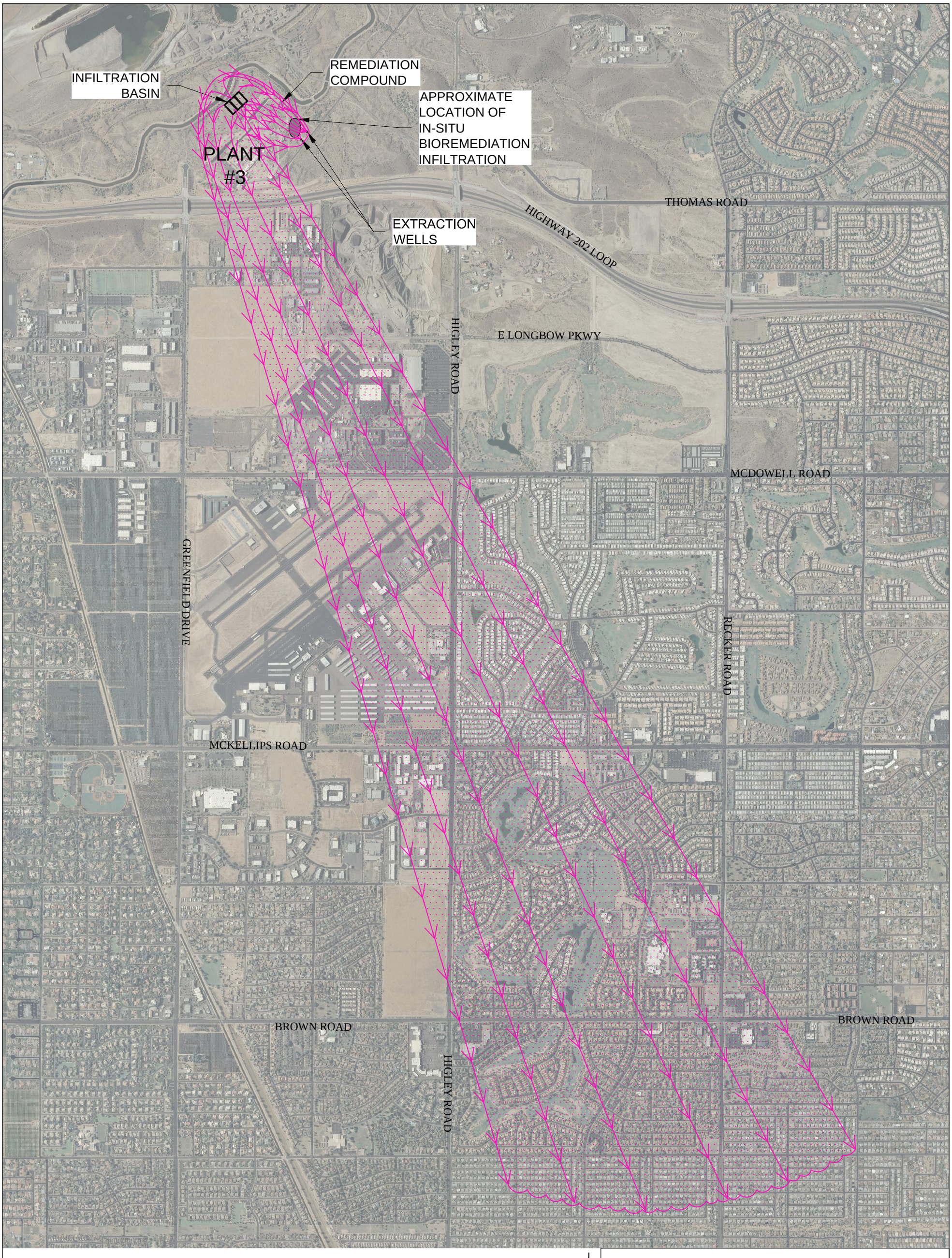
Figure 5

N:\GEOSYNTEC\NAMMO TALLEY\FIGURES\INFILTRATION TESTS\NT FIG 05 VADOSE ZONE



NOTE:
Pollution Management Area conservatively assumes that infiltration immediately comes in contact with water table and does not account for vadoes zone travel time.

EXPLANATION

Flow path with arrows representing approximately one year of travel time.

Pollution Management Area based on aquifer testing and three dimensional groundwater flow model outputs assuming thirty years of infiltration.

1,800 900 0 1,800 Feet

N

Perchlorate Source Area Treatment System
Discharge Impact Area

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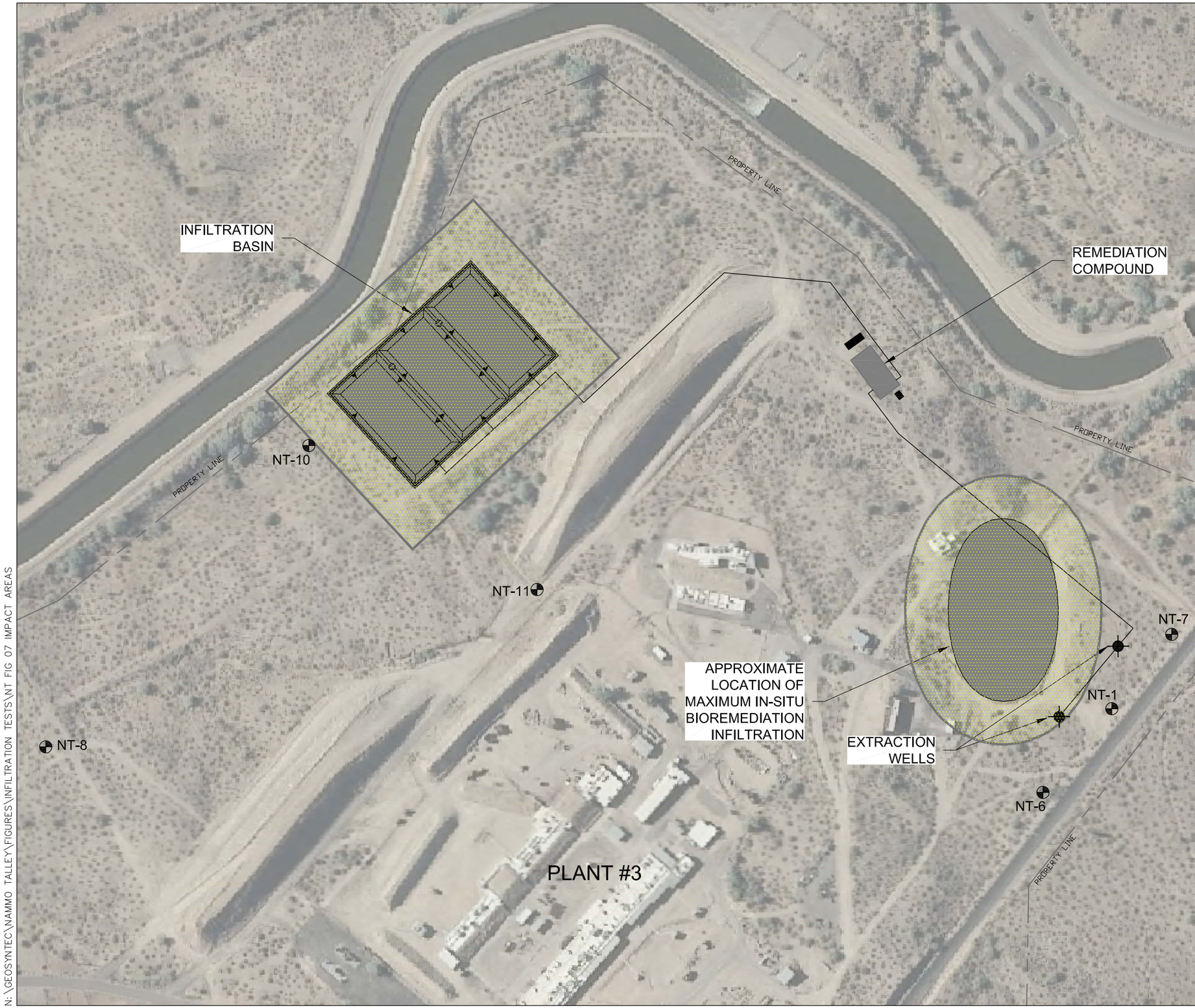
Figure 6

N:\GEOSYNTEC\NAMMO TALLEY\FIGURES\INFILTRATION TESTS\NT FIG 06 POLLUTANT MANAGEMENT



EXPLANATION

Estimated Discharge Impact Areas:
Based conservatively on 40 degrees of lateral spreading from ground surface to water table

Point of Compliance Wells

200 100 0 200 Feet

Perchlorate Source Area Treatment System
Pollution Management Areas

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Figure 7

N:\GEOSYNTEC\NAMMO TALLEY\FIGURES\INFILTRATION TESTS\NT FIG 07 IMPACT AREAS

Representative On-site And Off-site Groundwater Monitor Well Hydrographs

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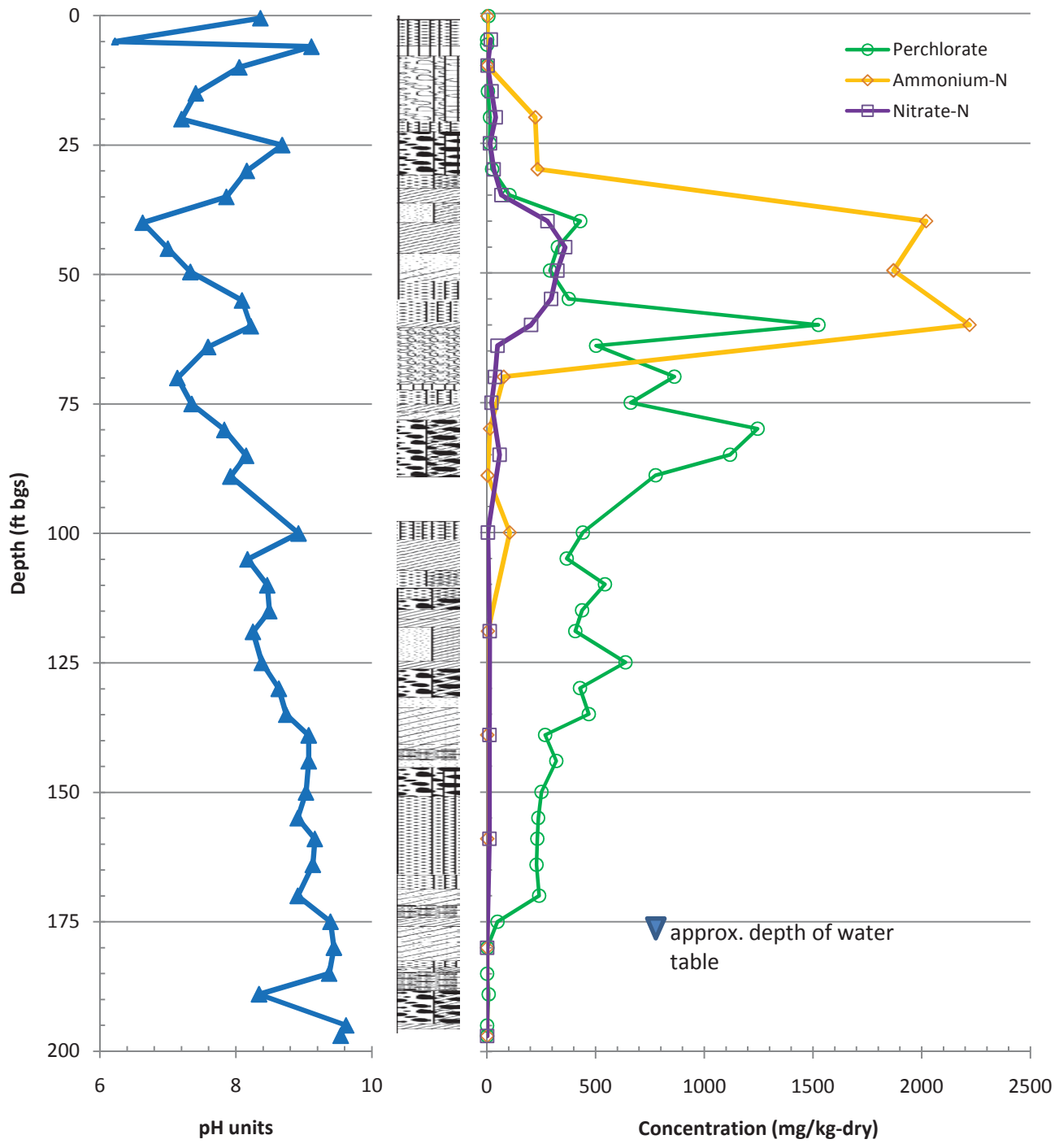
Figure 8

N:\GEOSYNTEC\NAMMO TALLEY\FIGURES\INFILTRATION TESTS\NT FIG 08 HYDROPHRAPH



Soil Concentration Versus Depth Profile for Perchlorate, Ammonium, Nitrate, and pH at WBO-1

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Mesa, Arizona

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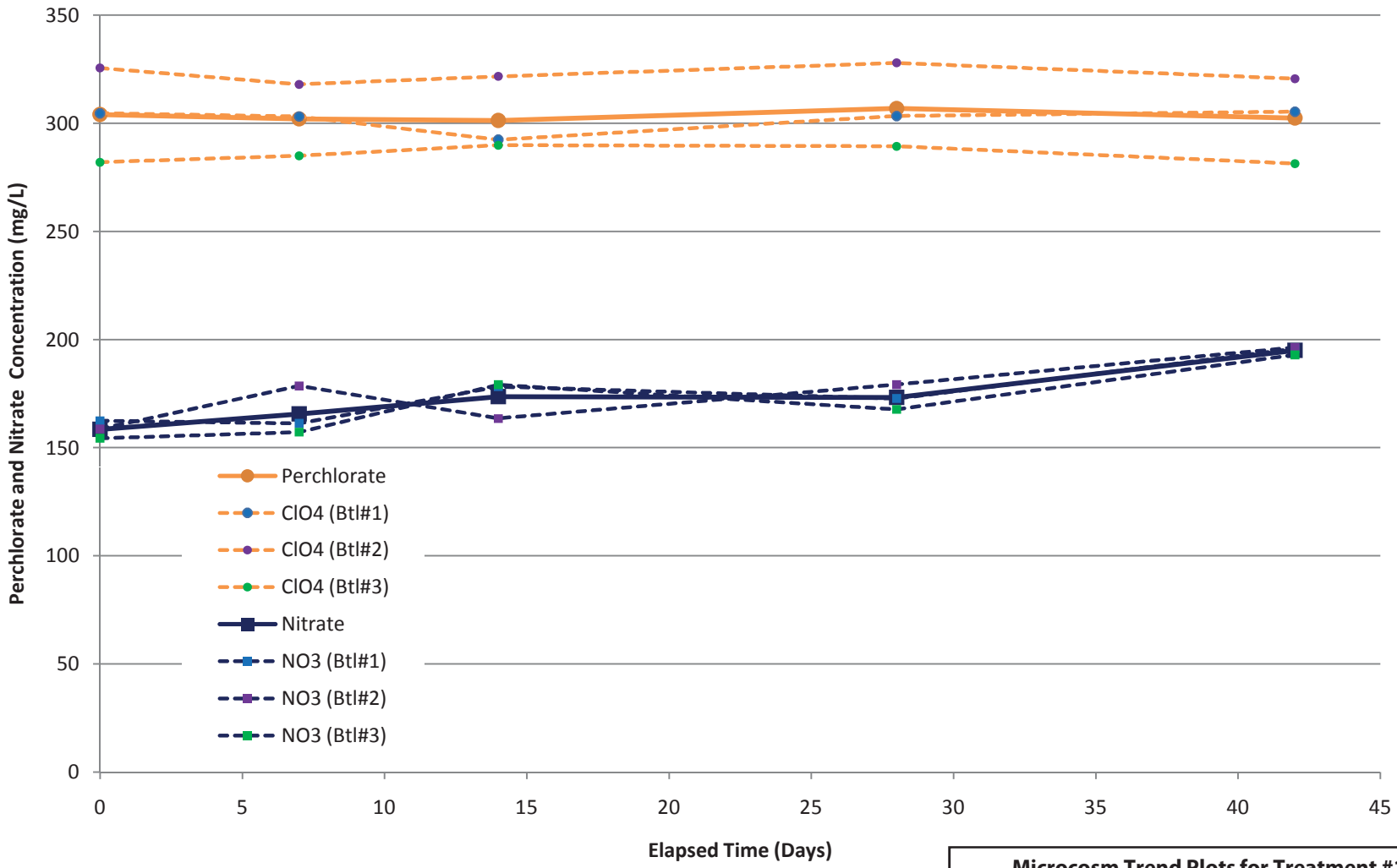
Figure 9

G:\PRJ\Projects\TR0308_Nammo_Talley (TR0328)\Data-GIS-AutoCad\Analytical Data\WBO\[WBO-1 Analytical Results-2009-03-08.xlsx]Fig 1-ADEQ



Microcosm Trend Plots for Treatment #1 (Control) – Perchlorate and Nitrate

Nammo Talley, Inc
Mesa, Arizona

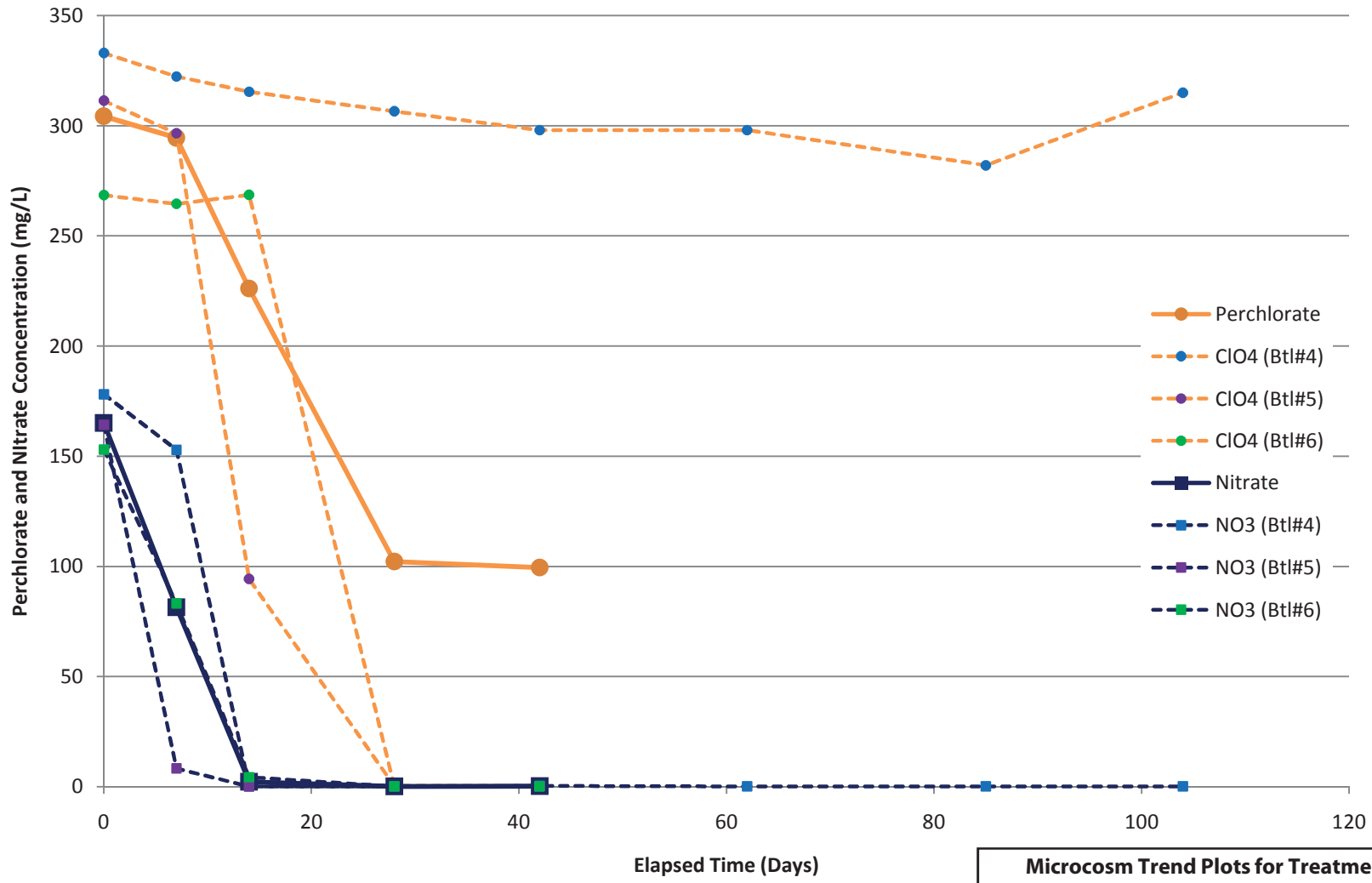
Notes
- Microcosms were constructed from the high ammonium zone (40 to 60 ft bgs) from WBO-1.
- No amendments were added to Treatment #1, other than water.
- Individual triplicate bottle concentrations shown as a dashed line.
- Average concentration of triplicate bottles shown as a solid line.

Geosyntec consultants

Guelph | October 2009

Figure **10a**

P:\PRJ\Projects\TR0308_Nammo_Talley (TR0328)\Documents\Pilot Test Work Plan\03 Draft-FINAL to ADEQ\Appendices\[WBO-PT-WP-Microcosm results-draft-2009-10-27.xlsx]Table B2-Lab R



Notes
- Microcosms were constructed from the high ammonium zone (40 to 60 ft bgs) from WBO-1.
- Electron donor added on Day 0.
- Incubation for bottles #5 and #6 was terminated on Day 42 because perchlorate degradation was complete (<0.32 mg/L) while incubation for bottle #4 continued.
- Individual triplicate bottle concentrations shown as a dashed line.
- Average concentration of triplicate bottles shown as a solid line.

Microcosm Trend Plots for Treatment #2 (High NH_4) – Perchlorate and Nitrate

Nammo Talley, Inc
Mesa, Arizona

Geosyntec consultants

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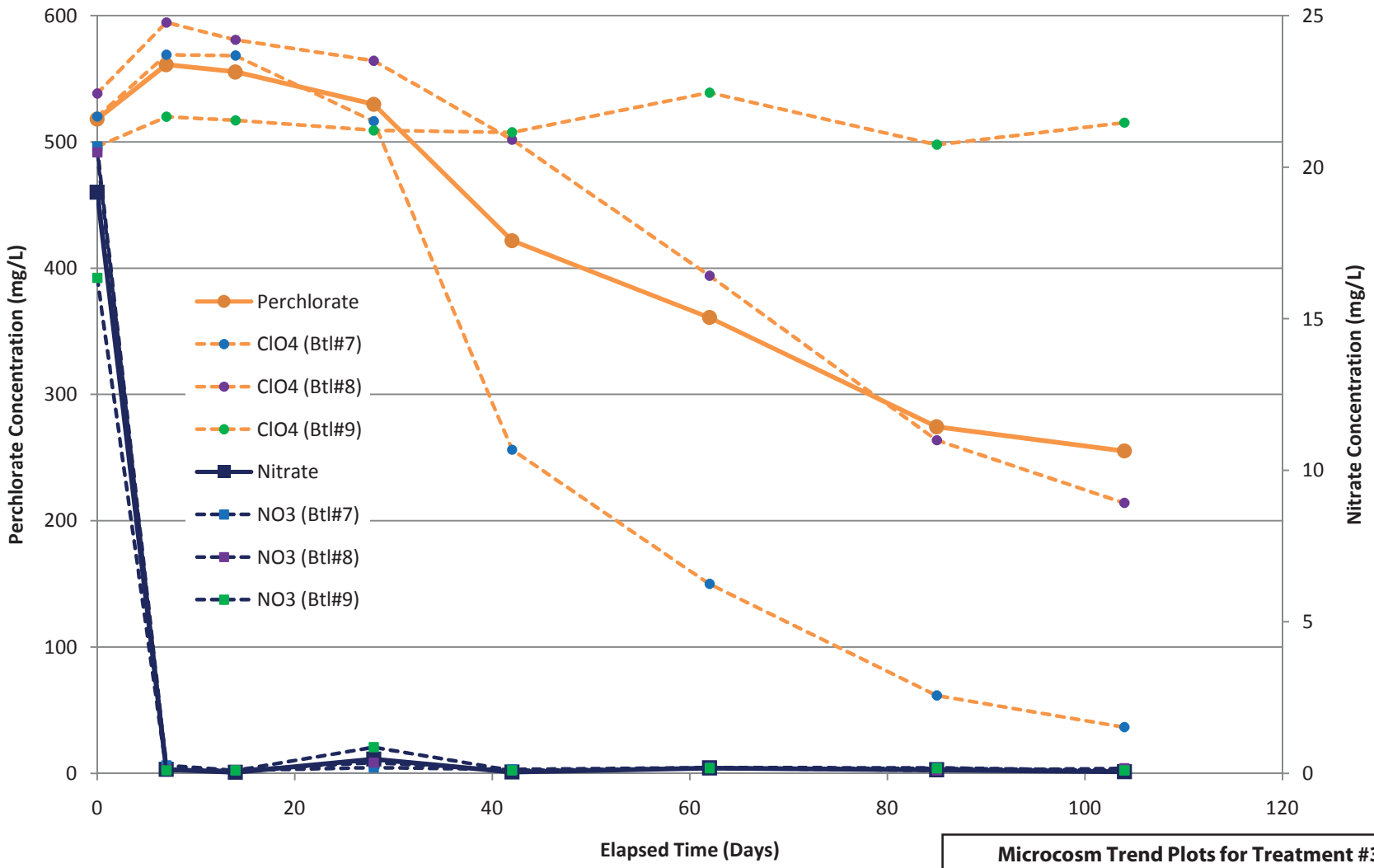
Figure **10b**

P:\PRJ\Projects\TR0308_Nammo_Talley (TR0328)\Documents\Pilot Test Work Plan\03 Draft-FINAL to ADEQ\Appendices\[WBO-PT-WP-Microcosm results-draft-2009-10-27.xlsx]Table B2-Lab R



Microcosm Trend Plots for Treatment #3 (High ClO_4) – Perchlorate and Nitrate

Nammo Talley, Inc
Mesa, Arizona

Notes
- Microcosms were constructed from the high perchlorate zone (60 to 90 ft bgs) from WBO-1.
- Electron donor added on Day 0 to all bottles, and again on Day 42 for bottles #8 and #9 only.
- Individual triplicate bottle concentrations shown as a dashed line.
- Average concentration of triplicate bottles shown as a solid line.

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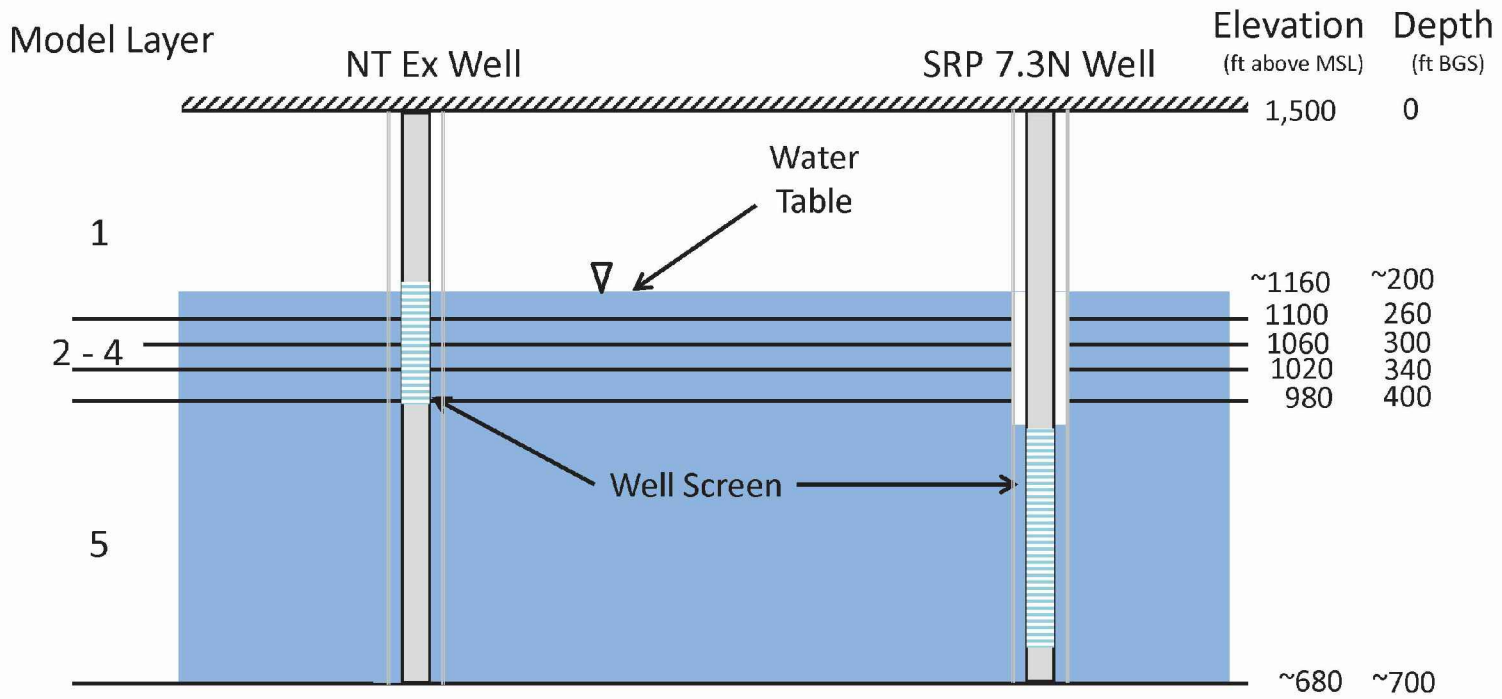
Figure **10c**

P:\PRJ\Projects\TR0308_Nammo_Talley (TR0328)\Documents\Pilot Test Work Plan\03 Draft-FINAL to ADEQ\Appendices\[WBO-PT-WP-Microcosm results-draft-2009-10-27.xlsx]Table B2-Lab R



Five model layers.

Hydraulic Conductivity based on hydraulic response to pumping at SRP Wells.

Kh & Kv (ft/d) Layer 1: 90 & 0.09, Layers 2 – 4: 70 & 0.35, Layer 5: 100 & 1.

Schematic Cross-Section Of Model Domain Showing Well Screens

Nammo Talley Inc. Plant #3

Mesa, Arizona

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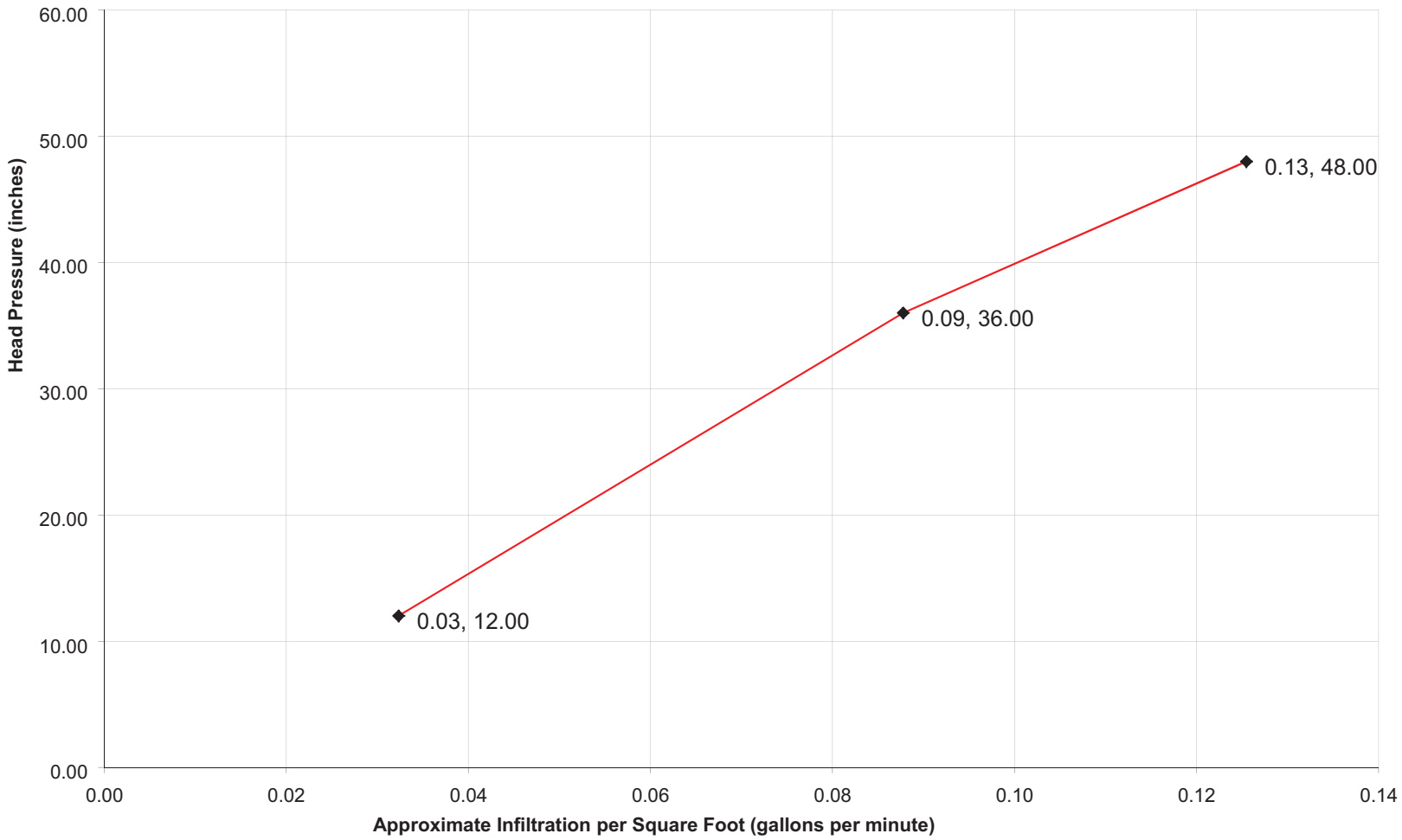
Figure 11

N:\GEOSYNTEC\NAMMO TALLEY\FIGURES\INFILTRATION TESTS\NT FIG 11 SCHEMATIC



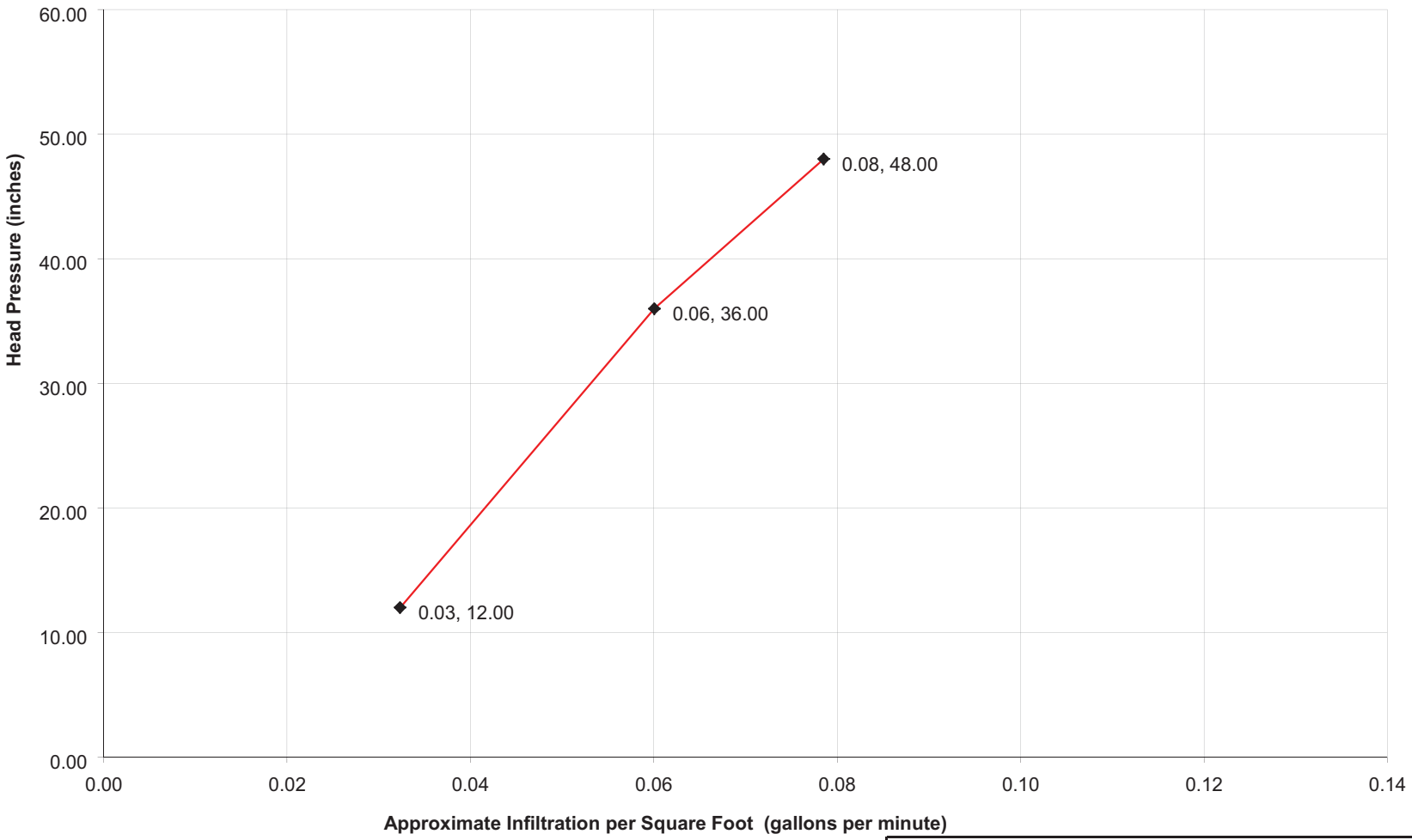
Former Water Bore-Out Pits Infiltration Test
Head Pressure vs. Surface Infiltration Rate per Square Foot
Nammo Talley, Inc.
Mesa, Arizona

Geosyntec consultants

Phoenix, AZ | January 2011

Figure **12**

C:\Users\Yepstein\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.Outlook\CCH0328L\Infiltration Test Data_rev graphs.xlsx]Figure 5 new



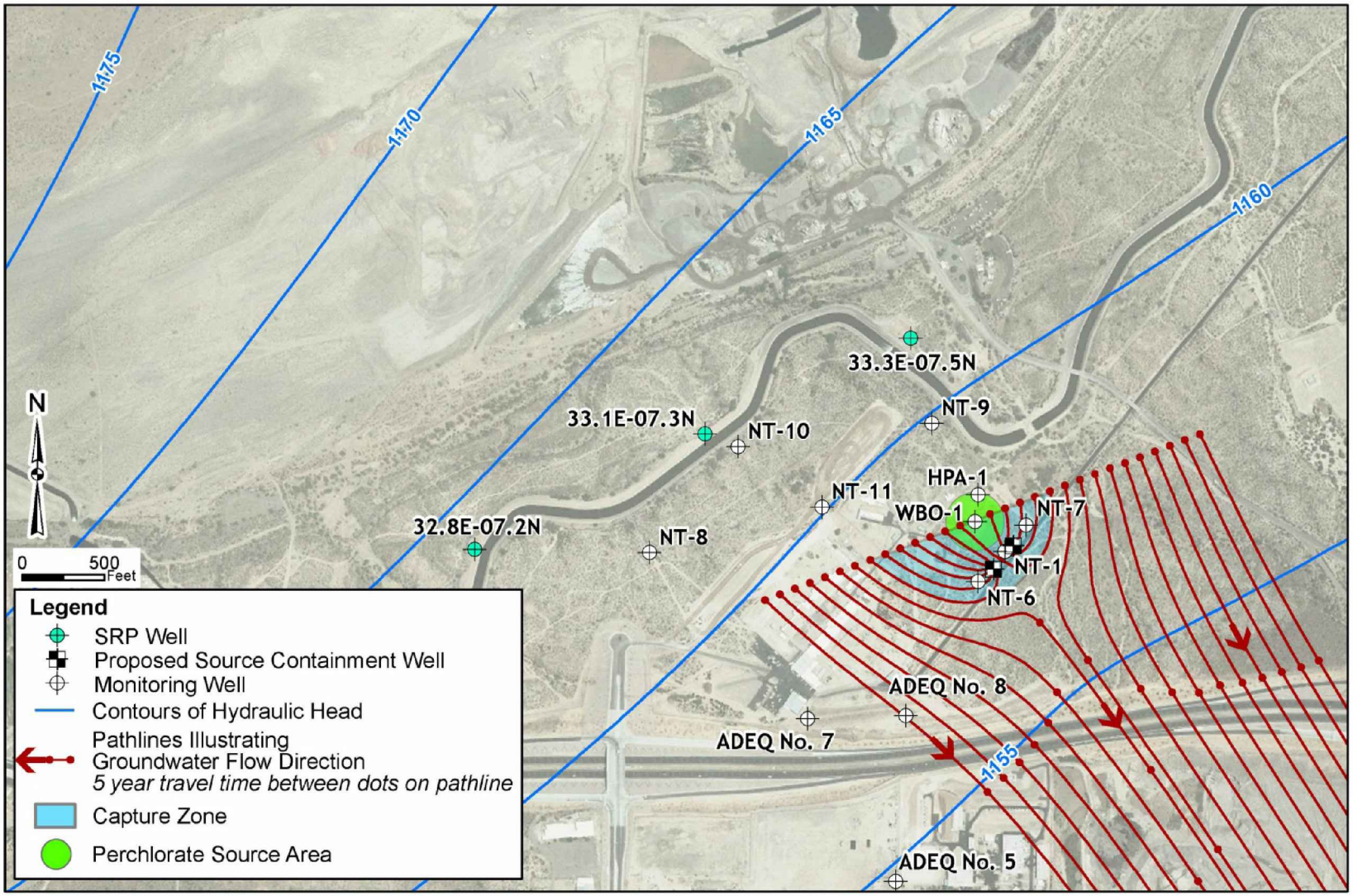
Potential Discharge Area Infiltration Test
Head Pressure vs. Surface Infiltration Rate per Square Foot
Nammo Talley, Inc.
Mesa, Arizona

Geosyntec consultants

Phoenix, AZ | January 2011

Figure **13**

C:\Users\lepstein\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.Outlook\CCH0308L\[Infiltration Test Data_rev graphs.xlsx]Figure 5 new



Groundwater Model Output Showing Hydraulic Containment Of The Perchlorate Source Area With 200 Gpm Extraction Per Well

Nammo Talley Inc. Plant #3
Mesa, Arizona

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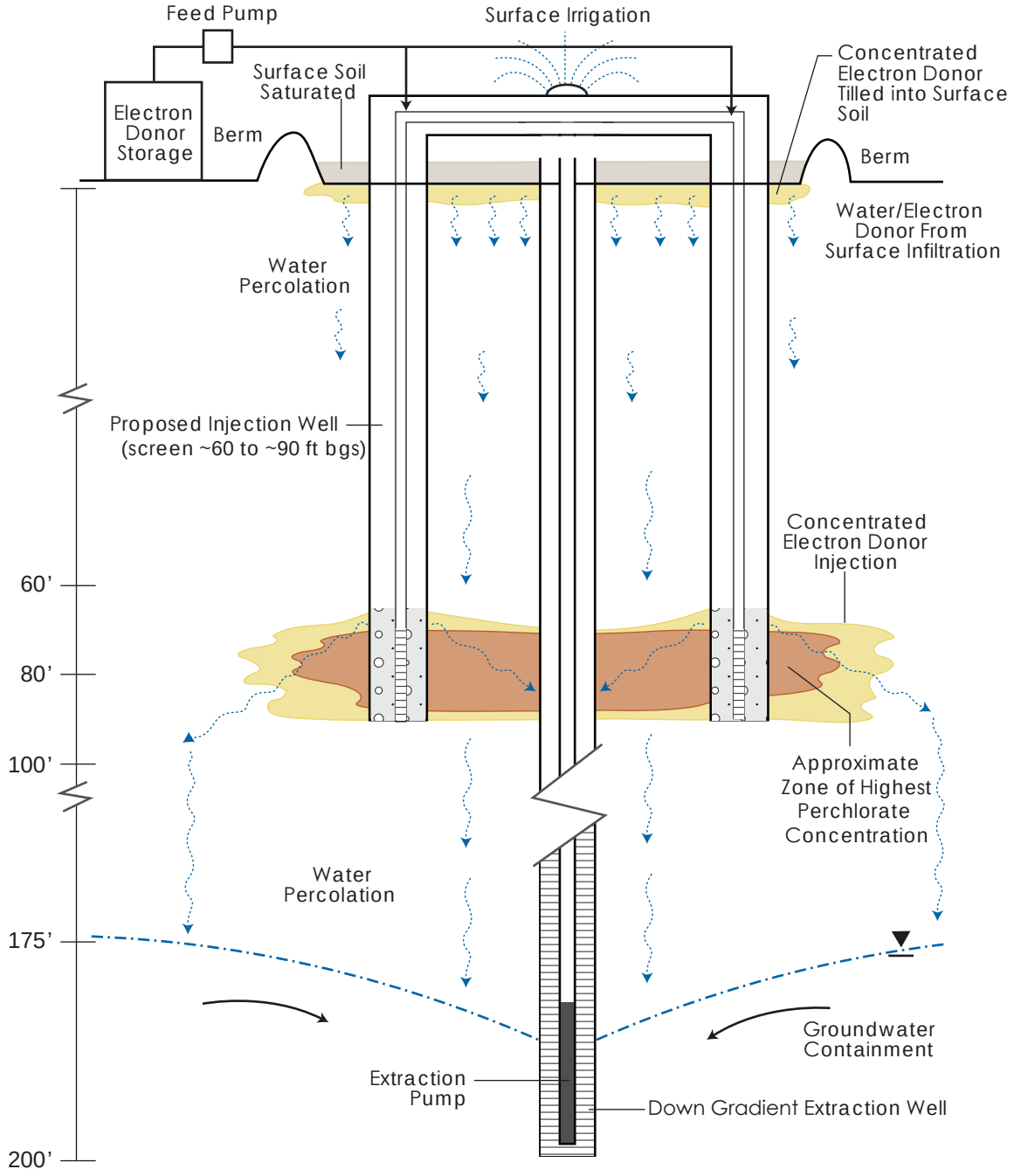
Figure 14

N:\GEOSYNTEC\NAMMO TALLEY\FIGURES\INFILTRATION TESTS\NT FIG 14 HYDRAULIC



ISB Conceptual Design
Nammo Talley, Inc.
Mesa, Arizona

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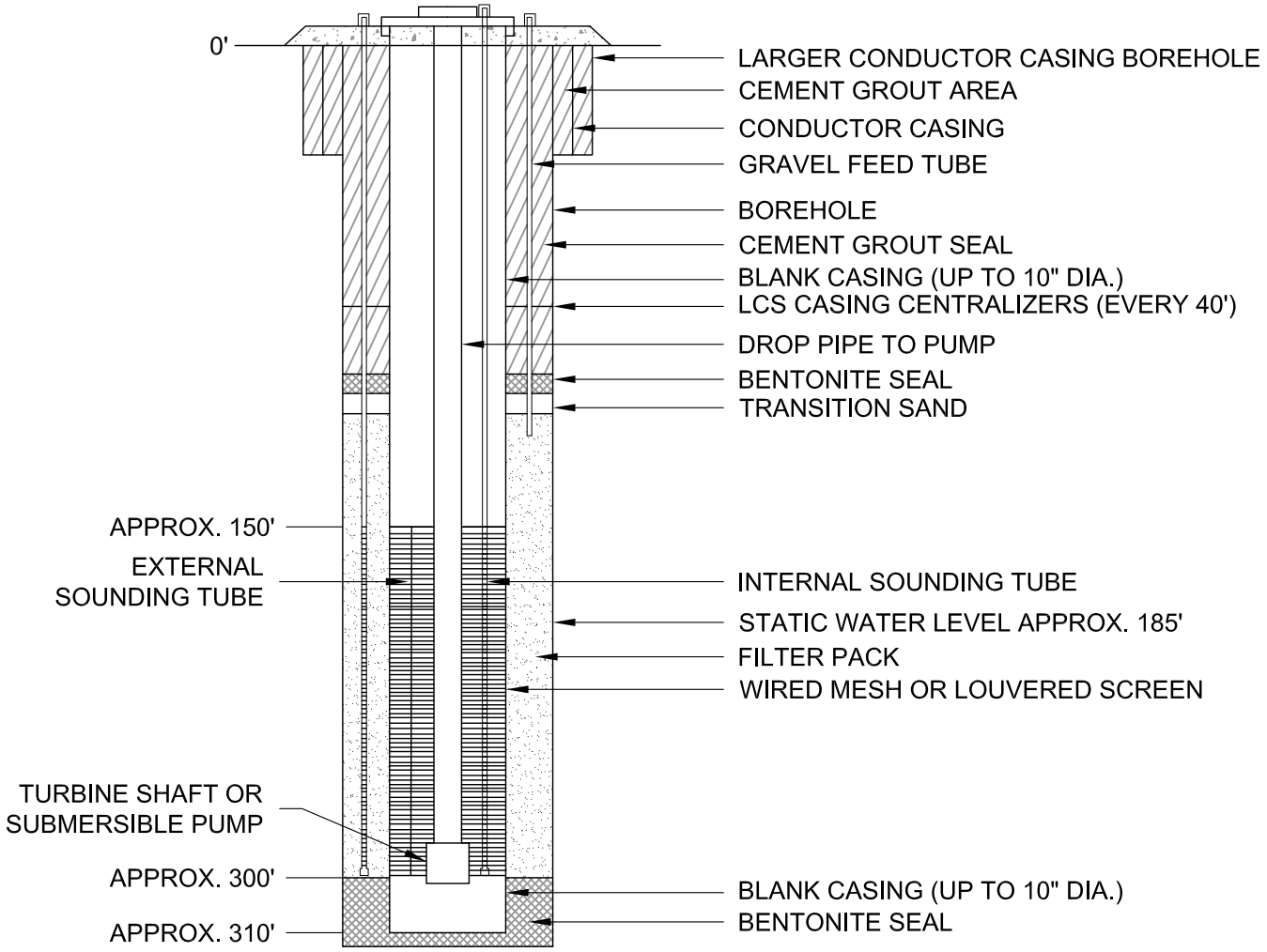
Phoenix | October 2012

Figure **15**

not to scale

ISB Conceptual Design.ai



CONCEPTUAL EXTRACTION WELL CROSS-SECTIONAL DETAILS

N.T.S.

Conceptual Extraction Well Design

Nammo Talley Inc. Plant #3

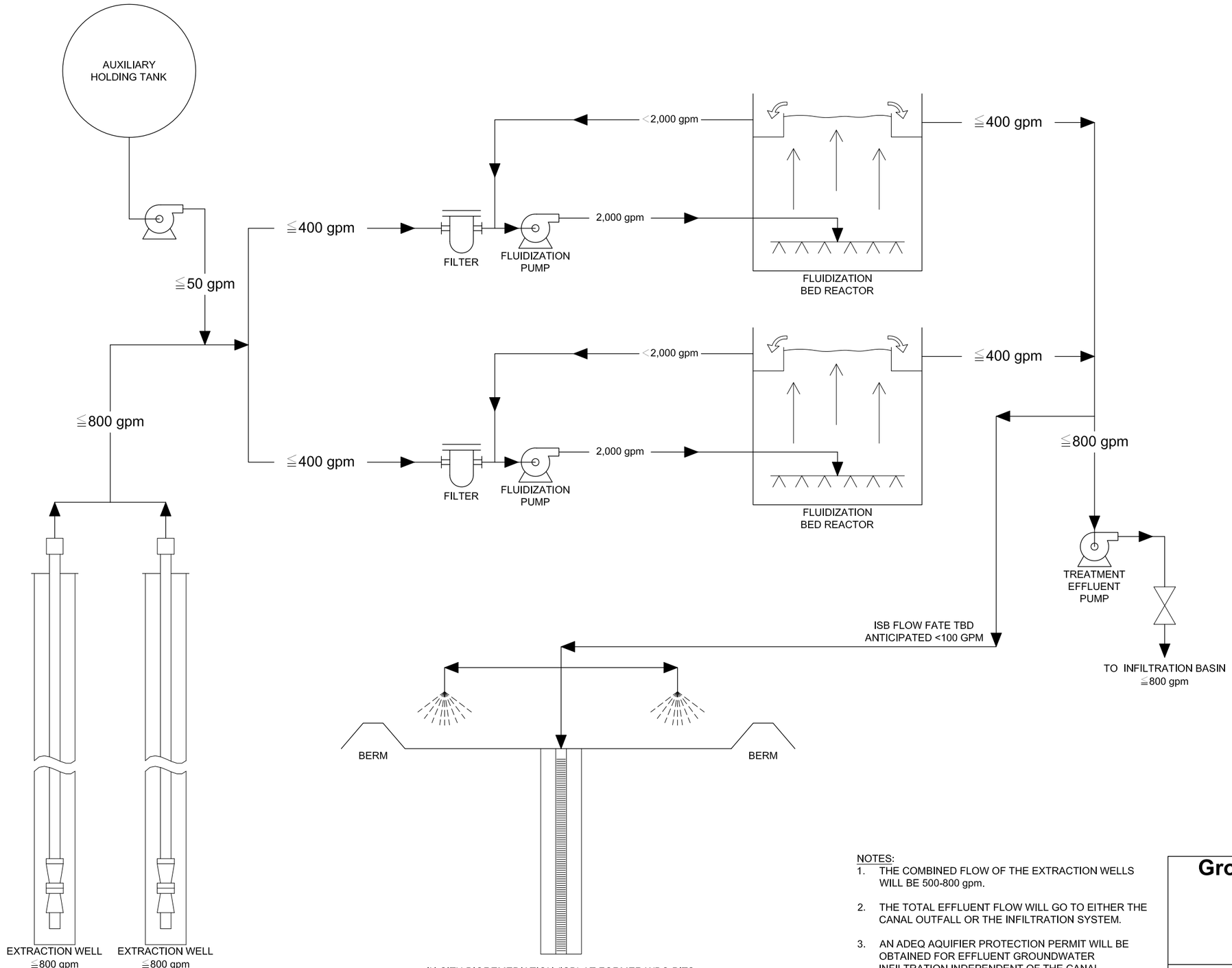
Mesa, Arizona

Geosyntec consultants

Phoenix, Az | October 2012

Figure 16

N:\GEOSYNTEC\NAMMO TALLEY\FIGURES\INFILTRATION TESTS\NT FIG 16 WELL EXTRACTION



NOTES:

1. THE COMBINED FLOW OF THE EXTRACTION WELLS WILL BE 500-800 gpm.
2. THE TOTAL EFFLUENT FLOW WILL GO TO EITHER THE CANAL OUTFALL OR THE INFILTRATION SYSTEM.
3. AN ADEQ AQUIFIER PROTECTION PERMIT WILL BE OBTAINED FOR EFFLUENT GROUNDWATER INFILTRATION INDEPENDENT OF THE CANAL OUTFALL AZPDES PERMIT.
4. TOTAL SYSTEM INFLUENT WILL BE EQUAL TO THE TOTAL SYSTEM EFFLUENT FLOW TO EITHER DISCHARGE ALTERNATIVE.

Groundwater Treatment System Process Flow Diagram

Nammo Talley Inc. Plant #3
Mesa, Arizona

Geosyntec consultants

Phoenix, Az | July 2013

Figure 17

N:\GEOSYNTEC\NAMMO TALLEY\FIGURES\INFILTRATION TESTS\NT FIG 17 PROCESS FLOW DIAGRAM

GEOMATRIX

Sampling and Analysis Plan
Perchlorate Soil Sampling Activities

Talley Defense Systems

Mesa, Arizona

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Prepared for:

Talley Defense Systems
P.O. Box 34299
Mesa, Arizona 85277

August 4, 2005

Project No. 10752.000.0

Geomatrix Consultants

GEOMATRIX

TABLE OF CONTENTS

Page

1.0 SITE BACKGROUND 1
- 1.1 ENVIRONMENTAL SETTING 2
- 1.2 ADJACENT LAND USE 3
- 1.3 BACKGROUND 3
  - 1.3.1 Chemical Usage, Handling, Storage, Treatment, and Disposal Practices 3
  - 1.3.2 Waste Management Practices 4
  - 1.3.3 Past Release/Spill History 5
  - 1.3.4 Northeast Mesa Water Quality Assurance Revolving Fund Investigation 5

2.0 PREVIOUS INVESTIGATIONS 5
- 2.1 1990 SAMPLING EVENTS 5
- 2.2 1996 SITE ASSESSMENT 6
- 2.3 1999 WBO CLOSURE 7

3.0 SAMPLING OBJECTIVES 7
- 3.1 SAMPLING RATIONALE, EQUIPMENT, AND PROCEDURES 7
- 3.2 WBO PIT SAMPLING 7
  - 3.2.1 Sample Locations 8
  - 3.2.2 Sampling Methods 8
  - 3.2.3 Equipment Decontamination 10
  - 3.2.4 Instrument/Equipment Testing, Inspection, and Maintenance Requirements 10

4.0 SAMPLE HANDLING AND ANALYSES 10
- 4.1 WBO PITS 11

5.0 QUALITY CONTROL ANALYSES 12
- 5.1 SOIL SAMPLING 12
- 5.2 LABORATORY QA/QC 12

6.0 SOIL BORING INSTALLATION 14
- 6.1 SOIL SAMPLING 14
- 6.2 INVESTIGATION DERIVED WASTES 14

7.0 DATA EVALUATION AND REPORTING 15
- 7.1 DATA REVIEW, VERIFICATION, AND VALIDATION 15
  - 7.1.1 Field Criteria 15
  - 7.1.2 Laboratory Criteria 16
- 7.2 VERIFICATION AND VALIDATION METHODS 16
  - 7.2.1 Verification Methods 16
  - 7.2.2 Validation Methods 18
- 7.3 RECONCILIATION WITH USER REQUIREMENTS 18

8.0 REFERENCES 20

TABLE OF CONTENTS (Continued)

TABLES

Table 1 Summary of Analytical Results for Water Bore-out Pit Soil Samples Collected During November 1990

Table 2 1996 Analytical Results of Metals in Soil at the Old Water Bore-Out Pits

Table 3 1996 Analytical Results of Perchlorate in Soil at the Old Water Bore-Out Pits

Table 4 Summary of Sample Results for Plant #3 WBO Pit #1

Table 5 Summary of Sample Containers, Preservation, Test Method, and Holding Times for Initial Soil Sample Analysis

Table 6 Bench-Scale Testing Parameters and Frequency

FIGURE

Figure 1 Boring Location Map

APPENDIX

Appendix A Field Forms

TABLES

GEOMATRIX

TABLE 1

SUMMARY OF ANALYTICAL RESULTS FOR WATER BORE-OUT PIT SOIL SAMPLES COLLECTED DURING NOVEMBER 1990

Talley Defense Systems
Mesa, Arizona

Location	Sample No.	Depth (ft)	Analytical Results (total concentration in mg/kg)				
			Ammonium Perchlorate	Cadmium	Chromium	Lead	Nitrate
Pit # 1	TDS3-11/9/90-LJ-1-1	0	4,400	<4 (1)	6	12	151
Pit # 1	TDS3-11/9/90-LJ-1-2	1	18,000	6	9	210	97
Pit # 1	TDS3-11/9/90-LJ-1-3	2	1,830	<4	3	39	64
Pit # 1	TDS3-11/9/90-LJ-1-4	3	615	<4	5	7	55
Pit # 2	TDS3-11/9/90-LJ-2-1	0	705	7	13	192	123
Pit # 2	TDS3-11/9/90-LJ-2-2	1	105	26	9	6	98
Pit # 2	TDS3-11/9/90-LJ-2-3	2	152	22	8	6	51
Pit # 2	TDS3-11/9/90-LJ-2-4	3	170	17	7	15	63
Background	TDS3-11/9/90-LJ-3-1	0	NA(2)	<4	7	12	32
Background	TDS3-11/9/90-LJ-3-2	1	NA	<4	7	6	19
ADEQ's Draft Health Based Guidance Level for Soil			NE(3)	100	2,000	400	200,000

NOTES:
(1) Constituent not detected at the indicated detection limit
(2) NA - Not Analyzed
(3) NE - Not Established

TABLE 2

GEOMATRIX

1996 ANALYTICAL RESULTS OF METALS IN SOIL AT THE OLD WATER BORE-OUT PITS

Talley Defense Systems

Mesa, Arizona

Sample Identification	Sample Depth [2] (feet)	Total Cadmium (mg/kg) [3]	Total Chromium (mg/kg)	Total Lead (mg/kg)	TCLP Lead (mg/L) [4]
Non-Residential HBGLs [5]		244	5,950	1,400	--
RCRA Regulatory Levels [6]		--	--	--	5.0
20x RCRA Regulatory Levels [7]		20	100	100	--
PIT 1					
WBO-BH1/2-0.2 [8]	0.2	11.6	10.6	1,100	0.45
WBO-BH1/2-0.3 [8][9]	0.2	10.9	13.4	1,270	NA [1]
WBO-BH1-5	5	NA	NA	5.96	NA
WBO-BH2-5	5	NA	NA	<3.29	NA
PIT 2					
WBO-BH3/4-0.2 [8]	0.2	5.91	4.72	19.8	NA
BERMS					
WBO-Berm1-0.2 [8]	0.2	2.19	4.45	78.4	0.12
WBO-Berm1-0.3 [8][9]	0.2	2.00	6.00	90.0	NA
WBO-Berm2-0.2 [8]	0.2	3.50	3.33	91.0	0.17
WBO-Berm3-0.2 [8]	0.2	0.598	6.44	21.6	NA
WBO-Berm4-0.2 [8]	0.2	<0.166	6.74	12.0	NA
WBO-Berm5-0.2 [8]	0.2	0.300	4.20	6.67	NA
TROUGHS					
WBO-Trough1-0.2	0.2	4.68	5.51	48.2	NA
WBO-Trough2-0.2	0.2	0.200	2.83	<3.33	NA
WBO-Trough3-0.2	0.2	0.733	5.5	10.3	NA
SURROUNDING AREA					
WBO-SA1-0.2	0.2	<0.167	2.27	<3.33	NA
WBO-SA2-0.2	0.2	0.233	5.27	5.33	NA
WBO-SA3-0.2	0.2	0.266	4.92	4.65	NA
WBO-SA4-0.2	0.2	0.397	7.98	8.61	NA
BACKGROUND					
WBO-BH5-0.2	0.2	0.233	4.07	7.33	NA
QUALITY ASSURANCE/QUALITY CONTROL					
WBO-EB-1	Water	<0.004	<0.005	<0.005	NA
WBO-EB2	Water	0.034	0.027	<0.005	NA
DECONTAMINATION RINSATE					
WBO-DR	Water	<0.004	0.030	0.059	NA

Notes:

(1) NA = Not Analyzed

(2) Vertical depth in feet below ground surface.

(3) mg/kg = milligrams per kilogram

(4) mg/L = milligrams per liter

(5) Non-residential HBGLs = Non-residential health based guidance levels for the ingestion of contaminants in soil as listed in Arizona Administrative Code R18-7-201 et seq.

(6) RCRA Regulatroy Levels = Resource Conservation and Recovery Act regulatory levels listed in 40 CFR 261.24 for the hazardous waste characteristic of toxicity.

(7) 20x TCRA Regulatory Levels = Twently times the RCRA regulatory levels.

(8) Composite Sample

(9) Duplicate sample collected from a depth of 0.2 foot.

GEOMATRIX

TABLE 3

1996 ANALYTICAL RESULTS FOR PERCHLORATE IN SOIL AT THE OLD WATER BORE-OUT PITS

Talley Defense Systems
Mesa, Arizona

Sample Identification	Sample Depth [2] (feet)	Total Perchlorate (Concentration as mg/kg) [3]
PIT 1		
WBO-BH1/2-0.2 [4]	0.2	140
WBO-BH1/2-0.3 [4][1]	0.2	141
WBO-BH1/2-2.5 [4]	2.5	59.7
WBO-BH1/2-10 [4]	10	215
PIT 2		
WBO-BH3/4-0.2 [4]	0.2	15.9
WBO-BH3/4-2.5 [4]	2.5	74.9
WBO-BH3/4-10 [4]	10	46
BACKGROUND		
WBO-BH5-0.2	0.2	<0.025
WBO-BH5-10	10	<0.125
QUALITY ASSURANCE/QUALITY CONTROL		
WBO-EB1	Water	<0.025
WBO-EB2	Water	<0.025
DECONTAMINATION RINSATE		
WBO-DR	Water	59.1

Notes:

(1) Duplicate sample collected from a depth of 0.2 foot.

(2) Vertical depth in feet below ground surface.

(3) mg/kg = milligrams per kilogram

(4) Composite Sample

GEOMATRIX

TABLE 4

SUMMARY OF SAMPLE RESULTS FOR PLANT #3 WBO PIT #1 (1)

Talley Defense Systems
Mesa, Arizona

SAMPLE ID	ARSENIC	BARIUM	CADMIUM	CHROMIUM	LEAD	SELENIUM	SILVER	MERCURY
WBO Pit #1 (mg/kg) (2)	N/A (7)	N/A	<2.5	N/A	41/13	N/A	N/A	N/A
WBO Pit #1 (mg/l) (3)	N/A	N/A	<0.50	N/A	<0.50	N/A	N/A	N/A
Residential SRL's (mg/kg) (4)	10	5300	38	2100	400	380	380	6.7
RCRA (mg/l) (5)	5	100	1	5	5	1	5	0.2
GPL (mg/kg) (6)	290	12,000	29	590	290	290	N/A	12

Notes:

(1) Sample results are from North Area of Pit #1 and South Area of Pit #1.
(2) WBO Pit #1 (mg/kg) = Total concentration reported in milligrams per kilograms.
(3) WBO Pit #1 (mg/l) = Toxicity Characteristic Leaching Procedure (TCLP) concentration in milligrams per liter.
(4) Residential SRL's (mg/kg) = Residential Soil Remediation Level's in milligrams per kilograms.
(5) RCRA (mg/l) = EPA Hazardous Waste Standards by TCLP Test in milligrams per liter.
(6) GPL (mg/kg) = Proposed ADEQ Minimum Groundwater Protection Levels in milligrams per kilogram.
(7) N/A = Not Applicable.

TABLE 5

SUMMARY OF SAMPLE CONTAINERS, PRESERVATION, TEST METHOD, AND HOLDING TIMES FOR INITIAL SOIL SAMPLE ANALYSIS

Talley Defense Systems
Mesa, Arizona

ANALYTE	CONTAINER [2]	PRESERVATION	TEST METHOD	HOLDING TIME
Perchlorate	8-Ounce Glass Jar with Teflon®-lined lid	None [1]	EPA Test Method 314.0	28 days
Total Organic Carbon	4 oz Glass Jar with Teflon®-lined lid	None [1]	EPA Test Method 9060	28 days
Total Phosphorus	8 oz Glass Jar with Teflon®-lined lid	None [1]	EPA Test Method 200.7	28 days
Total Kjeldahl Nitrogen	8 oz Glass Jar with Teflon®-lined lid	None [1]	EPA Test Method 351.3	28 days
Moisture Content	8 oz Glass Jar with Teflon®-lined lid	None [1]	SM 2540G	5 days
pH	8 oz Glass Jar with Teflon®-lined lid	None [1]	SW 9045C	5 days
Heterotrophic Microorganisms Anaerobes	Sterile 4 oz Glass Jar with Teflon®-lined lid or Sterile 50 ml HDPE container	None [1]	SM 9215B	24 hours

Notes:

[1] = Chemical preservation not required. Samples will be maintained at approximately 4 degrees Celsius

[2] = For the bench-scale study soil samples will be collected in polyethylene bags and will be stored at 4°C until perchlorate results are received. Soil samples will then be transferred to the Geomatrix lab. Where the bench scale study will be performed. Samples obtained at various time points will be transferred to the appropriate container and sent to the laboratory for analysis.

Abbreviations:
EPA = U.S. Environmental Protection Agency
oz = ounce
°C = degrees Celsius
g = grams
ml = milliliters

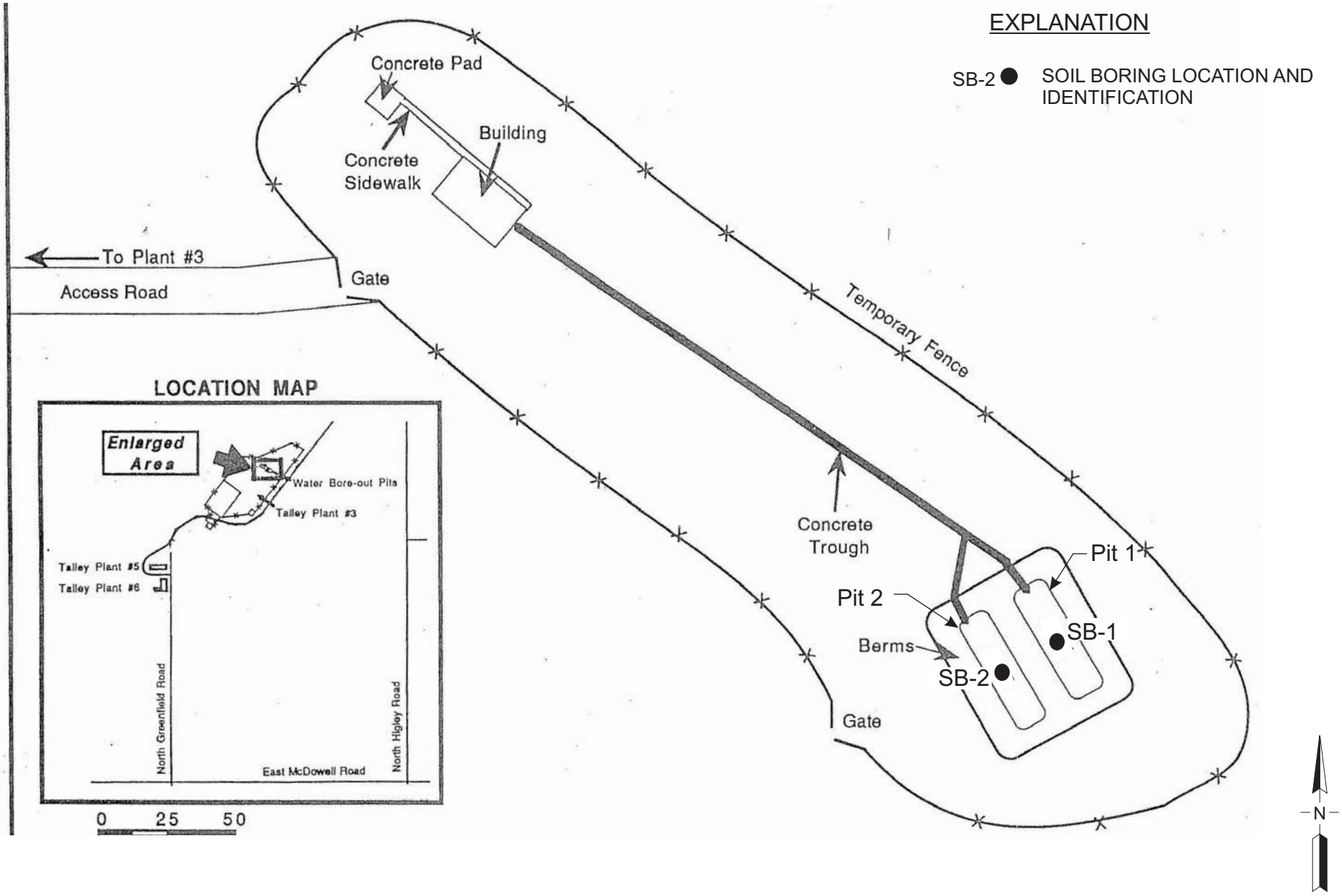
TABLE 6

BENCH-SCALE SAMPLING PARAMETERS AND FREQUENCY
Talley Defense Systems
Mesa, Arizona

MONITORING PARAMETERS	MONITORING FREQUENCY
Total Organic Carbon (TOC)	Baseline, Mid-Point and Final Sample Point
Anaerobic heterotrophic bacteria	Baseline, Mid-Point and Final Sample Point
Perchlorate	Baseline and 3 Sample Points
Total Phosphorus	Baseline and Mid-Point
Moisture Content	Baseline and 3 Sample Points
pH	Baseline and 3 Sample Points
Total Kjeldahl Nitrogen (TKN)	Baseline and Mid-Point

FIGURES

Y:\10572.00.0\other_figs\boring location map.cdr



GEOMATRIX

BORING LOCATION MAP

WATER BORE-OUT PITS

TALLEY DEFENSE SYSTEMS, MESA, ARIZONA

Figure by	Project No.
Pah	10572
Date	Figure
6/24/05	1

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15 July 2009

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PO Box 34299
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Subject: Status Update for Pre-Design Characterization Activities in Advance of a Pilot Test of In Situ Bioremediation for Perchlorate in Soils at the Former Water Bore-Out (WBO) Facility at Plant #3 at the Nammo Talley Site in Mesa, Arizona

Dear Robert:

Geosyntec is pleased to provide this update on the status of pre-design characterization activities being conducted to support design and anticipated future implementation of an in situ bioremediation (ISB) pilot test to treat perchlorate in vadose zone soils and/or groundwater at the former Water Bore-Out (WBO) facility at Plant #3 at the Nammo Talley, Inc. (Nammo Talley) facility in Mesa, Arizona (the Site). Geosyntec has developed a preliminary ISB pilot test design concept, consisting of a vertical recirculation loop, whereby perchlorate-impacted groundwater beneath the WBO area would be extracted, amended with food-grade electron donor (e.g., citric acid, benzoate), and infiltrated through the vadose zone to treat perchlorate remaining within the subsurface, so as to mitigate its potential future impact to groundwater. The intent of the pre-design characterization activities discussed herein is to generate additional information to better delineate the vertical distribution of perchlorate and other key constituents that may affect the ISB pilot test, confirm perchlorate biodegradability, and collect hydraulic information to allow for design of appropriate containment of infiltrating treatment amendments. Specific pre-design characterization activities described herein include:

- Collection of detailed depth-specific soil chemistry data (perchlorate, ammonia, pH, anions) from a borehole drilled through the approximate former WBO pit area to a depth of approximately 200 feet below ground surface (bgs);

- Installation, development and sampling of a new monitoring well, designated as WBO-1, in the borehole. It is anticipated that this well will be used to support future ISB pilot test activities;

Geosyntec consultants

Should you have any questions with information contained herein, please do not hesitate to contact me.

Sincerely,
Geosyntec Consultants

Evan Cox, M.Sc.
Principal
Perchlorate Practice Leader

Enclosures:
Figure 1 – Site Vicinity and Well Location Map
Figure 2 – Soil Concentration versus Depth Profile for Perchlorate, Ammonium, Nitrate and pH at WBO-1
Table 1 – WBO-1 Summary of Soil Analytical Results & Methods
Table 2 – WBO-1 Summary of Groundwater Analytical Results & Methods
Appendix A - Well Construction and Borehole Log for WBO-1
Appendix B – Laboratory and Data Validation Reports
Appendix C - AQTESOLV™ Outputs

References:

Brown and Caldwell (B&C), 2007. *Soil Investigation Report, Talley Defense System Plant #3, Former Water Bore-Out Pits,* Mesa, Arizona, 19 December 2008.

Brown and Caldwell (B&C), 2008. *Groundwater Investigation Plan,* Prepared for Nammo Talley Inc., Mesa, Arizona, 25 August 2008.

Geomatrix, 2007. *Perchlorate Bench-Scale Summary Report, Perchlorate Bioremediation Study,* Talley Defense Systems, Inc., Mesa, Arizona. 3 August 2007.

TABLES

Geosyntec consultants

Table 1
WBO-1 Summary of Soil Analytical Results and Methods
Nammo Talley Inc.
Mesa, Arizona

					Anions						
Depth (ft bgs)	**pH (SI units)**	**EC (µS/cm)**	**Perchlorate (mg/kg)**	**Ammonium-N (mg/kg)**	**Nitrate-N (mg/kg)**	**Nitrite-N (mg/kg)**	**Sulfate (mg/kg)**	**Phosphate (mg/kg)**	**Chlorate (mg/kg)**	**Chloride (mg/kg)**	**Bromide (mg/kg)**
0.5	7.86	698	6.6	0.86	--	--	--	--	--	--	--
5	5.72	166	0.47	--	17	<0.12	16	10	<0.32	2	0.99
6	8.61	340	< 0.4	--	--	--	--	--	--	--	--
10	7.55	116	1.1	1.8	3.4	<0.12	15.6	2.9	<0.32	2.6	< 0.39
15	6.91	242	3.9	--	22	<0.12	27.5	1.3	<0.32	6.2	< 0.39
20	6.70	404	13	222	40	<0.12	35.2	< 0.57	<0.32	6.6	1.07
25	8.18	340	12	--	14	<0.12	41.6	1.2	<0.32	12.2	2.46
30	7.66	400	23	232	31	<0.12	37.4	< 0.57	<0.32	8.8	1.08
35	7.36	786	103	--	67	<0.12	58.5	1.5	<0.32	13.9	0.89
40	6.13	2552	429	2020	279	<0.12	79.2	1.6	<0.32	33.3	< 0.39
45	6.50	2794	325	--	360	<0.12	41.5	< 0.57	<0.32	30.2	< 0.39
49.5	6.83	2630	290	1870	324	<0.12	60.5	< 0.57	<0.32	16.1	1.11
55	7.59	2518	376	--	296	<0.12	36.6	< 0.57	<0.32	14.6	0.68
60	7.72	2802	1525	2220	204	<0.12	37.6	< 0.57	<0.32	20.3	< 0.39
64	7.09	886	502	--	49	<0.12	33.2	< 0.57	<0.32	22.1	8.07
70	6.64	976	862	76	37	<0.12	10.0	< 0.57	<0.32	10.2	< 0.39
75	6.85	714	661	--	21	<0.12	5.7	< 0.57	<0.32	6.5	< 0.39
80	7.33	1324	1245	13.2	--	--	--	--	--	--	--
85	7.65	1284	1118	--	58	<0.12	25	< 0.57	<0.32	23	< 0.39
89	7.42	886	776	2.4	--	--	--	--	--	--	--
100	8.42	640	441	104	4.4	<0.12	35.7	< 0.57	<0.32	24.8	1.16
105	7.67	560	367	--	--	--	--	--	--	--	--
110	7.96	610	542	--	--	--	--	--	--	--	--
115	7.99	576	437	--	--	--	--	--	--	--	--
119	7.75	554	406	3.4	13	<0.12	9	< 0.57	<0.32	28	< 0.39
125	7.88	842	636	--	--	--	--	--	--	--	--
130	8.13	628	428	--	--	--	--	--	--	--	--
135	8.24	646	469	--	--	--	--	--	--	--	--
139	8.57	446	267	0.66	12	<0.12	25	< 0.57	<0.32	17	< 0.39
144	8.57	514	319	--	--	--	--	--	--	--	--
150	8.53	412	250	--	--	--	--	--	--	--	--
155	8.41	414	235	--	--	--	--	--	--	--	--
159	8.66	420	231	0.67	11	<0.12	4.8	< 0.57	<0.32	15.5	< 0.39
164	8.63	432	227	--	--	--	--	--	--	--	--
170	8.41	492	240	--	--	--	--	--	--	--	--
175	8.89	324	48.4	--	--	--	--	--	--	--	--
180	8.94	244	1.15	0.10	0.97	<0.12	7.34	< 0.57	<0.32	22.47	< 0.39
185	8.87	214	< 0.4	--	--	--	--	--	--	--	--
189	7.84	624	7.4	--	--	--	--	--	--	--	--
195	9.12	204	< 0.4	--	--	--	--	--	--	--	--
197	9.04	280	0.06	0.10	0.77	<0.12	8.62	< 0.57	<0.32	32.99	< 0.39

Abbreviations

"--" sample not analyzed
µS/cm - microsiemens per centimeter
ft bgs - feet below ground surface
EC - electrical conductivity
N - Nitrogen
mg/kg - milligrams per kilogram (dry weight basis)
SI - International System of Units

Analytical Methods

Perchlorate — modified EPA 314 method (SiREM SOP # 025)
Anions — modified EPA 300.1 method (SiREM SOP #025)
Ammonium-N — method SNL-035 (University of Guelph Laboratory Services)
- M4500-NH3 D; KCl extractable NH4-N and NO3-N

TR0308

Table 2
WBO-1 Summary of Groundwater Analytical Results and Methods
Nammo Talley Inc.
Mesa, Arizona

Analytes		Analytical Method	WBO-1-022609C 2/26/2009
Inorganics			
Ammonia-N	mg/L	M4500-NH3 D	< 0.50
Bromide	mg/L	E300	< 0.50
Chlorate	µg/L	EPA 300.1	< 20
Chloride	mg/L	E300	180
Sulfate	mg/L	E300	55
Sulfide	mg/L	M4500-S C,D	< 0.040
Perchlorate	µg/L	EPA 314.0	1900
Nitrate-N	mg/L	E300	2.2 [H1]
Nitrite-N	mg/L	E300	< 0.20 [H1]
Organics			
DOC	mg/L	M5310B	2.8
Methane	µg/L	AM20GAX	0.410
Dissolved Metals			
Arsenic	mg/L	SW6010B	< 0.10
Barium	mg/L	SW6010B	< 0.10
Beryllium	mg/L	SW6010B	< 0.0010
Cadmium	mg/L	SW6010B	< 0.0010
Chromium	mg/L	SW6010B	< 0.010
Copper	mg/L	SW6010B	< 0.010
Iron	mg/L	SW6010B	< 0.050
Lead	mg/L	SW6010B	< 0.015
Manganese	mg/L	SW6010B	0.023
Nickel	mg/L	SW6010B	< 0.010
Selenium	mg/L	SW6010B	< 0.10
Silver	mg/L	SW6010B	< 0.010
Thallium	mg/L	SW6010B	< 0.10

Final Field Parameters		
Temperature	°C	20
pH	SI	7.11
Electrical Conductivity	µS/cm	1058
Turbidity	NTU	8.7
Dissolved Oxygen	mg/L	6.87
ORP	mV	25.7

Notes

Groundwater sample was collected near the end of the pumping test at WBO-1, about 3,600 gallons of groundwater was extracted prior to sample collection.

Abbreviations

"--" unitless

°C - degrees Celsius

µg/L - micrograms per liter

µS/cm - microsiemens per centimeter

DOC- dissolved organic carbon

[H1] - sample exceeded hold time

N - Nitrogen

NTU - Nephelometric Turbidity Units

ORP - Oxidation-Reduction Potential

mg/L - milligrams per liter

mV - millivolts

SI - International System of Units

FIGURES

Site Vicinity and Well Location Map
Nammo Talley, Inc.
Mesa, Arizona

Geosyntec consultants

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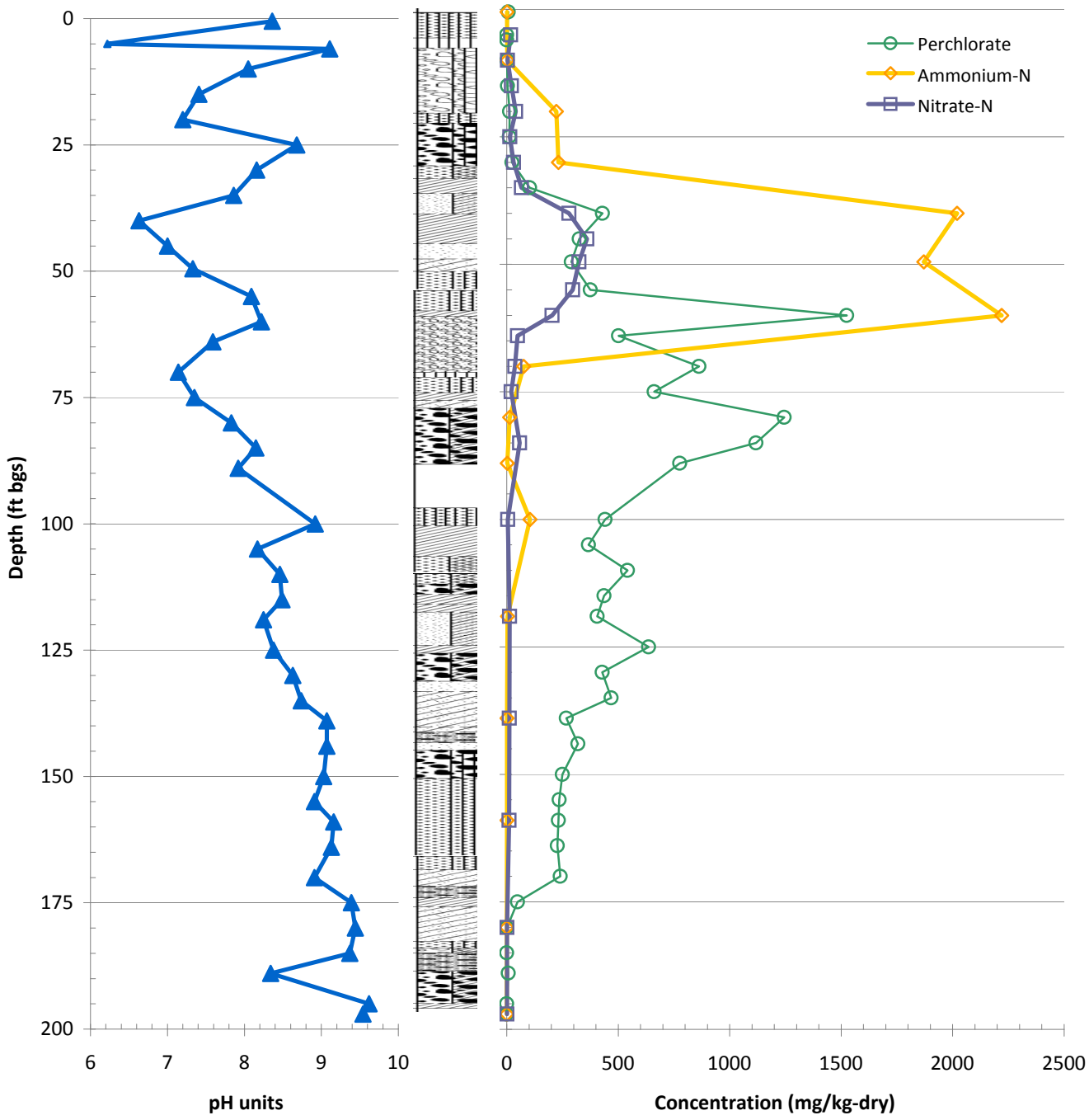
Figure 1

Site Location.ai



Soil Concentration versus Depth Profile for Perchlorate, Ammonium, Nitrate and pH at WBO-1

Nammo Talley Inc.

Mesa, Arizona

Geosyntec consultants

Guelph | June 2009

Figure **2**

P:\PRJ\Projects\TR0308_Nammo_Talley (TR0328)\Documents\UpdateReport-ADEQ-2009-06\[Figure 2.xlsx]Fig 2-ADEQ

TITLE 18. ENVIRONMENTAL QUALITY

CHAPTER 7. DEPARTMENT OF ENVIRONMENTAL QUALITY REMEDIAL ACTION

Editor's Note: The Office of the Secretary of State publishes all Code Chapters on white paper (01-4).

Editor's Note: The proposed summary action amending the heading of Chapter 7 was remanded by the Governor's Regulatory Review Council (August 4, 1999), which revoked the interim effectiveness of the change as of January 22, 1999. The heading of Chapter 7 before the proposed summary action has been restored (Supp. 99-3).

Editor's Note: Chapter 7 heading repealed; new heading adopted; both by summary action with an interim effective date of January 22, 1999; filed in the Office of the Secretary of State December 29, 1998 (Supp. 98-4).

Editor's Note: At the request of the Department of Environmental Quality, interim rules removed in Articles 1 & 2 (Supp. 97-3) by the emergency expiring were reinstated. The Department determined these emergency rules were in effect until permanent rules were adopted pursuant to Laws 1995, Ch. 232, § 5, and Laws 1996, Chapter 151, § 9. Under these Laws the Department was required to "adopt risk based remediation standards formally by rule pursuant to A.R.S. § 49-152(A) ... no later than August 1, 1997."; and the "interim standards adopted pursuant to A.R.S. § 49-152(A)(1)(a) and (b) ... as emergency rules shall remain in effect until the formally established rules are adopted." The interim rules have not been reprinted because permanent final rules have now been filed. Refer to Supp. 97-1 for interim emergency rules (Supp. 97-4).

Editor's Note: A Section of this Chapter was adopted under an exemption from the Arizona Administrative Procedure Act (A.R.S. Title 41, Chapter 6) pursuant to Laws 1997, Ch. 296, §§ 3(E) and (G), (10) and (11). Although exempt from certain provisions of the rulemaking process, the Department was required to submit notice of proposed rulemaking with the Secretary of State for publication in the Arizona Administrative Register and conduct a public hearing (Supp. 97-3).

Editor's Note: Some Sections of Chapter 7 were exempt from the rulemaking process (Laws 1995, Ch. 232, § 5). However the Department was required to provide a notice of hearing and public hearing before adoption of the emergency rules. The emergency rules were approved by the Attorney General (Supp. 96-1). Editor's note added to clarify exemptions of emergency adoptions (Supp. 97-1).

ARTICLE 1. EXPIRED

Article 1, consisting of Section R18-7-110, expired under A.R.S. § 41-1056(E) at 8 A.A.R. 4298, effective August 31, 2002 (Supp. 02-3).

The proposed summary action renumbering Section R18-7-110 to R18-7-101 was remanded by the Governor's Regulatory Review Council (August 4, 1999), which revoked the interim effectiveness of the changes as of January 22, 1999. The numbering of Article 1 before the proposed summary action has been restored (Supp. 99-3).

Article 1, consisting of Sections R18-7-101 thru R18-7-109 repealed; R18-7-110 renumbered to R18-7-101; both by summary action with an interim effective date of January 22, 1999; filed in the Office of the Secretary of State December 29, 1998 (Supp. 98-4).

Article 1 consisting of Sections R18-7-101 through R18-7-110 adopted as permanent rules effective December 22, 1987.

Article 1 consisting of Sections R18-7-101 through R18-7-110 adopted as an emergency effective September 17, 1987 pursuant to A.R.S. § 41-1026, valid for only 90 days. Emergency expired.

Article 1 consisting of Sections R18-7-101 through R18-7-110 adopted as an emergency effective June 17, 1987 pursuant to A.R.S. § 41-1026, valid for only 90 days. Emergency expired.

Article 1 consisting of Sections R9-20-102, R9-20-104 through R9-20-106 and R9-20-111 adopted as an emergency effective March 6, 1987 pursuant to A.R.S. § 41-1026, valid for only 90 days. Emergency expired.

Article 1 consisting of Sections R9-20-102, R9-20-104 through R9-20-106 and R9-20-111 adopted as an emergency effective December 5, 1986 pursuant to A.R.S. § 41-1003, valid for only 90 days. Emergency expired.

Section
R18-7-101. Repealed
R18-7-102. Repealed
R18-7-103. Repealed
R18-7-104. Repealed
R18-7-105. Repealed
R18-7-106. Repealed
R18-7-107. Repealed
R18-7-108. Repealed
R18-7-109. Repealed
R18-7-110. Expired

ARTICLE 2. SOIL REMEDIATION STANDARDS

Article 2, consisting of interim Sections R18-7-201 through R18-7-209 and Appendices A through C, replaced by new permanent Sections, adopted effective December 4, 1997. Appendix D emergency expired (Supp. 97-4).

Article 2, consisting of Sections R18-7-201 through R18-7-209 and Appendices A through D, removed in Supp. 97-3 reinstated at the request of the Department. Refer to Supp. 97-1 for interim rules. Introduction stating the emergency expired has been removed for clarity (Supp. 97-4).

Article introduction revised below to clarify exemptions of emergency adoption (Supp. 97-1).

Article 2, consisting of Sections R18-7-201 through R18-7-209 and Appendices A through D, adopted by emergency action effective March 29, 1996, pursuant to A.R.S. § 41-1026 and Laws 1995, Ch. 232, § 5. The Sections are in effect until permanent rules are adopted and in place by August 1, 1997, pursuant to A.R.S. § 49-152 and Laws 1995, Ch. 232, § 5 (Supp. 96-1).

Section
R18-7-201. Definitions
R18-7-202. Applicability
R18-7-203. Remediation Standards
R18-7-204. Background Remediation Standards
R18-7-205. Pre-determined Remediation Standards
R18-7-206. Site-specific Remediation Standards
R18-7-207. Site-specific Remediation Standards for Nitrates and Nitrites

Appendix A. Soil Remediation Levels (SRLs)

CONTAMINANT	CASRN	Class	Residential (mg/kg)			Non-residential (mg/kg)
			Carcinogen		Non-carcinogen	
			10^{-6} Risk	10^{-5} Risk		
Acephate	30560-19-1	ca, nc	63	630	240	2,000
Acetaldehyde	75-07-0	ca, nc	11	110	50	160
Acetochlor	34256-82-1	nc			1,200	12,000
Acetone	67-64-1	nc			14,000	54,000
Acetone cyanohydrin	75-86-5	nc			49	490
Acetonitrile	75-05-8	nc			420	1,800
Acrolein	107-02-8	nc			0.10	0.34
Acrylamide	79-06-1	ca, nc	0.12	1.2		3.8
Acrylic acid	79-10-7	nc			29,000	270,000
Acrylonitrile	107-13-1	ca, nc	0.21	2.1		4.9
Alachlor	15972-60-8	ca, nc	6.8	68		210
Alar	1596-84-5	nc			9,200	92,000
Aldicarb	116-06-3	nc			61	620
Aldicarb sulfone	1646-88-4	nc			61	620
Aldrin	309-00-2	ca, nc	0.032	0.32		1.0
Ally	74223-64-6	nc			15,000	150,000
Allyl alcohol	107-18-6	nc			310	3,100
Allyl chloride	107-05-1	nc			18	180
Aluminum	7429-90-5	nc			76,000	920,000
Aluminum phosphide	20859-73-8	nc			31	410
Amdro	67485-29-4	nc			18	180
Ametryn	834-12-8	nc			550	5,500
Aminodinitrotoluene	1321-12-6	nc			12	120
m-Aminophenol	591-27-5	nc			4,300	43,000
4-Aminopyridine	504-24-5	nc			1.2	12
Amitraz	33089-61-1	nc			150	1,500
Ammonium sulfamate	7773-06-0	nc			12,000	120,000
Aniline	62-53-3	ca, nc	96	960	430	3,000
Antimony and compounds	7440-36-0	nc			31	410
Apollo	74115-24-5	nc			790	8,000
Aramite	140-57-8	ca, nc	22	220		690
Arsenic[1]	7440-38-2	ca, nc	10	10	10	10
Assure	76578-12-6	nc			550	5,500

CONTAMINANT	CASRN	Class	Residential (mg/kg)			Non-residential (mg/kg)
			Carcinogen		Non-carcinogen	
			10^{-6} Risk	10^{-5} Risk		
Asulam	3337-71-1	nc			3,100	31,000
Atrazine	1912-24-9	ca, nc	2.5	25		78
Avermectin B1	71751-41-2	nc			24	250
Azobenzene	103-33-3	ca	5.0	50		160
Barium and compounds	7440-39-3	nc			15,000	170,000
Baygon	114-26-1	nc			240	2,500
Bayleton	43121-43-3	nc			1,800	18,000
Baythroid	68359-37-5	nc			1,500	15,000
Benefin	1861-40-1	nc			18,000	180,000
Benomyl	17804-35-2	nc			3,100	31,000
Bentazon	25057-89-0	nc			1,800	18,000
Benzaldehyde	100-52-7	nc			6,100	62,000
Benzene	71-43-2	ca, nc	0.65	NA		1.4
Benzidine	92-87-5	ca, nc	0.0024	NA		0.0075
Benzoic acid	65-85-0	nc			240,000	1,000,000 **
Benzotrichloride	98-07-7	ca	0.042	0.42		1.3
Benzyl alcohol	100-51-6	nc			18,000	180,000
Benzyl chloride	100-44-7	ca, nc	0.92	9.2		22
Beryllium and compounds	7440-41-7	ca, nc			150	1,900
Bidrin	141-66-2	nc			6.1	62
Biphenthrin (Talstar)	82657-04-3	nc			920	9,200
1,1-Biphenyl	92-52-4	nc			350 *	350 *
Bis(2-chloroethyl)ether	111-44-4	ca	0.23	2.3		5.8
Bis(2-chloroisopropyl)ether	39638-32-9	nc			790 *	790 *
Bis(chloromethyl)ether	542-88-1	ca	0.00020	NA		0.00043
Bis(2-chloro-1-methylethyl)ether	108-60-1	ca, nc	3.0	30		74
Bis(2-ethylhexyl)phthalate (DEHP)	117-81-7	ca, nc	39	390		1200
Bisphenol A	80-05-7	nc			3,100	31,000
Boron	7440-42-8	nc			16,000	200,000
Bromate	15541-45-4	ca, nc	0.78	7.8		25
Bromobenzene	108-86-1	nc			28	92
Bromodichloromethane	75-27-4	ca, nc	0.83	8.3		18
Bromoform (tribromomethane)	75-25-2	ca, nc	69	690		2,200
Bromomethane (methyl bromide)	74-83-9	nc			3.9	13
Bromophos	2104-96-3	nc			310	3,100

CONTAMINANT	CASRN	Class	Residential (mg/kg)			Non-residential (mg/kg)
			Carcinogen		Non-carcinogen	
			10^{-6} Risk	10^{-5} Risk		
Bromoxynil	1689-84-5	nc			1,200	12,000
Bromoxynil octanoate	1689-99-2	nc			1,200	12,000
1,3-Butadiene	106-99-0	ca, nc	0.058	0.58		1.2
1-Butanol	71-36-3	nc			6,100	61,000
Butylate	2008-41-5	nc			3,100	31,000
n-Butylbenzene	104-51-8	nc			240 *	240 *
sec-Butylbenzene	135-98-8	nc			220 *	220 *
tert-Butylbenzene	98-06-6	nc			390 *	390 *
Butyl benzyl phthalate	85-68-7	nc			12,000	120,000
Butylphthalyl butylglycolate	85-70-1	nc			61,000	620,000
Cadmium and compounds	7440-43-9	ca, nc			39	510
Caprolactam	105-60-2	nc			31,000	310,000
Captafol	2425-06-1	ca, nc	64	640	120	1,200
Captan	133-06-2	ca, nc	160	1,600		4,900
Carbaryl	63-25-2	nc			6,100	62,000
Carbazole	86-74-8	ca	27	270		860
Carbofuran	1563-66-2	nc			310	3,100
Carbon disulfide	75-15-0	nc			360	720 *
Carbon tetrachloride	56-23-5	ca, nc	0.25	2.5	2.2	5.5
Carbosulfan	55285-14-8	nc			610	6,200
Carboxin	5234-68-4	nc			6,100	62,000
Chloral hydrate	302-17-0	nc			6,100	62,000
Chloramben	133-90-4	nc			920	9,200
Chloranil	118-75-2	ca	1.4	14		43
Chlordane	12789-03-6	ca, nc	1.9	19		65
Chlorimuron-ethyl	90982-32-4	nc			1,200	12,000
Chloroacetic acid	79-11-8	nc			120	1,200
2-Chloroacetophenone	532-27-4	nc			0.033	0.11
4-Chloroaniline	106-47-8	nc			240	2,500
Chlorobenzene	108-90-7	nc			150	530
Chlorobenzilate	510-15-6	ca, nc	2.0	20		64
p-Chlorobenzoic acid	74-11-3	nc			12,000	120,000
4-Chlorobenzotrifluoride	98-56-6	nc			1,200	12,000
2-Chloro-1,3-butadiene	126-99-8	nc			3.6	12
1-Chlorobutane	109-69-3	nc			480 *	480 *

CONTAMINANT	CASRN	Class	Residential (mg/kg)			Non-residential (mg/kg)
			Carcinogen		Non-carcinogen	
			10^{-6} Risk	10^{-5} Risk		
1-Chloro-1,1-difluoroethane	75-68-3	nc			340 *	340 *
Chlorodifluoromethane	75-45-6	nc			340 *	340 *
Chloroethane	75-00-3	ca, nc	3.0	30		65
Chloroform	67-66-3	ca, nc	0.94	9.4		20
Chloromethane	74-87-3	nc			48	160
4-Chloro-2-methylaniline	95-69-2	ca	0.94	9.4		30
4-Chloro-2-methylaniline hydrochloride	3165-93-3	ca	1.2	12		37
beta-Chloronaphthalene	91-58-7	nc			110 *	110 *
o-Chloronitrobenzene	88-73-3	ca, nc			1.4	4.5
p-Chloronitrobenzene	100-00-5	ca, nc			10	37
2-Chlorophenol	95-57-8	nc			63	240
2-Chloropropane	75-29-6	nc			170	590
Chlorothalonil	1897-45-6	ca, nc	50	500		1600
o-Chlorotoluene	95-49-8	nc			160	510 *
Chlorpropham	101-21-3	nc			12,000	120,000
Chlorpyrifos	2921-88-2	nc			180	1,800
Chlorpyrifos-methyl	5598-13-0	nc			610	6,200
Chlorsulfuron	64902-72-3	nc			3,100	31,000
Chlorthiophos	60238-56-4	nc			49	490
Chromium III	16065-83-1	nc			120,000	1,000,000 **
Chromium VI	18540-29-9	ca, nc	30	NA		65
Cobalt	7440-48-4	ca, nc	900	9,000	1,400	13,000
Copper and compounds	7440-50-8	nc			3,100	41,000
Crotonaldehyde	123-73-9	ca	0.0053	0.053		0.11
Cumene (isopropylbenzene)	98-82-8	nc			92 *	92 *
Cyanazine	21725-46-2	ca, nc	0.65	6.5		21
Cyanide (free)[2]	57-12-5	nc			1,200	12,000
Cyanide (hydrogen)[3]	74-90-8	nc			11	35
Cyanogen	460-19-5	nc			130	430
Cyanogen bromide	506-68-3	nc			290	970
Cyanogen chloride	506-77-4	nc			160	540
Cyclohexane	110-82-7	nc			140 *	140 *
Cyclohexanone	108-94-1	nc			310,000	1,000,000 **
Cyclohexylamine	108-91-8	nc			12,000	120,000
Cyhalothrin/Karate	68085-85-8	nc			310	3,100

CONTAMINANT	CASRN	Class	Residential (mg/kg)			Non-residential (mg/kg)
			Carcinogen		Non-carcinogen	
			10^{-6} Risk	10^{-5} Risk		
Cypermethrin	52315-07-8	nc			610	6,200
Cyromazine	66215-27-8	nc			460	4,600
Dacthal	1861-32-1	nc			610	6,200
Dalapon	75-99-0	nc			1,800	18,000
Danitol	39515-41-8	nc			1,500	15,000
DDD	72-54-8	ca	2.8	28		100
DDE	72-55-9	ca	2.0	20		70
DDT	50-29-3	ca, nc	2.0	20		70
Decabromodiphenyl ether	1163-19-5	nc			610	6,200
Demeton	8065-48-3	nc			2.4	25
Diallate	2303-16-4	ca	9.0	90		280
Diazinon	333-41-5	nc			55	550
Dibenzofuran	132-64-9	nc			140 *	140 *
1,4-Dibromobenzene	106-37-6	nc			610	6,200
Dibromochloromethane	124-48-1	ca, nc	1.1	11		26
1,2-Dibromo-3-chloropropane	96-12-8	ca, nc	0.53	5.3	1.5	6.5
1,2-Dibromoethane	106-93-4	ca, nc	0.029	0.29		0.63
Dibutyl phthalate	84-74-2	nc			6,100	62,000
Dicamba	1918-00-9	nc			1,800	18,000
1,2-Dichlorobenzene	95-50-1	nc			600 *	600 *
1,3-Dichlorobenzene	541-73-1	nc			530	600 *
1,4-Dichlorobenzene	106-46-7	ca, nc	3.5	35		79
3,3-Dichlorobenzidine	91-94-1	ca	1.2	12		38
4,4'-Dichlorobenzophenone	90-98-2	nc			1,800	18,000
1,4-Dichloro-2-butene	764-41-0	ca	0.0080	0.080		0.18
Dichlorodifluoromethane	75-71-8	nc			94	310
1,1-Dichloroethane	75-34-3	nc			510	1,700 *
1,2-Dichloroethane (DCA)	107-06-2	ca, nc	0.28	2.8		6.0
1,1-Dichloroethylene (DCE)	75-35-4	nc			120	410
1,2-Dichloroethylene (cis)	156-59-2	nc			43	150
1,2-Dichloroethylene (trans)	156-60-5	nc			69	230
2,4-Dichlorophenol	120-83-2	nc			180	1,800
4-(2,4-Dichlorophenoxy)butyric acid	94-82-6	nc			490	4,900
2,4-Dichlorophenoxyacetic Acid (2,4-D)	94-75-7	nc			690	7,700
1,2-Dichloropropane	78-87-5	ca, nc	0.34	3.4		7.4

CONTAMINANT	CASRN	Class	Residential (mg/kg)			Non-residential (mg/kg)
			Carcinogen		Non-carcinogen	
			10^{-6} Risk	10^{-5} Risk		
1,3-Dichloropropane	142-28-9	nc			100	360
1,3-Dichloropropene	542-75-6	ca, nc	0.79	7.9		18
2,3-Dichloropropanol	616-23-9	nc			180	1,800
Dichlorvos	62-73-7	ca, nc	1.9	19		59
Dicofol	115-32-2	ca	1.2	12		39
Dicyclopentadiene	77-73-6	nc			0.54	1.8
Dieldrin	60-57-1	ca, nc	0.034	0.34		1.1
Diethylene glycol, monobutyl ether	112-34-5	nc			610	6,200
Diethylene glycol, monomethyl ether	111-90-0	nc			3,700	37,000
Diethylformamide	617-84-5	nc			24	250
Di(2-ethylhexyl)adipate	103-23-1	ca, nc	460	4,600		14,000
Diethyl phthalate	84-66-2	nc			49,000	490,000
Diethylstilbestrol	56-53-1	ca	0.00012	NA		0.0037
Difenzoquat (Avenge)	43222-48-6	nc			4,900	49,000
Diflubenzuron	35367-38-5	nc			1,200	12,000
Diisononyl phthalate	28553-12-0	nc			1,200	12,000
Diisopropyl methylphosphonate	1445-75-6	nc			4,900	49,000
Dimethipin	55290-64-7	nc			1,200	12,000
Dimethoate	60-51-5	nc			12	120
3,3'-Dimethoxybenzidine	119-90-4	ca	39	390		1,200
Dimethylamine	124-40-3	nc			0.067	0.25
N-N-Dimethylaniline	121-69-7	nc			120	1,200
2,4-Dimethylaniline	95-68-1	ca	0.73	7.3		23
2,4-Dimethylaniline hydrochloride	21436-96-4	ca	0.94	9.4		30
3,3'-Dimethylbenzidine	119-93-7	ca	0.24	2.4		7.5
N,N-Dimethylformamide	68-12-2	nc			6,100	62,000
Dimethylphenethylamine	122-09-8	nc			61	620
2,4-Dimethylphenol	105-67-9	nc			1,200	12,000
2,6-Dimethylphenol	576-26-1	nc			37	370
3,4-Dimethylphenol	95-65-8	nc			61	620
Dimethyl phthalate	131-11-3	nc			610,000	1,000,000 **
Dimethyl terephthalate	120-61-6	nc			6,100	62,000
4,6-Dinitro-o-cyclohexyl phenol	131-89-5	nc			120	1,200
1,2-Dinitrobenzene	528-29-0	nc			6.1	62
1,3-Dinitrobenzene	99-65-0	nc			6.1	62

CONTAMINANT	CASRN	Class	Residential (mg/kg)			Non-residential (mg/kg)
			Carcinogen		Non-carcinogen	
			10^{-6} Risk	10^{-5} Risk		
1,4-Dinitrobenzene	100-25-4	nc			6.1	62
2,4-Dinitrophenol	51-28-5	nc			120	1,200
Dinitrotoluene mixture	25321-14-6	ca	0.81	8.1		25
2,4-Dinitrotoluene	121-14-2	nc			120	1,200
2,6-Dinitrotoluene	606-20-2	nc			61	620
Dinoseb	88-85-7	nc			61	620
di-n-Octyl phthalate	117-84-0	nc			2,400	25,000
1,4-Dioxane	123-91-1	ca	50	500		1,600
Dioxin (2,3,7,8-TCDD)	1746-01-6	ca	0.0000045	0.000045		0.00016
Diphenamid	957-51-7	nc			1,800	18,000
Diphenylamine	122-39-4	nc			1,500	15,000
N,N-Diphenyl-1,4 benzenediamine (DPPD)	74-31-7	nc			18	180
1,2-Diphenylhydrazine	122-66-7	ca	0.68	6.8		22
Diphenyl sulfone	127-63-9	nc			180	1,800
Diquat	85-00-7	nc			130	1,400
Direct black 38	1937-37-7	ca	0.064	NA		0.20
Direct blue 6	2602-46-2	ca	0.068	NA		0.21
Direct brown 95	16071-86-6	ca	0.059	NA		0.19
Disulfoton	298-04-4	nc			2.4	25
1,4-Dithiane	505-29-3	nc			610	6,200
Diuron	330-54-1	nc			120	1,200
Dodine	2439-10-3	nc			240	2,500
Dysprosium	7429-91-6	nc			7,800	102,000
Endosulfan	115-29-7	nc			370	3,700
Endothall	145-73-3	nc			1,200	12,000
Endrin	72-20-8	nc			18	180
Epichlorohydrin	106-89-8	ca, nc			7.6	26
1,2-Epoxybutane	106-88-7	nc			350	3,500
EPTC (S-Ethyl dipropylthiocarbamate)	759-94-4	nc			1,500	15,000
Ethephon (2-chloroethyl phosphonic acid)	16672-87-0	nc			310	3,100
Ethion	563-12-2	nc			31	310
2-Ethoxyethanol	110-80-5	nc			24,000	250,000
2-Ethoxyethanol acetate	111-15-9	nc			18,000	180,000
Ethyl acetate	141-78-6	nc			19,000	37,000 *
Ethyl acrylate	140-88-5	ca	0.21	2.1		4.5

CONTAMINANT	CASRN	Class	Residential (mg/kg)			Non-residential (mg/kg)
			Carcinogen		Non-carcinogen	
			10^{-6} Risk	10^{-5} Risk		
Ethylbenzene	100-41-4	nc			400 *	400 *
Ethyl chloride	75-00-3	ca, nc	3.0	30		65
Ethylene cyanohydrin	109-78-4	nc			18,000	180,000
Ethylene diamine	107-15-3	nc			5,500	55,000
Ethylene glycol	107-21-1	nc			120,000	1,000,000 **
Ethylene glycol, monobutyl ether	111-76-2	nc			31,000	310,000
Ethylene oxide	75-21-8	ca	0.14	1.4		3.4
Ethylene thiourea (ETU)	96-45-7	ca, nc			4.9	49
Ethyl ether	60-29-7	nc			1,800 *	1,800 *
Ethyl methacrylate	97-63-2	nc			140 *	140 *
Ethyl p-nitrophenyl phenylphosphorothioate	2104-64-5	nc			0.61	6.2
Ethylphthalyl ethyl glycolate	84-72-0	nc			180,000	1,000,000 **
Express	101200-48-0	nc			490	4,900
Fenamiphos	22224-92-6	nc			15	150
Fluometuron	2164-17-2	nc			790	8,000
Fluoride	16984-48-8	nc			3,700	37,000
Fluoridone	59756-60-4	nc			4,900	49,000
Flurprimidol	56425-91-3	nc			1,200	12,000
Flutolanil	66332-96-5	nc			3,700	37,000
Fluvalinate	69409-94-5	nc			610	6,200
Folpet	133-07-3	ca, nc	160	1,600		4,900
Fomesafen	72178-02-0	ca	2.9	29		91
Fonofos	944-22-9	nc			120	1,200
Formaldehyde	50-00-0	ca, nc			9,200	92,000
Formic Acid	64-18-6	nc			110,000	1,000,000 **
Fosetyl-al	39148-24-8	nc			180,000	1,000,000 **
Furan	110-00-9	nc			2.5	8.5
Furazolidone	67-45-8	ca	0.14	1.4		4.5
Furfural	98-01-1	nc			180	1,800
Furium	531-82-8	ca	0.011	0.11		0.34
Furmecyclox	60568-05-0	ca	18	180		570
Glufosinate-ammonium	77182-82-2	nc			24	250
Glycidaldehyde	765-34-4	nc			24	250
Glyphosate	1071-83-6	nc			6,100	62,000
Haloxyfop-methyl	69806-40-2	nc			3.1	31

CONTAMINANT	CASRN	Class	Residential (mg/kg)			Non-residential (mg/kg)
			Carcinogen		Non-carcinogen	
			10^{-6} Risk	10^{-5} Risk		
Harmony	79277-27-3	nc			790	8,003
Heptachlor	76-44-8	ca, nc	0.12	1.2		3.8
Heptachlor epoxide	1024-57-3	ca, nc	0.060	0.60		1.9
Hexabromobenzene	87-82-1	nc			120	1,200
Hexachlorobenzene	118-74-1	ca, nc	0.34	3.4		11
Hexachlorobutadiene	87-68-3	ca, nc	7.0	70	18	180
HCH (alpha)	319-84-6	ca, nc	0.10	1.0		3.6
HCH (beta)	319-85-7	ca, nc	0.36	3.6		13
HCH (gamma) Lindane	58-89-9	ca, nc	0.50	5.0		17
HCH-technical	608-73-1	ca	0.36	3.6		13
Hexachlorocyclopentadiene	77-47-4	nc			370	3,700
Hexachloroethane	67-72-1	ca, nc	39	390	61	620
Hexachlorophene	70-30-4	nc			18	180
Hexahydro-1,3,5-trinitro-1,3,5-triazine	121-82-4	ca, nc	5.0	50		160
1,6-Hexamethylene diisocyanate	822-06-0	nc			0.17	1.8
n-Hexane	110-54-3	nc			110 *	110 *
Hexazinone	51235-04-2	nc			2,020	20,000
Hydrazine, hydrazine sulfate	302-01-2	ca	0.18	1.8		5.7
Hydrazine, monomethyl	60-34-4	ca	0.18	1.8		5.7
Hydrazine, dimethyl	57-14-7	ca	0.18	1.8		5.7
p-Hydroquinone	123-31-9	ca, nc	9.8	98		310
Imazalil	35554-44-0	nc			790	8,000
Imazaquin	81335-37-7	nc			15,000	150,000
Iprodione	36734-19-7	nc			2,400	25,000
Isobutanol	78-83-1	nc			13,000	40,000 *
Isophorone	78-59-1	ca, nc	580	5,800		18,000
Isopropalin	33820-53-0	nc			920	9,200
Isopropyl methyl phosphonic acid	1832-54-8	nc			6,100	62,000
Isoxaben	82558-50-7	nc			3,100	31,000
Kepone	143-50-0	ca, nc	0.068	0.68		2.2
Lactofen	77501-63-4	nc			120	1,200
Lead	7439-92-1	ca, nc			400	800
Lead (tetraethyl)	78-00-2	nc			0.0061	0.062
Linuron	330-55-2	nc			120	1,200
Lithium	7439-93-2	nc			1,600	20,000

CONTAMINANT	CASRN	Class	Residential (mg/kg)			Non-residential (mg/kg)
			Carcinogen		Non-carcinogen	
			10^{-6} Risk	10^{-5} Risk		
Londax	83055-99-6	nc			12,000	120,000
Malathion	121-75-5	nc			1,200	12,000
Maleic anhydride	108-31-6	nc			6,100	62,000
Maleic hydrazide	123-33-1	nc			1,700	2,400 *
Malononitrile	109-77-3	nc			6.1	62
Mancozeb	8018-01-7	nc			1,800	18,000
Maneb	12427-38-2	ca, nc	9.1	91		290
Manganese	7439-96-5	nc			3,300	32,000
Mephosfolan	950-10-7	nc			5.5	55
Mepiquat	24307-26-4	nc			1,800	18,000
2-Mercaptobenzothiazole	149-30-4	ca, nc	19	190		590
Mercury and compounds	7487-94-7	nc			23	310
Mercury (methyl)	22967-92-6	nc			6.1	62
Merphos	150-50-5	nc			1.8	18
Merphos oxide	78-48-8	nc			1.8	18
Metalaxyl	57837-19-1	nc			3,700	37,000
Methacrylonitrile	126-98-7	nc			2.1	8.4
Methamidophos	10265-92-6	nc			3.1	31
Methanol	67-56-1	nc			31,000	310,000
Methidathion	950-37-8	nc			61	620
Methomyl	16752-77-5	nc			44	150
Methoxychlor	72-43-5	nc			310	3,100
2-Methoxyethanol	109-86-4	nc			61	620
2-Methoxyethanol acetate	110-49-6	nc			120	1,200
2-Methoxy-5-nitroaniline	99-59-2	ca	12	120		370
Methyl acetate	79-20-9	nc			22,000	92,000
Methyl acrylate	96-33-3	nc			70	230
2-Methylaniline (o-toluidine)	95-53-4	ca	2.3	23		72
2-Methylaniline hydrochloride	636-21-5	ca	3.0	30		96
2-Methyl-4-chlorophenoxyacetic acid	94-74-6	nc			31	310
4-(2-Methyl-4-chlorophenoxy) butyric acid (MCPB)	94-81-5	nc			610	6,200
2-(2-Methyl-4-chlorophenoxy) propionic acid	93-65-2	nc			61	620
2-(2-Methyl-1,4-chlorophenoxy) propionic acid (MCPP)	16484-77-8	nc			61	620

CONTAMINANT	CASRN	Class	Residential (mg/kg)			Non-residential (mg/kg)
			Carcinogen		Non-carcinogen	
			10^{-6} Risk	10^{-5} Risk		
Methylcyclohexane	108-87-2	nc			230 *	230 *
4,4'-Methylenebisbenzeneamine	101-77-9	ca	2.2	22		69
4,4'-Methylene bis(2-chloroaniline)	101-14-4	ca, nc	4.2	42		130
4,4'-Methylene bis(N,N'-dimethyl) aniline	101-61-1	ca	12	120		370
Methylene bromide	74-95-3	nc			67	230
Methylene chloride	75-09-2	ca, nc	9.3	93		210
4,4'-Methylenediphenyl diisocyanate	101-68-8	nc			10	110
Methyl ethyl ketone (MEK)	78-93-3	nc			23,000	34,000 *
Methyl isobutyl ketone (MIBK)	108-10-1	nc			5,300	17,000 *
Methyl mercaptan	74-93-1	nc			35	350
Methyl methacrylate	80-62-6	nc			2,200	2,700 *
2-Methyl-5-nitroaniline	99-55-8	ca	17	170		520
Methyl parathion	298-00-0	nc			15	150
2-Methylphenol	95-48-7	nc			3,100	31,000
3-Methylphenol	108-39-4	nc			3,100	31,000
4-Methylphenol	106-44-5	nc			310	3,100
Methyl phosphonic acid	993-13-5	nc			1,200	12,000
Methyl styrene (mixture)	25013-15-4	nc			130	540
Methyl styrene (alpha)	98-83-9	nc			680 *	680 *
Methyl tertbutyl ether (MTBE)	1634-04-4	ca, nc	32	320		710
Metolaclor (Dual)	51218-45-2	nc			9,200	92,000
Metribuzin	21087-64-9	nc			1,500	15,000
Mirex	2385-85-5	ca, nc	0.30	3.0		9.6
Molinate	2212-67-1	nc			120	1,200
Molybdenum	7439-98-7	nc			390	5,100
Monochloramine	10599-90-3	nc			6,100	62,000
Naled	300-76-5	nc			120	1,200
Napropamide	15299-99-7	nc			6,100	62,000
Nickel and compounds	7440-02-0	nc			1,600	20,000
Nickel subsulfide	12035-72-2	ca	5,200	NA		11,000
2-Nitroaniline	88-74-4	nc			180	1,800
3-Nitroaniline	99-09-2	ca, nc			18	180
4-Nitroaniline	100-01-6	ca, nc	26	260	180	820
Nitrobenzene	98-95-3	nc			20	100
Nitrofurantoin	67-20-9	nc			4,300	43,000

CONTAMINANT	CASRN	Class	Residential (mg/kg)			Non-residential (mg/kg)
			Carcinogen		Non-carcinogen	
			10^{-6} Risk	10^{-5} Risk		
Nitrofurazone	59-87-0	ca	0.37	3.7		11
Nitroglycerin	55-63-0	ca	39	390		1,200
Nitroguanidine	556-88-7	nc			6,100	62,000
2-Nitropropane	79-46-9	ca, nc	0.0028	0.028		0.061
N-Nitrosodi-n-butylamine	924-16-3	ca	0.025	0.25		0.58
N-Nitrosodiethanolamine	1116-54-7	ca	0.20	2.0		6.2
N-Nitrosodiethylamine	55-18-5	ca	0.0037	0.037		0.11
N-Nitrosodimethylamine	62-75-9	ca, nc	0.011	0.11		0.34
N-Nitrosodiphenylamine	86-30-6	ca, nc	110	1,100		3,500
N-Nitroso di-n-propylamine	621-64-7	ca	0.078	0.78		2.5
N-Nitroso-N-methylethylamine	10595-95-6	ca	0.025	0.25		0.78
N-Nitrosopyrrolidine	930-55-2	ca	0.26	2.6		8.2
m-Nitrotoluene	99-08-1	nc			730	1,000 *
o-Nitrotoluene	88-72-2	ca, nc	0.93	9.3		22
p-Nitrotoluene	99-99-0	ca, nc	13	130		300
Norflurazon	27314-13-2	nc			2,400	25,000
NuStar	85509-19-9	nc			43	430
Octabromodiphenyl ether	32536-52-0	nc			180	1,800
Octahydro-1357-tetranitro-1357-tetrazocine (HMX)	2691-41-0	nc			3,100	31,000
Octamethylpyrophosphoramide	152-16-9	nc			120	1,200
Oryzalin	19044-88-3	nc			3,100	31,000
Oxadiazon	19666-30-9	nc			310	3,100
Oxamyl	23135-22-0	nc			1,500	15,000
Oxyfluorfen	42874-03-3	nc			180	1,800
Paclobutrazol	76738-62-0	nc			790	8,000
Paraquat	4685-14-7	nc			270	2,800
Parathion	56-38-2	nc			370	3,700
Pebulate	1114-71-2	nc			3,100	31,000
Pendimethalin	40487-42-1	nc			2,400	25,000
Pentabromo-6-chloro cyclohexane	87-84-3	ca	24	240		750
Pentabromodiphenyl ether	32534-81-9	nc			120	1,200
Pentachlorobenzene	608-93-5	nc			49	490
Pentachloronitrobenzene	82-68-8	ca, nc	2.1	21		66
Pentachlorophenol	87-86-5	ca, nc	3.2	32		90
Perchlorate	7601-90-3	nc			55	720

CONTAMINANT	CASRN	Class	Residential (mg/kg)			Non-residential (mg/kg)
			Carcinogen		Non-carcinogen	
			10^{-6} Risk	10^{-5} Risk		
Permethrin	52645-53-1	nc			3,100	31,000
Phenmedipham	13684-63-4	nc			15,000	150,000
Phenol	108-95-2	nc			18,000	180,000
Phenothiazine	92-84-2	nc			120	1,200
m-Phenylenediamine	108-45-2	nc			370	3,700
o-Phenylenediamine	95-54-5	ca	12	120		370
p-Phenylenediamine	106-50-3	nc			12,000	120,000
Phenylmercuric acetate	62-38-4	nc			4.9	49
2-Phenylphenol	90-43-7	ca	280	2,800		8,900
Phorate	298-02-2	nc			12	120
Phosmet	732-11-6	nc			1,200	12,000
Phosphine	7803-51-2	nc			18	180
Phosphorus (white)	7723-14-0	nc			1.6	20
p-Phthalic acid	100-21-0	nc			61,000	620,000
Phthalic anhydride	85-44-9	nc			120,000	1,000,000 **
Picloram	1918-02-1	nc			4,300	43,000
Pirimiphos-methyl	29232-93-7	nc			610	6,200
Polybrominated biphenyls (PBBs)	NA	ca, nc	0.062	0.62	0.43	1.9
Polychlorinated biphenyls (PCBs), low-risk mixture[4]	12674-11-2	ca, nc			3.9	37
Polychlorinated biphenyls (PCBs), high-risk mixture[5]	11097-69-1	ca, nc	0.25	2.5	1.1	7.4
Polychlorinated terphenyls	61788-33-8	ca	0.12	1.2		3.8
Polynuclear aromatic hydrocarbons						
Acenaphthene	83-32-9	nc			3,700	29,000
Anthracene	120-12-7	nc			22,000	240,000
Benz[a]anthracene	56-55-3	ca	0.69	6.9		21
Benzo[b]fluoranthene	205-99-2	ca	0.69	6.9		21
Benzo[k]fluoranthene	207-08-9	ca	6.9	69		210
Benzo[a]pyrene	50-32-8	ca	0.069	0.69		2.1
Chrysene	218-01-9	ca	68	680		2,000
Dibenz[ah]anthracene	53-70-3	ca	0.069	0.69		2.1
Fluoranthene	206-44-0	nc			2,300	22,000
Fluorene	86-73-7	nc			2,700	26,000
Indeno[1,2,3-cd]pyrene	193-39-5	ca	0.69	6.9		21
Naphthalene	91-20-3	nc			56	190

CONTAMINANT	CASRN	Class	Residential (mg/kg)			Non-residential (mg/kg)
			Carcinogen		Non-carcinogen	
			10^{-6} Risk	10^{-5} Risk		
Pyrene	129-00-0	nc			2,300	29,000
Prochloraz	67747-09-5	ca, nc	3.7	37		110
Profluralin	26399-36-0	nc			370	3,700
Prometon	1610-18-0	nc			920	9,200
Prometryn	7287-19-6	nc			240	2,500
Pronamide	23950-58-5	nc			4,600	46,000
Propachlor	1918-16-7	nc			790	8,000
Propanil	709-98-8	nc			310	3,100
Propargite	2312-35-8	nc			1,200	12,000
Propargyl alcohol	107-19-7	nc			120	1,200
Propazine	139-40-2	nc			1,200	12,000
Propham	122-42-9	nc			1,200	12,000
Propiconazole	60207-90-1	nc			790	8,000
n-Propylbenzene	103-65-1	nc			240 *	240 *
Propylene glycol	57-55-6	nc			30,000	290,000
Propylene glycol, monoethyl ether	52125-53-8	nc			43,000	430,000
Propylene glycol, monomethyl ether	107-98-2	nc			43,000	430,000
Propylene oxide	75-56-9	ca, nc	2.2	22		66
Pursuit	81335-77-5	nc			15,000	150,000
Pydrin	51630-58-1	nc			1,500	15,000
Pyridine	110-86-1	nc			61	620
Quinalphos	13593-03-8	nc			31	310
Quinoline	91-22-5	ca	0.18	1.8		5.7
RDX (Cyclonite)	121-82-4	ca, nc	5.0	50		160
Resmethrin	10453-86-8	nc			1,800	18,000
Ronnel	299-84-3	nc			3,100	31,000
Rotenone	83-79-4	nc			240	2,500
Savey	78587-05-0	nc			1,500	15,000
Selenious Acid	7783-00-8	nc			310	3,100
Selenium	7782-49-2	nc			390	5,100
Selenourea	630-10-4	nc			310	3,100
Sethoxydim	74051-80-2	nc			5,500	55,000
Silver and compounds	7440-22-4	nc			390	5,100
Simazine	122-34-9	ca, nc	4.6	46		140
Sodium azide	26628-22-8	nc			310	4,100

CONTAMINANT	CASRN	Class	Residential (mg/kg)			Non-residential (mg/kg)
			Carcinogen		Non-carcinogen	
			10^{-6} Risk	10^{-5} Risk		
Sodium diethyldithiocarbamate	148-18-5	ca, nc	2.0	20		64
Sodium fluoroacetate	62-74-8	nc			1.2	12
Sodium metavanadate	13718-26-8	nc			61	620
Strontium, stable	7440-24-6	nc			47,000	610,000
Strychnine	57-24-9	nc			18	180
Styrene	100-42-5	nc			1,500 *	1,500 *
1,1'-Sulfonylbis-(4-chlorobenzene)	80-07-9	nc			310	3,100
Systhane	88671-89-0	nc			1,500	15,000
Tebuthiuron	34014-18-1	nc			4,300	43,000
Temephos	3383-96-8	nc			1,200	12,000
Terbacil	5902-51-2	nc			790	8,000
Terbufos	13071-79-9	nc			1.5	15
Terbutryn	886-50-0	nc			61	620
1,2,4,5-Tetrachlorobenzene	95-94-3	nc			18	180
1,1,1,2-Tetrachloroethane	630-20-6	ca, nc	3.2	32		73
1,1,2,2-Tetrachloroethane	79-34-5	ca, nc	0.42	4.2		9.3
Tetrachloroethylene (PCE)	127-18-4	ca, nc	0.51	5.1		13
2,3,4,6-Tetrachlorophenol	58-90-2	nc			1,800	18,000
p,a,a,a-Tetrachlorotoluene	5216-25-1	ca	0.027	0.27		0.86
Tetrachlorovinphos	961-11-5	ca, nc	23	230		720
Tetraethyldithiopyrophosphate	3689-24-5	nc			31	310
Tetrahydrofuran	109-99-9	ca, nc	9.5	95		210
Thallium and compounds	7440-28-0	nc			5.2	67
Thiobencarb	28249-77-6	nc			610	6,200
Thiocyanate	NA	nc			3,100	31,000
Thiofanox	39196-18-4	nc			18	180
Thiophanate-methyl	23564-05-8	nc			4,900	49,000
Thiram	137-26-8	nc			310	3,100
Tin	7440-31-5	nc			47,000	610,000
Titanium	7440-32-6	nc			310,000	1,000,000 **
Toluene	108-88-3	nc			650 *	650 *
Toluene-2,4-diamine	95-80-7	ca	0.17	1.7		5.4
Toluene-2,5-diamine	95-70-5	nc			37,000	370,000
Toluene-2,6-diamine	823-40-5	nc			12,000	120,000
p-Toluidine	106-49-0	ca	2.9	29		91

CONTAMINANT	CASRN	Class	Residential (mg/kg)			Non-residential (mg/kg)
			Carcinogen		Non-carcinogen	
			10^{-6} Risk	10^{-5} Risk		
Toxaphene	8001-35-2	ca	0.50	5.0		16
Tralomethrin	66841-25-6	nc			460	4,600
Triallate	2303-17-5	nc			790	8,000
Triasulfuron	82097-50-5	nc			610	6,200
1,2,4-Tribromobenzene	615-54-3	nc			310	3,100
Tributyl phosphate	126-73-8	ca, nc	60	600		1,900
Tributyltin oxide (TBTO)	56-35-9	nc			18	180
2,4,6-Trichloroaniline	634-93-5	ca	16	160		510
2,4,6-Trichloroaniline hydrochloride	33663-50-2	ca	19	190		590
1,2,4-Trichlorobenzene	120-82-1	nc			62	220
1,1,1-Trichloroethane	71-55-6	nc			1,200 *	1,200 *
1,1,2-Trichloroethane	79-00-5	ca, nc	0.74	7.4		16
Trichloroethylene (TCE)	79-01-6	ca, nc	3.0	30	17	65
Trichlorofluoromethane	75-69-4	nc			390	1,300
2,4,5-Trichlorophenol	95-95-4	nc			6,100	62,000
2,4,6-Trichlorophenol	88-06-2	ca, nc			6.1	62
2,4,5-Trichlorophenoxyacetic Acid	93-76-5	nc			610	6,200
2-(2,4,5-Trichlorophenoxy) propionic acid	93-72-1	nc			490	4,900
1,1,2-Trichloropropane	598-77-6	nc			15	51
1,2,3-Trichloropropane	96-18-4	ca, nc	0.0050	0.050		0.11
1,2,3-Trichloropropene	96-19-5	nc			0.71	2.3
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	76-13-1	nc			5,600 *	5,600 *
Tridiphane	58138-08-2	nc			180	1,800
Triethylamine	121-44-8	nc			23	86
Trifluralin	1582-09-8	ca, nc	71	710	460	2,200
Trimellitic Anhydride (TMAN)	552-30-7	nc			8.6	86
1,2,4-Trimethylbenzene	95-63-6	nc			52	170
1,3,5-Trimethylbenzene	108-67-8	nc			21	70
Trimethyl phosphate	512-56-1	ca	15	150		470
1,3,5-Trinitrobenzene	99-35-4	nc			1,800	18,000
Trinitrophenylmethylnitramine	479-45-8	nc			610	6,200
2,4,6-Trinitrotoluene	118-96-7	ca, nc	18	180	31	310
Triphenylphosphine oxide	791-28-6	nc			1,200	12,000
Tris(2-chloroethyl) phosphate	115-96-8	ca, nc	39	390		1,200
Tris(2-ethylhexyl) phosphate	78-42-2	ca, nc	170	1,700		5,400

CONTAMINANT	CASRN	Class	Residential (mg/kg)			Non-residential (mg/kg)
			Carcinogen		Non-carcinogen	
			10^{-6} Risk	10^{-5} Risk		
Uranium (chemical toxicity only)	7440-61-0	nc			16	200
Vanadium and compounds	7440-62-2	nc			78	1,000
Vernam	1929-77-7	nc			61	620
Vinclozolin	50471-44-8	nc			1,500	15,000
Vinyl acetate	108-05-4	nc			430	1,400
Vinyl bromide	593-60-2	ca, nc	0.19	1.9		4.2
Vinyl chloride	75-01-4	ca, nc	0.085	NA		0.75
Warfarin	81-81-2	nc			18	180
Xylenes	1330-20-7	nc			270	420 *
Zinc	7440-66-6	nc			23,000	310,000
Zinc phosphide	1314-84-7	nc			23	310
Zineb	12122-67-7	nc			3,100	31,000
NA indicates not applicable.						

Class is the classification of the chemical. “ca” indicates carcinogenic effects; “nc” indicates non-carcinogenic effects. Chemicals that have both carcinogenic and non-carcinogenic effects are classified “ca, nc”.

* Indicates SRL is based on the chemical-specific saturation level in soil for volatile organic chemicals only.

** Indicates SRL is based on a 100% saturation ceiling limit for non-volatile organic chemicals.

[1]Arsenic standards are not risk-based standards, but based on background.

[2]Cyanide (free): Free cyanide is a subset of total cyanides. If any ADHS approved method for total cyanide reports a concentration exceeding this standard, further analyses to differentiate free cyanide from other cyanide metal complexes is required.

[3]Cyanide (hydrogen): If the cyanide concentrations using any method exceed the hydrogen cyanide standard, then hydrogen cyanide vapor samples should be collected at the site.

[4]PCBs, low-risk mixture: Use if laboratory analysis confirms that the total PCB concentration consists of 0.5 percent or less of congeners that contain five or more chlorines and that no dioxin-like congeners are present.

[5]PCBs, high-risk mixture: Use if only total PCB concentration is reported by any ADHS licensed analytical method, or if laboratory analysis confirms that the total PCB concentration consists of more than 0.5 percent congeners that contain five or more chlorines or that dioxin-like congeners are present.

Bold indicates adequate evidence to classify the chemical as a known human carcinogen.

CASRN is the Chemical Abstract System Registry Number.

Historical Note

Adopted by emergency action effective March 29, 1996, pursuant to A.R.S. § 41-1026 and Laws 1995, Ch. 232, § 5; in effect until permanent rules are adopted and in place no later than August 1, 1997, pursuant to A.R.S. § 49-152 and Laws 1995, Ch. 232, § 5 (Supp. 96-1). Historical note revised to clarify exemptions of emergency adoption (Supp. 97-1). Interim emergency appendix reinstated at the request of the Department; historical note from Supp. 97-3 stating emergency expired removed for clarity. Appendix A adopted permanently effective December 4, 1997, replacing emergency appendix (Supp. 97-4). Amended to correct measurement units in columns 5 and 6 from “mg/k” to “mg/kg” (Supp. 01-4). Former Appendix A renumbered to Appendix B; new Appendix A made by final rulemaking at 13 A.A.R. 971, effective May 5, 2007 (Supp. 07-1).

Appendix B. 1997 Soil Remediation Levels (SRLs)

	Chemical Name	CAS Number	Cancer Group	Residential (mg/kg)	Non-residential (mg/kg)
	A				
1	Acenaphthene	83-32-9	D	3900.0	41000.0
2	Acephate	30560-19-1	C	260.0	2200.0
3	Acetaldehyde	75-07-0	B2	39.0	150.0
4	Acetochlor	34256-82-1	D	1300.0	14000.0
5	Acetone	67-64-1	D	2100.0	8800.0
6	Acetone cyanohydrin	75-86-5	D	52.0	550.0
7	Acetonitrile	75-05-8	D	220.0	1200.0
8	Acetophenone	98-86-2	D	0.49	1.6
9	Acifluorfen	62476-59-9	D	850.0	8900.0
10	Acrolein	107-02-8	C	0.10	0.34
11	Acrylamide	79-06-1	B2	0.98	4.2
12	Acrylic acid	79-10-7	D	31000.0	290000.0
13	Acrylonitrile	107-13-1	B1	1.9	4.7
14	Alachlor	15972-60-8	B2	55.0	240.0
15	Alar	1596-84-5	D	9800.0	100000.0
16	Aldicarb	116-06-3	D	65.0	680.0
17	Aldicarb sulfone	1646-88-4	D	65.0	680.0
18	Aldrin	309-00-2	B2	0.26	1.1
19	Ally	74223-64-6	D	16000.0	170000.0
20	Allyl alcohol	107-18-6	D	330.0	3400.0
21	Allyl chloride	107-05-1	C	3200.0	33000.0
22	Aluminum	7429-90-5	D	77000.0	1000000.0
23	Aluminum phosphide	20859-73-8	D	31.0	680.0
24	Amdro	67485-29-4	D	20.0	200.0
25	Ametryn	834-12-8	D	590.0	6100.0
26	m-Aminophenol	591-27-5	D	4600.0	48000.0
27	4-Aminopyridine	504-24-5	D	1.3	14.0
28	Amitraz	33089-61-1	D	160.0	1700.0
29	Ammonia	7664-41-7	D	2200.0	58000.0
30	Ammonium sulfamate	7773-06-0	D	13000.0	140000.0
31	Aniline	62-53-3	B2	19.0	200.0
32	Anthracene	120-12-7	D	20000.0	200000.0
33	Antimony and compounds	7440-36-0	D	31.0	680.0
34	Antimony pentoxide	1314-60-9	D	38.0	850.0
35	Antimony potassium tartrate	28300-74-5	D	69.0	1500.0
36	Antimony tetroxide	1332-81-6	D	31.0	680.0
37	Antimony trioxide	1309-64-4	D	31.0	680.0
38	Apollo	74115-24-5	C	850.0	8900.0
39	Aramite	140-57-8	B2	180.0	760.0
40	~Arsenic	7440-38-2	A	10.0	10.0
41	Assure	76578-14-8	D	590.0	6100.0
42	Asulam	3337-71-1	D	3300.0	34000.0
43	Atrazine	1912-24-9	C	20.0	86.0
44	Avermectin B1	71751-41-2	D	26.0	270.0
45	Azobenzene	103-33-3	B2	40.0	170.0
	B				
46	Barium and compounds	7440-39-3	D	5300.0	110000.0
47	Barium cyanide	542-62-1	D	7700.0	170000.0
48	Baygon	114-26-1	D	260.0	2700.0
49	Bayleton	43121-43-3	D	2000.0	20000.0
50	Baythroid	68359-37-5	D	1600.0	17000.0
51	Benefin	1861-40-1	D	20000.0	200000.0
52	Benomyl	17804-35-2	D	3300.0	34000.0
53	Bentazon	25057-89-0	D	160.0	1700.0
54	Benzaldehyde	100-52-7	D	6500.0	68000.0
55	Benz[a]anthracene	56-55-3	B2	6.1	26.0
56	Benzene	71-43-2	A	0.62	1.4

	Chemical Name	CAS Number	Cancer Group	Residential (mg/kg)	Non-residential (mg/kg)
57	Benzidine	92-87-5	A	0.0019	0.0083
58	Benzo[a]pyrene	50-32-8	B2	0.61	2.6
59	Benzo[b]fluoranthene	205-99-2	B2	6.1	26.0
60	Benzoic acid	65-85-0	D	260000.0	1000000.0
61	Benzo[k]fluoranthene	207-08-9	B2	61.0	260.0
62	Benzotrichloride	98-07-7	B2	0.34	1.5
63	Benzyl alcohol	100-51-6	D	20000.0	200000.0
64	Benzyl chloride	100-44-7	B2	8.0	20.0
65	Beryllium and compounds	7440-41-7	B2	1.4	11.0
66	Bidrin	141-66-2	D	6.5	68.0
67	Biphenthrin (Talstar)	82657-04-3	D	980.0	10000.0
68	1,1-Biphenyl	92-52-4	D	3300.0	34000.0
69	Bis(2-chloroethyl)ether	111-44-4	B2	0.43	0.97
70	Bis(2-chloroisopropyl)ether	39638-32-9	C	25.0	67.0
71	Bis(chloromethyl)ether	542-88-1	A	0.0002	0.0004
72	Bis(2-chloro-1-methylethyl)ether	108-60-1	C	63.0	270.0
73	Bis(2-ethylhexyl)phthalate (DEHP)	117-81-7	B2	320.0	1400.0
74	Bisphenol A	80-05-7	D	3300.0	34000.0
75	Boron	7440-42-8	D	5900.0	61000.0
76	Bromodichloromethane	75-27-4	B2	6.3	14.0
77	Bromoform (tribromomethane)	75-25-2	B2	560.0	2400.0
78	Bromomethane	74-83-9	D	6.8	23.0
79	Bromophos	2104-96-3	D	330.0	3400.0
80	Bromoxynil	1689-84-5	D	1300.0	14000.0
81	Bromoxynil octanoate	1689-99-2	D	1300.0	14000.0
82	1,3-Butadiene	106-99-0	B2	0.064	0.14
83	1-Butanol	71-36-3	D	6500.0	68000.0
84	Butylate	2008-41-5	D	3300.0	34000.0
85	Butyl benzyl phthalate	85-68-7	C	13000.0	140000.0
86	Butylphthalyl butylglycolate	85-70-1	D	65000.0	680000.0
	C				
87	Cacodylic acid	75-60-5	D	200.0	2000.0
88	Cadmium and compounds	7440-43-9	B1	38.0	850.0
89	Calcium cyanide	592-01-8	D	3100.0	68000.0
90	Caprolactam	105-60-2	D	33000.0	340000.0
91	Captafol	2425-06-1	C	130.0	1400.0
92	Captan	133-06-2	D	1300.0	5500.0
93	Carbaryl	63-25-2	D	6500.0	68000.0
94	Carbazole	86-74-8	B2	220.0	950.0
95	Carbofuran	1563-66-2	E	330.0	3400.0
96	Carbon disulfide	75-15-0	D	7.5	24.0
97	Carbon tetrachloride	56-23-5	B2	1.6	5.0
98	Carbosulfan	55285-14-8	D	650.0	6800.0
99	Carboxin	5234-68-4	D	6500.0	68000.0
100	Chloral (hydrate)	302-17-0	D	130.0	1400.0
101	Chloramben	133-90-4	D	980.0	10000.0
102	Chloranil	118-75-2	C	11.0	47.0
103	Chlordane	12789-03-6	B2	3.4	15.0
104	Chlorimuron-ethyl	90982-32-4	D	1300.0	14000.0
105	Chlorine cyanide	506-77-4	D	3800.0	85000.0
106	Chloroacetic acid	79-11-8	D	130.0	1400.0
107	2-Chloroacetophenone	532-27-4	D	0.56	5.9
108	4-Chloroaniline	106-47-8	D	260.0	2700.0
109	Chlorobenzene	108-90-7	D	65.0	220.0
110	Chlorobenzilate	510-15-6	B2	16.0	71.0
111	p-Chlorobenzoic acid	74-11-3	D	13000.0	140000.0
112	4-Chlorobenzotrifluoride	98-56-6	D	1300.0	14000.0
113	2-Chloro-1,3-butadiene	126-99-8	D	3.6	12.0
114	1-Chlorobutane	109-69-3	D	710.0	2400.0

	Chemical Name	CAS Number	Cancer Group	Residential (mg/kg)	Non-residential (mg/kg)
115	* 1-Chloro-1,1-difluoroethane	75-68-3	D	2800.0	2800.0
116	* Chlorodifluoromethane	75-45-6	D	2800.0	2800.0
117	Chloroform	67-66-3	B2	2.5	5.3
118	Chloromethane	74-87-3	C	12.0	26.0
119	4-Chloro-2-methylaniline	95-69-2	B2	7.7	33.0
120	4-Chloro-2-methylaniline hydrochloride	3165-93-3	B2	9.7	41.0
121	beta-Chloronaphthalene	91-58-7	D	5200.0	55000.0
122	o-Chloronitrobenzene	88-73-3	B2	180.0	760.0
123	p-Chloronitrobenzene	100-00-5	B2	250.0	1100.0
124	2-Chlorophenol	95-57-8	D	91.0	370.0
125	2-Chloropropane	75-29-6	D	170.0	580.0
126	Chlorothalonil	1897-45-6	B2	400.0	1700.0
127	* o-Chlorotoluene	95-49-8	D	160.0	550.0
128	Chlorpropham	101-21-3	D	13000.0	140000.0
129	Chlorpyrifos	2921-88-2	D	200.0	2000.0
130	Chlorpyrifos-methyl	5598-13-0	D	650.0	6800.0
131	Chlorsulfuron	64902-72-3	D	3300.0	34000.0
132	Chlorthiophos	602-38-56-4	D	52.0	550.0
133	Chromium, Total (1/6 ratio Cr VI/Cr III)	N/A	D	2100.0	4500.0
134	Chromium III	16065-83-1	D	77000.0	1000000.0
135	Chromium VI	7440-47-3	A	30.0	64.0
136	Chrysene	218-01-9	B2	610.0	2600.0
137	Cobalt	7440-48-4	D	4600.0	97000.0
138	Copper and compounds	7440-50-8	D	2800.0	63000.0
139	Copper cyanide	544-92-3	D	380.0	8500.0
140	Crotonaldehyde	123-73-9	C	0.052	0.11
141	Cumene	98-82-8	D	19.0	62.0
142	Cyanazine	21725-46-2	D	5.3	23.0
143	Cyanide, Free	57-12-5	D	1300.0	14000.0
144	Cyanogen	460-19-5	D	2600.0	27000.0
145	Cyanogen bromide	506-68-3	D	5900.0	61000.0
146	Cyanogen chloride	506-77-4	D	3300.0	34000.0
147	Cyclohexanone	108-94-1	D	330000.0	1000000.0
148	Cyclohexylamine	108-91-8	D	13000.0	140000.0
149	Cyhalothrin/Karate	68085-85-8	D	330.0	3400.0
150	Cypermethrin	52315-07-8	D	650.0	6800.0
151	Cyromazine	66215-27-8	D	490.0	5100.0
	D				
152	Dacthal	1861-32-1	D	650.0	6800.0
153	Dalapon	75-99-0	D	2000.0	20000.0
154	Danitol	39515-41-8	D	1600.0	17000.0
155	DDD	72-54-8	B2	19.0	80.0
156	DDE	72-55-9	B2	13.0	56.0
157	DDT	50-29-3	B2	13.0	56.0
158	Decabromodiphenyl ether	1163-19-5	C	650.0	6800.0
159	Demeton	8065-48-3	D	2.6	27.0
160	Diallate	2303-16-4	B2	73.0	310.0
161	Diazinon	333-41-5	E	59.0	610.0
162	Dibenz[ah]anthracene	53-70-3	B2	0.61	2.6
163	Dibenzofuran	132-64-9	D	260.0	2700.0
164	1,4-Dibromobenzene	106-37-6	D	650.0	6800.0
165	Dibromochloromethane	124-48-1	C	53.0	230.0
166	1,2-Dibromo-3-chloropropane	96-12-8	B2	3.2	14.0
167	1,2-Dibromoethane	106-93-4	B2	0.049	0.2
168	Dibutyl phthalate	84-74-2	D	6500.0	68000.0
169	Dicamba	1918-00-9	D	2000.0	20000.0
170	* 1,2-Dichlorobenzene	95-50-1	D	1100.0	3900.0
171	* 1,3-Dichlorobenzene	541-73-1	D	500.0	2000.0
172	1,4-Dichlorobenzene	106-46-7	C	190.0	790.0

	Chemical Name	CAS Number	Cancer Group	Residential (mg/kg)	Non-residential (mg/kg)
173	3,3-Dichlorobenzidine	91-94-1	B2	9.9	42.0
174	1,4-Dichloro-2-butene	764-41-0	B2	0.074	0.17
175	Dichlorodifluoromethane	75-71-8	D	94.0	310.0
176	1,1-Dichloroethane	75-34-3	C	500.0	1700.0
177	1,2-Dichloroethane (EDC)	107-06-2	B2	2.5	5.5
178	1,1-Dichloroethylene	75-35-4	C	0.36	0.8
179	1,2-Dichloroethylene (cis)	156-59-2	D	31.0	100.0
180	1,2-Dichloroethylene (trans)	156-60-5	D	78.0	270.0
181	1,2-Dichloroethylene (mixture)	540-59-0	D	35.0	120.0
182	2,4-Dichlorophenol	120-83-2	D	200.0	2000.0
183	4-(2,4-Dichlorophenoxy)butyric Acid (2,4-DB)	94-82-6	D	520.0	5500.0
184	2,4-Dichlorophenoxyacetic Acid (2,4-D)	94-75-7	D	650.0	6800.0
185	1,2-Dichloropropane	78-87-5	B2	3.1	6.8
186	1,3-Dichloropropene	542-75-6	B2	2.4	5.5
187	2,3-Dichloropropanol	616-23-9	D	200.0	2000.0
188	Dichlorvos	62-73-7	B2	15.0	66.0
189	Dicofol	115-32-2	C	10.0	43.0
190	Dieldrin	60-57-1	B2	0.28	1.2
191	Diethylene glycol, monobutyl ether	112-34-5	D	370.0	3900.0
192	Diethylene glycol, monoethyl ether	111-90-0	D	130000.0	1000000.0
193	Diethylformamide	617-84-5	D	720.0	7500.0
194	Di(2-ethylhexyl)adipate	103-23-1	C	3700.0	16000.0
195	Diethyl phthalate	84-66-2	D	52000.0	550000.0
196	Diethylstilbestrol	56-53-1	A	0.0001	0.0004
197	Difenzoquat (Avenge)	43222-48-6	D	5200.0	55000.0
198	Diflubenzuron	35367-38-5	D	1300.0	14000.0
199	Diisopropyl methylphosphonate	1445-75-6	D	5200.0	55000.0
200	Dimethipin	55290-64-7	C	1300.0	14000.0
201	Dimethoate	60-51-5	D	13.0	140.0
202	3,3’-Dimethoxybenzidine	119-90-4	B2	320.0	1400.0
203	Dimethylamine	124-40-3	D	0.07	0.24
204	N-N-Dimethylaniline	121-69-7	D	130.0	1400.0
205	2,4-Dimethylaniline	95-68-1	C	5.9	25.0
206	2,4-Dimethylaniline hydrochloride	21436-96-4	C	7.7	33.0
207	3,3’-Dimethylbenzidine	119-93-7	B2	0.48	2.1
208	1,1-Dimethylhydrazine (Hydrazine, dimethyl)	57-14-7	B, C	1.7	7.3
209	1,2-Dimethylhydrazine	540-73-8	B2	0.12	0.52
210	N,N-Dimethylformamide	68-12-2	D	6500.0	68000.0
211	2,4-Dimethylphenol	105-67-9	D	1300.0	14000.0
212	2,6-Dimethylphenol	576-26-1	D	39.0	410.0
213	3,4-Dimethylphenol	95-65-8	D	65.0	680.0
214	Dimethyl phthalate	131-11-3	D	650000.0	1000000.0
215	Dimethyl terephthalate	120-61-6	D	6500.0	68000.0
216	4,6-Dinitro-o-cyclohexyl phenol	131-89-5	D	130.0	1400.0
217	1,3-Dinitrobenzene	99-65-0	D	6.5	68.0
218	1,2-Dinitrobenzene	528-29-0	D	26.0	270.0
219	1,4-Dinitrobenzene	100-25-4	D	26.0	270.0
220	2,4-Dinitrophenol	51-28-5	D	130.0	1400.0
221	Dinitrotoluene mixture	25321-14-6	B2	6.5	28.0
222	2,4-Dinitrotoluene	121-14-2	D	130.0	1400.0
223	2,6-Dinitrotoluene	606-20-2	D	65.0	680.0
224	Dinoseb	88-85-7	D	65.0	680.0
225	di-n-Octyl phthalate	117-84-0	D	1300.0	14000.0
226	1,4-Dioxane	123-91-1	B2	400.0	1700.0
227	Diphenamid	957-51-7	D	2000.0	20000.0
228	Diphenylamine	122-39-4	D	1600.0	17000.0
229	1,2-Diphenylhydrazine	122-66-7	B2	5.6	24.0
230	Diquat	85-00-7	D	140.0	1500.0

	Chemical Name	CAS Number	Cancer Group	Residential (mg/kg)	Non-residential (mg/kg)
231	Direct black 38	1937-37-7	A	0.052	0.22
232	Direct blue 6	2602-46-2	A	0.055	0.24
233	Direct brown 95	16071-86-6	A	0.048	0.21
234	Disulfoton	298-04-4	E	2.6	27.0
235	1,4-Dithiane	505-29-3	D	650.0	6800.0
236	Diuron	330-54-1	D	130.0	1400.0
237	Dodine	2439-10-3	D	260.0	2700.0
	E				
238	Endosulfan	115-29-7	D	390.0	4100.0
239	Endothall	145-73-3	D	1300.0	14000.0
240	Endrin	72-20-8	D	20.0	200.0
241	Epichlorohydrin	106-89-8	B2	7.5	25.0
242	1,2-Epoxybutane	106-88-7	D	370.0	3900.0
243	EPTC (S-Ethyl dipropylthiocarbamate)	759-94-4	D	1600.0	17000.0
244	Ethephon (2-chloroethyl phosphonic acid)	16672-87-0	D	330.0	3400.0
245	Ethion	563-12-2	D	33.0	340.0
246	2-Ethoxyethanol	110-80-5	D	26000.0	270000.0
247	2-Ethoxyethanol acetate	111-15-9	D	20000.0	200000.0
248	* Ethyl acetate	141-78-6	D	18000.0	39000.0
249	Ethyl acrylate	140-88-5	B2	2.1	4.5
250	* Ethylbenzene	100-41-4	D	1500.0	2700.0
251	Ethylene cyanohydrin	109-78-4	D	20000.0	200000.0
252	Ethylene diamine	107-15-3	D	1300.0	14000.0
253	Ethylene glycol	107-21-1	D	130000.0	1000000.0
254	Ethylene glycol, monobutyl ether	111-76-2	D	370.0	3900.0
255	Ethylene oxide	75-21-8	B1	1.3	3.2
256	Ethylene thiourea (ETU)	96-45-7	B2	5.2	55.0
257	* Ethyl chloride	75-00-3	D	1100.0	4200.0
258	* Ethyl ether	60-29-7	D	3800.0	3800.0
259	* Ethyl methacrylate	97-63-2	D	210.0	690.0
260	Ethyl p-nitrophenyl phenylphosphorothioate	2104-64-5	D	0.65	6.8
261	Ethylphthalyl ethyl glycolate	84-72-0	D	200000.0	1000000.0
262	Express	101200-48-0	D	520.0	5500.0
	F				
263	Fenamiphos	22224-92-6	D	16.0	170.0
264	Fluometuron	2164-17-2	D	850.0	8900.0
265	Fluoranthene	206-44-0	D	2600.0	27000.0
266	Fluorene	86-73-7	D	2600.0	27000.0
267	Fluorine (soluble fluoride)	7782-41-4	D	3900.0	41000.0
268	Fluoridone	59756-60-4	D	5200.0	55000.0
269	Flurprimidol	56425-91-3	D	1300.0	14000.0
270	Flutolanil	66332-96-5	D	3900.0	41000.0
271	Fluvalinate	69409-94-5	D	650.0	6800.0
272	Folpet	133-07-3	B2	1300.0	5500.0
273	Fomesafen	72178-02-0	C	23.0	100.0
274	Fonofos	944-22-9	D	130.0	1400.0
275	Formaldehyde	50-00-0	B1	9800.0	100000.0
276	Formic Acid	64-18-6	D	130000.0	1000000.0
277	Fosetyl-al	39148-24-8	C	200000.0	1000000.0
278	Furan	110-00-9	D	2.5	8.5
279	Furazolidone	67-45-8	B2	1.2	5.0
280	Furfural	98-01-1	D	200.0	2000.0
281	Furium	531-82-8	B2	0.089	0.38
282	Furmecyclox	60568-05-0	B2	150.0	640.0
	G				
283	Glufosinate-ammonium	77182-82-2	D	26.0	270.0
284	Glycidaldehyde	765-34-4	B2	26.0	270.0
285	Glyphosate	1071-83-6	D	6500.0	68000.0
	H				

	Chemical Name	CAS Number	Cancer Group	Residential (mg/kg)	Non-residential (mg/kg)
286	Haloxyfop-methyl	69806-40-2	D	3.3	34.0
287	Harmony	79277-27-3	D	850.0	8900.0
288	Heptachlor	76-44-8	B2	0.99	4.2
289	Heptachlor epoxide	1024-57-3	B2	0.49	2.1
290	Hexabromobenzene	87-82-1	D	130.0	1400.0
291	Hexachlorobenzene	118-74-1	B2	2.8	12.0
292	Hexachlorobutadiene	87-68-3	C	13.0	140.0
293	HCH (alpha)	319-84-6	B2	0.71	3.0
294	HCH (beta)	319-85-7	C	2.5	11.0
295	HCH (gamma) Lindane	58-89-9	B2-C	3.4	15.0
296	HCH-technical	608-73-1	B2	2.5	11.0
297	Hexachlorocyclopentadiene	77-47-4	D	450.0	4600.0
298	Hexachlorodibenzo-p-dioxin mixture (HxCDD)	19408-74-3	B2	0.00072	0.0031
299	Hexachloroethane	67-72-1	C	65.0	680.0
300	Hexachlorophene	70-30-4	D	20.0	200.0
301	Hexahydro-1,3,5-trinitro-1,3,5-triazine	121-82-4	C	40.0	170.0
302	* n-Hexane	110-54-3	D	120.0	400.0
303	Hexazinone	51235-04-2	D	2200.0	22000.0
304	Hydrazine, hydrazine sulfate	302-01-2	B2	1.5	6.4
305	Hydrocarbons (C_{10} to C_{32})	N/A	N/A	4100.0	18000.0
306	Hydrogen chloride	7647-01-0	D	370.0	3900.0
307	Hydrogen cyanide	74-90-8	D	11.0	35.0
308	p-Hydroquinone	123-31-9	D	2600.0	27000.0
	I				
309	Imazalil	35554-44-0	D	850.0	8900.0
310	Imazaquin	81335-37-7	D	16000.0	170000.0
311	Indeno[1,2,3-cd]pyrene	193-39-5	B2	6.1	26.0
312	Iprodione	36734-19-7	D	2600.0	27000.0
313	* Isobutanol	78-83-1	D	11000.0	42000.0
314	Isophorone	78-59-1	C	4700.0	20000.0
315	Isopropalin	33820-53-0	D	980.0	10000.0
316	Isopropyl methyl phosphonic acid	1832-54-8	D	6500.0	68000.0
317	Isoxaben	82558-50-7	C	3300.0	34000.0
	K				
318	Kepone	143-50-0	B, C	0.25	1.1
	L				
319	Lactofen	77501-63-4	D	130.0	1400.0
320	#Lead	7439-92-1	B2	400.0	2000.0
321	Lead (tetraethyl)	78-00-2	D	0.0065	0.068
322	Linuron	330-55-2	C	130.0	1400.0
323	Lithium	7439-93-2	D	1500.0	34000.0
324	Londax	83055-99-6	D	13000.0	140000.0
	M				
325	Malathion	121-75-5	D	1300.0	14000.0
326	Maleic anhydride	108-31-6	D	6500.0	68000.0
327	Maleic hydrazide	123-33-1	D	33000.0	340000.0
328	Malononitrile	109-77-3	D	1.3	14.0
329	Mancozeb	8018-01-7	D	2000.0	20000.0
330	Maneb	12427-38-2	D	330.0	3400.0
331	Manganese and compounds	7439-96-5	D	3200.0	43000.0
332	Mephosfolan	950-10-7	D	5.9	61.0
333	Mepiquat	24307-26-4	D	2000.0	20000.0
334	Mercuric chloride	7487-94-7	C	23.0	510.0
335	Mercury (elemental)	7439-97-6	D	6.7	180.0
336	Mercury (methyl)	22967-92-6	D	6.5	68.0
337	Merphos	150-50-5	D	2.0	20.0
338	Merphos oxide	78-48-8	D	2.0	20.0
339	Metalaxyl	57837-19-1	D	3900.0	41000.0

	Chemical Name	CAS Number	Cancer Group	Residential (mg/kg)	Non-residential (mg/kg)
340	Methacrylonitrile	126-98-7	D	2.0	8.1
341	Methamidophos	10265-92-6	D	3.3	34.0
342	Methanol	67-56-1	D	33000.0	340000.0
343	Methidathion	950-37-8	C	65.0	680.0
344	Methomyl	16752-77-5	D	1600.0	17000.0
345	Methoxychlor	72-43-5	D	330.0	3400.0
346	2-Methoxyethanol	109-86-4	D	65.0	680.0
347	2-Methoxyethanol acetate	110-49-6	D	130.0	1400.0
348	2-Methoxy-5-nitroaniline	99-59-2	C	97.0	410.0
349	Methyl acetate	79-20-9	D	21000.0	88000.0
350	Methyl acrylate	96-33-3	D	69.0	230.0
351	2-Methylaniline (o-toluidine)	95-53-4	B2	19.0	79.0
352	2-Methylaniline hydrochloride	636-21-5	B2	25.0	110.0
353	Methyl chlorocarbonate	79-22-1	D	65000.0	680000.0
354	2-Methyl-4-chlorophenoxyacetic acid	94-74-6	D	33.0	340.0
355	4-(2-Methyl-4-chlorophenoxy) butyric acid (MCPB)	94-81-5	D	650.0	6800.0
356	2-(2-Methyl-4-chlorophenoxy) propionic acid	93-65-2	D	65.0	680.0
357	2-(2-Methyl-1,4-chlorophenoxy) propionic acid (MCPP)	16484-77-8	D	65.0	680.0
358	Methylcyclohexane	108-87-2	D	56000.0	590000.0
359	4,4'-Methylenebisbenzeneamine	101-77-9	D	18.0	76.0
360	4,4'-Methylene bis(2-chloroaniline)	101-14-4	B2	34.0	150.0
361	4,4'-Methylene bis(N,N'-dimethyl)aniline	101-61-1	B2	97.0	410.0
362	Methylene bromide	74-95-3	D	650.0	6800.0
363	Methylene chloride	75-09-2	B2	77.0	180.0
364	Methyl ethyl ketone	78-93-3	D	7100.0	27000.0
365	Methyl hydrazine	60-34-4	B, C	4.0	17.0
366	Methyl isobutyl ketone	108-10-1	D	770.0	2800.0
367	* Methyl methacrylate	80-62-6	D	760.0	2800.0
368	2-Methyl-5-nitroaniline	99-55-8	C	130.0	580.0
369	Methyl parathion	298-00-0	D	16.0	170.0
370	2-Methylphenol	95-48-7	C	3300.0	34000.0
371	3-Methylphenol	108-39-4	C	3300.0	34000.0
372	4-Methylphenol	106-44-5	C	330.0	3400.0
373	Methyl styrene (mixture)	25013-15-4	D	120.0	520.0
374	* Methyl styrene (alpha)	98-83-9	D	890.0	3100.0
375	Methyl tertbutyl ether (MTBE)	1634-04-4	D	320.0	3300.0
376	Metolaclor (Dual)	51218-45-2	D	9800.0	100000.0
377	Metribuzin	21087-64-9	D	1600.0	17000.0
378	Mirex	2385-85-5	B2	2.5	11.0
379	Molinate	2212-67-1	D	130.0	1400.0
380	Molybdenum	7439-98-7	D	380.0	8500.0
381	Monochloramine	10599-90-3	D	6500.0	68000.0
	N				
382	Naled	300-76-5	D	130.0	1400.0
383	Naphthalene	91-20-3	D	2600.0	27000.0
384	Napropamide	15299-99-7	D	6500.0	68000.0
385	Nickel and compounds	7440-02-0	D	1500.0	34000.0
386	Nickel subsulfide	12035-72-2	A	5100.0	11000.0
387	Nitrapyrin	1929-82-4	D	98.0	1000.0
388	Nitrate	14797-55-8	D	100000.0	1000000.0
389	Nitrite	14797-65-0	D	6500.0	68000.0
390	2-Nitroaniline	88-74-4	D	3.9	41.0
391	Nitrobenzene	98-95-3	D	18.0	94.0
392	Nitrofurantoin	67-20-9	D	4600.0	48000.0
393	Nitrofurazone	59-87-0	B2	3.0	13.0
394	Nitroguanidine	556-88-7	D	6500.0	68000.0
395	N-Nitrosodi-n-butylamine	924-16-3	B2	0.22	0.55

	Chemical Name	CAS Number	Cancer Group	Residential (mg/kg)	Non-residential (mg/kg)
396	N-Nitrosodiethanolamine	1116-54-7	B2	1.6	6.8
397	N-Nitrosodiethylamine	55-18-5	B2	0.03	0.13
398	N-Nitrosodimethylamine	62-75-9	B2	0.087	0.37
399	N-Nitrosodiphenylamine	86-30-6	B2	910.0	3900.0
400	N-Nitroso di-n-propylamine	621-64-7	B2	0.63	2.7
401	N-Nitroso-N-methylethylamine	10595-95-6	B2	0.20	0.87
402	N-Nitrosopyrrolidine	930-55-2	B2	2.1	9.1
403	m-Nitrotoluene	99-08-1	D	650.0	6800.0
404	p-Nitrotoluene	99-99-0	D	650.0	6800.0
405	Norflurazon	27314-13-2	D	2600.0	27000.0
406	NuStar	85509-19-9	D	46.0	480.0
	O				
407	Octabromodiphenyl ether	32536-52-0	D	200.0	2000.0
408	Octahydro-1357-tetranitro-1357-tetrazocine (HMX)	2691-41-0	D	3300.0	34000.0
409	Octamethylpyrophosphoramide	152-16-9	D	130.0	1400.0
410	Oryzalin	19044-88-3	C	3300.0	34000.0
411	Oxadiazon	19666-30-9	D	330.0	3400.0
412	Oxamyl	23135-22-0	E	1600.0	17000.0
413	Oxyfluorfen	42874-03-3	D	200.0	2000.0
	P				
414	Paclobutrazol	76738-62-0	D	850.0	8900.0
415	Paraquat	4685-14-7	C	290.0	3100.0
416	Parathion	56-38-2	C	390.0	4100.0
417	Pebulate	1114-71-2	D	3300.0	34000.0
418	Pendimethalin	40487-42-1	D	2600.0	27000.0
419	Pentabromo-6-chloro cyclohexane	87-84-3	C	190.0	830.0
420	Pentabromodiphenyl ether	32534-81-9	D	130.0	1400.0
421	Pentachlorobenzene	608-93-5	D	52.0	550.0
422	Pentachloronitrobenzene	82-68-8	C	17.0	73.0
423	Pentachlorophenol	87-86-5	B2	25.0	79.0
424	Permethrin	52645-53-1	D	3300.0	34000.0
425	Phenmedipham	13684-63-4	D	16000.0	170000.0
426	Phenol	108-95-2	D	39000.0	410000.0
427	m-Phenylenediamine	108-45-2	D	390.0	4100.0
428	p-Phenylenediamine	106-50-3	D	12000.0	130000.0
429	Phenylmercuric acetate	62-38-4	D	5.2	55.0
430	2-Phenylphenol	90-43-7	C	2300.0	9800.0
431	Phorate	298-02-2	E	13.0	140.0
432	Phosmet	732-11-6	D	1300.0	14000.0
433	Phosphine	7803-51-2	D	20.0	200.0
434	Phosphorus, white	7723-14-0	D	1.5	34.0
435	Phthalic anhydride	85-44-9	D	130000.0	1000000.0
436	Picloram	1918-02-1	D	4600.0	48000.0
437	Pirimiphos-methyl	23505-41-1	D	650.0	6800.0
438	Polybrominated biphenyls (PBBs)	N/A	B2	0.46	2.1
439	Polychlorinated biphenyls (PCBs)	1336-36-3	B2	2.5	13.0
440	Potassium cyanide	151-50-8	D	3300.0	34000.0
441	Potassium silver cyanide	506-61-6	D	13000.0	140000.0
442	Prochloraz	67747-09-5	C	30.0	130.0
443	Profluralin	26399-36-0	D	390.0	4100.0
444	Prometon	1610-18-0	D	980.0	10000.0
445	Prometryn	7287-19-6	D	260.0	2700.0
446	Pronamide	23950-58-5	C	4900.0	51000.0
447	Propachlor	1918-16-7	D	850.0	8900.0
448	Propanil	709-98-8	D	330.0	3400.0
449	Propargite	2312-35-8	D	1300.0	14000.0
450	Propargyl alcohol	107-19-7	D	130.0	1400.0
451	Propazine	139-40-2	C	1300.0	14000.0

	Chemical Name	CAS Number	Cancer Group	Residential (mg/kg)	Non-residential (mg/kg)
452	Propham	122-42-9	D	1300.0	14000.0
453	Propiconazole	60207-90-1	D	850.0	8900.0
454	Propylene glycol	57-55-6	D	1000000.0	1000000.0
455	Propylene glycol, monoethyl ether	111-35-3	D	46000.0	480000.0
456	Propylene glycol, monomethyl ether	107-98-2	D	46000.0	480000.0
457	Propylene oxide	75-56-9	B2	19.0	79.0
458	Pursuit	81335-77-5	D	16000.0	170000.0
459	Pydrin	51630-58-1	D	1600.0	17000.0
460	Pyrene	129-00-0	D	2000.0	20000.0
461	Pyridine	110-86-1	D	65.0	680.0
	Q				
462	Quinalphos	13593-03-8	D	33.0	340.0
463	Quinoline	91-22-5	C	0.37	1.6
	R				
464	RDX (Cyclonite)	121-82-4	C	40.0	170.0
465	Resmethrin	10453-86-8	D	2000.0	20000.0
466	Ronnel	299-84-3	D	3300.0	34000.0
467	Rotenone	83-79-4	D	260.0	2700.0
	S				
468	Savey	78587-05-0	D	1600.0	17000.0
469	Selenious Acid	7783-00-8	D	330.0	3400.0
470	Selenium	7782-49-2	D	380.0	8500.0
471	Selenourea	630-10-4	D	330.0	3400.0
472	Sethoxydim	74051-80-2	D	5900.0	61000.0
473	Silver and compounds	7440-22-4	D	380.0	8500.0
474	Silver cyanide	506-64-9	D	6500.0	68000.0
475	Simazine	122-34-9	C	37.0	160.0
476	Sodium azide	26628-22-8	D	260.0	2700.0
477	Sodium cyanide	143-33-9	D	2600.0	27000.0
478	Sodium diethyldithiocarbamate	148-18-5	C	16.0	71.0
479	Sodium fluoroacetate	62-74-8	D	1.3	14.0
480	Sodium metavanadate	13718-26-8	D	65.0	680.0
481	Strontium, stable	7440-24-6	D	46000.0	1000000.0
482	Strychnine	57-24-9	D	20.0	200.0
483	* Styrene	100-42-5	C	3300.0	3300.0
484	Systhane	88671-89-0	D	1600.0	17000.0
	T				
485	2,3,7,8-TCDD (dioxin)	1746-01-6	B2	0.000038	0.00024
486	Tebuthiuron	34014-18-1	D	4600.0	48000.0
487	Temephos	3383-96-8	D	1300.0	14000.0
488	Terbacil	5902-51-2	E	850.0	8900.0
489	Terbufos	13071-79-9	D	1.6	17.0
490	Terbutryn	886-50-0	D	65.0	680.0
491	1,2,4,5-Tetrachlorobenzene	95-94-3	D	20.0	200.0
492	1,1,1,2-Tetrachloroethane	630-20-6	C	23.0	54.0
493	1,1,2,2-Tetrachloroethane	79-34-5	C	4.4	11.0
494	Tetrachloroethylene (PCE)	127-18-4	B2	53.0	170.0
495	2,3,4,6-Tetrachlorophenol	58-90-2	D	2000.0	20000.0
496	p,a,a,a-Tetrachlorotoluene	5216-25-1	B2	0.22	0.95
497	Tetrachlorovinphos	961-11-5	C	190.0	790.0
498	Tetraethyldithiopyrophosphate	3689-24-5	D	33.0	340.0
499	Thallic oxide	1314-32-5	D	5.4	120.0
500	Thallium acetate	563-68-8	D	6.9	150.0
501	Thallium carbonate	6533-73-9	D	6.1	140.0
502	Thallium chloride	7791-12-0	D	6.1	140.0
503	Thallium nitrate	10102-45-1	D	6.9	150.0
504	Thallium selenite	12039-52-0	D	6.9	150.0
505	Thallium sulfate	7446-18-6	D	6.1	140.0
506	Thiobencarb	28249-77-6	D	650.0	6800.0

	Chemical Name	CAS Number	Cancer Group	Residential (mg/kg)	Non-residential (mg/kg)
507	2-(Thiocyanomethylthio)- benzothiazole (TCMTB)	3689-24-5	D	2000.0	20000.0
508	Thiofanox	39196-18-4	D	20.0	200.0
509	Thiophanate-methyl	23564-05-8	D	5200.0	55000.0
510	Thiram	137-26-8	D	330.0	3400.0
511	Tin and compounds	7440-31-5	D	46000.0	1000000.0
512	* Toluene	108-88-3	D	790.0	2700.0
513	Toluene-2,4-diamine	95-80-7	B2	1.4	6.0
514	Toluene-2,5-diamine	95-70-5	D	39000.0	410000.0
515	Toluene-2,6-diamine	823-40-5	C	13000.0	140000.0
516	p-Toluidine	106-49-0	C	23.0	100.0
517	Toxaphene	8001-35-2	B2	4.0	17.0
518	Tralomethrin	66841-25-6	D	490.0	5100.0
519	Triallate	2303-17-5	D	850.0	8900.0
520	Triasulfuron	82097-50-5	D	650.0	6800.0
521	1,2,4-Tribromobenzene	615-54-3	D	330.0	3400.0
522	Tributyltin oxide (TBTO)	56-35-9	D	2.0	20.0
523	2,4,6-Trichloroaniline	634-93-5	C	130.0	560.0
524	2,4,6-Trichloroaniline hydrochloride	33663-50-2	C	150.0	660.0
525	* 1,2,4-Trichlorobenzene	120-82-1	D	570.0	4700.0
526	* 1,1,1-Trichloroethane	71-55-6	D	1200.0	4800.0
527	1,1,2-Trichloroethane	79-00-5	C	6.5	15.0
528	Trichloroethylene (TCE)	79-01-6	B2	27.0	70.0
529	Trichlorofluoromethane	75-69-4	D	380.0	1300.0
530	2,4,5-Trichlorophenol	95-95-4	D	6500.0	68000.0
531	2,4,6-Trichlorophenol	88-06-2	B2	400.0	1700.0
532	2,4,5-Trichlorophenoxyacetic acid	93-76-5	D	650.0	6800.0
533	2-(2,4,5-Trichlorophenoxy) propionic acid	93-72-1	D	520.0	5500.0
534	1,1,2-Trichloropropane	598-77-6	D	15.0	50.0
535	1,2,3-Trichloropropane	96-18-4	B2	0.014	0.03
536	1,2,3-Trichloropropene	96-19-5	D	11.0	38.0
537	* 1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	D	10000.0	10000.0
538	Tridiphane	58138-08-2	D	200.0	2000.0
539	Triethylamine	121-44-8	D	23.0	84.0
540	Trifluralin	1582-09-8	C	490.0	2500.0
541	Trimethyl phosphate	512-56-1	B2	120.0	520.0
542	1,3,5-Trinitrobenzene	99-35-4	D	3.3	34.0
543	Trinitrophenylmethylnitramine	479-45-8	D	650.0	6800.0
544	2,4,6-Trinitrotoluene	118-96-7	C	33.0	340.0
	V				
545	Vanadium	7440-62-2	D	540.0	12000.0
546	Vanadium pentoxide	1314-62-1	D	690.0	15000.0
547	Vanadium sulfate	13701-70-7	D	1500.0	34000.0
548	Vernam	1929-77-7	D	65.0	680.0
549	Vinclozolin	50471-44-8	D	1600.0	17000.0
550	Vinyl acetate	108-05-4	D	780.0	2600.0
551	Vinyl bromide	593-60-2	B2	1.9	4.1
552	Vinyl chloride	75-01-4	A	0.016	0.035
	W				
553	Warfarin	81-81-2	D	20.0	200.0
	X				
554	* Xylene (mixed)	1330-20-7	D	2800.0	2800.0
	Z				
555	Zinc	7440-66-6	D	23000.0	510000.0
556	Zinc phosphide	1314-84-7	D	23.0	510.0
557	Zinc cyanide	557-21-1	D	3300.0	34000.0
558	Zineb	12122-67-7	D	3300.0	34000.0

* = 1% free-phase analysis
# = Based on IEUBK Model

~ = Based on natural background
N/A = Not Applicable
CARCINOGENICITY CLASSIFICATIONS:
A = Known human carcinogen
B1 = Probable human carcinogen, with limited data indicating human carcinogenicity.
B2 = Probable human carcinogen, with inadequate or no evidence of carcinogenicity in humans. Sufficient evidence for carcinogenicity in laboratory animals.
C = Possible human carcinogen.
D = Not classifiable as to human carcinogenicity.
E = Evidence of noncarcinogenicity in humans.

Historical Note

Adopted by emergency action effective March 29, 1996, pursuant to A.R.S. § 41-1026 and Laws 1995, Ch. 232, § 5; in effect until permanent rules are adopted and in place no later than August 1, 1997, pursuant to A.R.S. § 49-152 and Laws 1995, Ch. 232, § 5 (Supp. 96-1). Historical note revised to clarify exemptions of emergency adoption (Supp. 97-1). Interim emergency appendix reinstated at the request of the Department; historical note from Supp. 97-3 stating emergency expired removed for clarity. Appendix B adopted permanently effective December 4, 1997, replacing emergency appendix (Supp. 97-4). Former Appendix B repealed; new Appendix B renumbered from Appendix A and amended by final rulemaking at 13 A.A.R. 971, effective May 5, 2007 (Supp. 07-1).

Appendix C. Repealed

Historical Note

Adopted by emergency action effective March 29, 1996, pursuant to A.R.S. § 41-1026 and Laws 1995, Ch. 232, § 5; in effect until permanent rules are adopted and in place no later than August 1, 1997, pursuant to A.R.S. § 49-152 and Laws 1995, Ch. 232, § 5 (Supp. 96-1). Historical note revised to clarify exemptions of emergency adoption (Supp. 97-1). Interim emergency appendix reinstated at the request of the Department; historical note from Supp. 97-3 stating emergency expired removed for clarity. Appendix C adopted permanently effective December 4, 1997, replacing emergency appendix (Supp. 97-4). Appendix C repealed by final rulemaking at 13 A.A.R. 971, effective May 5, 2007 (Supp. 07-1).

Appendix D. Emergency Expired

Historical Note

Adopted by emergency action effective March 29, 1996, pursuant to A.R.S. § 41-1026 and Laws 1995, Ch. 232, § 5; in effect until permanent rules are adopted and in place no later than August 1, 1997, pursuant to A.R.S. § 49-152 and Laws 1995, Ch. 232, § 5 (Supp. 96-1). Historical note revised to clarify exemptions of emergency adoption (Supp. 97-1). Historical note from Supp. 97-3 stating emergency expired removed for clarity; interim emergency rule reinstated at the request of the Department. Emergency expired effective December 4, 1997 (Supp. 97-4).

ARTICLE 3. PROSPECTIVE PURCHASER AGREEMENT

R18-7-301. Prospective Purchaser Agreement Fee

A. An applicant for a prospective purchaser agreement with the Department under A.R.S. § 49-285.01 shall pay to the Department the fee prescribed in this Article. The Department shall not refund a fee once it accepts an application.

B. An applicant for a prospective purchaser agreement shall pay a fee for each prospective purchaser agreement application submitted to the Department for review. The fee includes:
1. An initial charge as prescribed in subsection (C);
2. An hourly charge, if the conditions of subsection (D)(1) apply;
3. The publication costs for the legal notice as prescribed in subsection (F); and
4. A charge, as prescribed in subsection (D)(2), if an applicant requests a settlement.

C. An applicant shall pay an initial charge of $2,500 for an application for a prospective purchaser agreement requiring minimal review for property within a site that is listed in the Water Quality Assurance Revolving Fund (WQARF) registry under A.R.S. § 49-287.01. For property that is not on the WQARF registry, an applicant shall pay an initial charge of $3,600 for an application for a prospective purchaser agreement. The initial charge covers direct and indirect Department costs. An application for a prospective purchaser agreement requiring minimal review is one that requires 34 or fewer hours of review time for a site on the WQARF registry or 49 or fewer hours for a site not on the WQARF registry.

D. In addition to the initial charge described in subsection (C), the applicant shall pay the following charges, if applicable:
1. An hourly charge for reviewing a prospective purchaser agreement that requires more than the hours for review covered by the initial charge in subsection (C). The additional charge is $73 per hour for Department staff time and Assistant Attorney General time.
2. A charge in the amount of $2,000, to accompany a request for a settlement that includes immunity from contribution claims for existing contamination, if requested under A.R.S. § 49-285.01. If costs for the settlement exceed $2,000, the remainder of the costs will be paid for through the terms of the settlement.

E. The applicant may agree in writing to pay charges that exceed the initial charge described in subsection (C). Unless the applicant has so agreed, when the Department believes that the costs associated with the prospective purchaser agreement have begun to exceed the initial charge, the Department shall stop work on the prospective purchaser agreement and notify the applicant in writing. The applicant shall notify the Department in writing, within 30 days of the Department's notification under this subsection, whether the applicant wishes the Department to continue work on the application and to incur additional costs. The Department shall terminate the application if the applicant does not provide written confirmation within 30 days that it wishes the Department to continue work on the application.

F. The Department shall publish a legal notice announcing an opportunity for public comment on the prospective purchaser agreement. The legal notice shall include:
1. A general description of the contents of the agreement;

Prepared for

Nammo Talley, Inc.
4051 North Higley Road
Mesa, Arizona 85215

SUPPLEMENTAL PERCHLORATE SOURCE INVESTIGATION
PLANT #3
NAMMO TALLEY, INC.
MESA, ARIZONA

September 2010

Prepared by

Geosyntec consultants

engineers | scientists | innovators

10875 Rancho Bernardo Road, Suite 200
San Diego, California 92127

Project Number: SC0475

TABLE OF CONTENTS

1. INTRODUCTION 1
   1.1 Background 1
   1.2 Objective 1
2. GEOLOGY AND HYDROGEOLOGY 3
3. SUMMARY OF FIELD ACTIVITIES 4
   3.1 Pre-Field Activities 4
   3.2 Sampling Methodology 4
   3.3 Sample Preparation 5
   3.4 Soil Analysis 5
   3.5 Investigative Derived Waste (IDW) 6
4. SUMMARY OF RESULTS 7
   4.1 Former Grinding Facility and Historical Storm Water Retention Pond 7
      4.1.1 Boring B95 7
      4.1.2 Boring B96 7
   4.2 Waste Propellant Storage Pad #4 – Boring B97 7
5. CONCLUSIONS 8
   5.1 Former Grinding Facility and Historical Storm Water Retention Pond 8
      5.1.1 Boring B95 8
      5.1.2 Boring B96 8
   5.2 Waste Propellant Storage Pad #4 – Boring B97 9
   5.3 Summary 9
6. REFERENCES 10

TABLES

1 Plant #3 Summary of Soil Field Screening and Laboratory Results

FIGURES

1 Site Vicinity and Location Map

2 Approximate Boring Locations

3 Laboratory Analytical vs. Field Screening Results

APPENDICES

A Boring Logs

B Certificates of Analysis

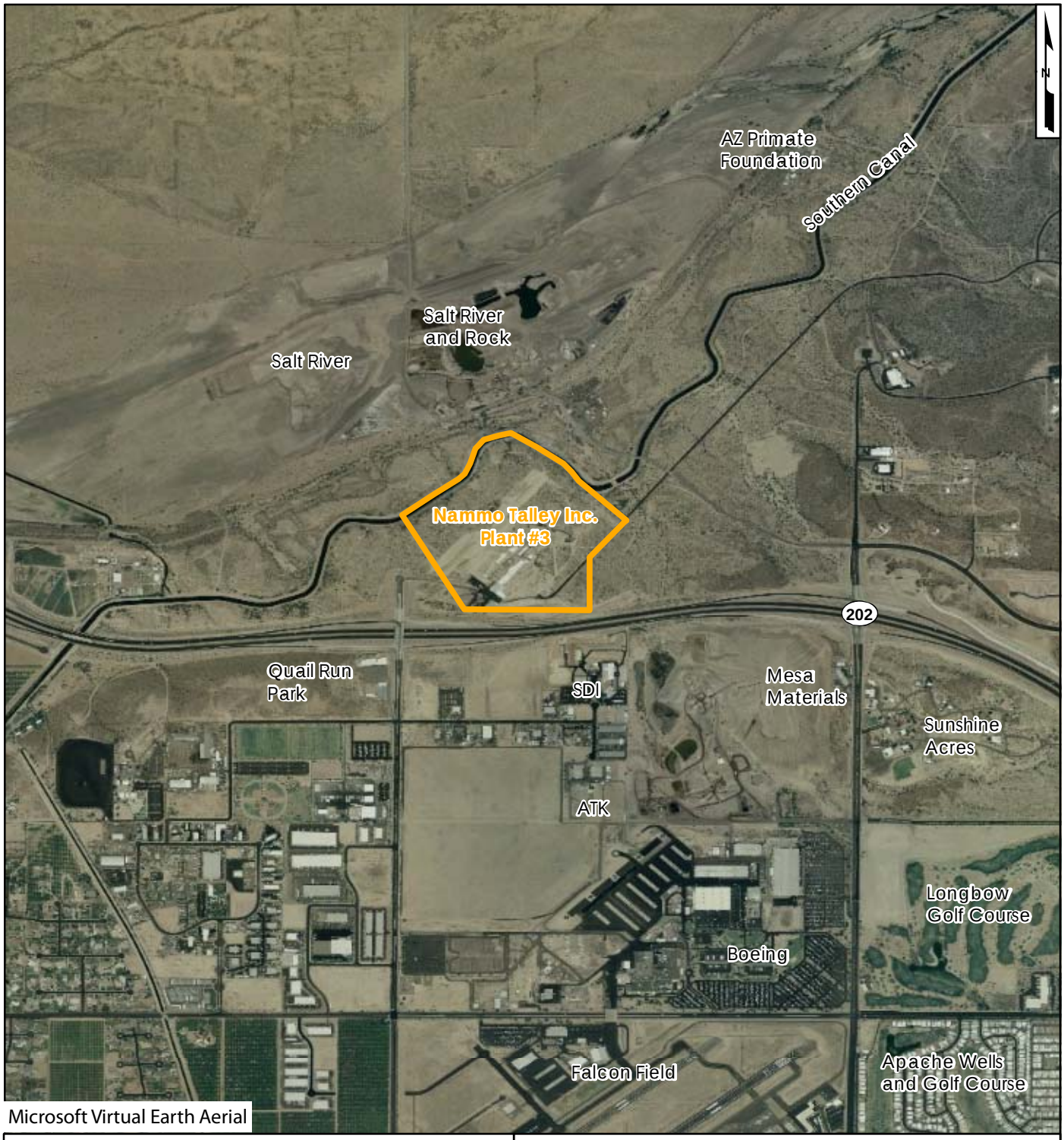
TABLES

Table 1
Summary of Soil Field Screening and Laboratory Results
Nammo Talley Inc. Plant #3
Mesa, Arizona

Location	Boring ID	Sample ID	Depth (ft bgs)	Perchlorate Concentrations*	
				Field Screening (mg/kg)	Analytical Result (mg/kg)
Former Grinding Facility and Historical Stormwater Retention Pond	P3-B95	P3-B95-0.5	0.5	ND <1.0	NA
		P3-B95-4.5	4.5	ND <1.0	NA
		P3-B95-10	10	ND <1.0	0.13
		P3-B95-15	15	ND <1.0	NA
		P3-B95-20	20	ND <1.0	0.18
		P3-B95-25	25	ND <1.0	NA
		P3-B95-31	31	ND <1.0	ND<0.04
		P3-B95-35	35	ND <1.0	NA
		P3-B95-40	40	ND <1.0	ND<0.04
		P3-B95-45	45	ND <1.0	NA
		P3-B95-50	50	ND <1.0	0.094
		P3-B95-55	55	ND <1.0	NA
		P3-B95-60	60	ND <1.0	0.38
		P3-B95-65	65	ND <1.0	NA
		P3-B95-70	70	ND <1.0	0.067
		P3-B95-75	75	ND <1.0	NA
		P3-B95-80	80	ND <1.0	0.068
	P3-B96	P3-B96-4.0	4.0	ND <1.0	NA
		P3-B96-10	10	ND <1.0	0.076
		P3-B96-15	15	ND <1.0	NA
		P3-B96-20	20	ND <1.0	0.30
		P3-B96-25	25	ND <1.0	NA
		P3-B96-31	31	ND <1.0	0.045
		P3-B96-35	35	ND <1.0	NA
		P3-B96-40	40	ND <1.0	ND<0.04
		P3-B96-45	45	ND <1.0	NA
		P3-B96-50	50	ND <1.0	ND<0.04
		P3-B96-55	55	ND <1.0	NA
		P3-B96-60	60	ND <1.0	0.043
Waste Propellant Storage Pad #4	P3-B97	P3-B97-2.5	2.5	ND <1.0	NA
		P3-B97-5	5	ND <1.0	2.5
		P3-B97-10	10	16.9	NA
		P3-B97-15	15	42.9	20
		P3-B97-20	20	47.1	NA
		P3-B97-25	25	12.7	7.2
		P3-B97-30	30	33.9	NA
		P3-B97-31	31	46.7	NA
		P3-B97-35	35	53.7	28
		P3-B97-40	40	49.6	NA
		P3-B97-45	45	96.9	**170**
		P3-B97-50	50	95.8	NA
		P3-B97-55	55	66.4	49
		P3-B97-60	60	39.7	NA
		P3-B97-65	65	ND <1.0	15
		P3-B97-70	70	ND <1.0	NA
		P3-B97-75	75	ND <1.0	1.1
		P3-B97-80	80	ND <1.0	NA
		P3-B97-85	85	ND <1.0	0.32

ND < 1.0 - Not detected at concentrations greater than or equal to the field screening limit
"ND < 0.04" Not detected at concentrations greater than or equal to the laboratory Reporting Limit (RL)
Bold values exceed GPL
GPL - Groundwater Protection Level: 143 mg/kg [B&C,2008]
mg/kg - milligrams per kilogram
* Results from analysis of soil extracts: The 1:1 extraction procedure provides a detection limit of 1 milligram per liter (mg/L) in the extract, equivalent to approximately 1 milligram per kilogram (mg/kg). The GPL is provided in mg/kg, therefore, the laboratory analytical results units have been converted to mg/kg herein.

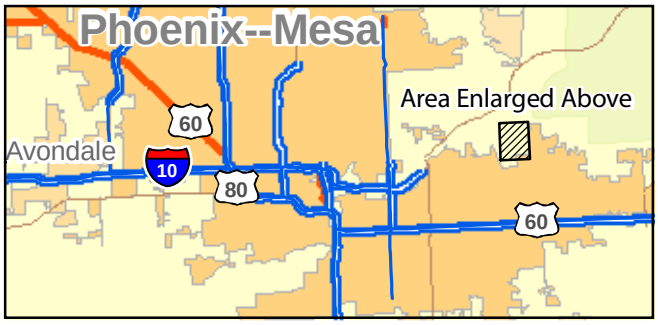
FIGURES



Microsoft Virtual Earth Aerial

Legend

Approximate Boundary of Nammo Talley Inc. Plant #3



2,000 1,000 0 2,000 Feet

Site Vicinity and Location Map

Nammo Talley Inc. Plant #3
Mesa, Arizona

Geosyntec consultants

San Diego | September 2010

Figure 1

P:\GIS\SC0475_Mesa\P:\GIS\Talley\SiteVicinityPlant3.mxd

300 150 0 300 Feet

Approximate Boring Locations

Supplemental Source Investigation
Nammo Talley Inc. Plant #3
Mesa, Arizona

Legend

Groundwater Monitor Well

Approximate Boring Location

Microsoft Virtual Earth Aerial

Geosyntec consultants

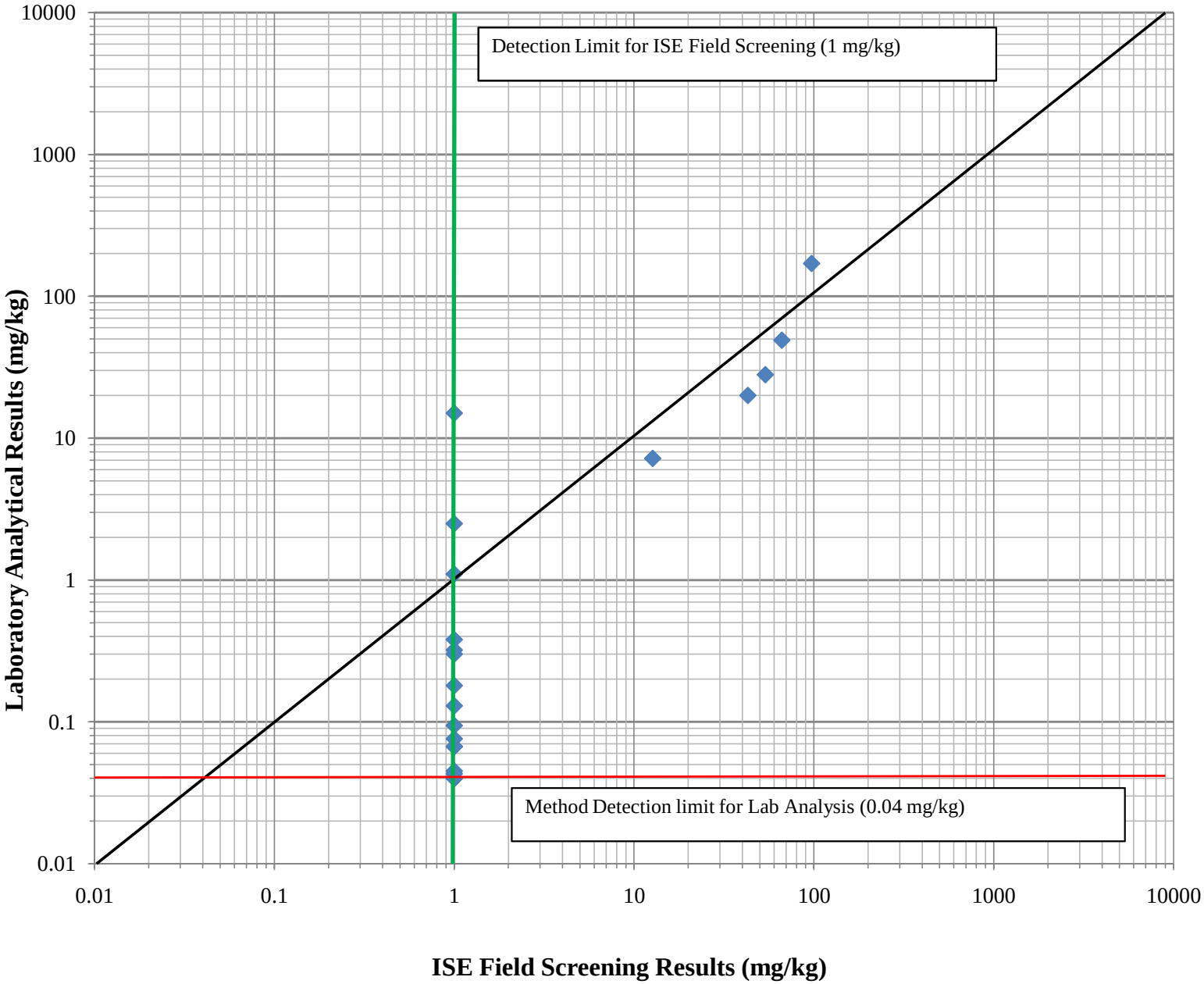
San Diego | September 2010

Figure 2

P:\GIS\SC0475_Mesa\P3\GIS\Talley\Supplemental Borings.mxd

Figure 3
Laboratory Analytical vs. Field Screening Results
Nammo Talley Plant #3
Mesa, Arizona

Geosyntec consultants



Prepared for

Arizona Department of Environmental Quality
1110 W. Washington Street
Phoenix, AZ 85007

FLUIDIZED BED REACTOR INITIAL PERFORMANCE REPORT

Nammo Talley, Inc., Plant No. 3
Mesa, Arizona

Prepared by:

Geosyntec consultants

engineers | scientists | innovators

11811 N. Tatum Blvd., Suite P186
Phoenix, AZ 85028

Project Number: SP0101Y01

June 2016

TABLE OF CONTENTS

Page

1. INTRODUCTION 1
   1.1 Preliminary FBR Operational History 1
   1.2 Transition of Operations 2
   1.3 Objective 3
2. FBR SYSTEM MONITORING AND ANALYTICAL RESULTS 3
   2.1 Influent Constituent Monitoring 3
   2.2 Effluent Constituent Monitoring 4
   2.3 Analytical Results 4
      2.3.1 Influent Constituent Monitoring Results 4
      2.3.2 Effluent Constituent Monitoring Results 5
3. FBR SYSTEM OPERATIONAL PERFORMANCE 5
   3.1 System Operational Flow Performance 5
      3.1.1 FBR Influent Flow Results 5
      3.1.2 FBR Effluent Flow Results 5
   3.2 System Monitoring and Maintenance Activities 6
      3.2.1 Monitoring and Weekly Reporting 6
      3.2.2 System Maintenance 6
      3.2.3 FBR System Downtime 7
   3.3 Infiltration Basin Performance and Restoration Activities 7
4. PATH FORWARD 7
5. REFERENCED DOCUMENTS 8

LIST OF FIGURES

Figure 1: FBR System Layout
Figure 2: Site Vicinity Map

LIST OF TABLES

Table 2-1: FBR System Influent Monitoring Results for Sample Date 4/4/2016

Table 2-2: FBR System Effluent Monitoring Results for Perchlorate (April - June 2016)

Table 2-3: FBR System Effluent Monitoring Results for Nitrate as N (April - June 2016)

Table 2-4: FBR System Effluent Monitoring Results for Nitrite as N (April - June 2016)

Table 2-5: FBR System Effluent Monitoring Results for Sample Date 4/4/2016

Table 3-1: FBR System Influent Monitoring Daily Flow Rates (from 4 April 2016 through 3 June 2016)

Table 3-2: FBR System Influent Monitoring Monthly Flow Totals (from 4 April 2016 through 3 June 2016)

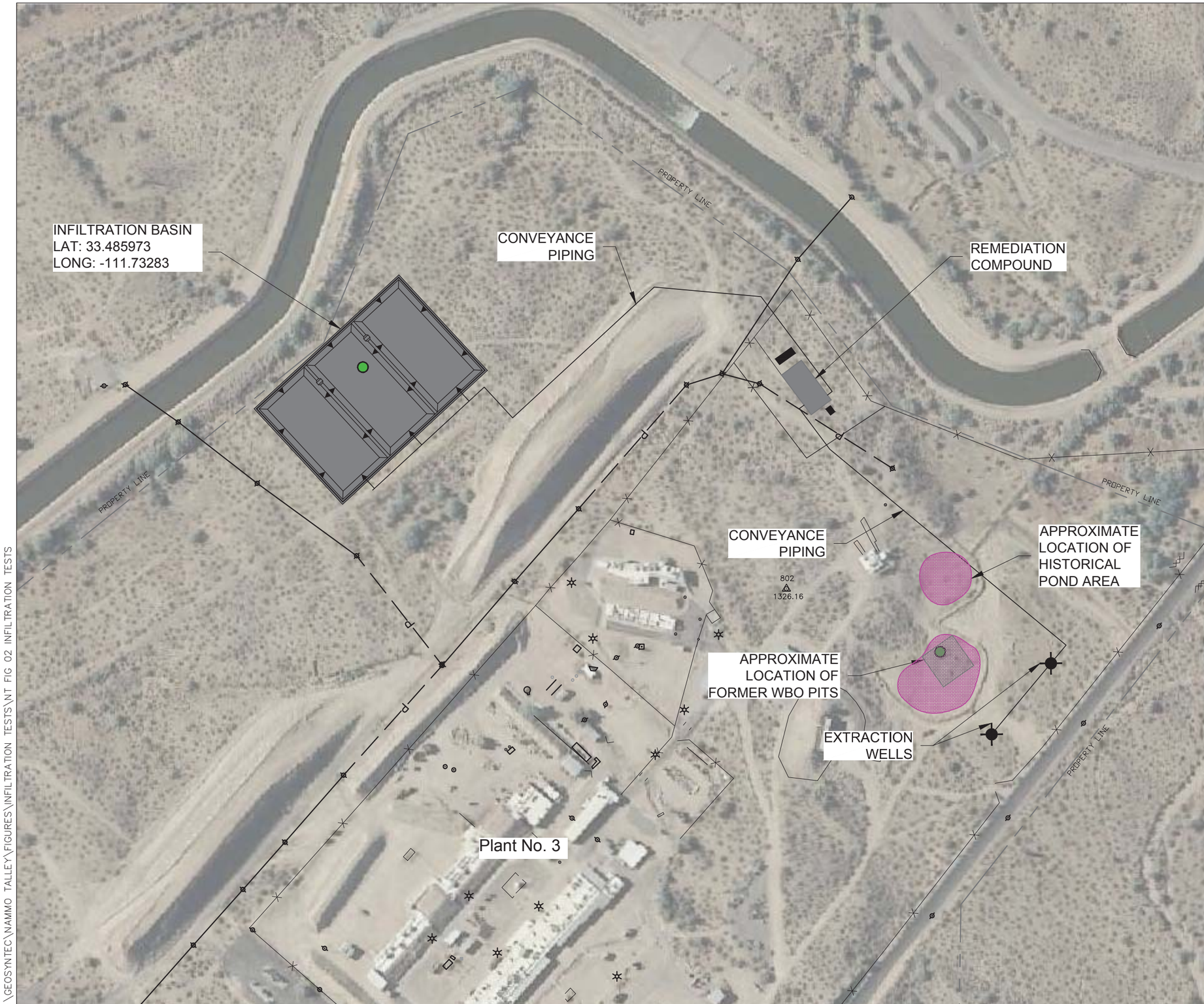
Table 3-3: FBR System Effluent Monitoring Daily Flow Rates (from 4 April 2016 through 3 June 2016)

Table 3-4: FBR System Effluent Monitoring Monthly Flow Totals (from 4 April 2016 through 3 June 2016)

LIST OF APPENDICES

Appendix A: Laboratory Results and Chain-Of Custody Forms (4 April to 3 June 2016)

FIGURES



EXPLANATION

Approximate Infiltration Test Locations

Estimated Extent of Maximum ISB Infiltration

200 100 0 200 Feet

FBR System Layout

Nammo Talley Inc. Plant #3 Mesa, Arizona

Geosyntec consultants

Phoenix, Az | July 2013

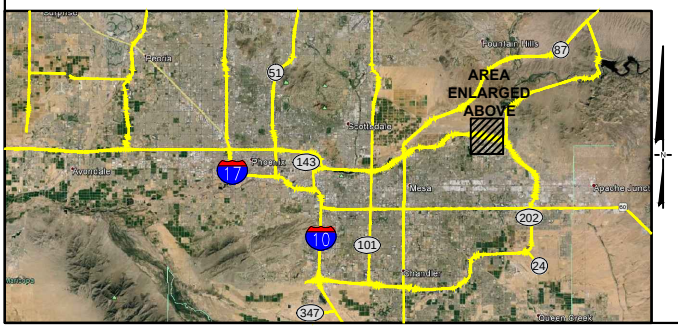
Figure 1

N:\GEOSYNTEC\NAMMO TALLEY\FIGURES\INFILTRATION TESTS\NT FIG 02 INFILTRATION TESTS

2010 AERIAL IMAGE FROM USDA: GEOSPATIAL GATEWAY

EXPLANATION:

APPROXIMATE PROPERTY BOUNDARY



2,000' 1,000' 0 2,000 Feet

SITE VICINITY MAP

Nammo Talley Inc. Plant #3

Mesa, Arizona

Geosyntec consultants

Phoenix, AZ | January 2015

Figure

2

N:\GEOSYNTEC\NAMMO TALLEY\VICINITY MAP\NT VICINITY MAP EXHIBIT

TABLES

Table 2-1
FBR System Influent Monitoring Results for Sample Date 4/4/2016

Parameter	DL[1]	Units	Sampling Date	Result
Perchlorate	Monitor[2]	mg/L[3]	4/4/2016	0.350
Total Nitrogen[4]	Monitor	mg/L	4/4/2016	1.70
Nitrate-Nitrite as N	Monitor	mg/L	4/4/2016	1.2
Nitrate as N	Monitor	mg/L	4/4/2016	1.2
Nitrite as N	Monitor	mg/L	4/4/2016	< 0.10
Total Kjeldahl N (TKN)	Monitor	mg/L	4/4/2016	0.50
Ammonia/Ammonium	Monitor	mg/L	4/4/2016	< 0.50
Volatile Organic Compounds				
Benzene	Monitor	mg/L	4/4/2016	< 0.0020
Carbon tetrachloride	Monitor	mg/L	4/4/2016	< 0.0050
o-Dichlorobenzene	Monitor	mg/L	4/4/2016	< 0.0020
p-Dichlorobenzene	Monitor	mg/L	4/4/2016	< 0.0020
1,2-Dichloroethane	Monitor	mg/L	4/4/2016	< 0.0020
1,1-Dichloroethylene	Monitor	mg/L	4/4/2016	< 0.0050
cis-1,2-Dichloroethylene	Monitor	mg/L	4/4/2016	< 0.0020
trans-1,2,-Dichloroethylene	Monitor	mg/L	4/4/2016	< 0.0020
Dichloromethane	Monitor	mg/L	4/4/2016	< 0.0050
1,2-Dichloropropane	Monitor	mg/L	4/4/2016	< 0.0020
Ethylbenzene	Monitor	mg/L	4/4/2016	< 0.0020
Hexachlorobenzene	Monitor	mg/L	4/4/2016	< 0.00010
Hexachlorocyclopentadiene	Monitor	mg/L	4/4/2016	< 0.00010
Monochlorobenzene	Monitor	mg/L	4/4/2016	< 0.0020
Styrene	Monitor	mg/L	4/4/2016	< 0.0020
Tetrachloroethylene	Monitor	mg/L	4/4/2016	< 0.0020
Toluene	Monitor	mg/L	4/4/2016	< 0.0020
Trihalomethanes (total)[5]	Monitor	mg/L	4/4/2016	< 0.0110
1,1,1-Trichloroethane	Monitor	mg/L	4/4/2016	< 0.0020
1,2,4-Trichlorobenzene	Monitor	mg/L	4/4/2016	< 0.0050
1,1,2-Trichloroethane	Monitor	mg/L	4/4/2016	< 0.0020
Trichloroethylene	Monitor	mg/L	4/4/2016	< 0.0020
Vinyl Chloride	Monitor	mg/L	4/4/2016	< 0.0050
Xylenes (total)	Monitor	mg/L	4/4/2016	< 0.010

Geosyntec consultants

Table 2-1 Continued
FBR System Influent Monitoring Results for Sample Date 4/4/2016

Field Parameters

pH	Monitor	S.U.[6]	4/18/2016	7.77
Dissolved Oxygen	Monitor	mg/L	4/18/2016	36.3
Oxidation-Reduction Potential	Monitor	mV[7]	4/18/2016	NR
Temperature	Monitor	°C[8]	4/18/2016	22.6
Specific Conductivity	Monitor	µmhos/cm[9]	4/18/2016	1.010

Metals (total)

Arsenic	Monitor	mg/L	4/4/2016	0.0070
Barium	Monitor	mg/L	4/4/2016	0.035
Beryllium	Monitor	mg/L	4/4/2016	< 0.0010
Cadmium	Monitor	mg/L	4/4/2016	< 0.00010
Chromium	Monitor	mg/L	4/4/2016	0.00059
Lead	Monitor	mg/L	4/4/2016	< 0.00050
Nickel	Monitor	mg/L	4/4/2016	< 0.010
Selenium	Monitor	mg/L	4/4/2016	< 0.00050
Thallium	Monitor	mg/L	4/4/2016	< 0.00010

Notes:
[1]DL = Discharge Limit
[2]Monitor = Monitoring required but no limits established
[3]mg/L = milligrams per liter
[4]Total nitrogen is equal to nitrate as N plus nitrite as N plus TKN
[5]Total trihalomethanes are comprised of bromoform, bromodichloromethane, chloroform, and dibromochloromethane
[6]SU = Standard Unit
[7]mV = millivolts
[8]°C = degrees Celsius
[9]µmhos/cm = micromhos per centimeter

Table 2-2
FBR System Effluent Monitoring Results for Perchlorate (April - June 2016)

Parameter	AL[1]	DL[2]	Units	Sampling Date	Result
Perchlorate	0.011	0.014	mg/L[3]	4/4/2016	< 0.0050
				4/11/2016	< 0.0050
				4/18/2016	< 0.0050
				4/25/2016	< 0.0050
				5/2/2016	< 0.0050
				6/3/2016	< 0.0050

Table 2-3
FBR System Effluent Monitoring Results for Nitrate as N (April - June 2016)

Parameter	AL[1]	DL[2]	Units	Sampling Date	Result
Nitrate as N	8	10	mg/L[3]	4/4/2016	< 0.11
				4/11/2016	< 0.11
				4/18/2016	< 0.11
				4/25/2016	< 0.11
				5/2/2016	< 0.11
				6/3/2016	< 0.11

Table 2-4
FBR System Effluent Monitoring Results for Nitrite as N (April - June 2016)

Parameter	AL[1]	DL[2]	Units	Sampling Date	Result
Nitrite as N	0.8	1	mg/L[3]	4/4/2016	< 0.15
				4/11/2016	< 0.15
				4/18/2016	< 0.15
				4/25/2016	< 0.15
				5/2/2016	< 0.15
				6/3/2016	< 0.15

Notes:
[1]AL = Alert Level
[2]DL = Discharge Limit
[3]mg/L = milligrams per liter

Table 2-5
FBR System Effluent Monitoring Results for Sample Date 4/4/2016

Parameter	AL[1]	DL[2]	Units	Sampling Date	Result
Total Nitrogen[3]	8	10	mg/L[4]	4/4/2016	0.50
Nitrate-Nitrite as N	8	10	mg/L	4/4/2016	< 0.10
Total Kjeldahl N (TKN)	Monitor[5]	Monitor	mg/L	4/4/2016	0.50
Ammonia/Ammonium	Monitor	Monitor	mg/L	4/4/2016	< 0.50
Volatile Organic Compounds					
Benzene	0.004	0.005	mg/L	4/4/2016	< 0.0020
Carbon tetrachloride	0.004	0.005	mg/L	4/4/2016	< 0.0050
o-Dichlorobenzene	0.48	0.6	mg/L	4/4/2016	< 0.0020
p-Dichlorobenzene	0.06	0.075	mg/L	4/4/2016	< 0.0020
1,2-Dichloroethane	0.004	0.005	mg/L	4/4/2016	< 0.0020
1,1-Dichloroethylene	0.0056	0.007	mg/L	4/4/2016	< 0.0050
cis-1,2-Dichloroethylene	0.056	0.07	mg/L	4/4/2016	< 0.0020
trans-1,2,-Dichloroethylene	0.08	0.1	mg/L	4/4/2016	< 0.0020
Dichloromethane	0.004	0.005	mg/L	4/4/2016	< 0.0050
1,2-Dichloropropane	0.004	0.005	mg/L	4/4/2016	< 0.0020
Ethylbenzene	0.56	0.7	mg/L	4/4/2016	< 0.0020
Hexachlorobenzene	0.0008	0.001	mg/L	4/4/2016	< 0.00010
Hexachlorocyclopentadiene	0.04	0.05	mg/L	4/4/2016	< 0.00010
Monochlorobenzene	0.08	0.1	mg/L	4/4/2016	< 0.0020
Styrene	0.08	0.1	mg/L	4/4/2016	< 0.0020
Tetrachloroethylene	0.004	0.005	mg/L	4/4/2016	< 0.0020
Toluene	0.8	1	mg/L	4/4/2016	< 0.0020
Trihalomethanes (total)[6]	0.08	0.10	mg/L	4/4/2016	< 0.0110
1,1,1-Trichloroethane	0.16	0.20	mg/L	4/4/2016	< 0.0020
1,2,4-Trichlorobenzene	0.056	0.07	mg/L	4/4/2016	< 0.0050
1,1,2-Trichloroethane	0.004	0.005	mg/L	4/4/2016	< 0.0020
Trichloroethylene	0.004	0.005	mg/L	4/4/2016	< 0.0020
Vinyl Chloride	0.0016	0.002	mg/L	4/4/2016	< 0.0050
Xylenes (total)	8	10	mg/L	4/4/2016	< 0.010

Table 2-5 Continued
FBR System Effluent Monitoring Results for Sample Date 4/4/2016

Field Parameters

pH	Monitor	Monitor	S.U.[7]	4/11/2016	7.45
				4/18/2016	7.40
				4/25/2016	7.31
				5/2/2016	7.89
				5/9/2016	7.63
				5/16/2016	7.36
				5/31/2016	7.33
Dissolved Oxygen	Monitor	Monitor	mg/L	4/11/2016	8.39
				4/18/2016	19.4
				4/25/2016	7.47
				5/2/2016	5.9
				5/9/2016	6.3
				5/16/2016	7.32
				5/31/2016	11.46
Oxidation-Reduction Potential	Monitor	Monitor	mV[8]	4/11/2016	-435
				4/18/2016	-425
				4/25/2016	-403
				5/2/2016	-395
				5/9/2016	-379
				5/16/2016	-388
				5/31/2016	-361
Temperature	Monitor	Monitor	°C[9]	4/11/2016	23
				4/18/2016	23
				4/25/2016	24
				5/2/2016	23
				5/9/2016	23
				5/16/2016	24
				5/31/2016	25
Specific Conductivity	Monitor	Monitor	µmhos/cm[10]	4/11/2016	NR
				4/18/2016	1.001
				4/25/2016	0.985
				5/2/2016	1.015
				5/9/2016	1.007
				5/16/2016	1.006
				5/31/2016	0.943

Table 2-5 Continued
FBR System Effluent Monitoring Results for Sample Date 4/4/2016

Metals (total)

Arsenic	0.04	0.05	mg/L	4/4/2016	0.013
Barium	1.6	2	mg/L	4/4/2016	0.036
Beryllium	0.0032	0.004	mg/L	4/4/2016	< 0.0010
Cadmium	0.004	0.005	mg/L	4/4/2016	< 0.00010
Chromium	0.08	0.1	mg/L	4/4/2016	< 0.00050
Lead	0.04	0.05	mg/L	4/4/2016	< 0.00050
Nickel	0.08	0.1	mg/L	4/4/2016	< 0.010
Selenium	0.04	0.05	mg/L	4/4/2016	< 0.00050
Thallium	0.0016	0.002	mg/L	4/4/2016	< 0.00010

Notes:
[1]AL = Alert Level
[2]DL = Discharge Limit
[3]Total nitrogen is equal to nitrate as N plus nitrite as N plus TKN
[4]mg/L = milligrams per liter
[5]Monitor = Monitoring required but no limits established
[6]Total trihalomethanes are comprised of bromoform, bromodichloromethane, chloroform, and dibromochloromethane
[7]SU = Standard Unit
[8]mV = millivolts
[9]°C = degrees Celsius
[10]µmhos/cm = micromhos per centimeter

Table 3-1
FBR System Influent Monitoring Daily Flow Rates
(from 4 April 2016 through 3 June 2016)

Date	Flow Rate (gpm)
4/4/2016	345
4/5/2016	340
4/6/2016	336
4/7/2016	348
4/8/2016	348
4/9/2016	347
4/10/2016	346
4/11/2016	347
4/12/2016	347
4/13/2016	347
4/14/2016	347
4/15/2016	347
4/16/2016	346
4/17/2016	347
4/18/2016	347
4/19/2016	347
4/20/2016	347
4/21/2016	348
4/22/2016	347
4/23/2016	322
4/24/2016	257
4/25/2016	192
4/26/2016	153
4/27/2016	347
4/28/2016	348
4/29/2016	250
4/30/2016	300
5/1/2016	317
5/2/2016	347
5/3/2016	344
5/4/2016	277
5/5/2016	405
5/6/2016	398
5/7/2016	397
5/8/2016	396
5/9/2016	396
5/10/2016	367

Date	Flow Rate (gpm)
5/11/2016	398
5/12/2016	396
5/13/2016	393
5/14/2016	NR
5/15/2016	NR
5/16/2016	396
5/17/2016	396
5/18/2016	396
5/19/2016	396
5/20/2016	396
5/21/2016	395
5/22/2016	395
5/23/2016	0
5/24/2016	0
5/25/2016	0
5/26/2016	147
5/27/2016	147
5/28/2016	149
5/29/2016	158
5/30/2016	146
5/31/2016	143
6/1/2016	156
6/2/2016	145
6/3/2016	199
Average:	*301*

Note: NR is Not Recorded

Table 3-3
FBR System Effluent Monitoring Daily Flow Rates
(from 4 April 2016 through 3 June 2016)

Date	Flow Rate (gpm)
4/4/2016	402
4/5/2016	385
4/6/2016	354
4/7/2016	409
4/8/2016	396
4/9/2016	391
4/10/2016	414
4/11/2016	368
4/12/2016	386
4/13/2016	409
4/14/2016	426
4/15/2016	387
4/16/2016	382
4/17/2016	347
4/18/2016	374
4/19/2016	375
4/20/2016	406
4/21/2016	385
4/22/2016	363
4/23/2016	400
4/24/2016	289
4/25/2016	204
4/26/2016	155
4/27/2016	400
4/28/2016	408
4/29/2016	263
4/30/2016	305
5/1/2016	356
5/2/2016	398
5/3/2016	391
5/4/2016	300
5/5/2016	515
5/6/2016	518
5/7/2016	539
5/8/2016	535
5/9/2016	500
5/10/2016	488

Date	Flow Rate (gpm)
5/11/2016	514
5/12/2016	528
5/13/2016	477
5/14/2016	374
5/15/2016	394
5/16/2016	440
5/17/2016	501
5/18/2016	457
5/19/2016	420
5/20/2016	506
5/21/2016	449
5/22/2016	426
5/23/2016	0
5/24/2016	0
5/25/2016	0
5/26/2016	144
5/27/2016	145
5/28/2016	147
5/29/2016	144
5/30/2016	143
5/31/2016	152
6/1/2016	153
6/2/2016	162
6/3/2016	207
Average:	*348*

Table 3-2
FBR System Influent Monitoring Monthly Flow Totals
(from 4 April 2016 through 3 June 2016)

Month	Total Influent Flow (gallons)	Total Influent Flow Rate (gpm, totaled)
April 2016	14,266,607	320
May 2016	11,796,016	264
Total:	*26,062,623*	

Table 3-4
FBR System Effluent Monitoring Monthly Flow Totals
(from 4 April 2016 through 3 June 2016)

Month	Total Effluent Flow (gallons)	Total Effluent Flow Rate (gpm, totaled)
April 2016	15,943,031	357
May 2016	14,640,314	328
Total:	*30,583,345*	

TABLES

Table 1: Aquifer Test Summary
Phase 1 Capture Zone Evaluation Report
Nammo Talley, Plant No. 3
Mesa, Arizona

Test Phase	Well ID	Test Phase Start Date and Time	Extraction Rate (gpm)	Duration of Test Phase (days)	Description
Phase 1: Equilibration	SRP 32.8, -7.2N	9/20/2018 8:08	4322	15	EXT wells and SRP wells were pumped for several days to equilibrate water levels
	SRP 33.1E, -7.3N	9/20/2018 7:20	4567		
	EXT-1 and EXT-2	9/20/2108 9:30	400		
Phase 2: Site Extraction Wells Recovery Test	EXT-1 and EXT-2	10/5/2018 12:58	0	15	EXT well pumps were turned off while SRP wells continue to pump. Recovery was monitored to estimate aquifer parameters
Phase 3: Site Extraction Wells Pumping Test	EXT-1 and EXT-2	10/20/2018 7:00	400	16	EXT wells were turned on while SRP wells continued to pump. Drawdown was monitored to estimate aquifer parameters
Phase 4: Site Extraction and SRP Wells Recovery	SRP 32.8, -7.2N	11/5/2018 9:00	0	16	All wells were turned off to end test. Recovery was monitored for 16 days
	SRP 33.1E, -7.3N	11/5/2018 9:00	0		
	EXT-1 and EXT-2	11/5/2018 9:00	0		

Notes:
EXT-1 and EXT-2 pumped a combined rate of 400 gpm
gpm - gallons per minute
SRP - Salt River Project
EXT - Site Extraction Wells
FSP -

Table 2: Perchlorate Analytical Results
Phase 1 Capture Zone Evaluation Report
Nammo Talley, Plant No. 3
Mesa, Arizona

Sample Date	Sample Event	Perchlorate by EPA 314.0 (µg/L)					
	Well ID	NT-8	NT-10	NT-11	NT-12D	SRP 32.8E, -7.2N	SRP 33.1E, -7.3N
9/20/2018	Baseline	< 1.0	**1.4**	< 1.0/< 1.0	< 1.0	< 1.0	< 1.0
9/27/2018	Phase 1: Equilibration	< 1.0	**1.7**	--	**< 1.0/1.3**	**5.1**	**2.3**
10/3/2018	Phase 1: Equilibration	< 1.0	**1.1**	--	< 1.0	**5.2**	**2.3/2.5**
10/10/2018	Phase 2: Recovery Test	< 1.0	**1.3**	--	< 1.0	**5.7**	**2.6/2.8**
10/17/2018	Phase 2: Recovery Test	< 1.0	< 1.0	--	< 1.0/< 1.0	**5.7**	**2.6**
10/24/2018	Phase 3: Pumping Test	< 1.0	< 1.0	--	< 1.0	**5.8/6.1**	**2.8**
10/31/2018	Phase 3: Pumping Test	< 1.0	< 1.0	--	< 1.0	**6.1**	**2.6/2.4**
11/7/2018	Phase 4: Post-Test[1]	**1.2/1.0**	< 1.0	--	< 1.0	--	--
11/14/2018	Phase 4: Post-Test	< 1.0	< 1.0/< 1.0	< 1.0	< 1.0	--	--
11/19/2018	Phase 4: Post-Test	--	--	--	--	< 1.0	< 1.0

Notes:
-- = no sample collected
µg/L = micrograms per liter
1. No access to SRP wells provided on 11/7/2107

Table 3: Well Construction
Phase 1 Capture Zone Evaluation Report
Nammo Talley, Plant No. 3
Mesa, Arizona

Well Identification	Latitude	Longitude	Measuring Point Elevation (ft msl)	ADWR Number	Well Type/Use	Well Name/ Owner	Well Owner Information	Well Const	Well Diameter (in)	Casing Depth (ft bgs)	Screen Interval (ft bgs)
Observation Wells											
NT-1	33 29 03.1	-111 43 41.3	1312.07	55-910226	Monitor	Nammo-Talley	P.O. Box 34299 Mesa, AZ 85277	PVC	6	258	107-257
NT-6	33 29 1.5	-111 45 42.7	1313.22	55-912177	Monitor	Nammo-Talley	P.O. Box 34299 Mesa, AZ 85277	PVC	6	261	115 - 260
NT-7	33 29 4.7	-111 43 39.8	1310.94	55-912178	Monitor	Nammo-Talley	P.O. Box 34299 Mesa, AZ 85277	PVC	6	260	109 - 259
NT-8	33 29 3.4	-111 44 6.5	1317.27	55-914414	Monitor	Nammo-Talley	P.O. Box 34299 Mesa, AZ 85277	PVC	4	311	161-311
NT-10	33 29 9.8	-111 44 0.3	1310.01	55-617109	Monitor	Nammo-Talley	P.O. Box 34299 Mesa, AZ 85277	PVC	4	311	161-311
NT-11	33 29 6.2	-111 43 54.2	1314.54	55-914420	Monitor	Nammo-Talley	P.O. Box 34299 Mesa, AZ 85277	PVC	4	311	161-311
NT-12D	33 29 3.8	-111.43 56.8	1324.38	55-917166	Monitor	Nammo-Talley	P.O. Box 34299 Mesa, AZ 85277	PVC	5	600	300-600
NT-9	33 29 11.3	-111 43 46.4	1319.03	55-607730	Monitor	Nammo-Talley	P.O. Box 34299 Mesa, AZ 85277	PVC	4	311	161-311
ADEQ Well No. 7	33 28 52.87	-111 43 52.59	1334.00	55-561850	Monitor	ADEQ	1110 W. Washington St. Phoenix, AZ 85007	PVC	5	369	236 - 369
ADEQ Well No. 8	33 28 53.14	-111 43 46.04	1326.81	55-563131	Monitor	ADEQ	1110 W. Washington St. Phoenix, AZ 85007	PVC	5	367	240 - 360

Well Identification	Latitude	Longitude	Measuring Point Elevation (ft msl)	ADWR Number	Well Type/Use	Well Name/ Owner	Well Owner Information	Well Const	Well Diameter (in)	Casing Depth (ft bgs)	Screen Interval (ft bgs)
Groundwater Extraction Wells											
SRP 32.8E-7.2N	33 29 3.48	-111 44 19.18	1305.24	55-607739	Irrigation	Salt River Project	Mail Station PAB352 PO Box 52025 Phoenix, AZ 85072	Steel	24	800	340 - 750
SRP 33.1E-7.3N	33 29 10.45	-111 44 3.67	1306.95	55-617109	Irrigation	Salt River Project	Mail Station PAB352 PO Box 52025 Phoenix, AZ 85072	Steel	20	687	350 - 687
SRP 33.3E-7.5N	33 29 16.61	-111 43 48.40	1309.38	55-607730	Irrigation	Salt River Project	Mail Station PAB352 PO Box 52025 Phoenix, AZ 85072	Steel	24	640	320 - 620
EXT-1	33 29 4.15	-111 43 40.65	1312.84	55-223104	Extraction	Nammo-Talley	P.O. Box 34299 Mesa, AZ 85277	Steel	12	350	190 - 350
EXT-2	33 29 2.62	-111 43 42.39	1314.47	55-223095	Extraction	Nammo-Talley	P.O. Box 34299 Mesa, AZ 85277	Steel	12	350	190 - 350

Abbreviations:

ft amsl = feet above mean sea level (NAVD88)
Const = construction
in = inches
ft bgs = feet below ground surface
NT = Nammo Talley
SRP = Salt River Project
PVC = polyvinyl chloride
ADEQ = Arizona Department of Environmental Quality
No. = number

Table 4: Summary of Aquifer Test Results
Phase 1 Capture Zone Evaluation Report
Nammo Talley, Plant No. 3
Mesa, Arizona

		Inputs		Fitted Parameters		Calculated Parameters	
Well ID	**Solution**	**Aquifer Thickness (feet)**	**Vertical Anisotropy (K_Z/K_H)**	**Transmissivity ($feet^2$/day)**	**Storativity (dimensionless)**	**Hydraulic Conductivity (K_H, feet/day)**	**Specific Storage (1/feet)**
Recovery Test (Phase 2)							
ADEQ-8	Theis (1935)/Hantush (1961) Confined Aquifer	160	0.001	18,000	0.004	110	3E-05
NT-1	Theis (1935)/Hantush (1961) Confined Aquifer	160	0.001	10,000	0.03	60	2E-04
NT-11	Theis (1935)/Hantush (1961) Confined Aquifer	160	0.001	30,000	0.007	190	4E-05
NT-6	Theis (1935)/Hantush (1961) Confined Aquifer	160	0.001	13,000	0.01	80	6E-05
NT-7	Theis (1935)/Hantush (1961) Confined Aquifer	160	0.001	9,000	0.009	60	6E-05
NT-9	Theis (1935)/Hantush (1961) Confined Aquifer	160	0.001	7,000	0.003	40	2E-05
Pumping Test (Phase 3)							
ADEQ-8	Theis (1935)/Hantush (1961) Confined Aquifer	160	0.001	15,000	0.006	90	4E-05
NT-11	Theis (1935)/Hantush (1961) Confined Aquifer	160	0.001	8,000	0.01	50	6E-05
NT-9	Theis (1935)/Hantush (1961) Confined Aquifer	160	0.001	5,000	0.005	30	3E-05

Notes:
K_Z - Hydraulic conductivity along the vertical axis
K_H - Hydraulic conductivity along the horizontal axis

Table 5: Summary of Model Properties
Phase 1 Capture Zone Evaluation Report
Nammo Talley, Plant No. 3
Mesa, Arizona

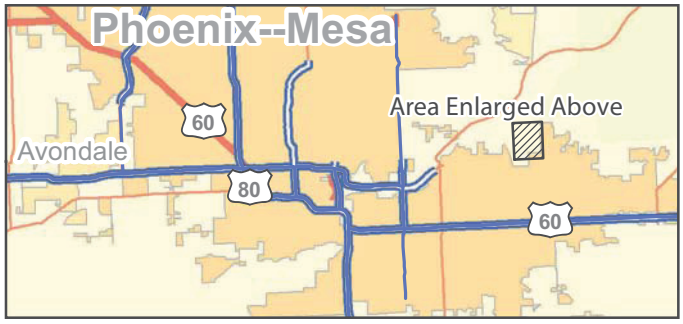
NT Model Properties	Layer 1	Layer 2	Layer 3	Layer 4
Maximum Thickness (feet)	490	41	37	802
Minimum Thickness (feet)	418	40	37	35
Specific Yield	0.3	0.2	0.2	0.2
Specific Storage (1/feet)	5E-05	5E-05	5E-05	5E-05
Effective porosity	0.25	0.25	0.25	0.25
NT Model (2016)				
K_x (feet/day)	90	90	90	70
K_z (feet/day)	0.9	0.5	0.9	0.35
NT Model (2019) - Less Conservative Case				
K_x (feet/day)	50	50	50	70
K_z (feet/day)	0.5	0.5	0.5	0.35
NT Model (2019) - Most Conservative Case				
K_x (feet/day)	80	80	80	70
K_z (feet/day)	0.8	0.8	0.8	0.35

Notes:
K_x - Hydraulic conductivity along the x axis, defined as east-west in the NT Model
K_y - Hydraulic conductivity along the y axis, defined as north-south in the NT Model
K_z - Hydraulic conductivity along the z axis, defined as vertical in the NT Model

FIGURES

Legend

Approximate Boundary of Nammo Talley Inc. Plant #3



2,000 1,000 0 2,000 Feet

Site Location

Nammo Talley Inc. Plant #3
Mesa, Arizona

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SP0101	February 2019	Figure 1

P:\GIS\Nammo_Talley\Project\2019Feb\Fig01_SiteLocation.ai

Legend

- Extraction Well
- Monitoring Well
- SRP Well
- Infiltration Basins
- Water Bore-Out Pit Area
- Treatment Pad

N

0 500 Feet

Well Locations

Nammo Talley Inc. Plant #3
Mesa, Arizona

Geosyntec consultants

SP0101	February 2019	Figure 2

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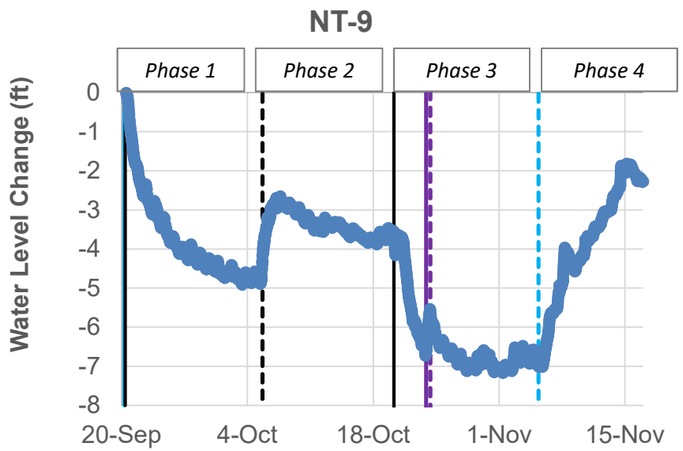

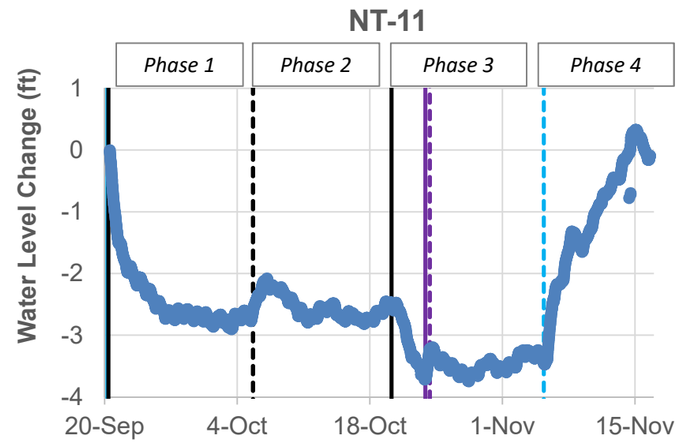

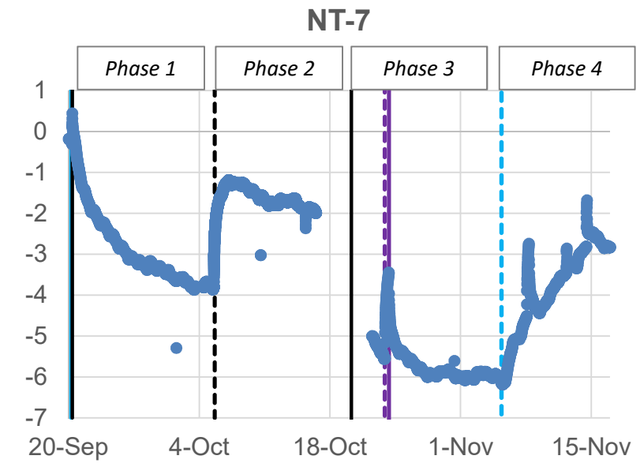

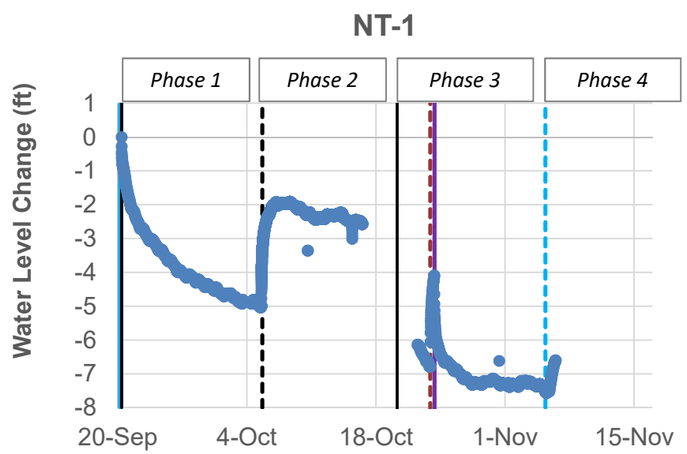

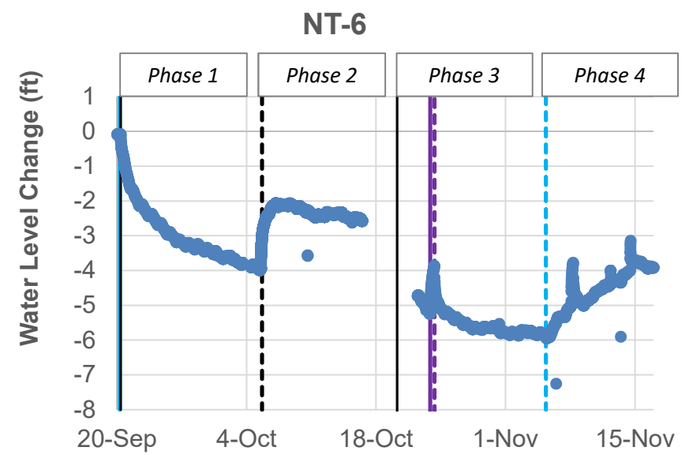

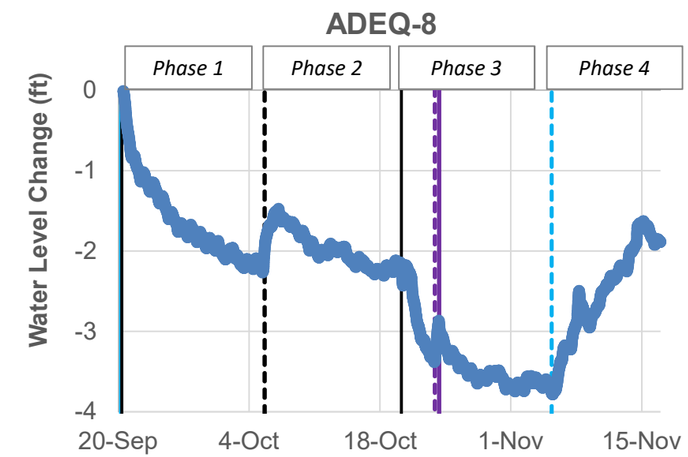

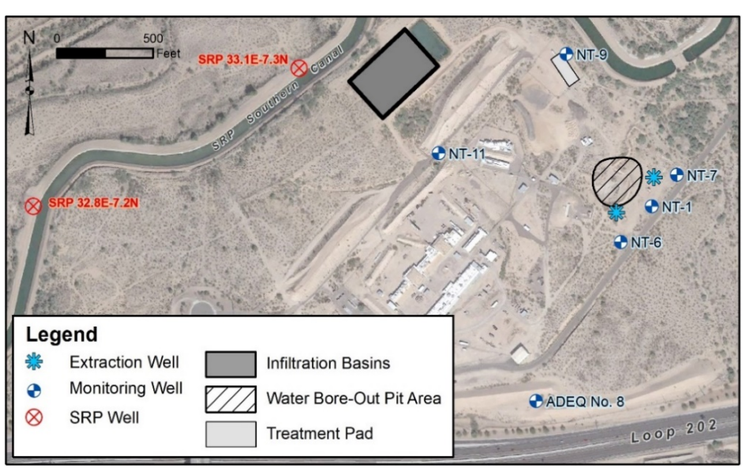

Legend

- SRP Wells on
- SRP Wells off
- EX Wells on
- EX Wells off
- SRP 7.2n on
- SRP 7.2n off
- Water Level Change

Notes:
SRP - Salt River Project
EX - Site Extraction Wells
Phase 1 through 4 refer to the aquifer test phase summarized in Table 1

Observation Well Hydrographs

Nammo Talley Inc. Plant No. 3
Mesa, Arizona

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Figure 3

SP0101 | February 2019

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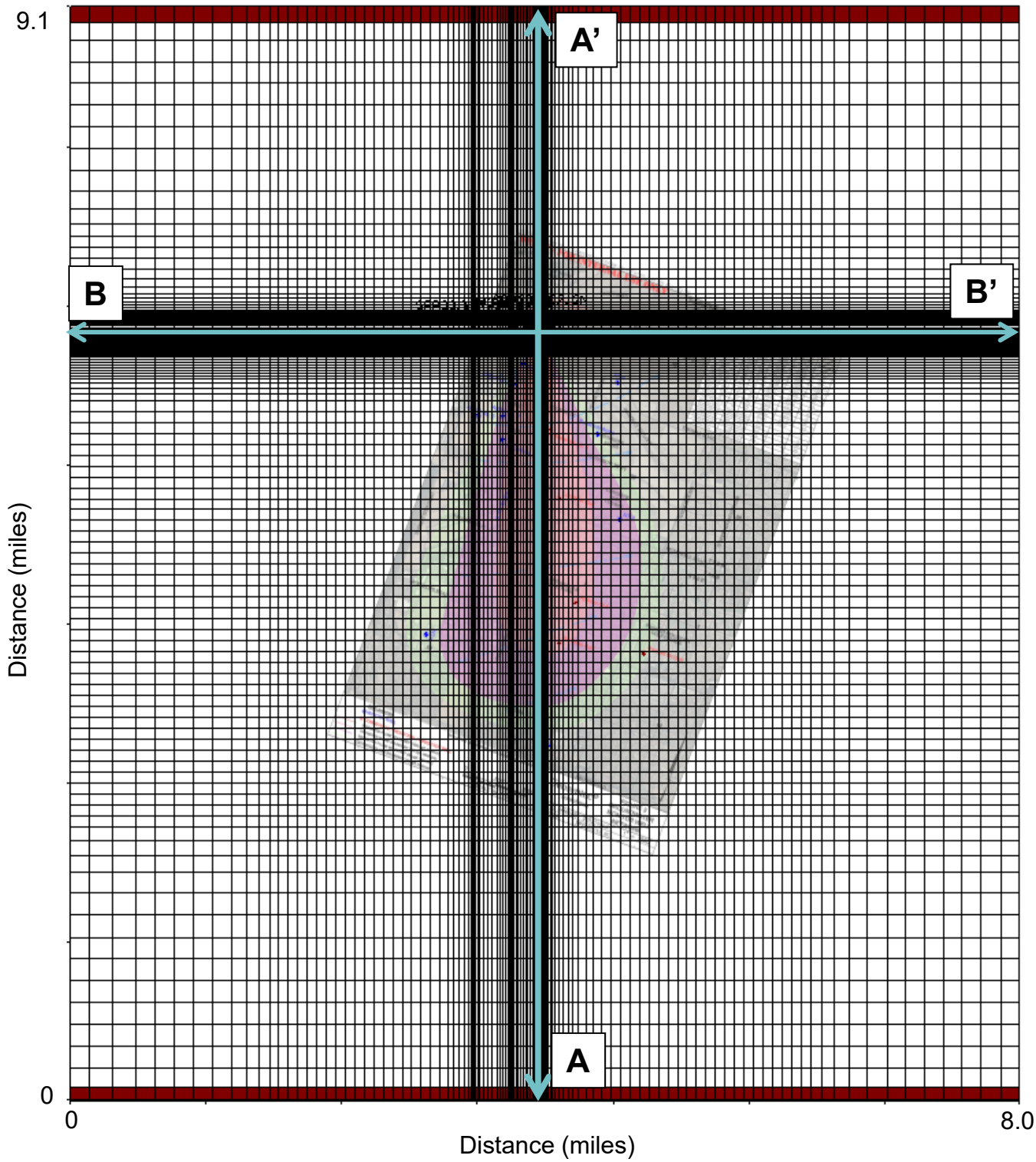

Notes:

Cross-section location

Model Domain and Grid Spacing

Nammo Talley, Plant No. 3
Mesa, Arizona

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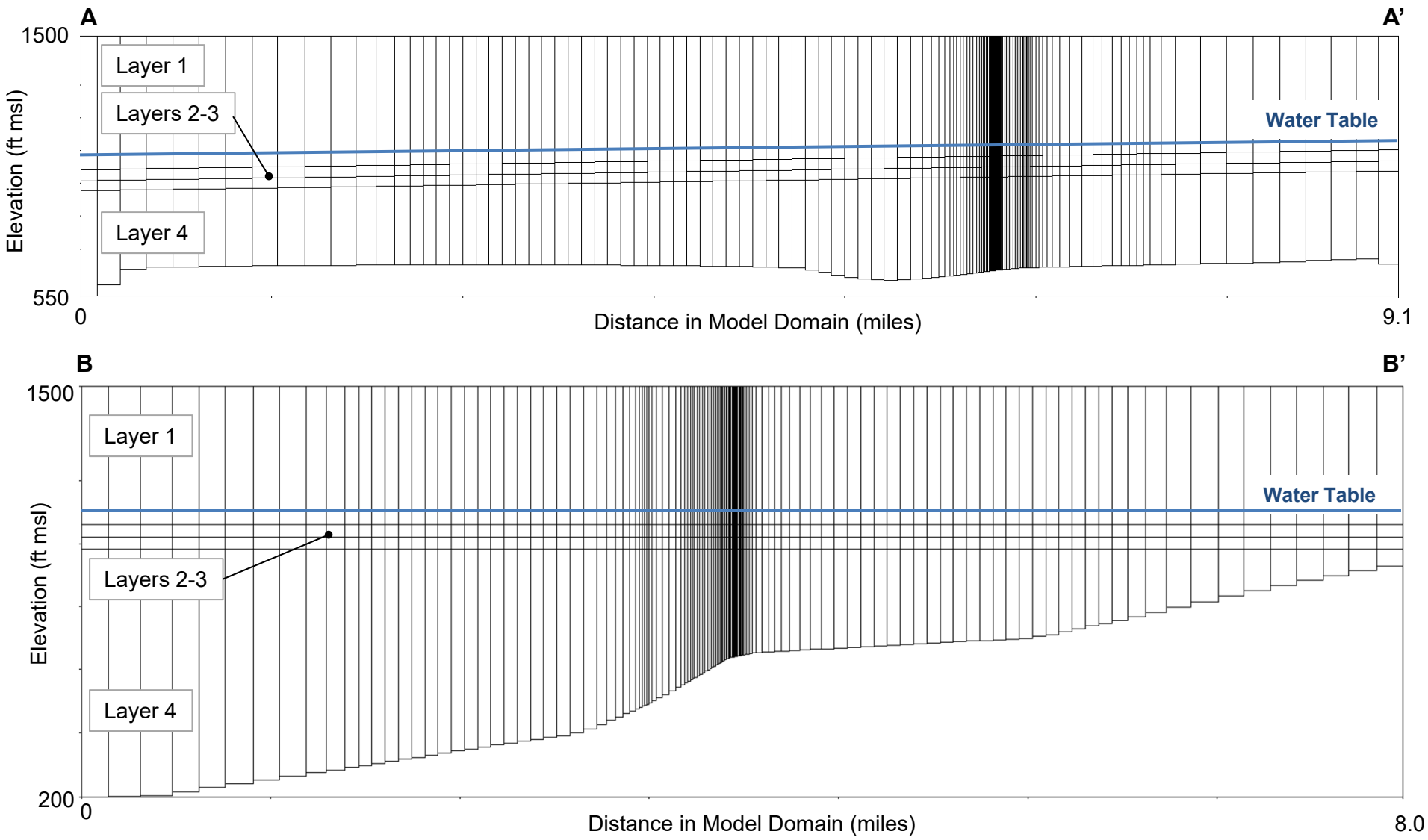
SP0101	February 2019	Figure 4



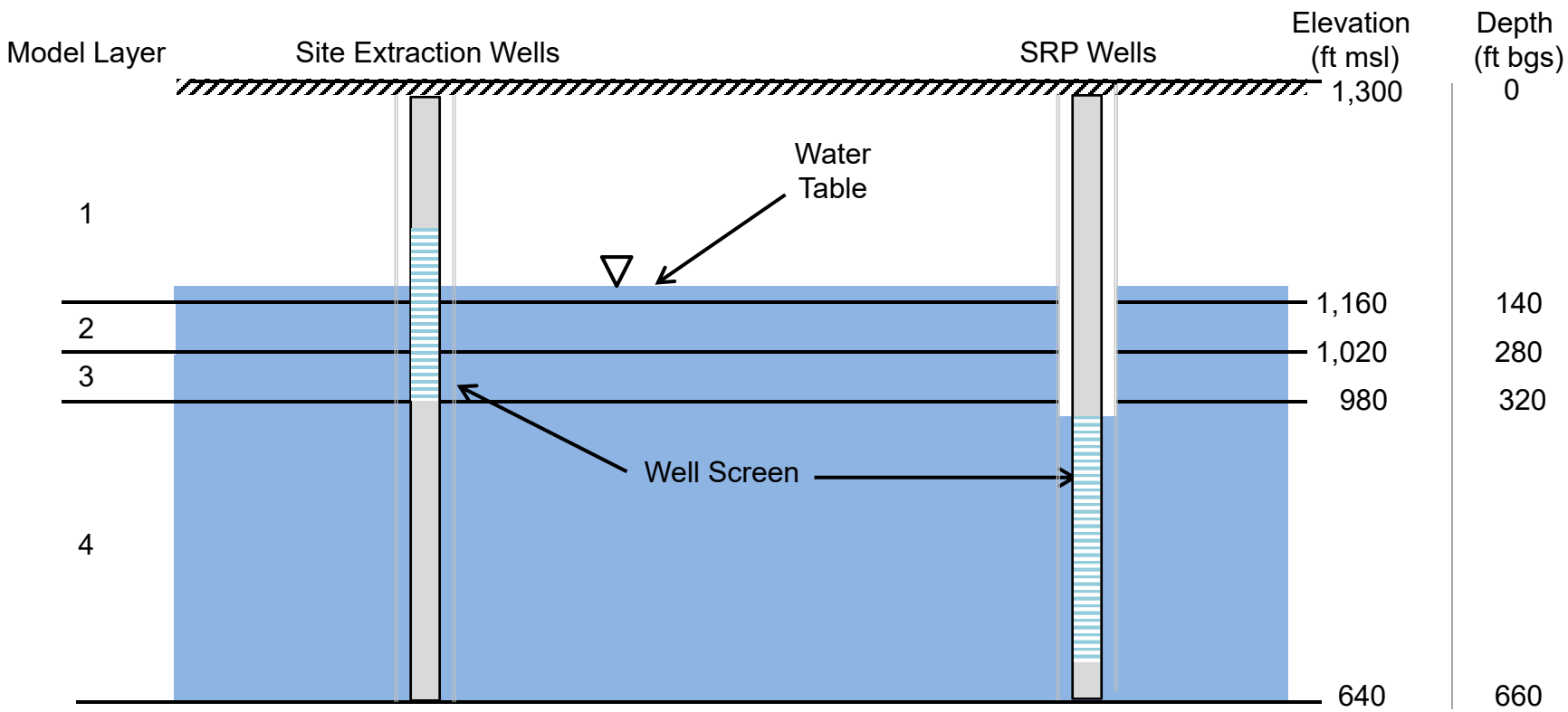
Notes:
10x vertical exaggeration
ft msl – feet relative to mean sea level
Cross-section locations shown on Figure 4

Cross-Sections of Model Domain

Nammo Talley, Plant No. 3
Mesa, Arizona

Geosyntec consultants

SP0101	February 2019	Figure 5



Notes:
Elevation and depth are approximate values in the vicinity of the Site. Actual layer thickness varies in the model
Conceptual diagram not to scale
SRP – Salt River Project
ft bgs – feet below ground surface
ft msl – feet relative to mean sea level

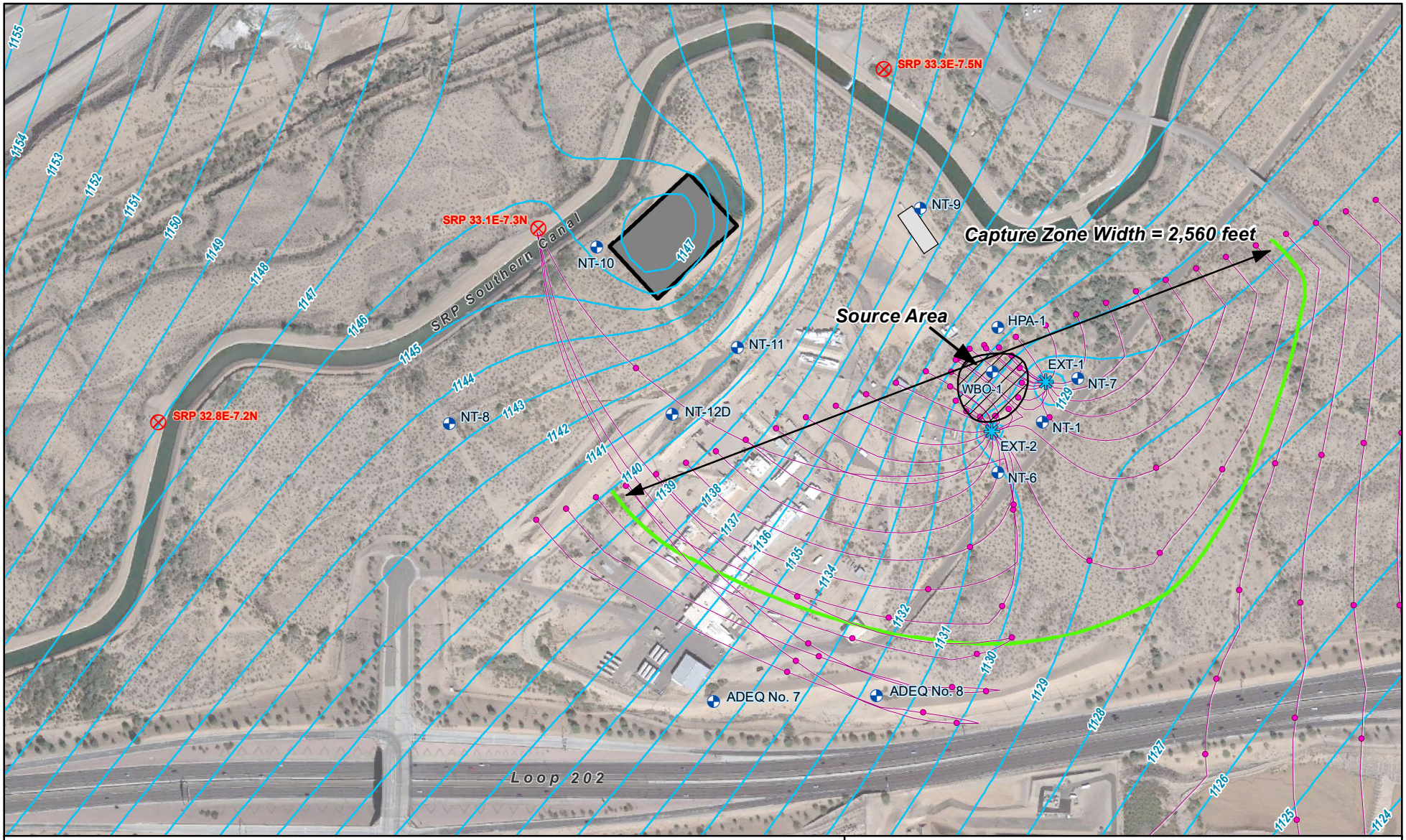
Model Layers Relative to Well Screens

Nammo Talley, Plant No. 3
Mesa, Arizona

Geosyntec consultants

SP0101 | February 2019

Figure 6



Legend

- Extraction Well
- Monitoring Well
- SRP Well
- Infiltration Basins
- Water Bore-Out Pit Area
- Treatment Pad
- Pathline
- Groundwater Elevation Contour
- Capture Zone

Notes:
Horizontal hydraulic Conductivity = 50 ft/day in Layer 1,2, and 3.
Vertical anisotropy (Kh/Kz) = 0.001
Dots indicate a travel time of 5 years.

N

0 500 Feet

Capture Zone Evaluation
Less Conservative Case: Layer 1

Nammo Talley Inc. Plant #3
Mesa, Arizona

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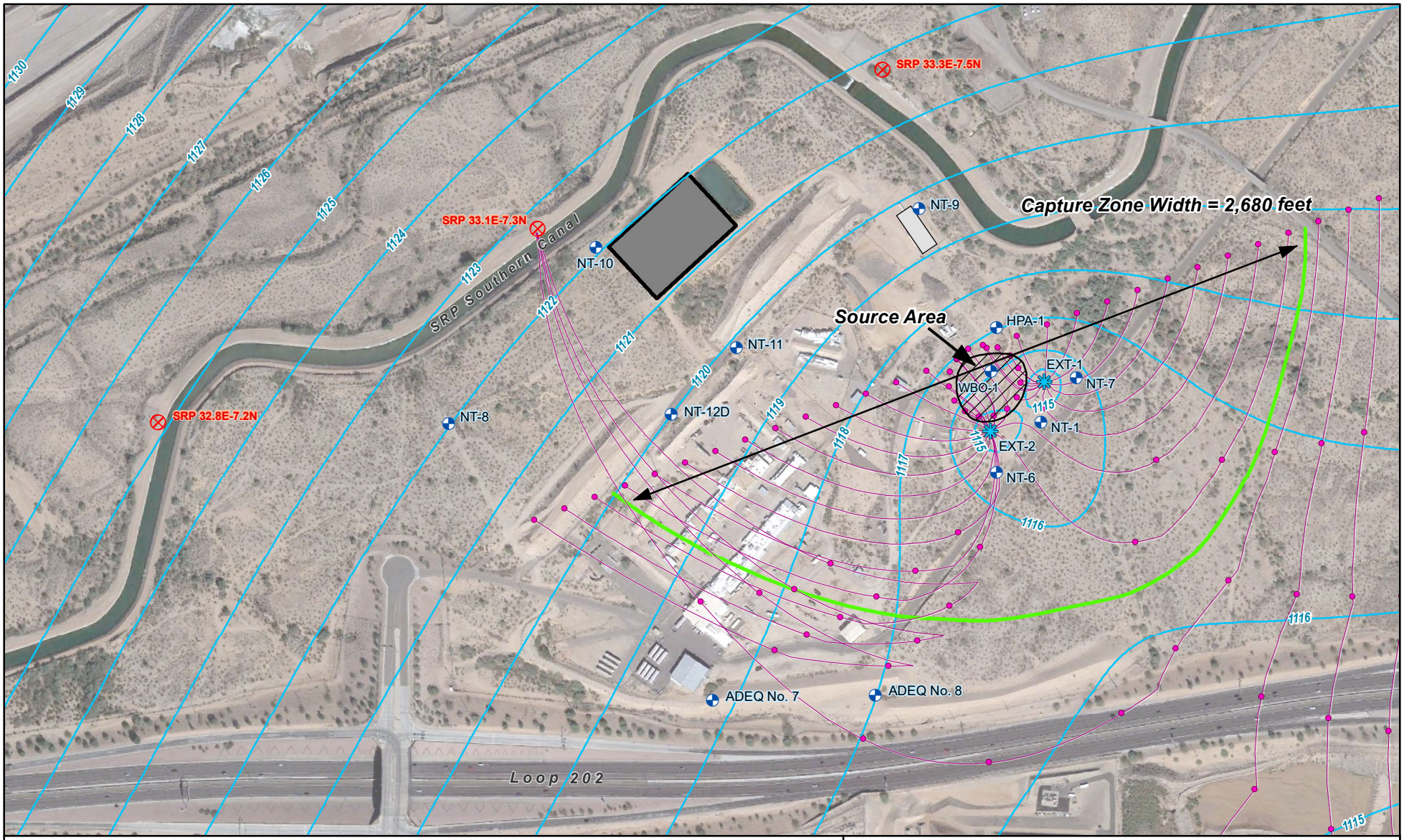
Figure **7a**

\\Oakland-01\data\GIS\Nammo_Talley\Project\2019Feb\Fig07a_CaptureEval_BaseCase_Layer_1.mxd



Legend

- Extraction Well
- Monitoring Well
- SRP Well
- Infiltration Basins
- Water Bore-Out Pit Area
- Treatment Pad
- Pathline
- Groundwater Elevation Contour
- Capture Zone

Notes:
Horizontal hydraulic Conductivity = 50 ft/day in Layer 1,2, and 3.
Vertical anisotropy (Kh/Kz) = 0.001
Dots indicate a travel time of 5 years.

N

0 500 Feet

Capture Zone Evaluation
Less Conservative Case: Layer 2

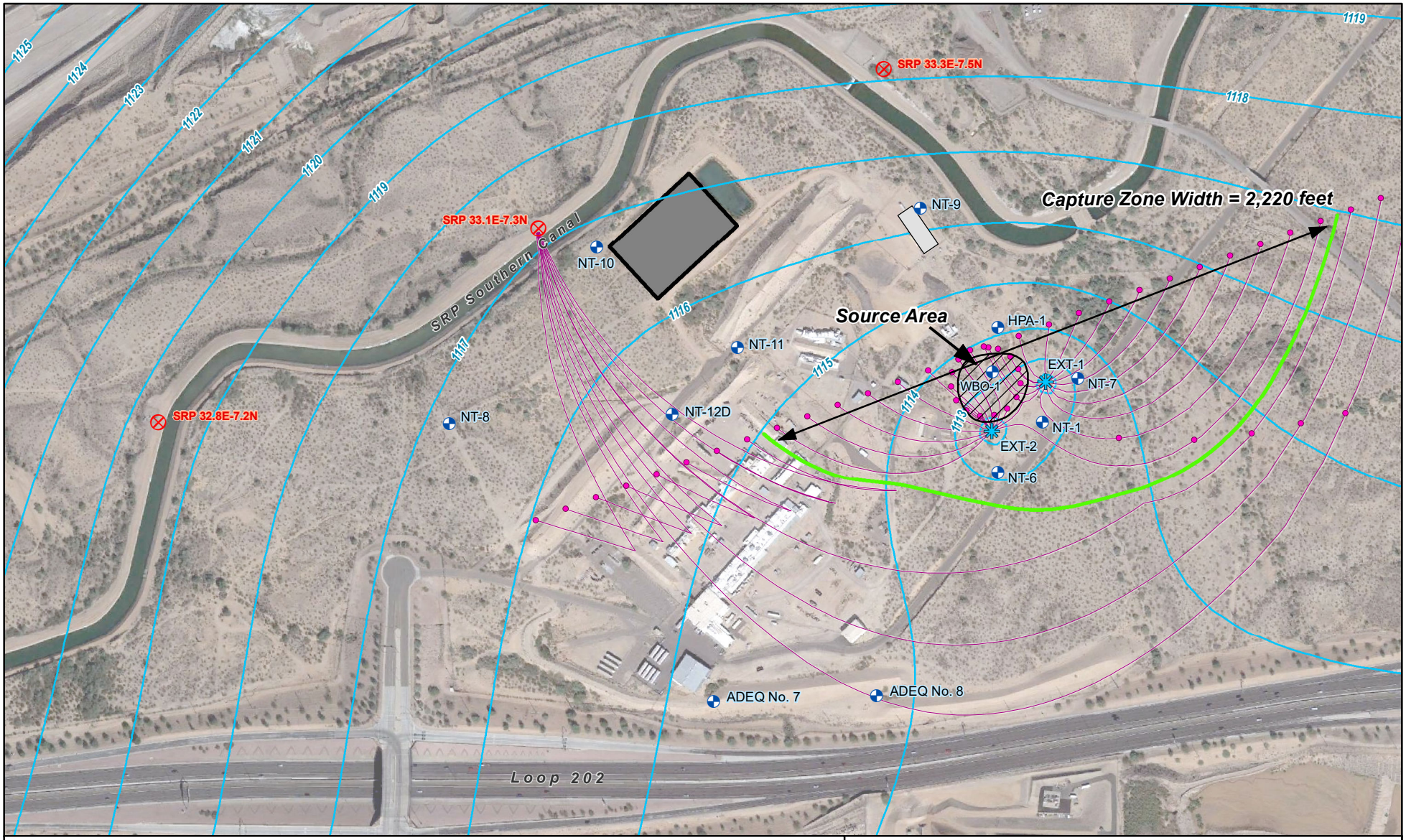
Nammo Talley Inc. Plant #3
Mesa, Arizona

Geosyntec consultants

Figure **7b**

SP0101 | February 2019

\\Oakland-01\data\GIS\Nammo_Talley\Project\2019Feb\Fig07b_CaptureEval_BaseCase_Layer_2.mxd



Legend

- Extraction Well
- Monitoring Well
- SRP Well
- Infiltration Basins
- Water Bore-Out Pit Area
- Treatment Pad
- Pathline
- Groundwater Elevation Contour
- Capture Zone

Notes:
Horizontal hydraulic Conductivity = 50 ft/day in Layer 1,2, and 3.
Vertical anisotropy (Kh/Kz) = 0.001
Dots indicate a travel time of 5 years.

N

0 500 Feet

Capture Zone Evaluation
Less Conservative Case: Layer 3

Nammo Talley Inc. Plant #3
Mesa, Arizona

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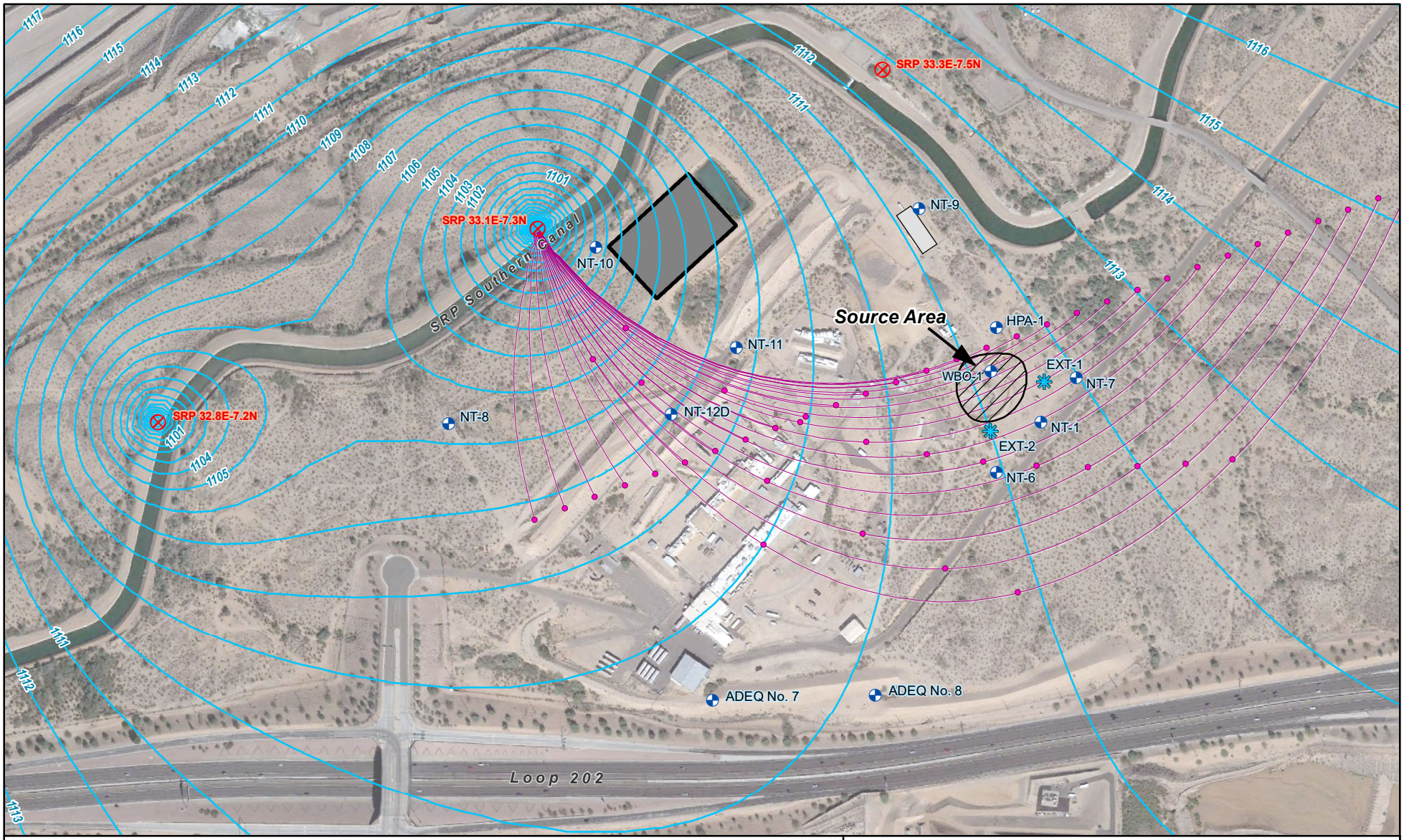
SP0101 | February 2019

Figure **7c**

\\Oakland-01\data\GIS\Nammo_Talley\Project\2019Feb\Fig07c_CaptureEval_BaseCase_Layer_3.mxd



Legend

- Extraction Well
- Monitoring Well
- SRP Well
- Infiltration Basins
- Water Bore-Out Pit Area
- Treatment Pad
- Pathline
- Groundwater Elevation Contour

Notes:
Horizontal hydraulic Conductivity = 50 ft/day in Layer 1,2, and 3.
Vertical anisotropy (Kh/Kz) = 0.001
Dots indicate a travel time of 5 years.

N

0 500 Feet

Capture Zone Evaluation
Less Conservative Case: Layer 4

Nammo Talley Inc. Plant #3
Mesa, Arizona

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Figure **7d**

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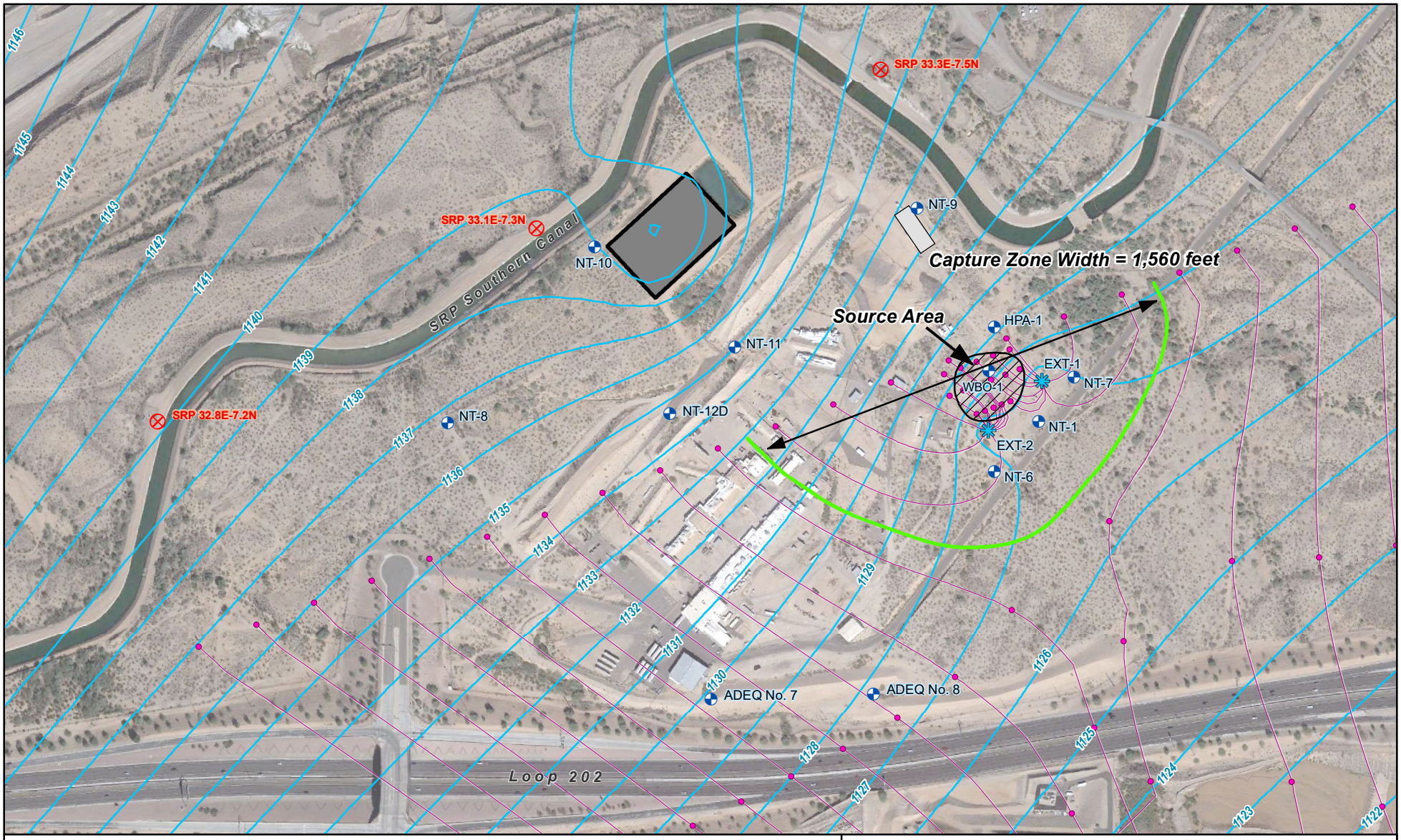


Legend

- Extraction Well
- Monitoring Well
- SRP Well
- Infiltration Basins
- Water Bore-Out Pit Area
- Treatment Pad
- Pathline
- Groundwater Elevation Contour
- Capture Zone

Notes:
Horizontal hydraulic Conductivity = 80 ft/day in Layer 1,2, and 3.
Vertical anisotropy (Kh/Kz) = 0.001
Dots indicate a travel time of 5 years.

N

0 500 Feet

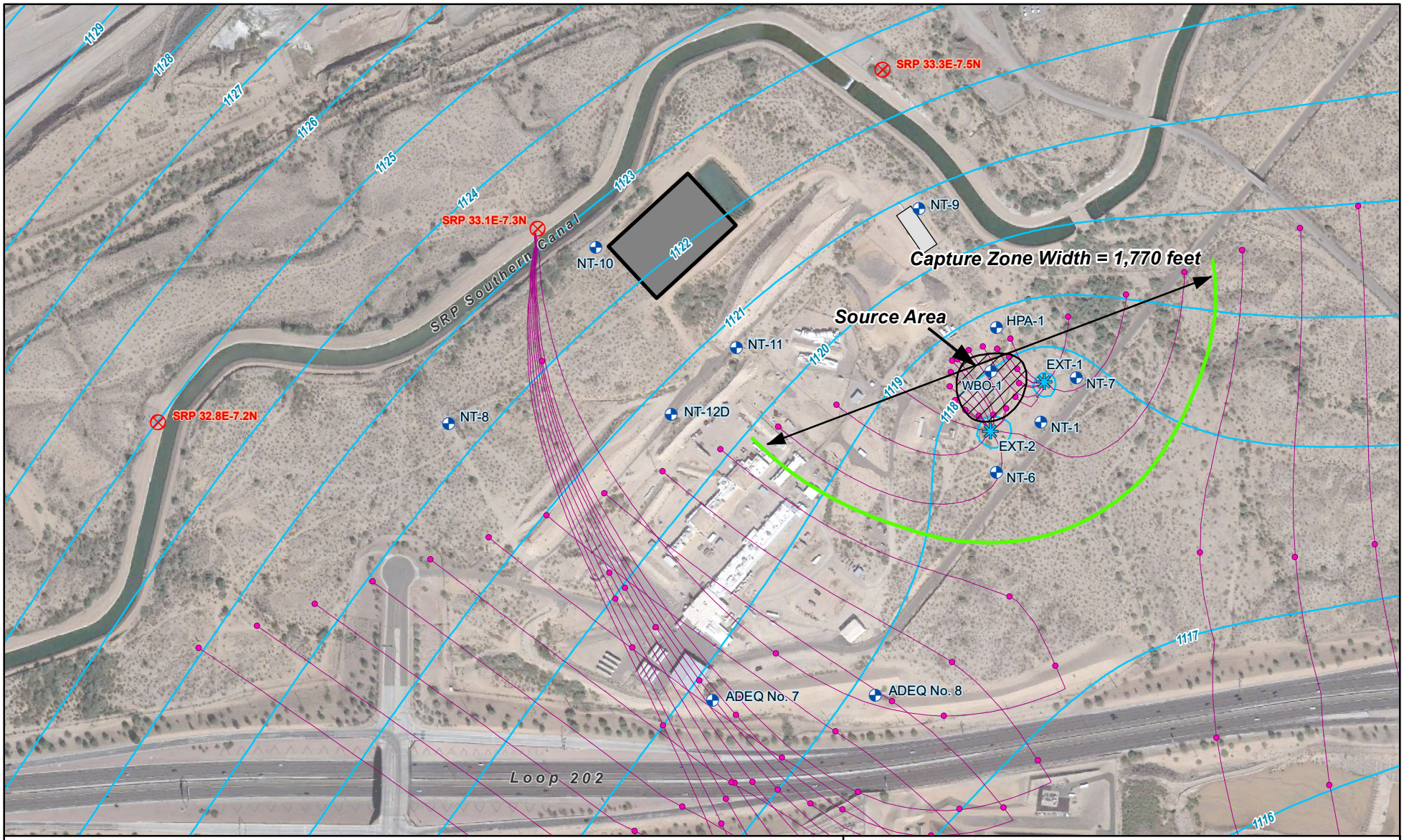
Capture Zone Evaluation
Most Conservative Case: Layer 1

Nammo Talley Inc. Plant #3
Mesa, Arizona

Geosyntec consultants

SP0101	February 2019	Figure 8a

\\Oakland-01\data\GIS\Nammo_Talley\Project\2019Feb\Fig08a_CaptureEval_Conservative_Layer_1.mxd



Legend

- Extraction Well
- Monitoring Well
- SRP Well
- Infiltration Basins
- Water Bore-Out Pit Area
- Treatment Pad
- Pathline
- Groundwater Elevation Contour
- Capture Zone

Notes:
Horizontal hydraulic Conductivity = 80 ft/day in Layer 1,2, and 3.
Vertical anisotropy (Kh/Kz) = 0.001
Dots indicate a travel time of 5 years.

N

0 500 Feet

Capture Zone Evaluation
Most Conservative Case: Layer 2

Nammo Talley Inc. Plant #3
Mesa, Arizona

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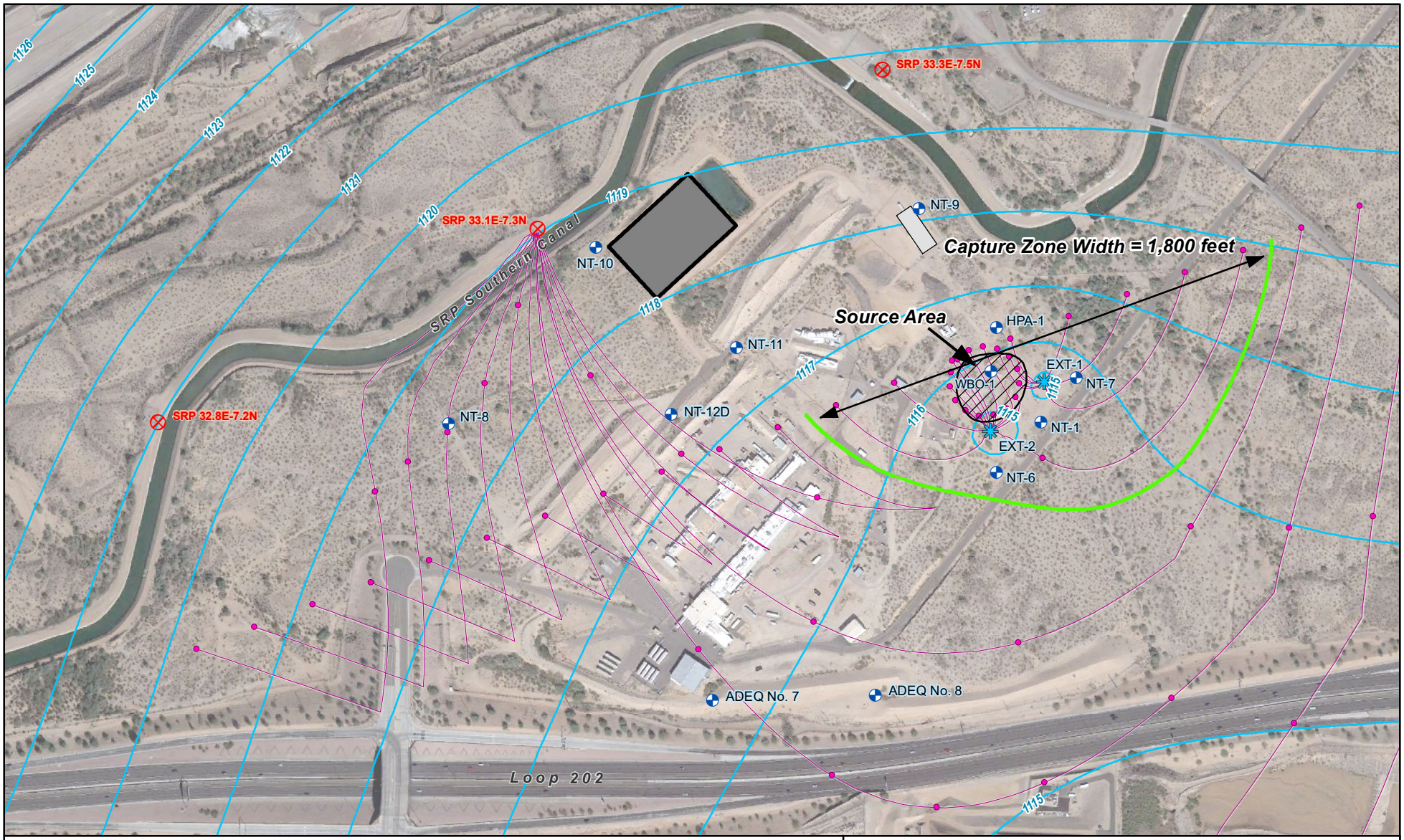
SP0101 | February 2019

Figure **8b**

\\Oakland-01\data\GIS\Nammo_Talley\Project\2019Feb\Fig08b_CaptureEval_Conservative_Layer_2.mxd



Legend

- Extraction Well
- Monitoring Well
- SRP Well
- Infiltration Basins
- Water Bore-Out Pit Area
- Treatment Pad
- Pathline
- Groundwater Elevation Contour
- Capture Zone

Notes:
Horizontal hydraulic Conductivity = 80 ft/day in Layer 1,2, and 3.
Vertical anisotropy (Kh/Kz) = 0.001
Dots indicate a travel time of 5 years.

N

0 500 Feet

Capture Zone Evaluation
Most Conservative Case: Layer 3

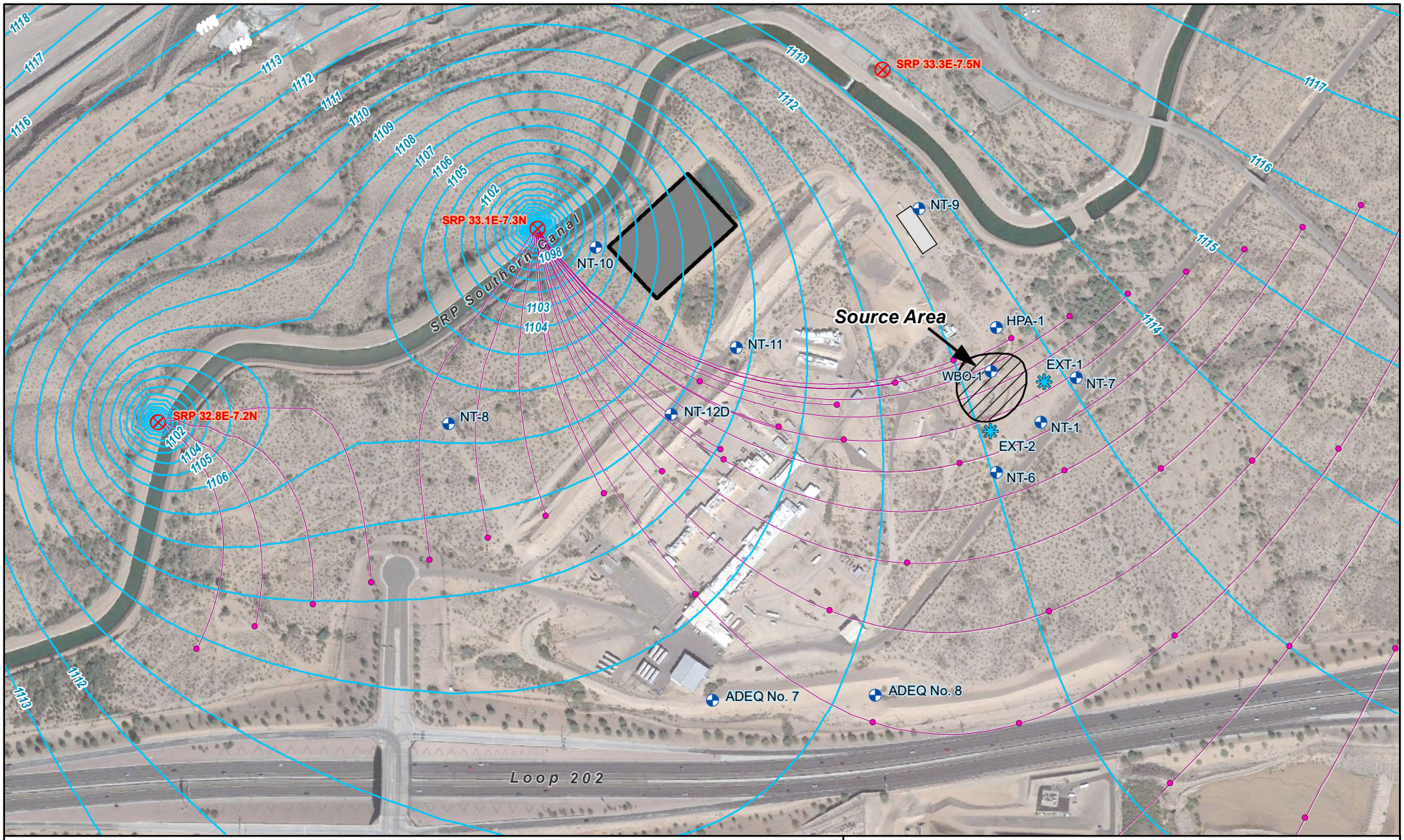
Nammo Talley Inc. Plant #3
Mesa, Arizona

Geosyntec consultants

Figure **8c**

SP0101 | February 2019

\\Oakland-01\data\GIS\Nammo_Talley\Project\2019Feb\Fig08c_CaptureEval_Conservative_Layer_3.mxd



Legend

- Extraction Well
- Monitoring Well
- SRP Well
- Infiltration Basins
- Water Bore-Out Pit Area
- Treatment Pad
- Pathline
- Groundwater Elevation Contour

Notes:
Horizontal hydraulic Conductivity = 80 ft/day in Layer 1,2, and 3.
Vertical anisotropy (Kh/Kz) = 0.001
Dots indicate a travel time of 5 years.

N

0 500 Feet

Capture Zone Evaluation
Most Conservative Case: Layer 4

Nammo Talley Inc. Plant #3
Mesa, Arizona

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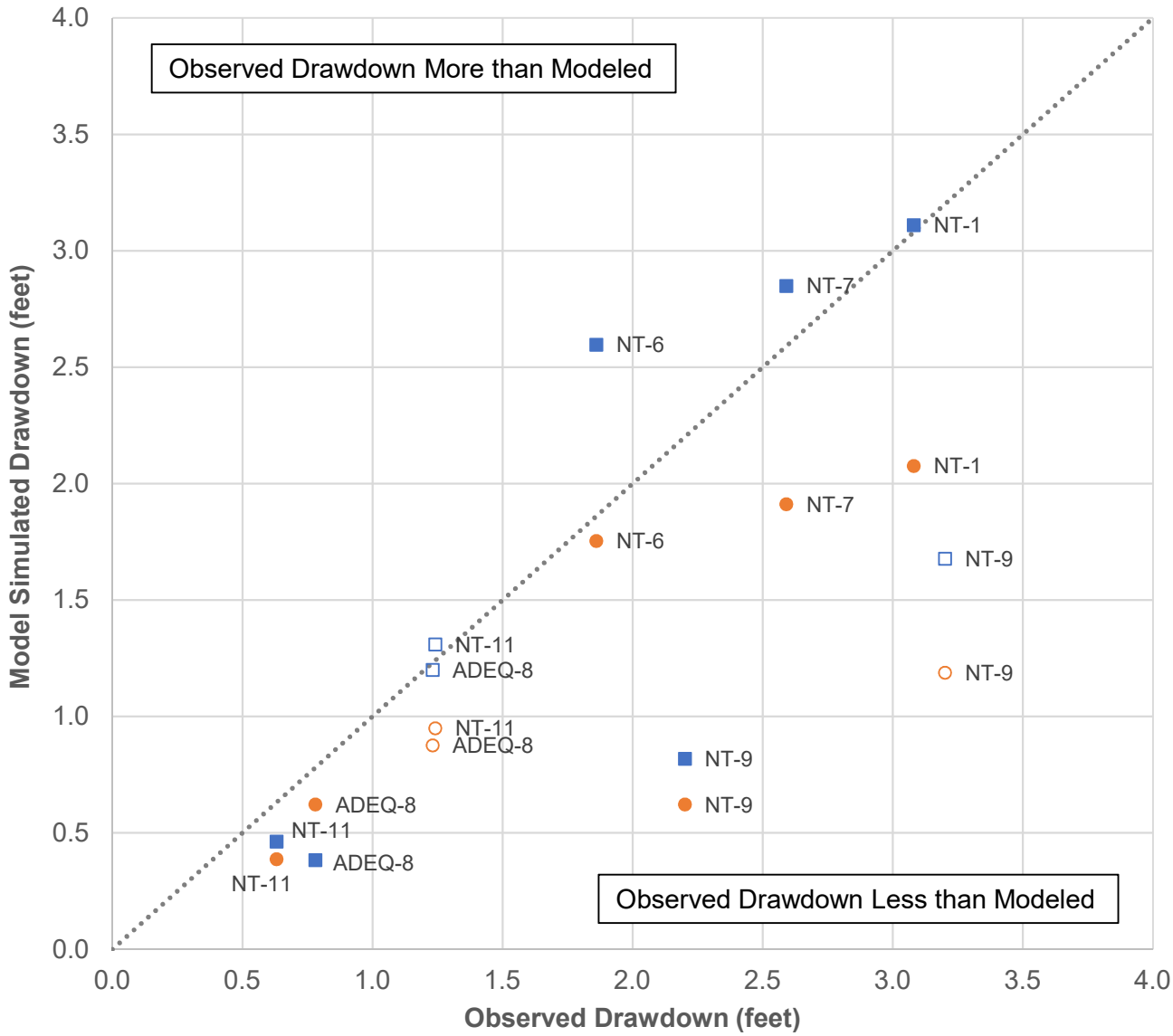
SP0101 | February 2019

Figure **8d**

\\Oakland-01\data\GIS\Nammo_Talley\Project\2019Feb\Fig08d_CaptureEval_Conservative_Layer_4.mxd



Legend:

- Less Conservative Case - Recovery Test (Phase 2)
- Less Conservative Case - Pumping Test (Phase 3)
- More Conservative Case - Recovery Test (Phase 2)
- More Conservative Case - Pumping Test (Phase 3)
- 1:1 line

Notes:
The Recovery Test (Phase 2) drawdown is equal to the drawdown multiplied by -1
Simulated drawdown and recovery values are calculated from layer 2 of the NT model

Model Simulated and Observed Drawdown

Nammo Talley, Plant No. 3
Mesa, Arizona

Geosyntec consultants

SP0101	Febrauary 2019	**Figure 9**

P:\PRJ2003REM\Nammo Talley AZ 2012-2019\2018-19 Phase 02 - Capture Zone Test\Memo\Figures\[CalcVobs-dd.xlsx]

Prepared for

Nammo Defense Systems Inc.
4051 North Higley Road
Mesa, Arizona 85215

REMEDIAL INVESTIGATION WORK PLAN
PLANT 3 AND FORMER WBO FACILITY
NAMMO DEFENSE SYSTEMS
MESA, ARIZONA

ADEQ VRP SITE CODE 52005-1

Prepared by

Geosyntec consultants

engineers | scientists | innovators

11811 N. Tatum Blvd., Suite P-186
Phoenix, Arizona 85028

Project No. SP0101J

May 2020

TABLE OF CONTENTS

1.0 INTRODUCTION 1

1.1 RI Work Plan Organization. 1

2.0 BACKGROUND AND SETTING 3

2.1 Site Location 3
2.2 Geologic and Hydrogeologic Conditions 3
2.3 Historical Facility Operations 4
2.4 Historical Investigations, Remedial Activities, and Permits 5
2.4.1 1990 Soil Sampling - Metals, Nitrate 5
2.4.2 1994 Resource Conservation and Recovery Act (RCRA) Facility Assessment Report for Talley Defense Systems, Inc., Mesa, Arizona 5
2.4.3 1996 Site Assessment - Metals 7
2.4.4 1999 SWMU Investigation 8
2.4.5 1999 WBO Pit Closure - Metals 9
2.4.6 2005 Soil Sampling - Perchlorate 9
2.4.7 2007 Soil Investigation - Perchlorate 10
2.4.8 2009 Perchlorate Source Area Investigation and Pre-Remedial Design Activities 11
2.4.9 2010 Supplemental Perchlorate Source Investigation 14
2.4.10 2010 Perchlorate “Hot Spot” Removal Report 16
2.4.11 Revised Remedial Action Plan – 2013 to Present 16
2.4.12 Phase I Capture Zone Evaluation Report 17
2.4.13 The Former HPA 18
2.4.14 2014 - Aquifer Protection Permit No. P-1010370 (closed in 2019 via transition to VRP) 19
2.4.15 2017 - Updated RCRA Facility Assessment Report 19
2.4.16 2019 – 2020 – Drake Materials, Golf Courses, and COM Wells ... 20
2.4.17 2019 – Existing Monitor Well Vertical Delineation and Video Logs 24
2.4.18 2020 – Soil Vapor VOC Source Area Investigation, NDS Plant 3 . 25
2.4.19 Permits and Legal Requirements 27
2.5 Statement of Purpose and Justification for Work 28

3.0 CONCEPTUAL SITE MODEL 30

3.1 The Former WBO Pits 30
3.2 The Former HPA 32
3.3 VOCs 32

4.0 SCOPE OF WORK 34

4.1 Review of Previous Investigations and Remedial Activities 34
4.2 Data Gap Evaluation 34
4.3 Vadose Zone Impact Characterization 35
4.3.1 Vadose Zone Perchlorate Investigation – Drake Materials 35
4.3.2 Vadose Zone VOC Source Area Investigation – NDS Plant 3 36
4.4 Groundwater Impact Characterization 42
4.4.1 Groundwater Monitoring 42
4.4.2 Monitoring Well Installations, Development, Survey, and Investigative-Derived Waste (IDW) Management 42
4.5 Community Involvement Activities 48
4.6 Risk Evaluation and Well Inventory 48
4.7 RI Report 49

5.0 QUALITY ASSURANCE PROJECT PLAN 50

6.0 SAMPLING AND ANALYSIS PLAN 51

7.0 HEALTH AND SAFETY PLAN 52

8.0 PROJECT SCHEDULE 53

9.0 REFERENCES 54

LIST OF FIGURES

Figure 1: Site Location Map

Figure 2: Plant 3 Site Layout Plan

Figure 3: Groundwater Elevations and Contours in Shallow Wells – March 2020

Figure 4: Existing Monitor Wells and Proposed Monitor Well Locations

Figure 5: Former WBO Pits Perchlorate Source Area

Figure 6: Site Plan Lateral Extent of Perchlorate Concentration to Residual SRL (2007)

Figure 7: Section A-A’ Boring Log with Perchlorate Concentrations (2007)

Figure 8: Section B-B’ Boring Log with Perchlorate Concentrations (2007)

Figure 9: Plant #3 Soil Borings
Figure 10: Plant #3 Northwestern Pond Sample Locations
Figure 11: Historic Ponding Area Maximum Concentrations of Perchlorate in Soil
Figure 12: HPA Soil Profile Results (2009)
Figure 13: Former WBO Pits Soil Profile Results (2009)
Figure 14: Approximate Boring Locations Supplemental Source Investigation (2010)
Figure 15: SWMU Locations from RCRA Facility Assessment Report (2017)
Figure 16: Drake Materials Facility Map and Sample Locations
Figure 17: Soil Vapor TCE Results 5' Depth
Figure 18: Soil Vapor TCE Results 15' Depth
Figure 19: Soil Vapor 1,1-DCE Results 5' Depth
Figure 20: Soil Vapor 1,1-DCE Results 15' Depth
Figure 21: Plant 3 Conceptual Site Model
Figure 22: Trichloroethene Concentrations and Contours March 2020
Figure 23: Drake Materials Facility Map and Proposed Soil Sampling Locations

LIST OF TABLES

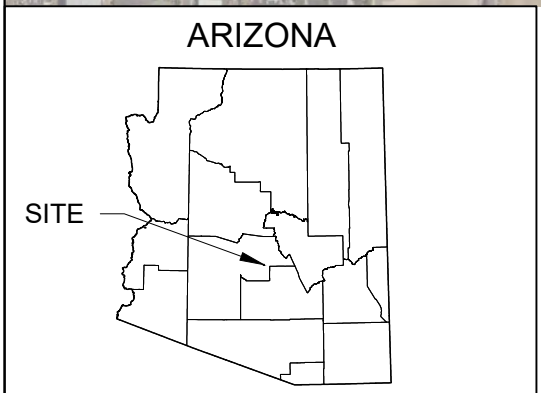
Table 1: Well Information and Groundwater Elevations
Table 2: Monitor Wells Construction Details
Table 3: WBO-1 Summary of Soil Analytical Results
Table 4: 2009 Source Area Investigation Plant 3
Table 5: 2010 Supplemental Perchlorate Source Area Investigation Plant 3
Table 6: Drake Materials and Golf Courses Perchlorate Results
Table 7: Summary of Perchlorate Concentrations – 1Q 2019 Through 1Q 2020
Table 8: Summary of Detected VOCs Concentrations – 1Q 2019 and 1Q 2020
Table 9: Depth to Water and Perchlorate Concentrations in Well WBO-1 (2009 – 2020)

Table 10: Proposed Suite of Analyses for Groundwater Monitoring
Table 11: Proposed Well Construction Details and Sampling Plan

LIST OF APPENDICES

Appendix A: NT-11 and NT-12D Heat Pulse Data
Appendix B: Selected Historical Documents
Appendix C: FF-02 and FF-07 Laboratory Reports and ADWR Records
Appendix D: Historical Groundwater Data Northeast Mesa WQARF
Appendix E: Sampling and Analysis Plan
Appendix F: Proposed Well Design Diagrams
Appendix G: Quality Assurance Project Plan
Appendix H: Health and Safety Plan
Appendix I: Project Schedule

FIGURES



0 1000' 2000'

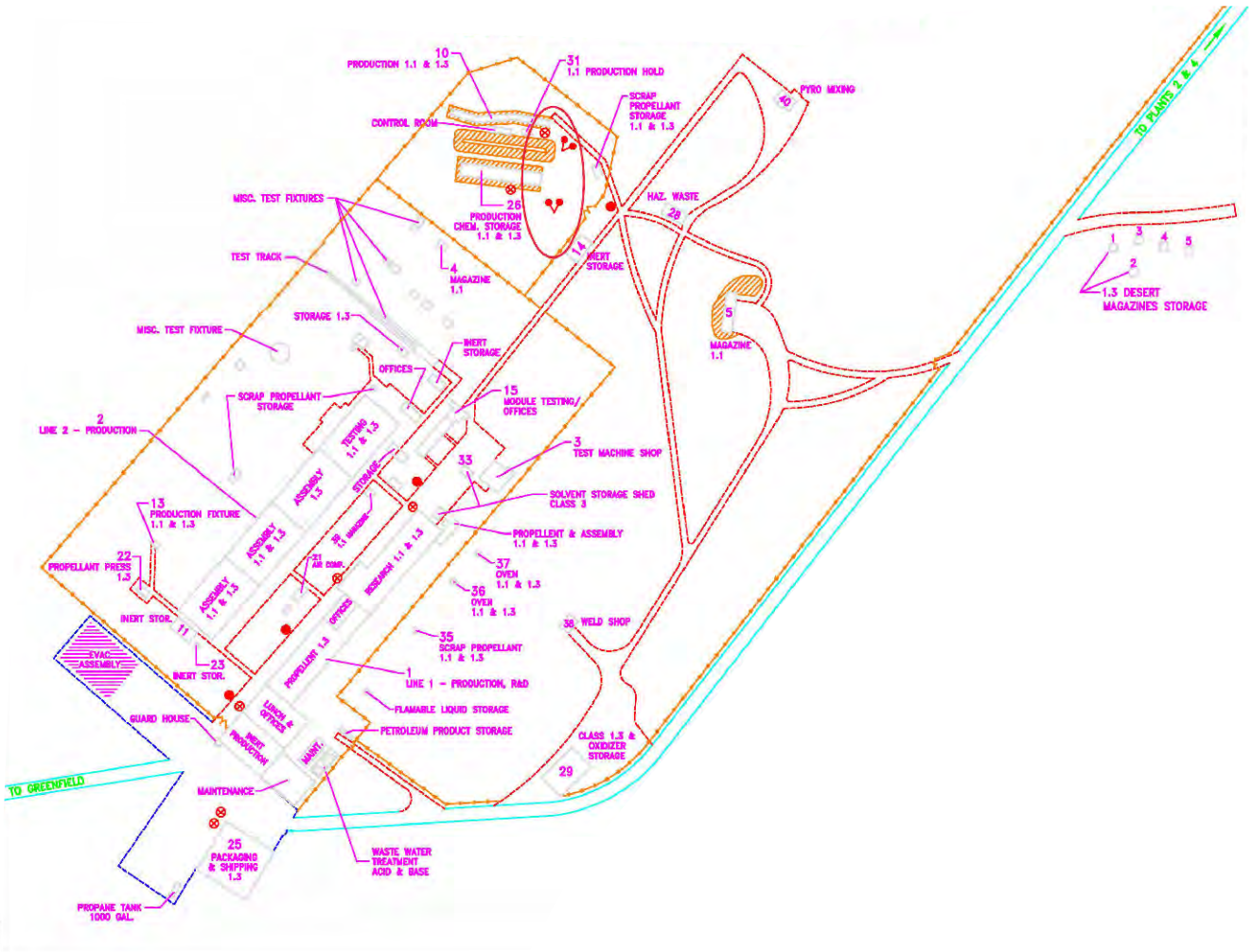
SCALE IN FEET

Geosyntec consultants

Figure 1
SITE LOCATION MAP
NAMMO DEFENSE SYSTEMS, PLANT 3
MESA, ARIZONA

DATE:	October 2019	SCALE:	1" = 1,000'
PROJECT NO.	SP0101	FILE NO.	N/A
DOCUMENT NO.	N/A	FIGURE NO.	1

N:\GEOSYNTEC\NAMMO TALLEY\FIGURES\UPDATE SITE MAP\NAMMO TALLEY SITE LOCATION MAP EXHIBIT



Data Source: Nammo Defense Systems, Inc.

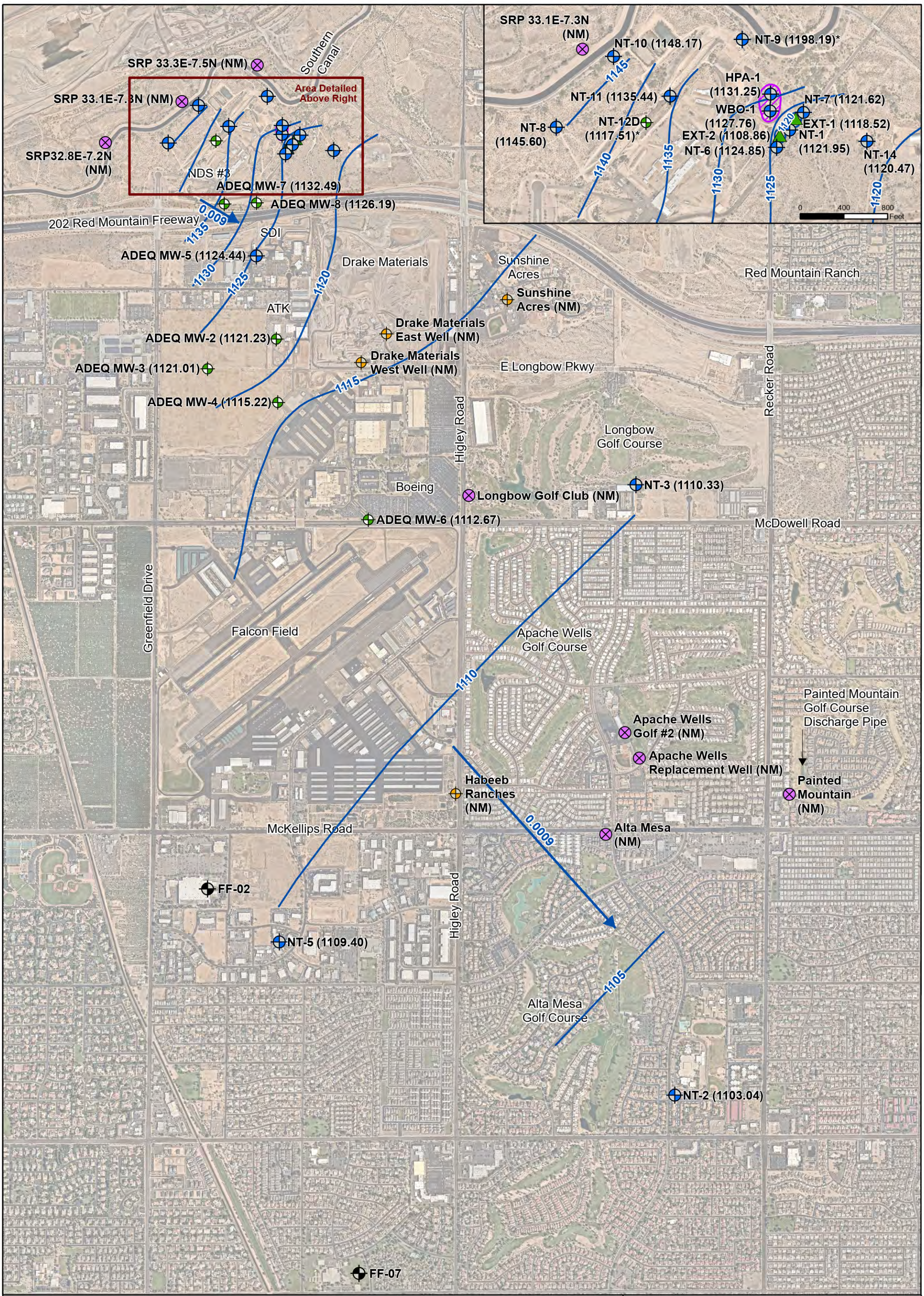
Plant 3 Site Layout Plan

Nammo Talley Inc. Plant #3
Mesa, Arizona

Geosyntec consultants

Phoenix, AZ | September 2020

Figure 2



Extraction Well
Inaccessible Well
Industrial/Irrigation Well
Monitor Well
Monitor Well with Submerged Screen Interval
Production Well
Estimated Groundwater Elevation Contour (Contour Interval = 5 ft)
Inferred Flow Direction and Hydraulic Gradient (ft/ft)
Approximate Perchlorate Source Area

ADEQ MW-7 = Monitoring Well Location
(1132.49) = Groundwater Elevation (ft amsl)

Notes:
-ft amsl: feet above mean sea level
-NDS: Nammo Defense Systems, Inc.
-NM: Not Measured
-* Not used for contouring
-NT-12D is a deep well.
-Approximate perchlorate source area is within the vicinity of WBO-1 and HPA-1.

N

0 750 1,500 Feet

Groundwater Elevations and Contours in Shallow Wells
March 2020
Nammo Defense Systems, Inc. Plant #3
Mesa, Arizona

Geosyntec consultants

Phoenix, AZ | September 2020

Figure 3

SantaBarbara-01\D:\WorkingFromSB\SP0101 - Nammo Talley\Workplan2020\Projects\WorkplanFigures2020\WorkplanFigures2020.aprx 9/4/2020 (Author: JGordon) 3:05 PM

Monitor Well with Screen Interval Across the Static Groundwater Level

Monitor Well with Submerged Screen Interval

Extraction Well Location

Industrial Water Supply/ Irrigation Well Location

Well Not Accessible or Not In Service or Damaged

Production Well

Approximate Proposed Monitoring Well Installation Area

NT-5 = Monitoring Well Location
357 = Perchlorate Concentration (µg/l)

Extent of Estimated Perchlorate Concentration in Groundwater 1st Quarter 2020 (Dashed Where Inferred)

Approximate Perchlorate Source Area

0 1,500 Feet

N

Notes:
-NDS: Nammo Defense Systems, Inc
-<: concentration was below the indicated laboratory reporting limit
-*: Well not used for contouring due to well screen >100 ft deeper than surrounding wells, resulting in groundwater grab sample results from the deeper portion of the upper alluvial unit.
-Maximum result is shown for duplicate detections and locations with multiple depths
-Arizona Health Based Guidance Level for Perchlorate is 14 µg/l
-Approximate perchlorate source area is within the vicinity of WBO-1 and HPA-1

Existing Monitor Wells and Proposed Monitor Well Locations

Nammo Talley Inc. Plant #3
Mesa, Arizona

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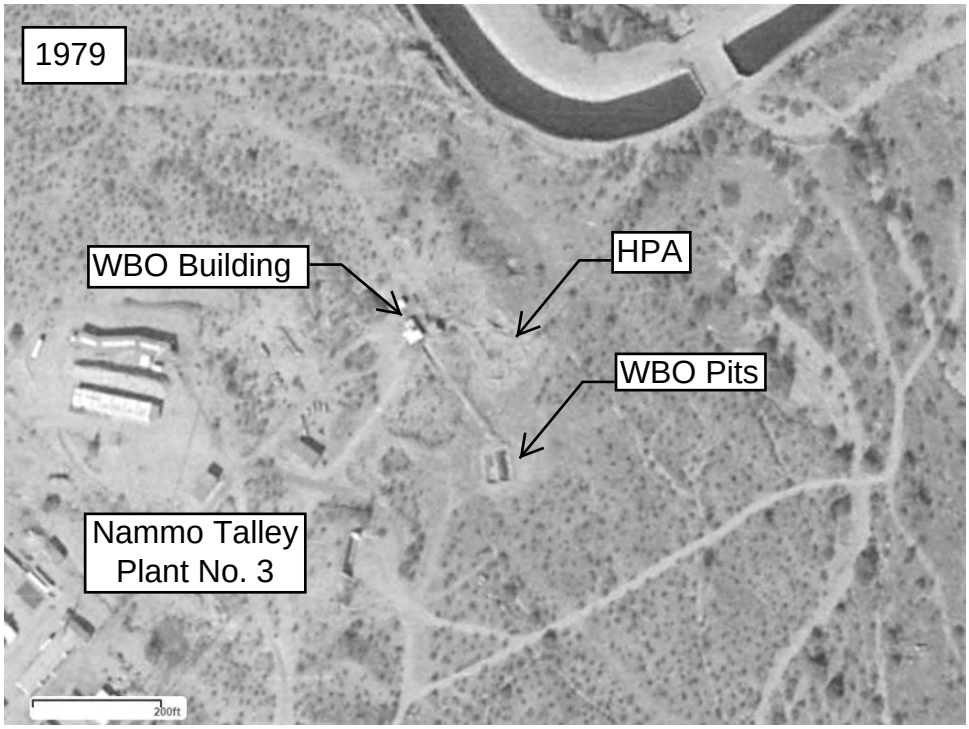
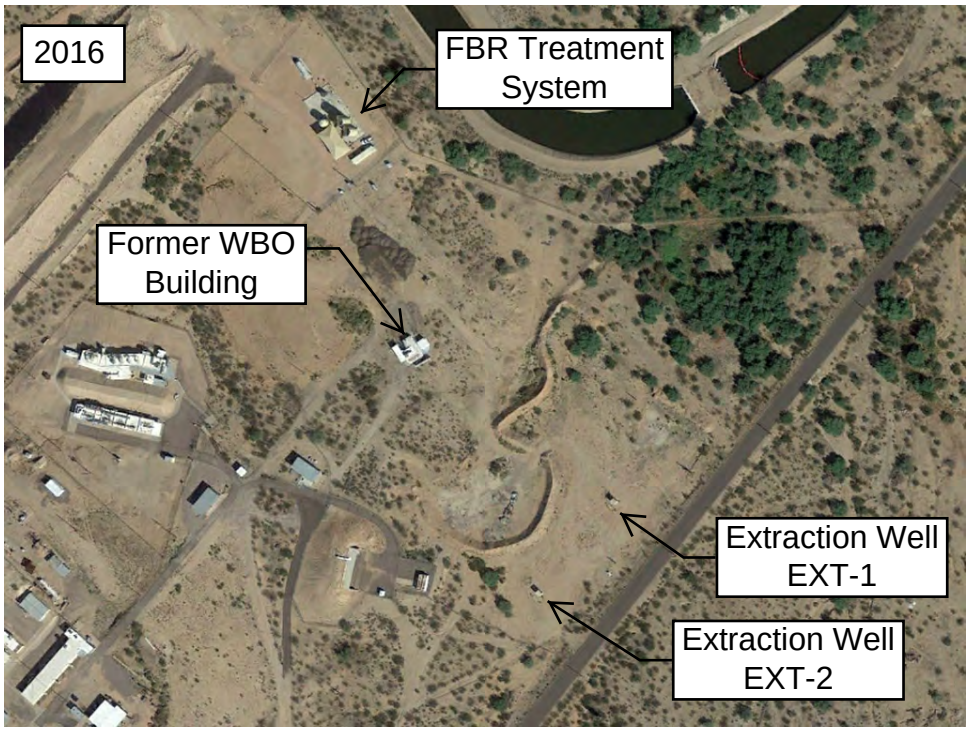
Phoenix, AZ | April 2021

Figure 4

SantaBarbara-01\P:\GIS\SP0101 - Nammo\Source\TransferedFromSanDiego\WorkingFromSB\WorkingFromSB\SP0101 - Nammo Talley\Projects\2020\WorkPlan2020\ExistingandProposedWellsPerchlorate_Contours_1Q2020.mxd 4/20/2021 (Author: MBradford) 8:11:39 AM





Former WBO Pits Perchlorate Source Area

Nammo Talley Plant No. 3, Mesa, Arizona

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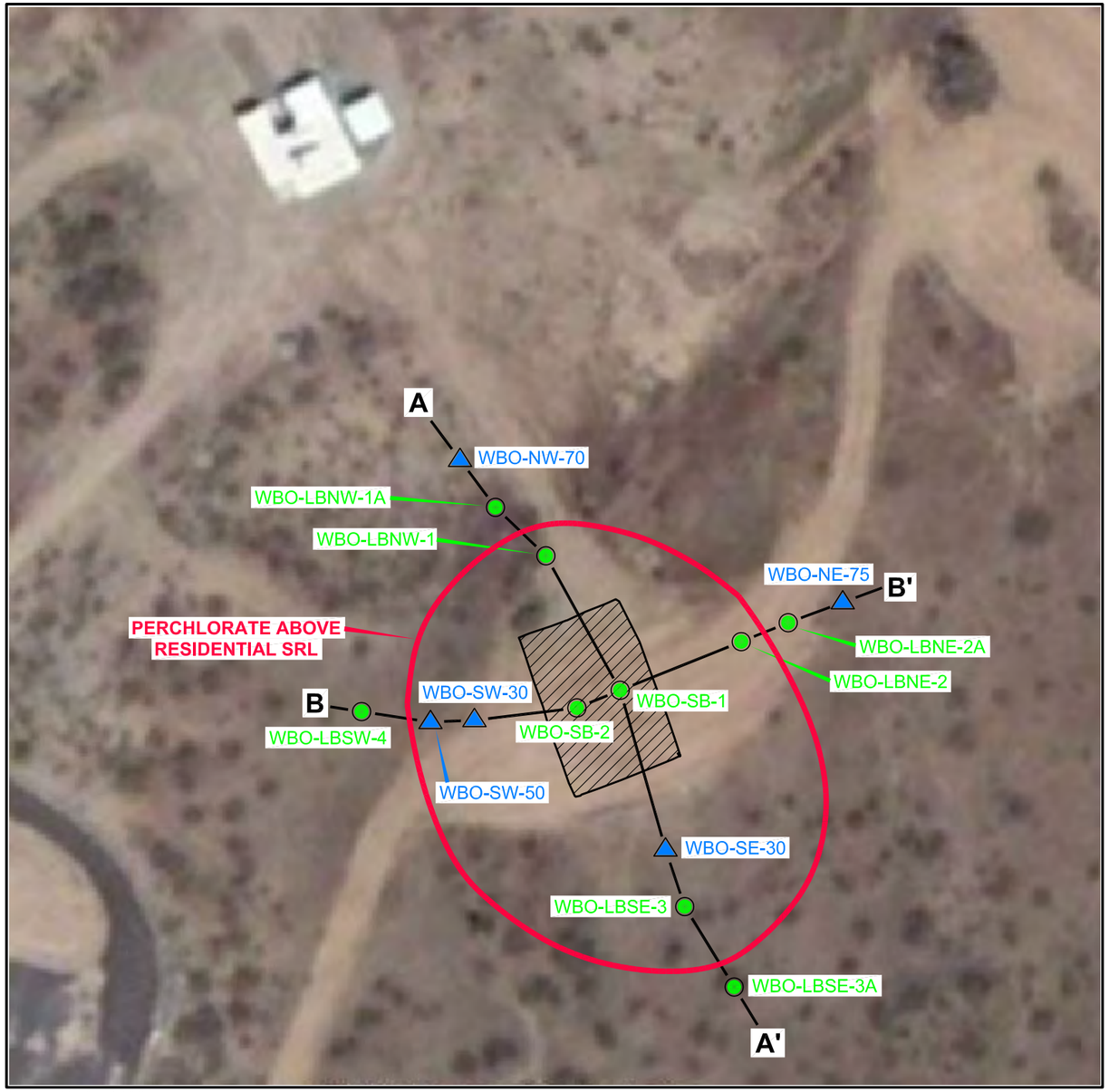
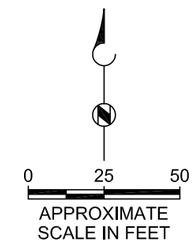
Figure **5**

Phoenix, AZ | March 2017



AERIAL SOURCE: GOOGLE EARTH



EXPLANATION

- WBO-SB-1 BORING LOCATION
- WBO-SW-30 SAMPLE LOCATION
- WATER BORE OUT PITS

Source: Brown & Caldwell, 2007

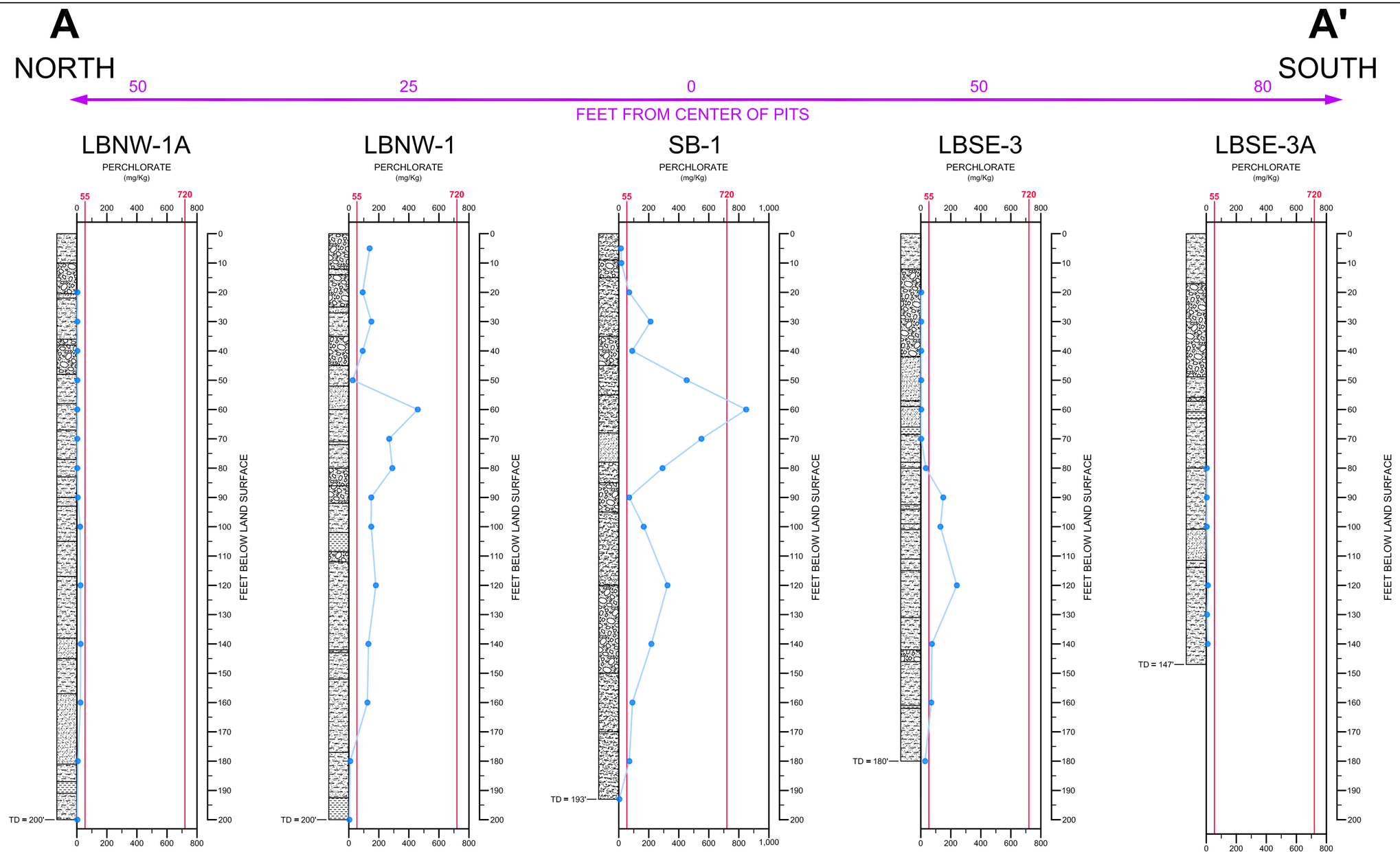
Site Plan
Lateral Extent of Perchlorate Concentration to Residential SRL (2007)

Nammo Talley Plant No. 3, Mesa, Arizona

Geosyntec consultants

Phoenix, AZ | March 2017

Figure **6**



EXPLANATION

- GRAVEL / GRAVEL MIXTURES
- SAND
- SAND / FINES MIXTURES
- CLAY

Source: Brown & Caldwell, 2007

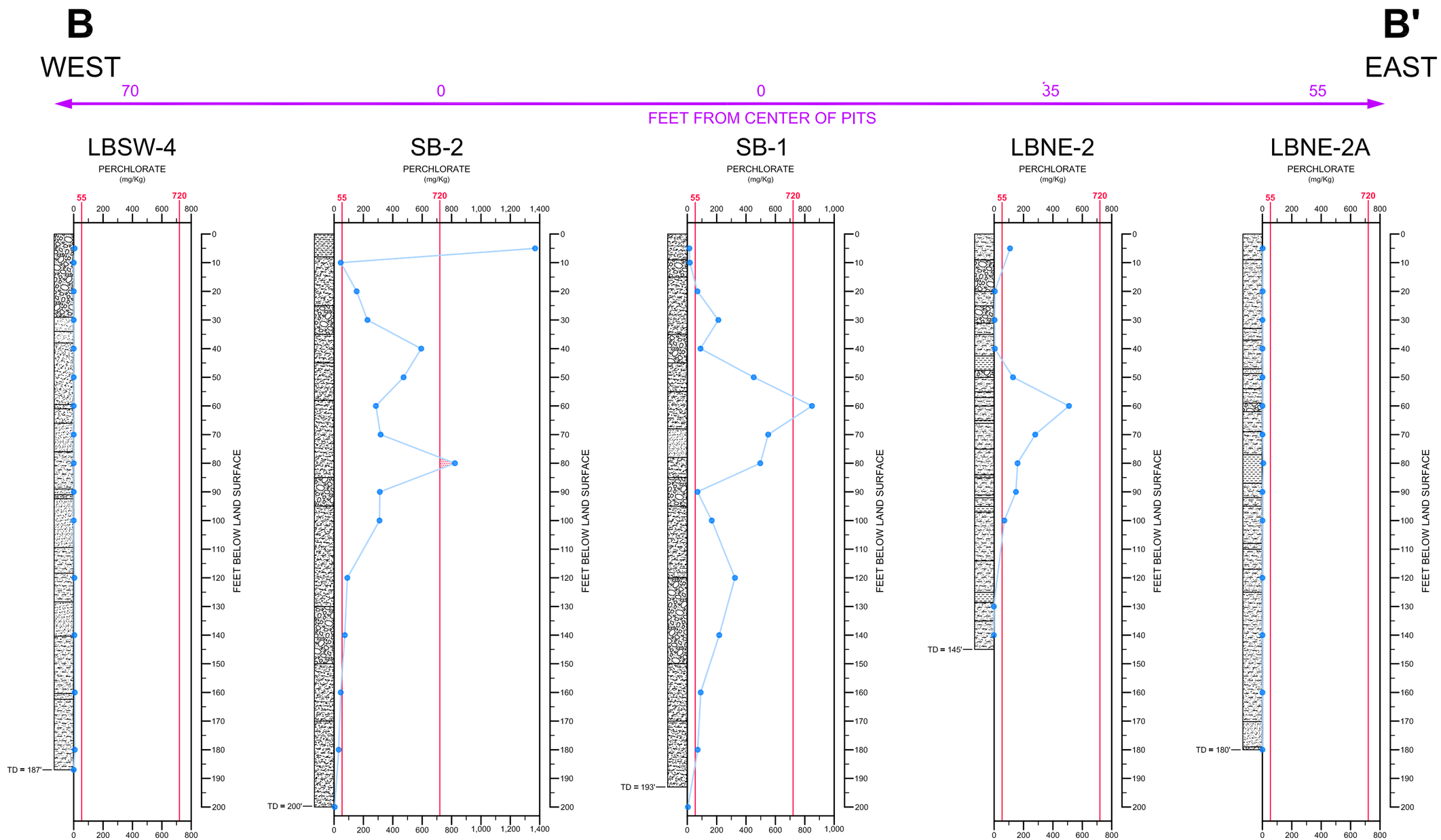
Section A-A' Boring Log with Perchlorate Concentrations (2007)

Nammo Talley Plant No. 3, Mesa, Arizona

Geosyntec consultants

Phoenix, AZ | March 2017

Figure 7



SECTION B-B' BORING LOG
WITH PERCHLORATE
CONCENTRATIONS

EXPLANATION

- GRAVEL / GRAVEL MIXTURES
- SAND
- SAND / FINES MIXTURES
- CLAY

Source: Brown & Caldwell, 2007

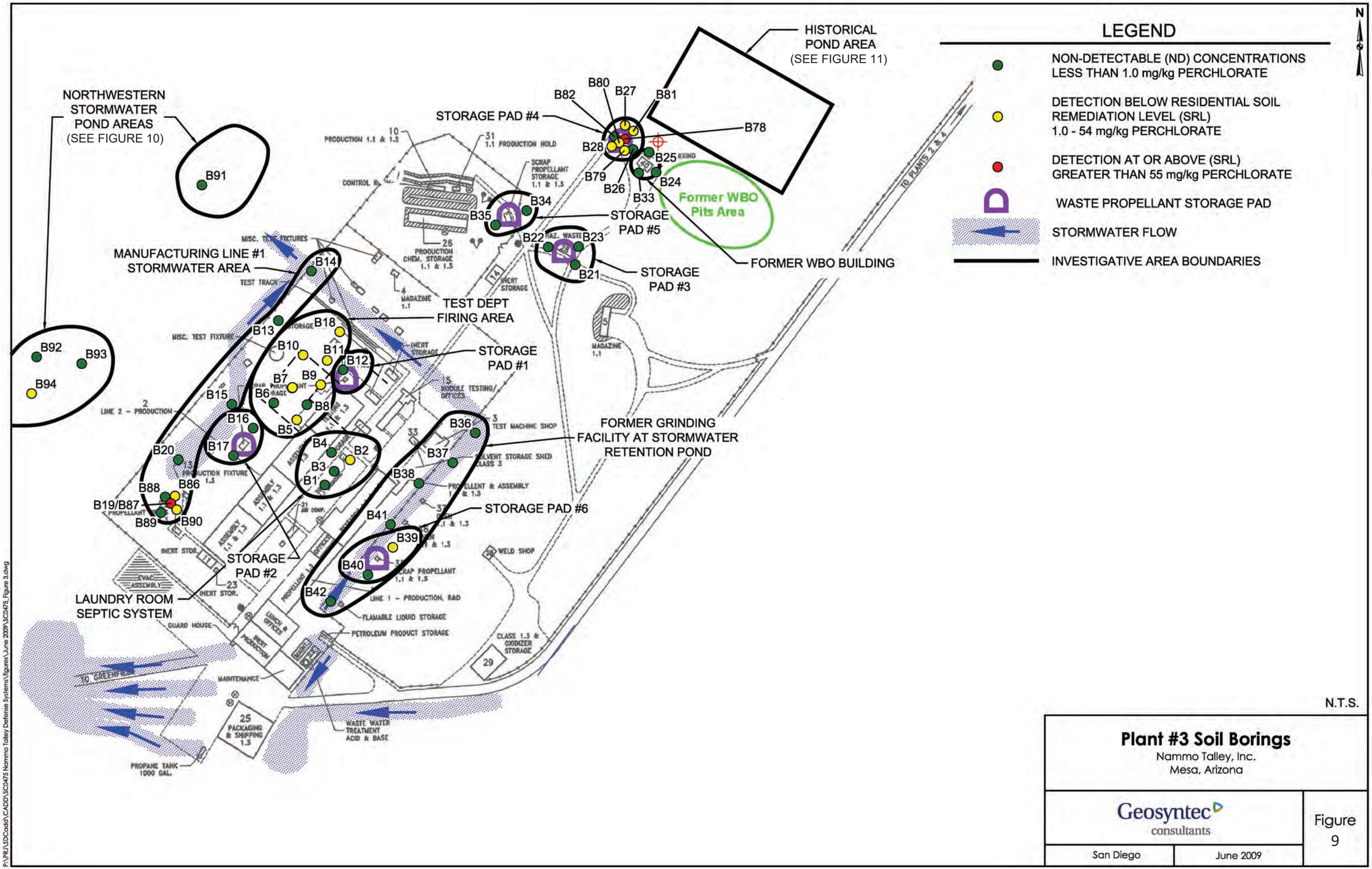
Section B-B' Boring Log with Perchlorate Concentrations (2007)

Nammo Talley Plant No. 3, Mesa, Arizona

Geosyntec consultants

Phoenix, AZ | March 2017

Figure **8**



N.T.S.

Plant #3 Soil Borings
Nammo Talley, Inc.
Mesa, Arizona

Geosyntec consultants

San Diego | June 2009

Figure 9

Legend

- Non-Detectable (ND) Concentration Less Than 1.0 mg/kg Perchlorate
- Detection Below Residential Soil Remediation Level (SRL) 1.0 - 54 mg/kg Perchlorate
- Investigative Area Boundary

Microsoft Virtual Earth Aerial.

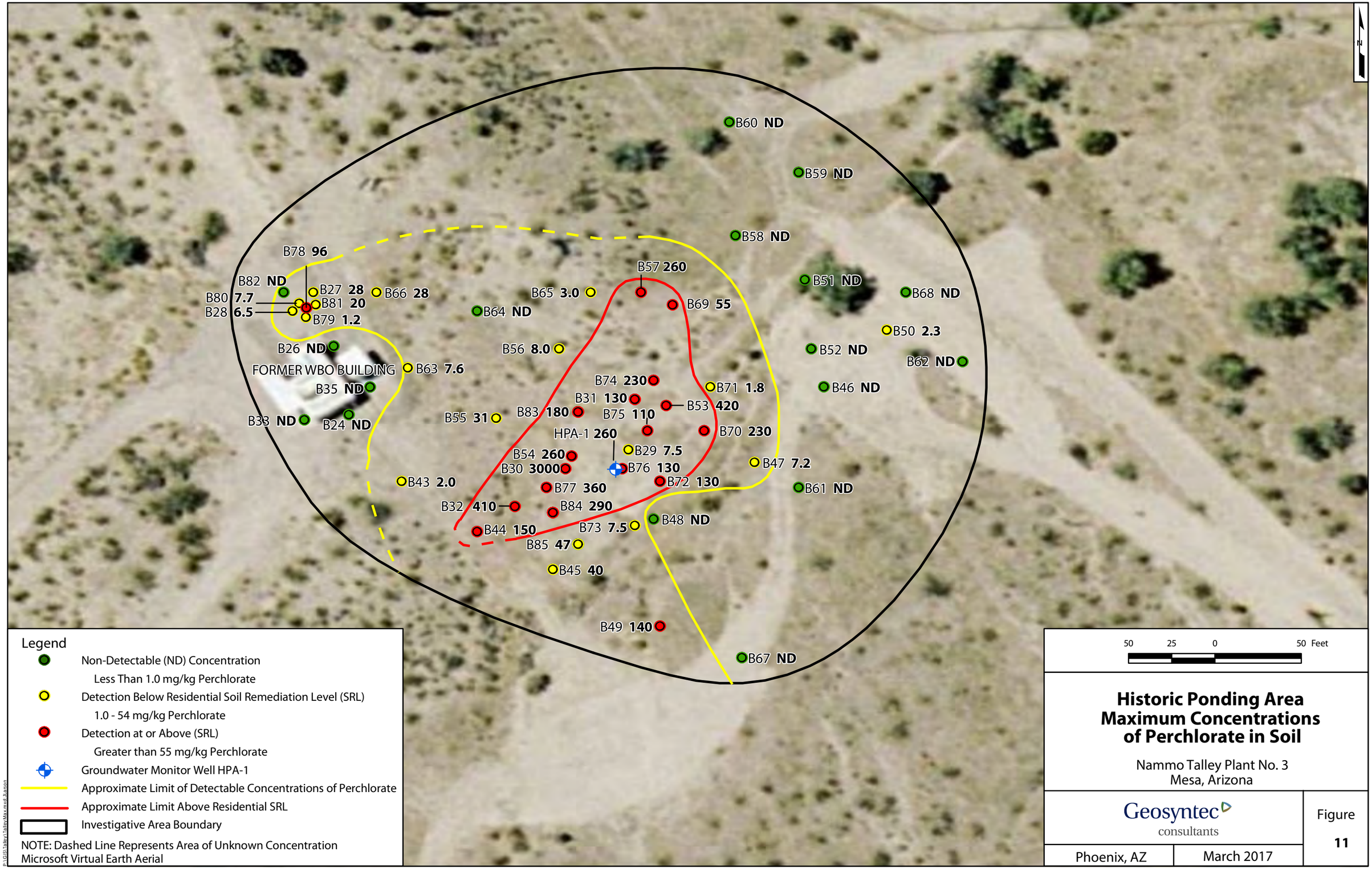
Plant #3 Northwestern Pond Sample Locations

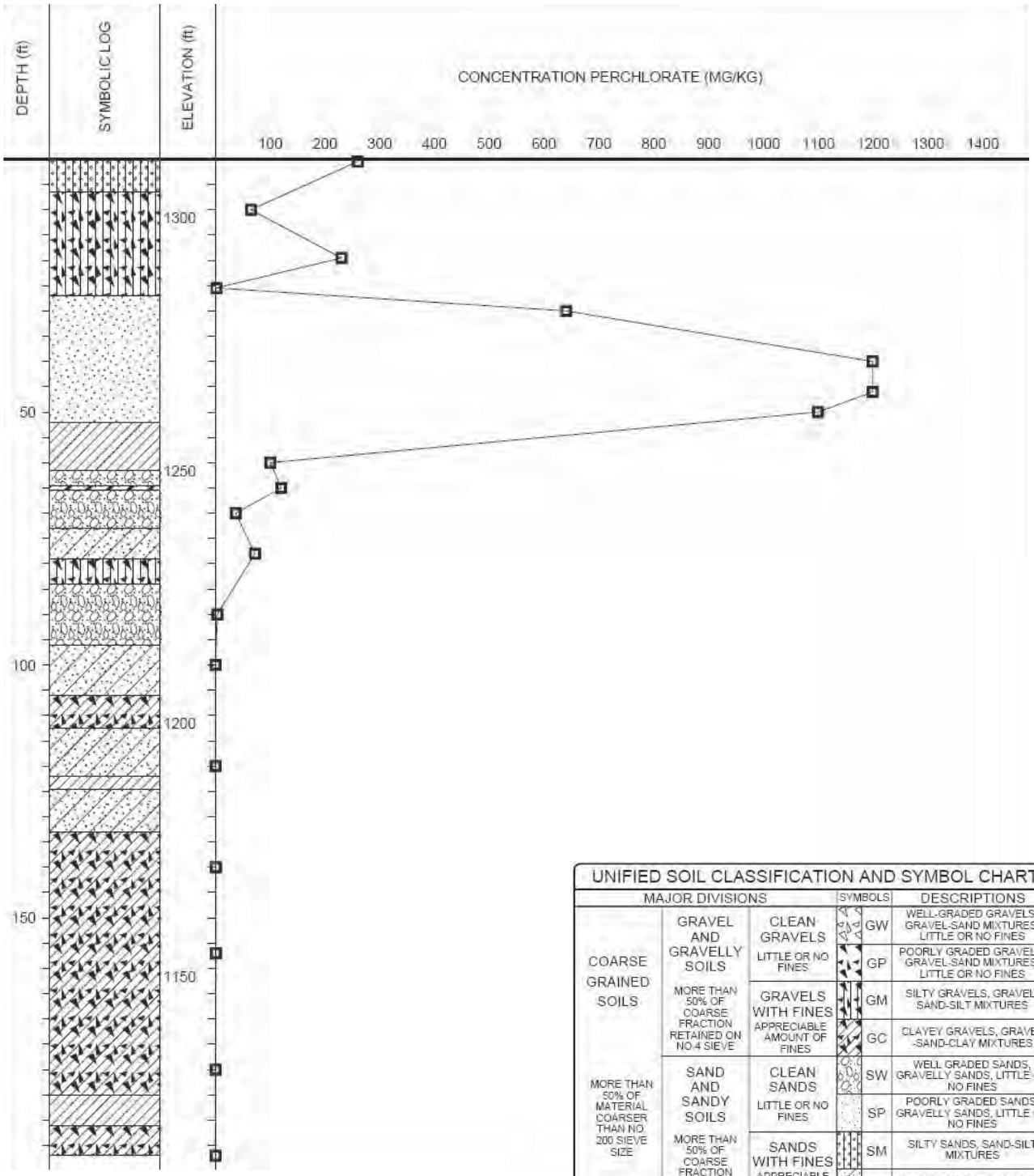
Nammo Talley, Inc.
Mesa, Arizona

Geosyntec consultants

San Diego | June 2009

Figure 10


B60 ND
B59 ND
B58 ND
B51 ND
B68 ND
B50 2.3
B52 ND
B62 ND
B46 ND
B47 7.2
B61 ND
B48 ND
B67 ND
B49 140
B78 96
B82 ND
B80 7.7
B28 6.5
B27 28
B81 20
B79 1.2
B66 28
B64 ND
B65 3.0
B57 260
B69 55
B26 ND
FORMER WBO BUILDING
B63 7.6
B56 8.0
B35 ND
B33 ND
B24 ND
B55 31
B74 230
B71 1.8
B31 130
B53 420
B83 180
B75 110
HPA-1 260
B70 230
B29 7.5
B54 260
B30 3000
B76 130
B72 130
B43 2.0
B77 360
B32 410
B84 290
B44 150
B73 7.5
B85 47
B45 40
Legend
Non-Detectable (ND) Concentration
Less Than 1.0 mg/kg Perchlorate
Detection Below Residential Soil Remediation Level (SRL)
1.0 - 54 mg/kg Perchlorate
Detection at or Above (SRL)
Greater than 55 mg/kg Perchlorate
Groundwater Monitor Well HPA-1
Approximate Limit of Detectable Concentrations of Perchlorate
Approximate Limit Above Residential SRL
Investigative Area Boundary
NOTE: Dashed Line Represents Area of Unknown Concentration
Microsoft Virtual Earth Aerial
50 25 0 50 Feet
Historic Ponding Area
Maximum Concentrations
of Perchlorate in Soil
Nammo Talley Plant No. 3
Mesa, Arizona
Geosyntec consultants
Figure
11
Phoenix, AZ
March 2017
P:\GIS\Talley\TalleyMax.mxd: Jhanson



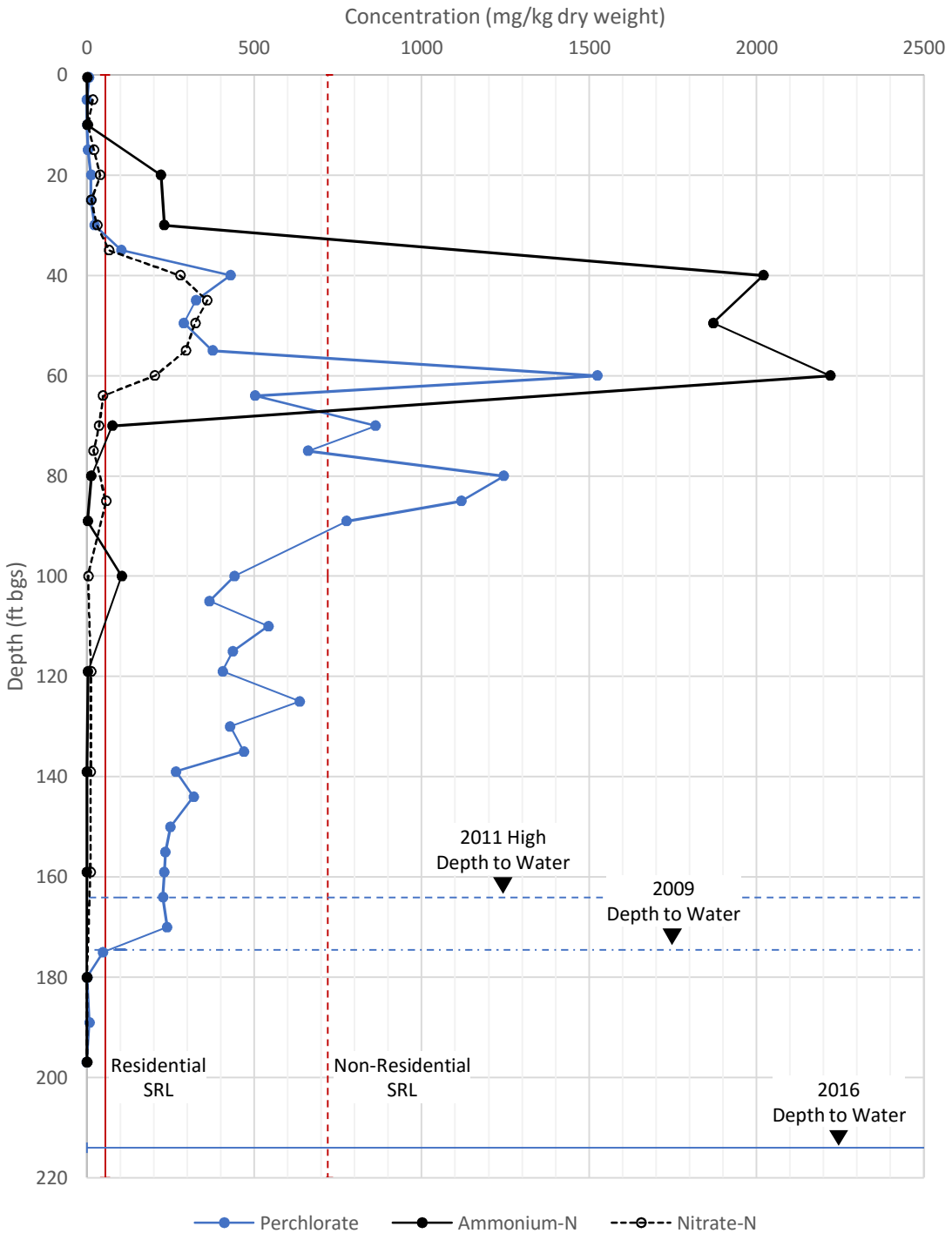
UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART				
MAJOR DIVISIONS			SYMBOLS	DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS LITTLE OR NO FINES	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO.4 SIEVE		GP	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES APPRECIABLE AMOUNT OF FINES	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
MORE THAN 50% OF MATERIAL COARSER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	CLEAN SANDS LITTLE OR NO FINES	SW	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
			SP	POORLY GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION PASSING NO.4 SIEVE	SANDS WITH FINES APPRECIABLE AMOUNT OF FINES	SM	SILTY SANDS, SAND-SILT MIXTURES
			SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL FINER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILT
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENT
NOTE: DUAL SYMBOLS USED FOR BORDERLINE CLASSIFICATIONS				

HPA Soil Profile Results (2009)
Nammo Talley Plant No. 3
Mesa, Arizona

Geosyntec consultants

Figure **12**

Phoenix, AZ | March 2017



Former WBO Pits Soil Profile Results (2009)

Nammo Talley Plant No. 3, Mesa, Arizona

Geosyntec consultants

Figure **13**

Phoenix, AZ | March 2017

300 150 0 300 Feet

Approximate Boring Locations

Supplemental Source Investigation
Nammo Talley Inc. Plant #3
Mesa, Arizona

Legend

Groundwater Monitor Well

Approximate Boring Location

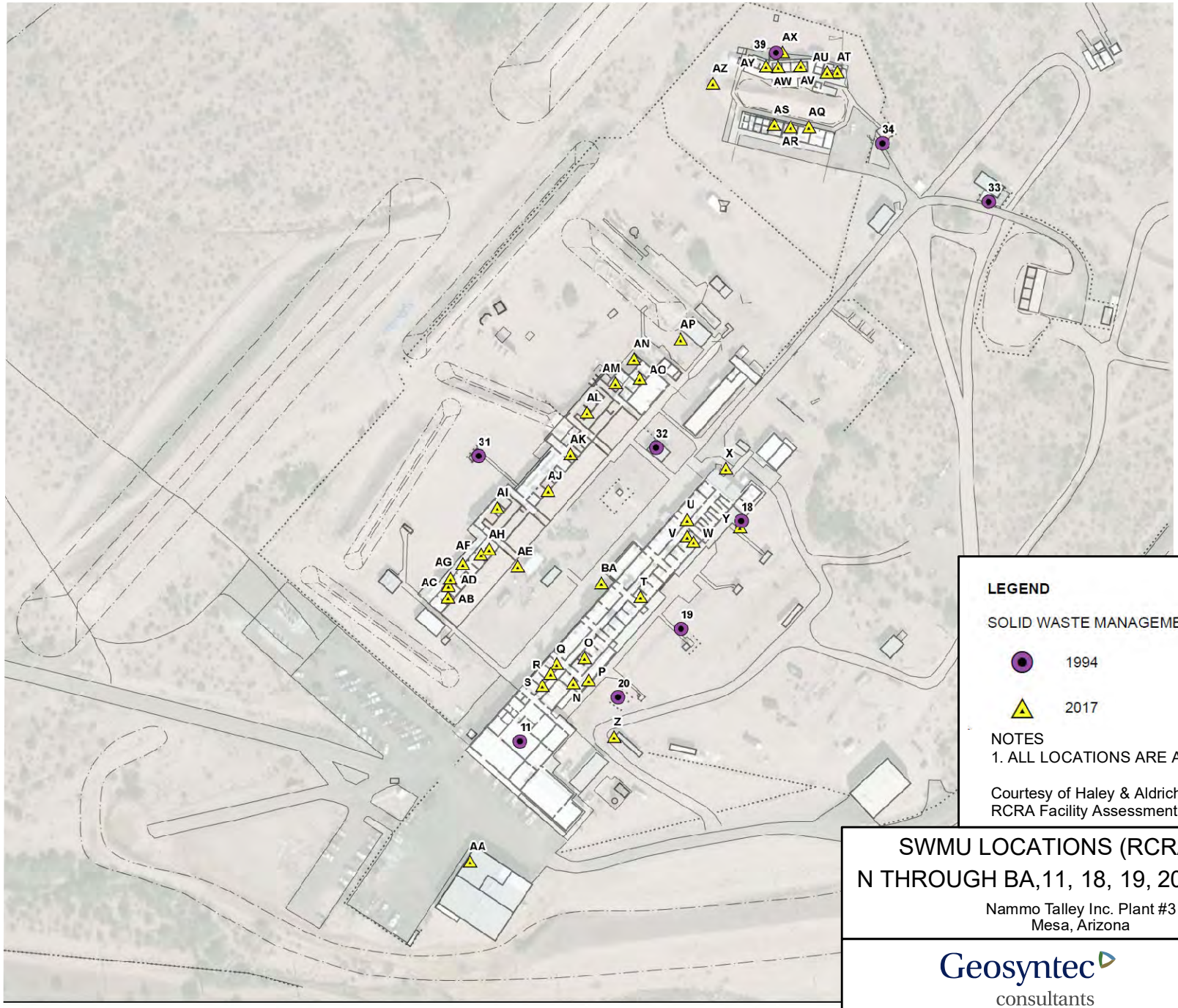
Microsoft Virtual Earth Aerial

Geosyntec consultants

San Diego | September 2010

Figure 14

P:\GIS\SC0475_Mesa\P:\GIS\Talley\SupplementalBorings.mxd



LEGEND

SOLID WASTE MANAGEMENT UNIT (SWMU)

1994

2017

NOTES
1. ALL LOCATIONS ARE AP P ROXIMATE

Courtesy of Haley & Aldrich 2017 Updated RCRA Facility Assessment Report

SWMU LOCATIONS (RCRA 2017)
N THROUGH BA,11, 18, 19, 20, 34, 39, 42

Nammo Talley Inc. Plant #3
Mesa, Arizona

Geosyntec consultants

Phoenix, AZ | September 2020

Figure 15

SantaBarbara-01\D:\WorkingFromSB\SP0101 - Nammo Talley\Projects\2020\WorkPlan2020\SWMUS HA FigureLayoutGraphic.mxd 9/4/2020 (Author: JGordon) 6:00:07 PM

Legend

- Pond Grab Sample
- Industrial Water Supply/ Irrigation Well Location
- Approximate Drake Property Boundary

Slump Rack = Sample Location
27.9 = Perchlorate Concentration (µg/l)

N

0 300 Feet

Drake Materials Facility Map and Sample Locations

Nammo Talley Inc. Plant #3
Mesa, Arizona

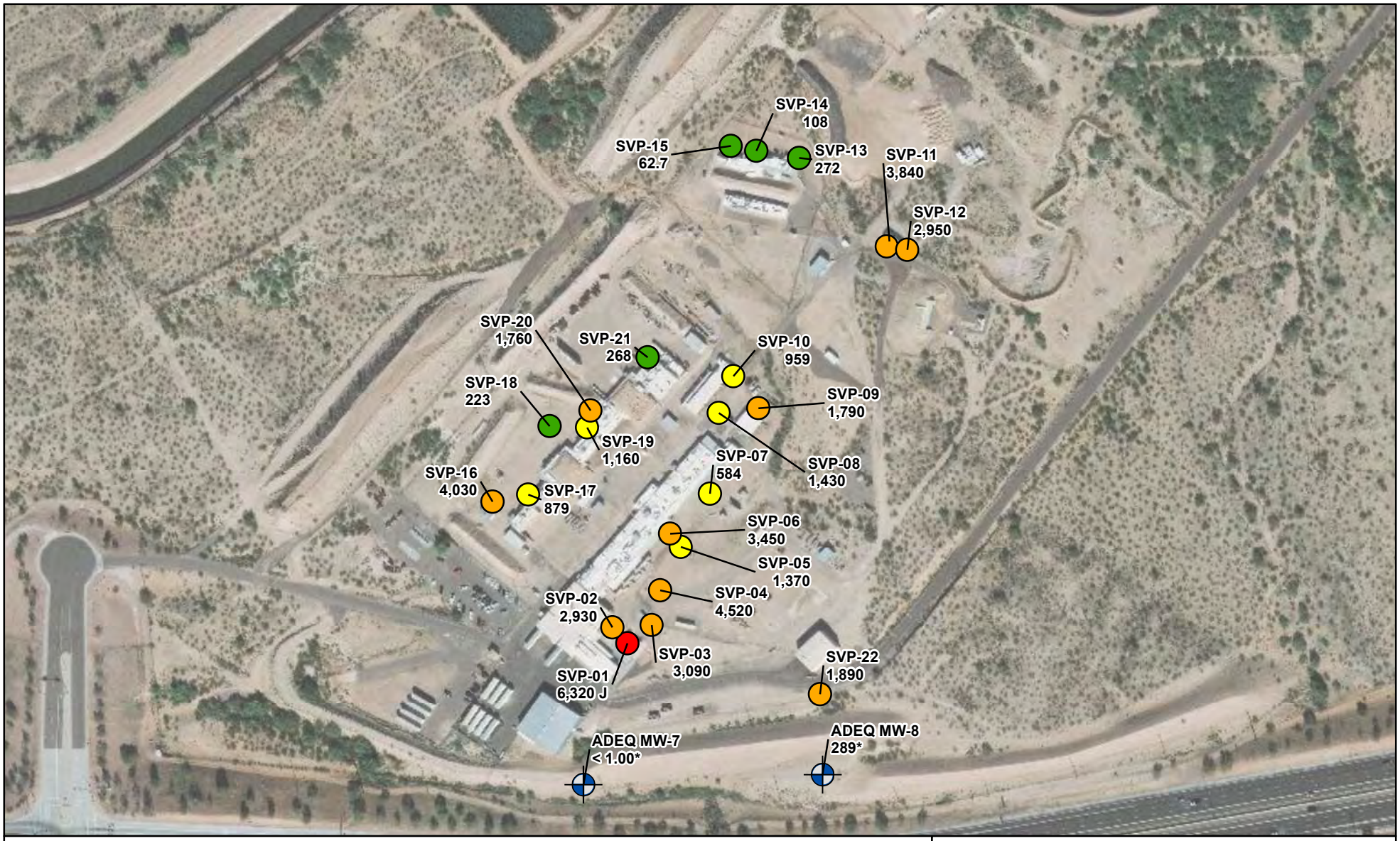
Geosyntec consultants

Phoenix, AZ | September 2020

Figure 16

SantaBarbara-01\D:\WorkingFromSB\SP0101 - Nammo Talley\Projects\December 2019\DrakeMaterialsFacility.mxd 1/22/2020 (Author: JGordon) 10:14:46 AM

Notes:



Legend

- 0 - 291
- 292 - 1,500
- 1,501 - 5,000
- 5,001 - 10,000
- Monitoring Well

Notes:
Units are in µg/m^3
Non-detect results are indicated by ">" followed by the laboratory RL.
*Groundwater concentrations from 1Q 2020 groundwater quarterly sampling event in ug/L
J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample

N

0 300 Feet

Soil Vapor TCE Results
5' Depth

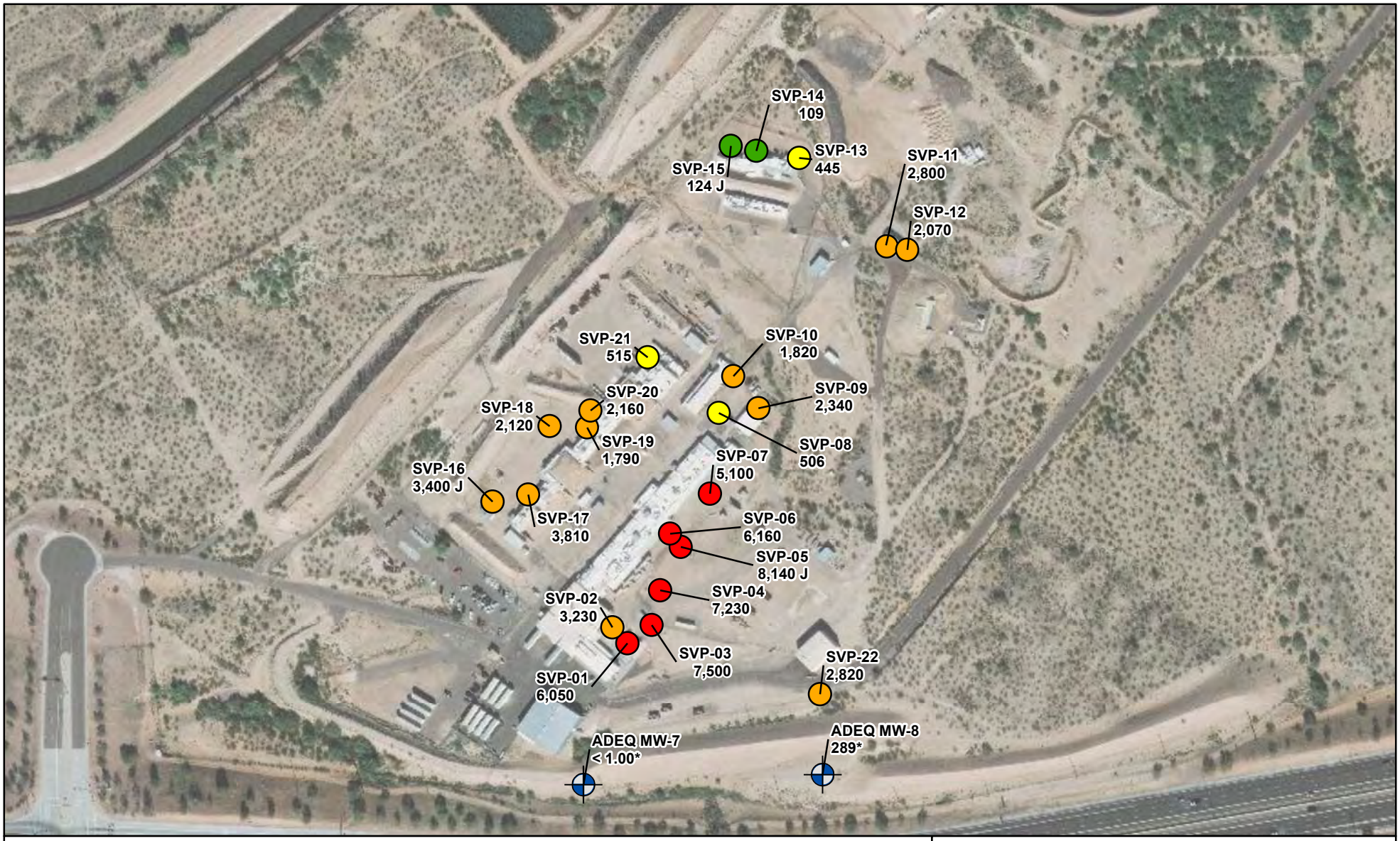
Nammo Defense Systems, Inc. Plant 3
Mesa, Arizona

Geosyntec consultants

Phoenix, AZ | June 2020

Figure 17

SantaBarbara-01\P:\GIS\SP0101 - Nammo Talley\Projects\2020 Plant 3 Soil Vapor Monitoring\Fig02_NammoTalley_SoilVapor_Heatmap_05ft_TCE.mxd 6/12/2020 (Author: PFitzgibbon) 2:23:13 PM



Legend

- 0 - 291
- 292 - 1,500
- 1,501 - 5,000
- 5,001 - 10,000
- Monitoring Well

Notes:
Units are in µg/m^3
Non-detect results are indicated by ">" followed by the laboratory RL.
*Groundwater concentrations from 1Q 2020 groundwater quarterly sampling event in ug/L
J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample

N

0 300 Feet

Soil Vapor TCE Results
15' Depth

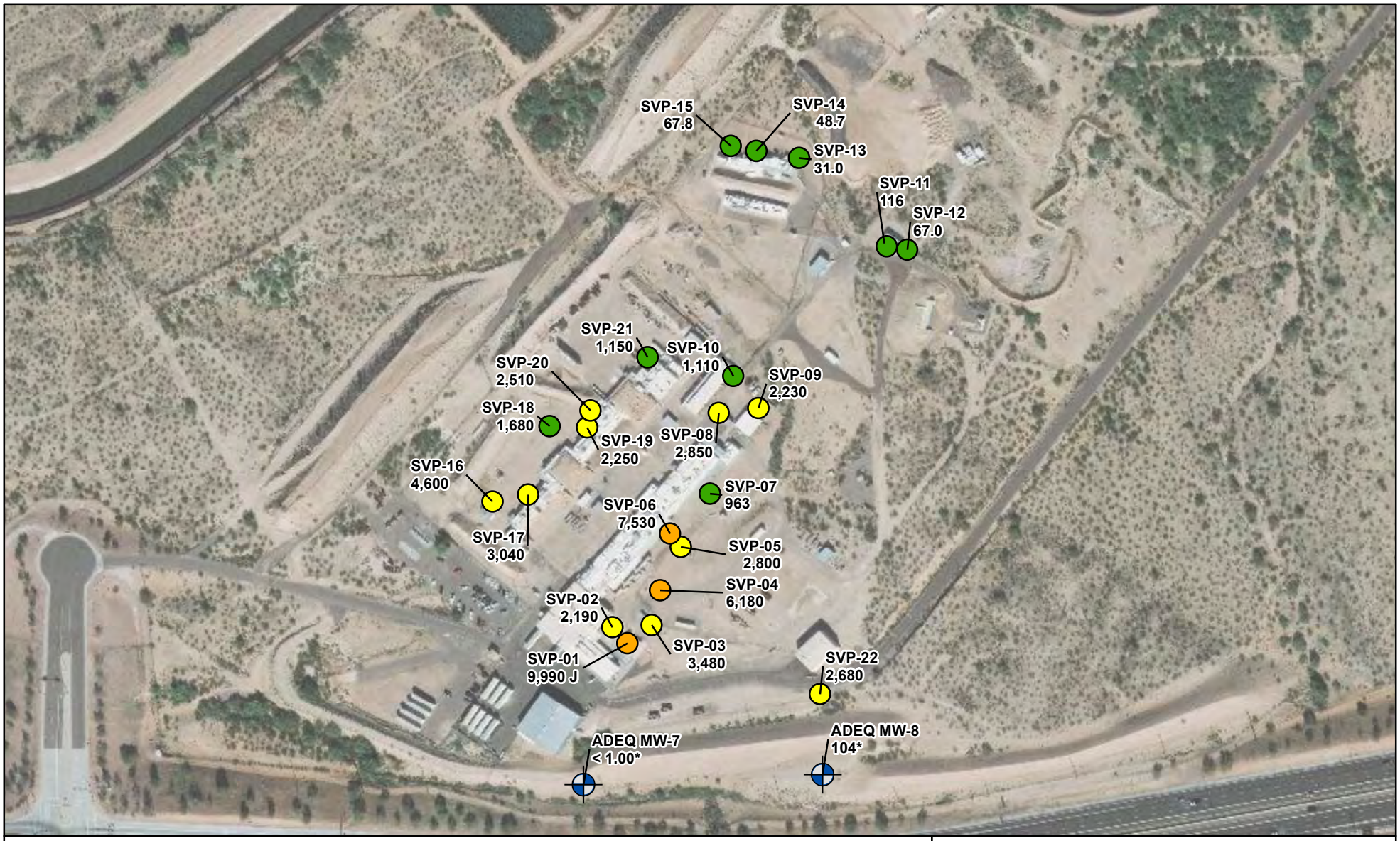
Nammo Defense Systems, Inc. Plant 3
Mesa, Arizona

Geosyntec consultants

Phoenix, AZ | June 2020

Figure 18

SantaBarbara-01\P:\GIS\SP0101 - Nammo Talley\Projects\2020 Plant 3 Soil Vapor Monitoring\Fig03_NammoTalley_SoilVapor_Heatmap_15ft_TCE.mxd 6/12/2020 (Author: PFitzgibbon) 2:26:55 PM



Legend

- 0 - 2,000
- 2,001 - 5,000
- 5,001 - 10,000
- 10,001 - 20,000
- Monitoring Well

Notes:
Units are in µg/m^3
Non-detect results are indicated by ">" followed by the laboratory RL.
*Groundwater concentrations from 1Q 2020 groundwater quarterly sampling event in ug/L
J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample

N

0 300 Feet

Soil Vapor 1,1-DCE Results
5' Depth

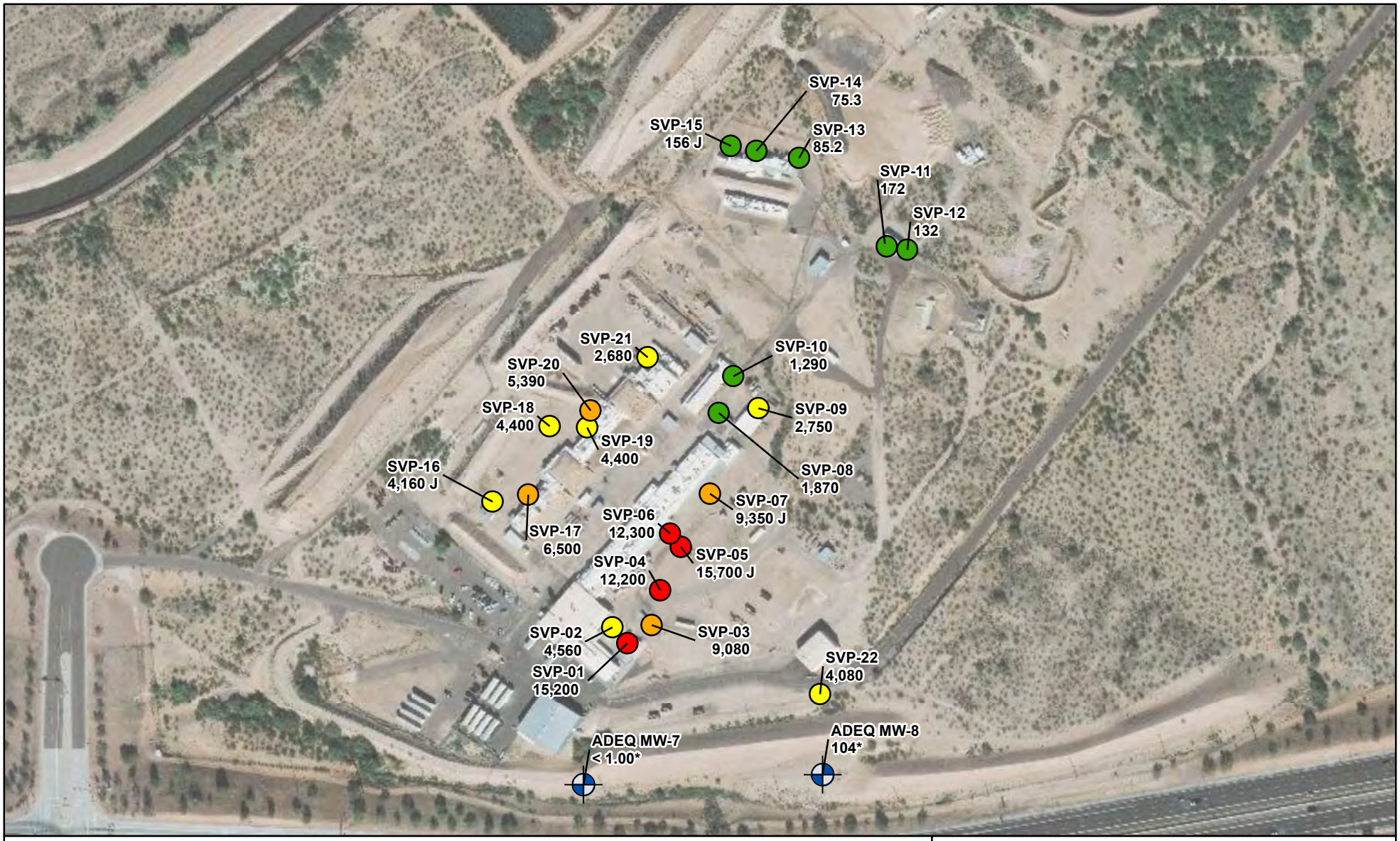
Nammo Defense Systems, Inc. Plant 3
Mesa, Arizona

Geosyntec consultants

Phoenix, AZ | June 2020

Figure 19

SantaBarbara-01\P:\GIS\SP0101 - Nammo Talley\Projects\2020 Plant 3 Soil Vapor Monitoring\Fig04_NammoTalley_SoilVapor_Heatmap_05ft_11DCE.mxd 6/12/2020 (Author: PFitzgibbon) 2:36:30 PM



Legend

- 0 - 2,000
- 2,001 - 5,000
- 5,001 - 10,000
- 10,001 - 20,000
- Monitoring Well

Notes:
Units are in µg/m^3
Non-detect results are indicated by ">" followed by the laboratory RL.
*Groundwater concentrations from 1Q 2020 groundwater quarterly sampling event in ug/L
J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample

N

0 300 Feet

Soil Vapor 1,1-DCE Results
15' Depth

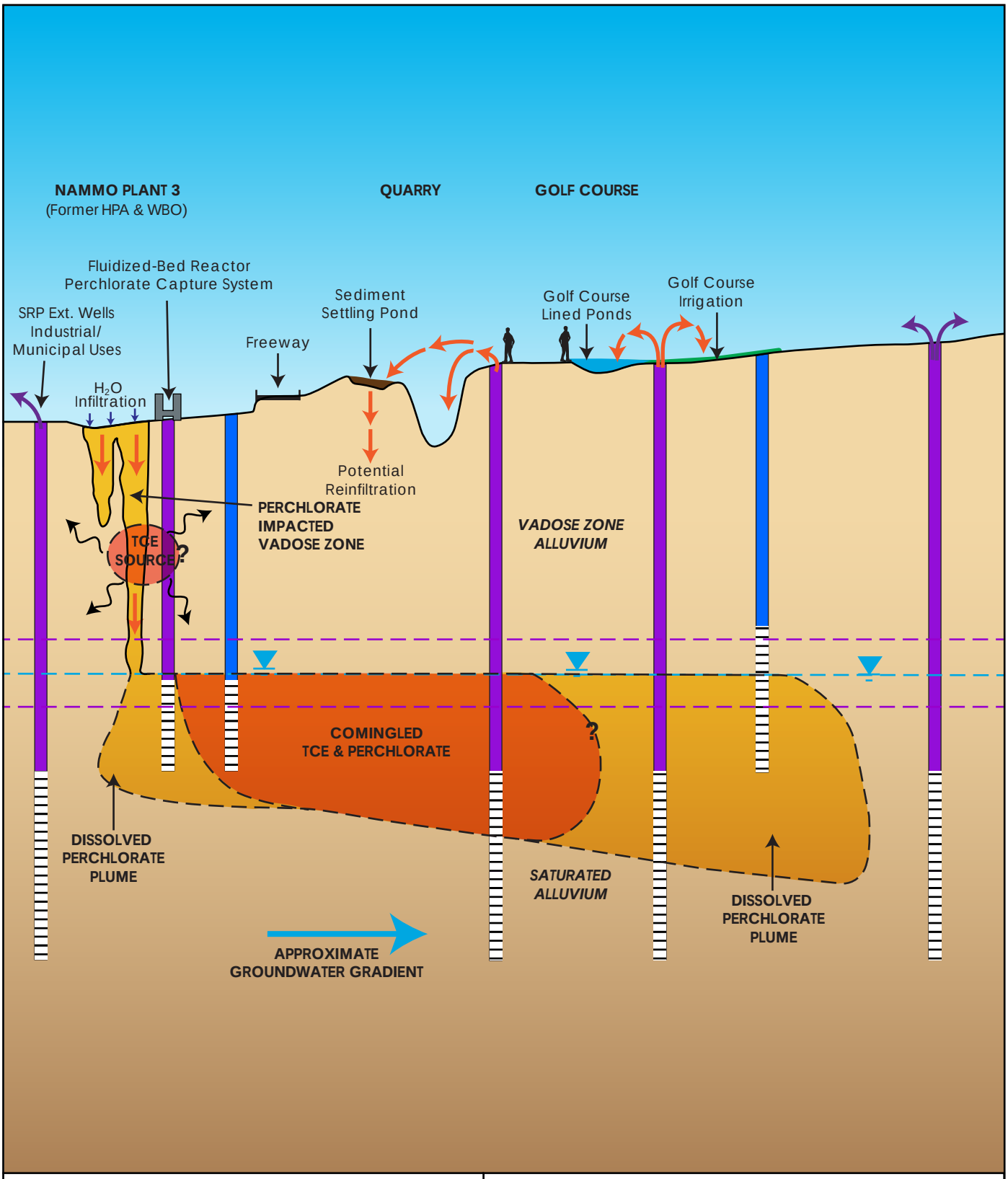
Nammo Defense Systems, Inc. Plant 3
Mesa, Arizona

Geosyntec consultants

Phoenix, AZ | June 2020

Figure 20

SantaBarbara-01\P:\GIS\SP0101 - Nammo Talley\Projects\2020 Plant 3 Soil Vapor Monitoring\Fig05_NammoTalley_SoilVapor_Heatmap_15ft_11DCE.mxd 6/12/2020 (Author: PFitzgibbon) 2:40:41 PM



Legend

Fluctuating Groundwater Level

Approximate Groundwater Table

Monitoring Well

Extraction Well

Notes:
1. Alluvium is defined as: "Interbedded, sands, gravels, caliche with minor silt components. Representative boring logs provided from SRP 33.3E-7.5N, NT-12D, WBO-1, and Longbow Golf Course exploration boring No. 55-552879."
2. According to the golf course the ponds located at their course are lined.

Plant 3 Conceptual Site Model

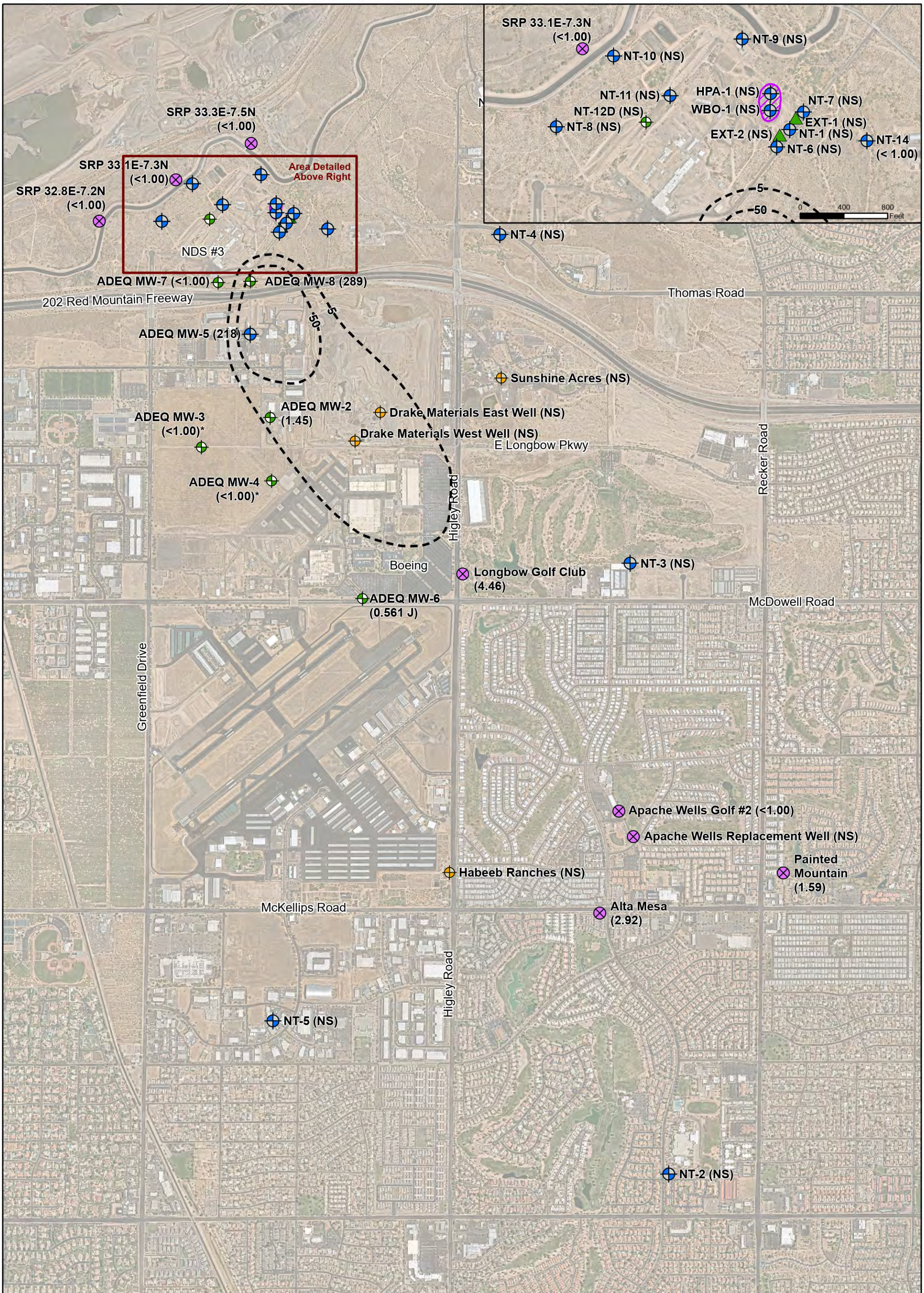
Nanno Defense Systems, Inc.
Mesa, Arizona

Geosyntec consultants

Phoenix, AZ | April 2021

Figure 21

Plant 3 CSM_SP0101J.ai



Extraction Well
Inaccessible Well
Industrial/Irrigation Well
Monitor Well
Monitor Well with Submerged Screen Interval
Estimated TCE concentration contour (µg/l)
Approximate Perchlorate Source Area

Alta Mesa = Monitoring Well Location
(2.92) = Trichloroethene (TCE) Concentration in micrograms per liter (µg/l)

Notes:
-<: concentration was below the indicated laboratory reporting limit
-NDS: Nammo Defense Systems, Inc
-NS: not sampled for TCE in this monitoring event
-J: The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
-Maximum result is shown for duplicate detections
-*: Well not used for contouring due to well screen >100 ft deeper than surrounding wells, resulting in groundwater grab sample results from the deeper portion of the upper alluvial unit.
-Approximate perchlorate source area is within the vicinity of WBO-1 and HPA-1

N

0 750 1,500 Feet

Trichloroethene Concentrations and Contours
March 2020
Nammo Defense Systems, Inc. Plant #3
Mesa, Arizona

Geosyntec consultants

Phoenix, AZ | September 2020

Figure 22

SantaBarbara-01\D:\WorkingFromSB\SP0101 - Nammo Talley\Workplan2020\Projects\WorkplanFigures2020\WorkplanFigures2020.aprx 9/4/2020 (Author: JGordon) 3:05 PM

Legend

- Proposed Soil Boring Locations
- Proposed Surface Soil Sample Location
- Inaccessible Sediment Settling Ponds
- Accessible Old Sediments Ponds
- Drake Material Facilities Grab Sample
- Industrial Water Supply/Irrigation Well Location
- Approximate Drake Property Boundary

N

0 300 Feet

Drake materials Facility Map and Proposed Soil Sampling Locations

Nammo Inc. Plant #3
Mesa, Arizona

Geosyntec consultants

Phoenix, AZ | February 2020

Figure 23

SantaBarbara-01\P:\GIS_SanDiego01\WorkingFromSB\SP0101 - Nammo Talley\Projects\December 2019\DrakeMaterialsFacilityProposedSoilSamplingLocs.mxd 2/17/2020 (Author: JGordon) 11:31:00 AM

TABLES

TABLE 1: WELL INFORMATION AND GROUNDWATER ELEVATIONS
Remedial Investigation Work Plan
Former WBO Facility, Nammo Defense Systems, Inc. Plant No. 3
Mesa, Arizona
September 2020

Monitor Well ID	Measuring Point Elevation (ft amsl)	Screened Interval (ft btoc)	Screened Interval (ft amsl)	Transducer (ft btoc)	Date	Depth to Water (ft btoc)	Groundwater Elevation (ft amsl)
NT-1	1312.07	107-257	1205.07-1055.07	NA	2/3/2009	183.24	1128.83
					2/28/2009	181.93	1130.14
					7/28/2009	178.11	1133.96
					5/26/2010	170.65	1141.42
					7/12/2010	168.32	1143.75
					3/22/2011	167.75	1144.32
					10/6/2011	169.87	1142.20
					12/13/2011	173.13	1138.94
					12/15/2011	172.98	1139.09
					1/19/2012	174.06	1138.01
					2/20/2012	177.33	1134.74
					3/19/2012	178.58	1133.49
					4/16/2012	178.89	1133.18
					5/21/2012	180.20	1131.87
					6/18/2012	181.10	1130.97
					7/16/2012	181.92	1130.15
					8/20/2012	183.24	1128.83
					9/20/2012	185.85	1126.22
					10/15/2012	186.45	1125.62
					11/19/2012	187.24	1124.83
					12/17/2012	186.32	1125.75
					3/18/2013	187.60	1124.47
					6/17/2013	189.30	1122.77
					9/16/2013	191.15	1120.92
					12/16/2013	194.77	1117.30
				205	3/18/2014	195.47	1116.60
					6/19/2014	199.09	1112.98
					9/17/2014	203.92	1108.15
				213	12/16/2014	205.15	1106.92
					3/18/2015	206.70	1105.37
					6/30/2015	209.61	1102.46
					9/22/2015	210.49	1101.58
					12/16/2015	210.80	1101.27
					1/13/2016	206.91	1105.16
					3/21/2016	208.02	1104.05
				227	6/20/2016	214.00	1098.07
					9/12/2016	209.07	1103.00
					12/13/2016	208.50	1103.57
					3/14/2017	203.30	1108.77
					6/5/2017	204.37	1107.70
					9/12/2017	201.22	1110.85
				NA	12/5/2017	196.12	1115.95
					3/28/2018	198.48	1113.59
					6/27/2018	204.60	1107.47
					9/11/2018	203.23	1108.84
					12/4/2018	206.43	1105.64
					3/21/2019	197.85	1114.22
					6/25/2019	193.73	1118.34
					9/24/2019	190.98	1121.09
					11/14/2019	194.80	1117.27
					3/11/2020	190.12	1121.95

TABLE 1: WELL INFORMATION AND GROUNDWATER ELEVATIONS
Remedial Investigation Work Plan
Former WBO Facility, Nammo Defense Systems, Inc. Plant No. 3
Mesa, Arizona
September 2020

Monitor Well ID	Measuring Point Elevation (ft amsl)	Screened Interval (ft btoc)	Screened Interval (ft amsl)	Transducer (ft btoc)	Date	Depth to Water (ft btoc)	Groundwater Elevation (ft amsl)
NT-2	1419.02	215-365	1204.02-1054.02	NA	9/16/2009	332.35	1086.67
					12/12/2011	307.65	1111.37
					1/19/2012	306.92	1112.10
					2/20/2012	306.70	1112.32
					3/19/2012	306.92	1112.10
					4/16/2012	307.11	1111.91
					5/21/2012	307.02	1112.00
					6/18/2012	307.30	1111.72
					7/16/2012	308.05	1110.97
					8/20/2012	308.67	1110.35
					9/17/2012	309.74	1109.28
					10/15/2012	310.75	1108.27
					11/19/2012	311.00	1108.02
					12/17/2012	312.05	1106.97
					3/18/2013	311.90	1107.12
				323	6/17/2013	313.00	1106.02
					9/16/2013	315.24	1103.78
					12/16/2013	316.86	1102.16
				NA	3/17/2014	316.90	1102.12
					6/18/2014	318.68	1100.34
					9/16/2014	321.22	1097.80
					12/15/2014	322.20	1096.82
					3/17/2015	321.59	1097.43
					6/29/2015	323.02	1096.00
					9/21/2015	324.87	1094.15
					12/14/2015	325.48	1093.54
					3/23/2016	324.06	1094.96
					6/22/2016	325.30	1093.72
					9/12/2016	328.31	1090.71
					12/12/2016	327.85	1091.17
					3/15/2017	325.81	1093.21
					6/5/2017	324.87	1094.15
					9/11/2017	325.23	1093.79
					12/6/2017	324.59	1094.47
					3/29/2018	326.35	1092.67
					6/26/2018	322.90	1096.12
					9/12/2018	323.23	1095.79
					12/3/2018	322.69	1096.33
					3/20/2019	320.18	1098.84
					6/26/2019	319.60	1099.42
					9/30/2019	318.38	1100.64
					11/11/2019	318.58	1100.44
					3/10/2020	315.98	1103.04

TABLE 1: WELL INFORMATION AND GROUNDWATER ELEVATIONS
Remedial Investigation Work Plan
Former WBO Facility, Nammo Defense Systems, Inc. Plant No. 3
Mesa, Arizona
September 2020

Monitor Well ID	Measuring Point Elevation (ft amsl)	Screened Interval (ft btoc)	Screened Interval (ft amsl)	Transducer (ft btoc)	Date	Depth to Water (ft btoc)	Groundwater Elevation (ft amsl)
NT-3	1423.50	208-358	1215.50-1065.50	NA	5/21/2010	306.21	1117.29
					5/26/2010	306.4	1117.10
					3/23/2011	297.55	1125.95
					12/12/2011	296.55	1126.95
					12/15/2011	296.62	1126.88
					1/19/2012	296.48	1127.02
					2/20/2012	297.64	1125.86
					3/19/2012	298.35	1125.15
					4/16/2012	299.12	1124.38
					5/21/2012	299.84	1123.66
					6/18/2012	300.64	1122.86
					7/16/2012	301.40	1122.10
					8/20/2012	302.19	1121.31
					9/17/2012	303.11	1120.39
					10/15/2012	303.73	1119.77
					11/19/2012	305.57	1117.93
					12/17/2012	305.83	1117.67
					3/18/2013	306.65	1116.85
				319	6/17/2013	309.02	1114.48
					9/16/2013	310.91	1112.59
				NA	12/16/2013	313.19	1110.31
					3/17/2014	313.77	1109.73
					6/18/2014	316.25	1107.25
					9/16/2014	318.95	1104.55
					12/15/2014	321.00	1102.50
					3/17/2015	321.44	1102.06
					6/29/2015	323.70	1099.80
					9/21/2015	324.53	1098.97
					12/14/2015	324.51	1098.99
					3/23/2016	323.70	1099.80
					6/22/2016	325.55	1097.95
					9/12/2016	327.04	1096.46
					12/12/2016	325.81	1097.69
					3/15/2017	323.81	1099.69
					6/5/2017	322.73	1100.77
					9/11/2017	323.33	1100.17
					12/5/2017	321.50	1102.00
					3/28/2018	319.26	1104.24
					5/15/2018	319.76	1103.74
					6/26/2018	321.27	1102.23
					9/10/2018	321.05	1102.45
					12/3/2018	321.46	1102.04
					3/20/2019	319.34	1104.16
					6/26/2019	317.52	1105.98
					9/23/2019	316.06	1107.44
					11/11/2019	315.92	1107.58
					3/10/2020	313.17	1110.33

TABLE 1: WELL INFORMATION AND GROUNDWATER ELEVATIONS
Remedial Investigation Work Plan
Former WBO Facility, Nammo Defense Systems, Inc. Plant No. 3
Mesa, Arizona
September 2020

Monitor Well ID	Measuring Point Elevation (ft amsl)	Screened Interval (ft btoc)	Screened Interval (ft amsl)	Transducer (ft btoc)	Date	Depth to Water (ft btoc)	Groundwater Elevation (ft amsl)
NT-4	1385.69	153-313	1232.69-1072.69	NA	2/3/2009	263.9	1121.79
					7/28/2009	258.77	1126.92
					5/26/2010	250.3	1135.39
					3/23/2011	286.75	1098.94
				268	12/12/2011	250.70	1134.99
					12/15/2011	250.20	1135.49
					1/19/2012	251.62	1134.07
					2/20/2012	255.57	1130.12
				NA	3/19/2012	255.86	1129.83
					4/16/2012	255.42	1130.27
					5/21/2012	256.42	1129.27
					6/18/2012	257.53	1128.16
					7/16/2012	258.10	1127.59
					8/20/2012	259.85	1125.84
					9/17/2012	262.84	1122.85
					10/15/2012	262.68	1123.01
					11/19/2012	263.65	1122.04
					12/17/2012	262.38	1123.31
					3/18/2013	264.43	1121.26
					6/17/2013	266.70	1118.99
					9/16/2013	268.32	1117.37
					12/16/2013	271.39	1114.30
					3/17/2014	271.63	1114.06
					6/18/2014	275.65	1110.04
					9/16/2014	279.22	1106.47
					12/15/2014	280.45	1105.24
					3/17/2015	281.92	1103.77
					6/30/2015	285.49	1100.20
					9/21/2015	284.02	1101.67
					12/14/2015	282.01	1103.68
					3/23/2016	280.44	1105.25
					6/22/2016	286.67	1099.02
					9/12/2016	283.41	1102.28
					12/12/2016	281.85	1103.84
					3/15/2017	276.70	1108.99
					6/5/2017	278.02	1107.67
					9/11/2017	278.46	1107.23
					12/5/2017	273.75	1111.94
					3/28/2018	273.50	1112.19
					6/26/2018	282.00	1103.69
					9/10/2018	276.9	1108.79
					12/3/2018	280.25	1105.44
					3/20/2019	274.70	1110.99
					6/26/2019	269.83	1115.86
					9/25/2019	267.68	1118.01
					11/13/2019	271.07	1114.62
					3/10/2020	268.61	1117.08

TABLE 1: WELL INFORMATION AND GROUNDWATER ELEVATIONS
Remedial Investigation Work Plan
Former WBO Facility, Nammo Defense Systems, Inc. Plant No. 3
Mesa, Arizona
September 2020

Monitor Well ID	Measuring Point Elevation (ft amsl)	Screened Interval (ft btoc)	Screened Interval (ft amsl)	Transducer (ft btoc)	Date	Depth to Water (ft btoc)	Groundwater Elevation (ft amsl)
NT-5	1367.64	161-311	1206.64-1056.64	NA	5/21/2010	256.03	1111.61
					3/23/2011	247.1	1120.54
					12/12/2011	244.96	1122.68
					12/15/2011	245.15	1122.49
					1/19/2012	244.55	1123.09
					2/20/2012	246.9	1120.74
					3/19/2012	248.68	1118.96
					4/16/2012	249.05	1118.59
					5/21/2012	249.42	1118.22
					6/18/2012	250.29	1117.35
					7/16/2012	251.72	1115.92
					8/20/2012	253.45	1114.19
					9/17/2012	255.90	1111.74
					10/15/2012	257.78	1109.86
				268	11/19/2012	259.15	1108.49
					12/17/2012	259.47	1108.17
					3/18/2013	259.92	1107.72
					6/17/2013	261.70	1105.94
				NA	9/16/2013	264.58	1103.06
					12/16/2013	265.37	1102.27
					3/17/2014	265.22	1102.42
					6/18/2014	269.02	1098.62
					9/16/2014	271.74	1095.90
					12/15/2014	273.20	1094.44
					3/17/2015	271.97	1095.67
					6/29/2015	274.12	1093.52
					9/21/2015	275.56	1092.08
					12/14/2015	274.09	1093.55
					3/23/2016	272.44	1095.20
					6/22/2016	274.76	1092.88
					9/12/2016	279.05	1088.59
					12/12/2016	273.95	1093.69
					3/14/2017	270.88	1096.76
					6/6/2017	270.25	1097.39
					9/13/2017	271.24	1096.40
					12/5/2017	268.23	1099.41
					3/29/2018	268.90	1098.74
					6/26/2018	269.55	1098.09
					9/11/2018	269.08	1098.56
					12/3/2018	267.70	1099.94
					3/20/2019	264.77	1102.87
					6/26/2019	263.82	1103.82
					9/23/2019	261.84	1105.80
					11/11/2019	262.27	1105.37
					3/10/2020	258.24	1109.40

TABLE 1: WELL INFORMATION AND GROUNDWATER ELEVATIONS
Remedial Investigation Work Plan
Former WBO Facility, Nammo Defense Systems, Inc. Plant No. 3
Mesa, Arizona
September 2020

Monitor Well ID	Measuring Point Elevation (ft amsl)	Screened Interval (ft btoc)	Screened Interval (ft amsl)	Transducer (ft btoc)	Date	Depth to Water (ft btoc)	Groundwater Elevation (ft amsl)
NT-6	1313.22	115 - 260	1198.22-1053.22	NA	7/12/2010	169.00	1144.22
					3/22/2011	168.33	1144.89
					10/6/2011	170.63	1142.59
				183	12/13/2011	173.60	1139.62
					12/15/2011	173.48	1139.74
					1/19/2012	174.44	1138.78
					2/20/2012	177.46	1135.76
					3/19/2012	178.88	1134.34
					4/16/2012	179.55	1133.67
					5/21/2012	180.76	1132.46
				193	6/18/2012	181.65	1131.57
					7/16/2012	182.57	1130.65
					8/20/2012	183.69	1129.53
					9/18/2012	185.89	1127.33
					10/15/2012	186.8	1126.42
					11/19/2012	187.57	1125.65
					12/17/2012	186.94	1126.28
					3/18/2013	187.96	1125.26
				198	6/17/2013	189.38	1123.84
					9/16/2013	191.54	1121.68
					12/16/2013	195.05	1118.17
					3/18/2014	195.85	1117.37
				205	6/19/2014	199.25	1113.97
					9/18/2014	203.95	1109.27
				213	12/16/2014	205.45	1107.77
					3/18/2015	206.51	1106.71
					6/29/2015	209.11	1104.11
					9/22/2015	209.25	1103.97
					12/15/2015	209.80	1103.42
					1/13/2016	207.77	1105.45
					3/21/2016	207.58	1105.64
				227	6/20/2016	211.70	1101.52
					9/13/2016	207.89	1105.33
					12/13/2016	207.01	1106.21
					3/14/2017	202.23	1110.99
					6/5/2017	202.60	1110.62
					9/12/2017	199.81	1113.41
				NA	12/5/2017	194.84	1118.38
					3/28/2018	196.65	1116.57
					6/27/2018	203.07	1110.15
					9/11/2018	201.74	1111.48
					12/4/2018	204.42	1108.80
					3/21/2019	197.51	1115.71
					6/25/2019	191.95	1121.27
					9/24/2019	188.68	1124.54
					11/14/2019	191.49	1121.73
					3/11/2020	188.37	1124.85

TABLE 1: WELL INFORMATION AND GROUNDWATER ELEVATIONS
Remedial Investigation Work Plan
Former WBO Facility, Nammo Defense Systems, Inc. Plant No. 3
Mesa, Arizona
September 2020

Monitor Well ID	Measuring Point Elevation (ft amsl)	Screened Interval (ft btoc)	Screened Interval (ft amsl)	Transducer (ft btoc)	Date	Depth to Water (ft btoc)	Groundwater Elevation (ft amsl)
NT-7	1310.94	109 - 259	1201.94-1051.94	NA	7/12/2010	168.39	1142.55
					3/22/2011	168.00	1142.94
					10/6/2011	169.51	1141.43
				183	12/13/2011	173.13	1137.81
					12/15/2011	172.90	1138.04
					1/19/2012	174.26	1136.68
					2/20/2012	177.78	1133.16
					3/19/2012	178.68	1132.26
					4/16/2012	178.84	1132.10
					5/21/2012	179.98	1130.96
				193	6/18/2012	181.01	1129.93
					7/16/2012	181.63	1129.31
					8/20/2012	183.15	1127.79
					9/18/2012	185.65	1125.29
					10/15/2012	186.35	1124.59
					11/19/2012	186.92	1124.02
					12/17/2012	185.84	1125.10
					3/18/2013	187.35	1123.59
				198	6/17/2013	189.22	1121.72
					9/16/2013	190.96	1119.98
					12/16/2013	194.40	1116.54
					3/18/2014	195.12	1115.82
				210	6/19/2014	198.94	1112.00
					9/17/2014	203.77	1107.17
					12/16/2014	204.62	1106.32
				215	3/18/2015	206.10	1104.84
					6/30/2015	209.15	1101.79
					9/22/2015	209.99	1100.95
					12/16/2015	209.40	1101.54
					1/13/2016	205.81	1105.13
					3/21/2016	206.63	1104.31
				230	6/20/2016	212.80	1098.14
					9/12/2016	208.18	1102.76
					12/13/2016	206.72	1104.22
					3/14/2017	201.80	1109.14
					6/5/2017	203.26	1107.68
					9/12/2017	206.09	1104.85
				NA	12/5/2017	195.48	1115.46
					3/28/2018	197.80	1113.14
					6/27/2018	204.27	1106.67
					9/11/2018	202.4	1108.54
					12/4/2018	205.70	1105.24
					3/21/2019	197.41	1113.53
					6/25/2019	192.95	1117.99
					9/24/2019	190.37	1120.57
					11/14/2019	194.49	1116.45
					3/11/2020	189.32	1121.62

TABLE 1: WELL INFORMATION AND GROUNDWATER ELEVATIONS
Remedial Investigation Work Plan
Former WBO Facility, Nammo Defense Systems, Inc. Plant No. 3
Mesa, Arizona
September 2020

Monitor Well ID	Measuring Point Elevation (ft amsl)	Screened Interval (ft btoc)	Screened Interval (ft amsl)	Transducer (ft btoc)	Date	Depth to Water (ft btoc)	Groundwater Elevation (ft amsl)
NT-8	1317.50	130-300	1187.50-1017.50	NA	7/16/2012	179.38	1138.12
				189	8/20/2012	179.40	1138.10
					9/18/2012	181.01	1136.49
					10/15/2012	181.88	1135.62
					11/19/2012	181.68	1135.82
					12/17/2012	180.87	1136.63
					3/18/2013	180.92	1136.58
					6/17/2013	181.40	1136.10
					9/16/2013	184.85	1132.65
				199	12/16/2013	188.82	1128.68
					3/17/2014	189.02	1128.48
					6/18/2014	191.10	1126.40
					9/16/2014	195.30	1122.20
					10/8/2014	197.22	1120.28
					10/13/2014	197.42	1120.08
					12/16/2014	197.77	1119.73
				208	3/17/2015	196.20	1121.30
					6/30/2015	199.03	1118.47
					9/21/2015	219.28 (1)	1098.22
					12/15/2015	199.83	1117.67
					1/13/2016	199.05	1118.45
					3/21/2016	193.85	1123.65
					6/20/2016	192.63	1124.87
					9/12/2016	193.42	1124.08
					12/12/2016	188.54	1128.96
					3/14/2017	186.76	1130.74
					6/5/2017	181.10	1136.40
					9/12/2017	178.02	1139.48
				NA	12/5/2017	178.35	1139.15
					3/28/2018	181.63	1135.87
					6/27/2018	190.05	1127.45
					9/11/2018	190.2	1127.30
					12/4/2018	187.88	1129.62
					3/25/2019	180.52	1136.98
					6/25/2019	171.80	1145.70
					9/24/2019	174.40	1143.10
					11/13/2019	171.02	1146.48
					3/11/2020	171.90	1145.60

TABLE 1: WELL INFORMATION AND GROUNDWATER ELEVATIONS
Remedial Investigation Work Plan
Former WBO Facility, Nammo Defense Systems, Inc. Plant No. 3
Mesa, Arizona
September 2020

Monitor Well ID	Measuring Point Elevation (ft amsl)	Screened Interval (ft btoc)	Screened Interval (ft amsl)	Transducer (ft btoc)	Date	Depth to Water (ft btoc)	Groundwater Elevation (ft amsl)
NT-9	1319.03	120-290	1199.03-1029.03	204	3/19/2012	183.65	1135.38
					4/16/2012	185.39	1133.64
					5/21/2012	186.80	1132.23
					6/18/2012	187.98	1131.05
					7/16/2012	188.39	1130.64
					8/20/2012	190.17	1128.86
					9/18/2012	192.62	1126.41
					10/15/2012	193.18	1125.85
					11/19/2012	193.50	1125.53
					12/17/2012	192.03	1127.00
					3/18/2013	193.69	1125.34
					6/17/2013	195.55	1123.48
					9/16/2013	197.35	1121.68
					12/16/2013	200.89	1118.14
					3/17/2014	201.45	1117.58
				217	6/19/2014	206.25	1112.78
					9/16/2014	210.60	1108.43
					10/8/2014	216.89	1102.14
					10/13/2014	215.05	1103.98
					12/17/2014	211.09	1107.94
				222	3/17/2015	213.00	1106.03
					6/30/2015	216.35	1102.68
					9/21/2015	216.25	1102.78
					12/15/2015	128.75 (1)	1190.28
					1/13/2016	211.36	1107.67
				221	3/21/2016	212.45	1106.58
				226	6/20/2016	210.60	1108.43
					9/12/2016	212.05	1106.98
					12/13/2016	211.65	1107.38
					3/14/2017	205.91	1113.12
					6/26/2017	204.77	1114.26
					9/12/2017	201.64	1117.39
				NA	12/6/2017	198.01	1121.02
					3/28/2018	200.28	1118.75
					6/27/2018	209.20	1109.83
					9/11/2018	207.19	1111.84
					12/4/2018	208.39	1110.64
					3/21/2019	198.81	1120.22
					6/25/2019	192.05	1126.98
					9/24/2019	188.95	1130.08
					11/13/2019	192.41	1126.62
					3/11/2020	120.84 (1)	1198.19

TABLE 1: WELL INFORMATION AND GROUNDWATER ELEVATIONS
Remedial Investigation Work Plan
Former WBO Facility, Nammo Defense Systems, Inc. Plant No. 3
Mesa, Arizona
September 2020

Monitor Well ID	Measuring Point Elevation (ft amsl)	Screened Interval (ft btoc)	Screened Interval (ft amsl)	Transducer (ft btoc)	Date	Depth to Water (ft btoc)	Groundwater Elevation (ft amsl)
NT-10	1310.01	110-296	1200.01-1014.01	188	3/19/2012	167.45	1142.56
					4/16/2012	168.70	1141.31
					5/21/2012	169.77	1140.24
					6/18/2012	170.32	1139.69
					7/16/2012	170.75	1139.26
					8/20/2012	171.04	1138.97
					9/18/2012	172.43	1137.58
					10/15/2012	173.16	1136.85
					11/19/2012	172.68	1137.33
					12/17/2012	171.74	1138.27
					3/18/2013	171.89	1138.12
					6/17/2013	172.25	1137.76
					9/16/2013	175.70	1134.31
					12/16/2013	179.80	1130.21
					3/17/2014	180.23	1129.78
					6/18/2014	182.10	1127.91
					9/17/2014	186.09	1123.92
				196	10/8/2014	188.65	1121.36
					10/13/2014	188.51	1121.50
				NA	12/16/2014	188.09	1121.92
					3/17/2015	186.64	1123.37
					6/30/2015	189.40	1120.61
					9/21/2015	189.71	1120.30
					12/15/2015	113.08 (1)	1196.93
					1/13/2016	188.82	1121.19
				199	3/21/2016	184.05	1125.96
				197	6/20/2016	182.40	1127.61
					9/13/2016	183.03	1126.98
					12/13/2016	179.31	1130.70
					3/14/2017	178.92	1131.09
					6/5/2017	170.29	1139.72
					9/12/2017	170.01	1140.00
				NA	12/5/2017	167.01	1143.00
					3/28/2018	171.10	1138.91
					6/27/2018	179.70	1130.31
					9/11/2018	180.19	1129.82
					12/4/2018	115.85	1194.16
					3/21/2019	170.01	1140.00
					6/25/2019	161.65	1148.36
					9/24/2019	160.53	1149.48
					11/13/2019	161.15	1148.86
					3/11/2020	161.84	1148.17

TABLE 1: WELL INFORMATION AND GROUNDWATER ELEVATIONS
Remedial Investigation Work Plan
Former WBO Facility, Nammo Defense Systems, Inc. Plant No. 3
Mesa, Arizona
September 2020

Monitor Well ID	Measuring Point Elevation (ft amsl)	Screened Interval (ft btoc)	Screened Interval (ft amsl)	Transducer (ft btoc)	Date	Depth to Water (ft btoc)	Groundwater Elevation (ft amsl)
NT-11	1317.10	130-300	1187.10-1017.10	NA	7/16/2012	183.44	1133.66
				195	8/20/2012	184.77	1132.33
					9/18/2012	186.98	1130.12
					10/15/2012	186.79	1130.31
					11/19/2012	187.89	1129.21
					12/17/2012	186.60	1130.50
					3/18/2013	187.85	1129.25
					6/17/2013	189.38	1127.72
					9/16/2013	191.93	1125.17
				206	12/16/2013	195.81	1121.29
					3/17/2014	196.27	1120.83
					6/18/2014	199.52	1117.58
					9/17/2014	203.83	1113.27
					10/8/2014	208.73	1108.37
					10/13/2014	207.01	1110.09
				214	12/16/2014	205.10	1112.00
					3/17/2015	205.60	1111.50
					6/30/2015	208.32	1108.78
					9/21/2015	208.49	1108.61
					12/16/2015	207.83	1109.27
					1/13/2016	205.25	1111.85
					3/21/2016	203.55	1113.55
					6/21/2016	198.54	1118.56
					9/13/2016	201.73	1115.37
					12/12/2016	197.90	1119.20
					3/14/2017	194.17	1122.93
					6/5/2017	184.75	1132.35
					9/12/2017	185.01	1132.09
				NA	12/6/2017	185.19	1131.91
					3/28/2018	190.45	1126.65
					6/27/2018	199.60	1117.50
					9/11/2018	197.98	1119.12
					12/4/2018	194.83	1122.27
					3/21/2019	185.72	1131.38
					6/25/2019	183.22	1133.88
					9/24/2019	178.46	1138.64
					11/13/2019	183.41	1133.69
					3/11/2020	181.66	1135.44

TABLE 1: WELL INFORMATION AND GROUNDWATER ELEVATIONS
Remedial Investigation Work Plan
Former WBO Facility, Nammo Defense Systems, Inc. Plant No. 3
Mesa, Arizona
September 2020

Monitor Well ID	Measuring Point Elevation (ft amsl)	Screened Interval (ft btoc)	Screened Interval (ft amsl)	Transducer (ft btoc)	Date	Depth to Water (ft btoc)	Groundwater Elevation (ft amsl)
NT-12D	1324.38	300-600	1024.38-724.38	NA	9/3/2014	223.70	1100.68
					9/16/2014	225.15	1099.23
					10/8/2014	242.83	1081.55
					10/13/2014	229.05	1095.33
					12/16/2014	218.06	1106.32
					3/17/2015	226.63	1097.75
					7/1/2015	225.61	1098.77
					9/23/2015	NM	NA
					12/16/2015	225.02	1099.36
					3/24/2016	223.14	1101.24
				247	6/22/2016	231.30	1093.08
					9/13/2016	218.20	1106.18
					12/22/2016	227.25	1094.83
					3/15/2017	208.00	1116.38
					6/7/2017	219.56	1104.82
					9/12/2017	208.75	1115.63
				NA	12/6/2017	211.64	1112.74
					3/28/2018	213.63	1110.75
					6/27/2018	224.83	1099.55
					9/11/2018	217.01	1107.37
					12/4/2018	218.00	1106.38
					3/25/2019	204.83	1119.55
					6/25/2019	203.04	1121.34
					9/24/2019	201.29	1123.09
					11/13/2019	217.38	1107.00
					3/11/2020	206.87	1117.51
NT-14	1317.97	150-320		NA	6/27/2019	201.21	1116.76
					9/25/2019	198.48	1119.49
					9/30/2019	199.70	1118.27
					11/13/2019	203.14	1114.83
					3/16/2020	197.50	1120.47
WBO-1 (2)	1311.26	135 - 195	1176.26-1116.26	NA	2/26/2009	175.00	1136.26
					2/27/2009	177.16	1134.10
					7/28/2009	172.86	1138.40
					5/26/2010	167.2	1144.06
					7/12/2010	164.41	1146.85
					3/22/2011	164.13	1147.13
				180(2)	12/13/2011	169.79	1141.55
					12/15/2011	169.85	1141.41
					1/19/2012	170.5	1140.76
					2/20/2012	173.20	1138.06
					3/19/2012	175.15	1136.11
					4/16/2012	176.30	1134.96
					5/21/2012	177.25	1134.01
				190	6/18/2012	178.13	1133.13
					7/16/2012	179.20	1132.06
					8/20/2012	180.09	1131.17
					9/17/2012	181.87	1129.39
					10/15/2012	183.12	1128.14
					11/19/2012	184.05	1127.21
					12/17/2012	183.72	1127.54
					3/18/2013	184.30	1126.96
				195	6/17/2013	185.30	1125.96
					9/16/2013	187.40	1123.86
					12/16/2013	191.18	1120.08
					3/18/2014	192.37	1118.89
					6/19/2014	194.73	1116.53
					9/18/2014	198.50	1112.76
					3/28/2018	190.92	1120.34
					6/27/2018	195.90	1115.36
					9/11/2018	196.46	1114.80

TABLE 1: WELL INFORMATION AND GROUNDWATER ELEVATIONS
Remedial Investigation Work Plan
Former WBO Facility, Nammo Defense Systems, Inc. Plant No. 3
Mesa, Arizona
September 2020

Monitor Well ID	Measuring Point Elevation (ft amsl)	Screened Interval (ft btoc)	Screened Interval (ft amsl)	Transducer (ft btoc)	Date	Depth to Water (ft btoc)	Groundwater Elevation (ft amsl)
					12/4/2018	197.40	1113.86
					3/21/2019	192.64	1118.62
					6/25/2019	186.80	1124.46
					9/24/2019	183.77	1127.49
					11/14/2019	185.42	1125.84
					3/11/2020	183.50	1127.76
HPA-1[(2)]	1311.30	135 - 195	1176.30-1116.30		2/16/2009	173.20	1138.10
					2/27/2009	175.57	1135.73
					7/28/2009	171.13	1140.17
					5/26/2010	166.32	1144.98
					7/12/2010	163.23	1148.07
					3/22/2011	163.13	1148.17
					12/13/2011	168.75	1142.55
					12/15/2011	168.86	1142.44
				NA	1/19/2012	169.54	1141.76
					2/20/2012	171.90	1139.40
					3/19/2012	174.04	1137.26
					4/16/2012	175.25	1136.05
					5/21/2012	176.44	1134.86
					6/18/2012	177.31	1133.99
					7/16/2012	178.40	1132.90
					8/20/2012	179.29	1132.01
					9/17/2012	180.98	1130.32
					10/15/2012	182.29	1129.01
					11/19/2012	183.29	1128.01
				191	12/17/2012	183.10	1128.20
					3/18/2013	183.55	1127.75
					6/17/2013	184.30	1127.00
					9/16/2013	186.20	1125.10
					12/16/2013	190.15	1121.15
				195	3/18/2014	191.70	1119.60
					6/19/2014	194.20	1117.10
					9/18/2014	197.53	1113.77
					12/17/2014	197.57	1113.73
					3/18/2015	197.45	1113.85
					7/1/2015	DRY	
					9/22/2015	196.84	1114.46
					3/28/2018	185.80	1125.50
					6/27/2018	187.88	1123.42
				NA	9/11/2018	190.8	1120.50
					12/4/2018	191.52	1119.78
					3/21/2019	186.84	1124.46
					6/25/2019	183.23	1128.07
					9/24/2019	180.26	1131.04
					11/14/2019	181.10	1130.20
					3/11/2020	180.05	1131.25

TABLE 1: WELL INFORMATION AND GROUNDWATER ELEVATIONS
Remedial Investigation Work Plan
Former WBO Facility, Nammo Defense Systems, Inc. Plant No. 3
Mesa, Arizona
September 2020

Monitor Well ID	Measuring Point Elevation (ft amsl)	Screened Interval (ft btoc)	Screened Interval (ft amsl)	Transducer (ft btoc)	Date	Depth to Water (ft btoc)	Groundwater Elevation (ft amsl)
EXT-1	1312.84	190-350	1122.78-962.78	NA	10/13/2014	211.44	1101.34
					12/16/2014	206.77	1106.01
					3/18/2015	209.40	1103.44
					6/30/2015	211.99	1100.85
					9/22/2015	216.81 (PL)	1096.03
					12/16/2015	NM	NA
					1/13/2016	207.74	1105.10
					3/24/2016	210.25 (PL)	1102.59
				240	6/23/2016	225.46 (PL)	1087.38
					9/13/2016	215.20 (PL)	1097.64
				NA	12/22/2016	212.48	1100.36
				240	3/15/2017	208.70 (PL)	1104.14
					6/7/2017	219.90 (PL)	1092.94
					9/12/2017	208.60 (PL)	1104.24
					12/4/2017	203.29 (PL)	1109.55
					3/28/2018	210.52	1102.32
					6/27/2018	213.52	1099.32
					9/11/2018	214.99	1097.85
					12/4/2018	219.47	1093.37
					3/21/2019	210.80	1102.04
					6/25/2019	206.55	1106.29
					9/24/2019	203.53	1109.31
					11/14/2019	210.70	1102.14
					3/11/2020	194.32	1118.52
EXT-2	1314.47	190-350	1124.46-964.46	NA	10/13/2014	212.62	1101.84
					12/16/2014	208.30	1106.16
					3/18/2015	210.70	1103.77
					6/30/2015	213.22	1101.25
					9/22/2015	214.05	1100.42
					12/16/2015	220.90 (PL)	1093.57
					1/13/2016	214.77 (PL)	1099.66
					3/24/2016	220.08 (PL)	1094.39
				236	6/23/2016	NM	NA
					9/13/2016	NM	NA
					1/5/2017	207.30	1107.17
					3/15/2017	210.30 (PL)	1104.17
					6/7/2017	214.00 (PL)	1100.47
					9/12/2017	203.71	1110.76
					12/4/2017	200.93 (PL)	1113.54
					3/28/2018	204.18	1110.29
					6/27/2018	NM	NA
					9/11/2018	NM	NA
					12/4/2018	NM	NA
					3/21/2019	211.87	1102.60
					6/27/2019	207.75	1106.72
					9/24/2019	NM	NA
					11/14/2019	210.68	1103.79
					3/11/2020	205.61	1108.86

TABLE 1: WELL INFORMATION AND GROUNDWATER ELEVATIONS
Remedial Investigation Work Plan
Former WBO Facility, Nammo Defense Systems, Inc. Plant No. 3
Mesa, Arizona
September 2020

Monitor Well ID	Measuring Point Elevation (ft amsl)	Screened Interval (ft btoc)	Screened Interval (ft amsl)	Transducer (ft btoc)	Date	Depth to Water (ft btoc)	Groundwater Elevation (ft amsl)
ADEQ Well No. 2	1374.73	380 - 444	994.73-930.73	NA	12/15/1992	365.07	1009.66
					6/28/1995	332.12	1042.61
					6/25/1996	320.48	1054.25
					10/17/1996	327.38	1047.35
					11/8/1996	317.35	1057.38
					5/13/1997	314.36	1060.37
					2/26/1998	298.42	1076.31
					8/20/1998	296.66	1078.07
					9/10/2001	287	1087.73
					1/31/2003	298.29	1076.44
					6/8/2007	270.3	1104.43
				250	12/12/2011	239.42	1135.31
					12/15/2011	238.48	1136.25
					1/19/2012	242.18	1132.55
					2/20/2012	246.82	1127.91
					3/19/2012	246.75	1127.98
					4/16/2012	246.01	1128.72
					5/21/2012	247.19	1127.54
				260	6/18/2012	248.54	1126.19
					7/16/2012	248.32	1126.41
					8/20/2012	251.40	1123.33
				NA	9/17/2012	254.09	1120.64
					10/15/2012	253.09	1121.64
					11/19/2012	253.99	1120.74
					12/17/2012	252.36	1122.37
					3/18/2013	254.82	1119.91
					6/17/2013	257.57	1117.16
					9/16/2013	258.57	1116.16
					12/16/2013	261.62	1113.11
					3/17/2014	261.95	1112.78
					6/19/2014	266.50	1108.23
					9/16/2014	270.13	1104.60
					12/15/2014	270.51	1104.22
					3/17/2015	271.82	1102.91
					6/29/2015	274.69	1100.04
					9/21/2015	274.82	1099.91
					12/16/2015	272.55	1102.18
					3/23/2016	272.24	1102.49
					6/22/2016	272.45	1102.28
					9/15/2016	271.20	1103.53
					12/12/2016	271.29	1103.44
					3/13/2017	263.17	1111.56
					6/6/2017	265.50	1109.23
					9/11/2017	263.86	1110.87
					12/4/2017	260.70	1114.03
					5/15/2018	266.85	1107.88
					6/26/2018	270.05	1104.68
					9/10/2018	265.45	1109.28
					12/3/2018	267.05	1107.68
					3/20/2019	259.79	1114.94
					6/26/2019	255.82	1118.91
					9/23/2019	253.42	1121.31
					11/11/2019	257.26	1117.47
					3/10/2020	253.50	1121.23

TABLE 1: WELL INFORMATION AND GROUNDWATER ELEVATIONS
Remedial Investigation Work Plan
Former WBO Facility, Nammo Defense Systems, Inc. Plant No. 3
Mesa, Arizona
September 2020

Monitor Well ID	Measuring Point Elevation (ft amsl)	Screened Interval (ft btoc)	Screened Interval (ft amsl)	Transducer (ft btoc)	Date	Depth to Water (ft btoc)	Groundwater Elevation (ft amsl)
ADEQ Well No. 3	1372.49	401 - 465	971.49-907.49	NA	12/15/1992	365.11	1007.38
					2/14/1995	329.38	1043.11
					6/25/1996	315.9	1056.59
					10/16/1996	344.7	1027.79
					11/8/1996	317.08	1055.41
					5/13/1997	312.18	1060.31
					2/26/1998	298.33	1074.16
					8/19/1998	297.78	1074.71
					9/10/2001	283	1089.49
					1/31/2003	294.68	1077.81
					6/8/2007	266.8	1105.69
				250	12/12/2011	237.70	1134.79
					12/15/2011	237.45	1135.04
					1/19/2012	239.32	1133.17
					2/20/2012	244.12	1128.37
					3/19/2012	245.86	1126.63
					4/16/2012	245.61	1126.88
					5/21/2012	246.10	1126.39
				260	6/18/2012	246.94	1125.55
					7/16/2012	247.20	1125.29
					8/20/2012	249.05	1123.44
				NA	9/17/2012	251.85	1120.64
					10/15/2012	252.01	1120.48
					11/19/2012	252.93	1119.56
					12/17/2012	252.27	1120.22
					3/18/2013	253.65	1118.84
					6/17/2013	255.30	1117.19
					9/16/2013	257.35	1115.14
					12/16/2013	260.42	1112.07
					3/17/2014	260.62	1111.87
					6/19/2014	264.38	1108.11
					9/16/2014	268.22	1104.27
					12/15/2014	269.55	1102.94
					3/17/2015	269.64	1102.85
					6/29/2015	272.40	1100.09
					9/21/2015	272.21	1100.28
					12/14/2015	271.34	1101.15
					3/23/2016	267.88	1104.61
					6/22/2016	275.45	1097.04
					9/15/2016	270.55	1101.94
					12/12/2016	268.05	1104.44
					3/13/2017	262.10	1110.39
					6/6/2017	262.82	1109.67
					9/11/2017	262.56	1109.93
					12/4/2017	259.09	1113.40
					5/15/2018	263.25	1109.24
					6/26/2018	267.18	1105.31
					9/10/2018	263.99	1108.50
					12/3/2018	264.42	1108.07
					3/20/2019	258.42	1114.07
					6/26/2019	253.95	1118.54
					9/23/2019	251.39	1121.10
					11/11/2019	254.12	1118.37
					3/10/2020	251.48	1121.01

TABLE 1: WELL INFORMATION AND GROUNDWATER ELEVATIONS
Remedial Investigation Work Plan
Former WBO Facility, Nammo Defense Systems, Inc. Plant No. 3
Mesa, Arizona
September 2020

Monitor Well ID	Measuring Point Elevation (ft amsl)	Screened Interval (ft btoc)	Screened Interval (ft amsl)	Transducer (ft btoc)	Date	Depth to Water (ft btoc)	Groundwater Elevation (ft amsl)
ADEQ Well No. 4	1373.61	400 - 460	973.61-913.61	NA	12/15/1992	379.57	994.04
					2/14/1995	324.5	1049.11
					6/25/1996	330.4	1043.21
					10/16/1996	334.26	1039.35
					11/8/1996	331.6	1042.01
					5/13/1997	323.36	1050.25
					2/26/1998	312.33	1061.28
					8/19/1998	310.15	1063.46
					9/10/2001	293	1080.61
					1/31/2003	305.75	1067.86
					6/8/2007	273.2	1100.41
				260	12/12/2011	242.55	1131.06
					12/15/2011	242.41	1131.20
					1/19/2012	243.60	1130.01
					2/20/2012	247.62	1125.99
				NA	3/19/2012	249.16	1124.45
					4/16/2012	249.30	1124.31
					5/21/2012	249.90	1123.71
					6/18/2012	250.84	1122.77
					7/16/2012	251.16	1122.45
					8/20/2012	253.05	1120.56
					9/17/2012	255.20	1118.41
					10/15/2012	255.29	1118.32
					11/19/2012	256.83	1116.78
					12/17/2012	256.34	1117.27
					3/18/2013	257.63	1115.98
					6/17/2013	259.90	1113.71
					9/16/2013	261.67	1111.94
					12/16/2013	264.45	1109.16
					3/17/2014	264.73	1108.88
					6/19/2014	268.59	1105.02
					9/16/2014	272.25	1101.36
					12/15/2014	273.32	1100.29
					3/17/2015	273.90	1099.71
					6/29/2015	274.69	1098.92
					9/21/2015	276.89	1096.72
					12/14/2015	275.56	1098.05
					3/23/2016	273.02	1100.59
					6/22/2016	277.26	1096.35
					9/15/2016	276.81	1096.80
					12/12/2016	273.99	1099.62
					3/13/2017	269.56	1104.05
					6/6/2017	269.65	1103.96
					9/11/2017	270.10	1103.51
					12/4/2017	266.27	1107.34
					3/29/2018	269.10	1104.51
					6/26/2018	272.18	1101.43
					9/10/2018	269.4	1104.21
					12/3/2018	270.07	1103.54
					3/20/2019	265.47	1108.14
					6/26/2019	261.65	1111.96
					9/23/2019	259.14	1114.47
					11/11/2019	261.35	1112.26
					3/10/2020	258.39	1115.22

TABLE 1: WELL INFORMATION AND GROUNDWATER ELEVATIONS
Remedial Investigation Work Plan
Former WBO Facility, Nammo Defense Systems, Inc. Plant No. 3
Mesa, Arizona
September 2020

Monitor Well ID	Measuring Point Elevation (ft amsl)	Screened Interval (ft btoc)	Screened Interval (ft amsl)	Transducer (ft btoc)	Date	Depth to Water (ft btoc)	Groundwater Elevation (ft amsl)
ADEQ Well No. 5[3]	1375.57	261 - 421	1114.57-954.57	NA	2/14/1995	325.24	1050.33
					7/7/1995	318.4	1057.17
					6/25/1996	307.7	1067.87
					10/17/1996	313.64	1061.93
					11/8/1996	312.08	1063.49
					5/12/1997	306.12	1069.45
					2/25/1998	295.73	1079.84
					8/20/1998	288.35	1087.22
					9/10/2001	279	1096.57
					1/29/2003	291.1	1084.47
					6/8/2007	265.8	1109.77
					2/6/2008	258.1	1117.47
					2/20/2008	257.21	1118.36
				245	12/13/2011	235.43	1140.14
					12/15/2011	235.32	1140.25
	1372.33				1/19/2012	237.10	1135.23
					2/20/2012	241.08	1131.25
					3/19/2012	242.15	1130.18
					4/16/2012	242.23	1130.10
					5/21/2012	243.22	1129.11
				255	6/18/2012	244.25	1128.08
					7/16/2012	244.50	1127.83
					8/20/2012	246.25	1126.08
				NA	10/3/2012	249.45	1122.88
					10/15/2012	249.15	1123.18
				259	11/19/2012	249.84	1122.49
					12/17/2012	248.68	1123.65
					6/17/2013	252.14	1120.19
					9/16/2013	254.10	1118.23
					12/16/2013	257.30	1115.03
				NA	3/18/2014	257.62	1114.71
					6/19/2014	261.55	1110.78
					9/17/2014	265.34	1106.99
					12/15/2014	266.76	1105.57
					3/19/2015	267.60	1104.73
					6/29/2015	271.08	1101.25
					9/23/2015	269.99	1102.34
	1370.19	261-421/ 240-320[3]	1114.57-954.57/ 1130.19-1050.19		9/20/2017	256.86	1113.33
					12/4/2017	252.59	1117.60
					3/29/2018	257.30	1112.89
					6/26/2018	261.25	1108.94
					9/10/2018	258.86	1111.33
					12/5/2018	259.89	1110.30
					3/20/2019	254.59	1115.60
					6/27/2019	248.80	1121.39
					9/23/2019	245.89	1124.30
					11/12/2019	248.12	1122.07
					3/11/2020	245.75	1124.44

TABLE 1: WELL INFORMATION AND GROUNDWATER ELEVATIONS
Remedial Investigation Work Plan
Former WBO Facility, Nammo Defense Systems, Inc. Plant No. 3
Mesa, Arizona
September 2020

Monitor Well ID	Measuring Point Elevation (ft amsl)	Screened Interval (ft btoc)	Screened Interval (ft amsl)	Transducer (ft btoc)	Date	Depth to Water (ft btoc)	Groundwater Elevation (ft amsl)
ADEQ Well No. 6	1382.36	320 - 440	1062.36-942.36	NA	5/13/1997	338.75	1043.61
					2/26/1998	321.7	1060.66
					8/19/1998	325.88	1056.48
					9/10/2001	308	1074.36
					1/31/2003	318.78	1063.58
					6/8/2007	286.2	1096.16
					2/6/2008	287.07	1095.29
					2/20/2008	286.01	1096.35
					12/12/2011	254.11	1128.25
					12/15/2011	253.82	1128.54
					1/19/2012	254.48	1127.88
					2/20/2012	257.85	1124.51
					3/19/2012	259.00	1123.36
					4/16/2012	253.30	1129.06
					5/21/2012	260.35	1122.01
					6/18/2012	261.27	1121.09
					7/16/2012	261.60	1120.76
					8/20/2012	263.49	1118.87
					9/17/2012	264.98	1117.38
					10/15/2012	265.24	1117.12
					11/19/2012	267.08	1115.28
					12/17/2012	266.83	1115.53
					3/18/2013	268.01	1114.35
					6/17/2013	270.60	1111.76
					9/16/2013	272.12	1110.24
					12/16/2013	274.52	1107.84
					3/17/2014	274.87	1107.49
					6/19/2014	278.46	1103.90
					9/16/2014	281.65	1100.71
					12/15/2014	283.12	1099.24
					3/17/2015	283.30	1099.06
					6/29/2015	286.15	1096.21
					9/21/2015	286.72	1095.64
					12/14/2015	289.49	1092.87
					3/23/2016	283.28	1099.08
					6/22/2016	286.90	1095.46
					9/15/2016	286.65	1095.71
					12/12/2016	284.60	1097.76
					3/13/2017	281.12	1101.24
					6/6/2017	280.94	1101.42
					9/11/2017	281.35	1101.01
					12/4/2017	278.11	1104.25
					5/15/2018	279.07	1103.29
					6/26/2018	282.15	1100.21
					9/10/2018	280.07	1102.29
					12/3/2018	280.58	1101.78
					3/20/2019	276.37	1105.99
					6/26/2019	273.60	1108.76
					9/23/2019	271.39	1110.97
					11/11/2019	273.16	1109.20
					3/10/2020	269.69	1112.67

TABLE 1: WELL INFORMATION AND GROUNDWATER ELEVATIONS
Remedial Investigation Work Plan
Former WBO Facility, Nammo Defense Systems, Inc. Plant No. 3
Mesa, Arizona
September 2020

Monitor Well ID	Measuring Point Elevation (ft amsl)	Screened Interval (ft btoc)	Screened Interval (ft amsl)	Transducer (ft btoc)	Date	Depth to Water (ft btoc)	Groundwater Elevation (ft amsl)
ADEQ Well No. 7	1326.98	236 - 369	1090.98-957.98	NA	5/12/1997	243.44	1083.54
					2/25/1998	239.19	1087.79
					8/20/1998	227.72	1099.26
					9/10/2001	218	1108.98
					2/6/2003	228.78	1098.20
					6/7/2007	206.7	1120.28
					3/22/2011	180.17	1146.81
				195	12/13/2011	185.24	1148.76
					12/15/2011	185.23	1141.75
					1/19/2012	186.88	1140.10
					2/20/2012	189.10	1137.88
					3/19/2012	191.24	1135.74
					4/16/2012	192.34	1134.64
					5/21/2012	193.30	1133.68
				205	6/18/2012	193.90	1133.08
					7/16/2012	194.78	1132.20
					8/20/2012	195.40	1131.58
					9/17/2012	197.29	1129.69
					10/15/2012	198.52	1128.46
					11/19/2012	199.10	1127.88
					12/17/2012	198.60	1128.38
					3/18/2013	199.25	1127.73
				215	6/17/2013	200.10	1126.88
					9/16/2013	202.66	1124.32
					12/16/2013	206.30	1120.68
					3/17/2014	206.74	1120.24
					6/19/2014	209.71	1117.27
					9/16/2014	213.57	1113.41
				224	12/17/2014	216.30	1110.68
					3/18/2015	215.72	1111.26
					6/30/2015	218.33	1108.65
					9/23/2015	218.14	1108.84
					12/15/2015	218.38	1108.60
					3/21/2016	214.02	1112.96
				232	6/23/2016	216.22	1110.76
					9/12/2016	215.51	1111.47
					12/13/2016	211.30	1115.68
					3/13/2017	208.65	1118.33
					6/6/2017	205.72	1121.26
					9/11/2017	205.50	1121.48
				NA	12/4/2017	201.20	1125.78
					3/28/2018	203.10	1123.88
					6/27/2018	209.95	1117.03
					9/12/2018	209.73	1117.25
					12/4/2018	209.58	1117.40
					3/21/2019	203.91	1123.07
					6/27/2019	197.25	1129.73
					9/24/2019	194.15	1132.83
					11/11/2019	195.42	1131.56
					3/10/2020	194.49	1132.49

TABLE 1: WELL INFORMATION AND GROUNDWATER ELEVATIONS
Remedial Investigation Work Plan
Former WBO Facility, Nammo Defense Systems, Inc. Plant No. 3
Mesa, Arizona
September 2020

Monitor Well ID	Measuring Point Elevation (ft amsl)	Screened Interval (ft btoc)	Screened Interval (ft amsl)	Transducer (ft btoc)	Date	Depth to Water (ft btoc)	Groundwater Elevation (ft amsl)
ADEQ Well No. 8	1338.05	240 - 360	1098.05-978.05	NA	2/25/1998	259.18	1078.87
					8/20/1998	250.82	1087.23
					9/10/2001	242.00	1096.05
					2/6/2003	252.85	1085.20
					6/7/2007	228.90	1109.15
					2/4/2008	221.82	1116.23
					2/6/2008	222.00	1116.05
					2/20/2008	220.51	1117.54
					3/22/2011	194.42	1143.63
				210	12/13/2011	199.29	1127.52
					12/15/2011	198.98	1139.07
					1/19/2012	200.56	1137.49
					2/20/2012	204.11	1133.94
					3/19/2012	205.34	1132.71
					4/16/2012	205.74	1132.31
					5/21/2012	206.78	1131.27
				220	6/18/2012	207.68	1130.37
					7/16/2012	208.21	1129.84
					8/20/2012	209.50	1128.55
					9/17/2012	211.85	1126.20
					10/15/2012	212.68	1125.37
					11/19/2012	213.18	1124.87
					12/17/2012	212.30	1125.75
					3/18/2013	213.65	1124.40
					6/17/2013	215.20	1122.85
					9/16/2013	217.30	1120.75
				231	12/16/2013	220.70	1117.35
					3/17/2014	221.04	1117.01
					6/19/2014	224.86	1113.19
					9/16/2014	228.83	1109.22
				239	12/17/2014	230.48	1107.57
					3/18/2015	231.14	1106.91
					6/30/2015	233.77	1104.28
					9/23/2015	234.00	1104.05
					12/15/2015	233.45	1104.60
					3/21/2016	230.25	1107.80
				249	6/20/2016	234.45	1103.60
					9/12/2016	231.92	1106.13
					12/13/2016	229.64	1108.41
					3/13/2017	224.70	1113.35
					6/6/2017	224.44	1113.61
					9/11/2017	223.41	1114.64
				NA	12/4/2017	218.49	1119.56
					3/28/2018	220.47	1117.58
					6/27/2018	227.31	1110.74
					9/12/2018	225.54	1112.51
					12/4/2018	226.85	1111.20
					3/21/2019	220.48	1117.57
					6/27/2019	214.72	1123.33
					9/24/2019	211.74	1126.31
					11/11/2019	214.15	1123.90
					3/10/2020	211.86	1126.19

Abbreviations:

ID - identification
TOC - Top of Casing elevation
ft amsl - feet above mean sea level
ft btoc - feet below top of casing (measuring point recorded on the north side of the casing)
D - deep
EX - extraction well
ADEQ - Arizona Department of Environmental Quality
NA - not applicable
WBO - Water Bore Out
HPA - Historical Pond Area
PL - Pumping Level

TABLE 1: WELL INFORMATION AND GROUNDWATER ELEVATIONS
Remedial Investigation Work Plan
Former WBO Facility, Nammo Defense Systems, Inc. Plant No. 3
Mesa, Arizona
September 2020

Monitor Well ID	Measuring Point Elevation (ft amsl)	Screened Interval (ft btoc)	Screened Interval (ft amsl)	Transducer (ft btoc)	Date	Depth to Water (ft btoc)	Groundwater Elevation (ft amsl)

NM- Not Measured

Notes:
(1) Sounder malfunction.
(2) From September 2014 through the present no representative groundwater level is present in the well (groundwater was occasionally observed in the end cap of the well however the groundwater level was below the bottom of the well screen).
(3) Well salvaged June 2017. A 2 inch PVC liner with a screened interval of 240 to 320 ft bgs was installed inside steel casing with a screen interval from 240 to 320 ft bgs. This was initiated by ADEQ and installed by Yellow Jacket Drilling.
Alert Levels for select wells set by ADEQ in the Aquifer Protection Permit (ADEQ, 2014). Groundwater levels must be within the set range given.

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TABLE 2: MONITOR WELLS CONSTRUCTION DETAILS

Remedial Investigation Work Plan
Former WBO Facility, Nammo Defense Systems, Inc. Plant No. 3
Mesa, Arizona
September 2020

Well Identification	Latitude	Longitude	ADWR Number	Well Type	Well Diameter (in)	Screen Interval (ft btoc)
NT-1	33 29 03.1	-111 43 41.3	55-910226	Monitor	6	107-257
NT-2	33 26 21.7	-111 42 24.3	55-911007	Monitor	4	215-365
NT-3	33 28 5.3	-111 42 31.9	55-911773	Monitor	4	208-358
NT-4	33 29 1.1	-111 42 58.1	55-910266	Monitor	4	153-313
NT-5	33 26 47.8	-111 43 44.3	55-911687	Monitor	4	161-311
NT-6	33 29 1.5	-111 45 42.7	55-912177	Monitor	6	115 - 260
NT-7	33 29 4.7	-111 43 39.8	55-912178	Monitor	6	109 - 259
NT-8	33 29 3.4	-111 44 6.5	55-914414	Monitor	4	161-311
NT-9	33 29 11.3	-111 43 46.4	55-607730	Monitor	4	161-311
NT-10	33 29 9.8	-111 44 0.3	55-617109	Monitor	4	161-311
NT-11	33 29 6.2	-111 43 54.2	55-914420	Monitor	4	161-311
NT-12D	33 29 3.8	-111.43 56.8	55-917166	Monitor	5	300-600
NT-14	33 29 2.08	-111 43 32.95	55-230344	Monitor	4	150-325
WBO-1	33 29 04.83	-111 43 43.4	55-910345	Monitor	5	135 - 195
HPA-1	33 29 06.35	-111 43 43.37	55-910346	Monitor	5	135 - 195
ADEQ Well No. 2	33 28 30.14	-111 43 44.64	55-534577	Monitor	4.5	380 - 444
ADEQ Well No. 3	33 28 25.14	-111 43 58.58	55-534579	Monitor	4.5	401 - 465
ADEQ Well No. 4	33 28 19.23	-111 43 41.75	55-534578	Monitor	5	400 - 460
ADEQ Well No. 5	33 28 44.25	-111 43 48.66	55-544569	Monitor	2	240 - 320
ADEQ Well No. 6	33 27 59.47	-111 43 26.07	55-561851	Monitor	5	320 - 440
ADEQ Well No. 7	33 28 52.87	-111 43 52.59	55-561850	Monitor	5	236 - 369
ADEQ Well No. 8	33 28 53.14	-111 43 46.04	55-563131	Monitor	5	240 - 360
Alta Mesa Golf CC	33 27 6.02	-111 42 38.15	55-610677	Production	20	NA
Apache Wells Replacement Well	33 27 18.95	-111 42 31.36	55-221426	Production	16	400 - 770
Longbow Golf Club	33 28 03.54	-111 43 05.75	55-554072	Production	12	400 - 708
Painted Mt. Golf CC	33 27 12.75	-111 42 01.01	55-800719	Production	16	NA
SRP 32.8E-7.2N	33 29 3.48	-111 44 19.18	55-607739	Production	24	340 - 750
SRP 33.1E-7.3N	33 29 10.45	-111 44 3.67	55-617109	Production	20	350 - 687
SRP 33.3E-7.5N	33 29 16.61	-111 43 48.40	55-607730	Production	24	320 - 620
EXT-1	33 29 4.15	-111 43 40.65	55-223104	Production	12	190 - 350
EXT-2	33 29 2.62	-111 43 42.39	55-223095	Production	12	190 - 350

Abbreviationss:

ADEQ = Arizona Department of Environmental Quality
ADWR = Arizona Department of Water Resources
in = inches
ft btoc = feet below top of casing
NA = Not available
NE = Not established

Table 3: WBO-1 Summary of Soil Analytical Results
Remedial Investigation Work Plan
Former WBO Facility, Nammo Defense Systems Inc. Plant No. 3
Mesa, Arizona
September 2020

					Anions						
Depth (ft bgs)	**pH (SI units)**	**EC (µS/cm)**	**Perchlorate (mg/kg)**	**Ammonium-N (mg/kg)**	**Nitrate-N (mg/kg)**	**Nitrite-N (mg/kg)**	**Sulfate (mg/kg)**	**Phosphate (mg/kg)**	**Chlorate (mg/kg)**	**Chloride (mg/kg)**	**Bromide (mg/kg)**
0.5	7.86	698	6.6	0.86	--	--	--	--	--	--	--
5	5.72	166	0.47	--	17	<0.12	16	10	<0.32	2	0.99
6	8.61	340	< 0.4	--	--	--	--	--	--	--	--
10	7.55	116	1.1	1.8	3.4	<0.12	15.6	2.9	<0.32	2.6	< 0.39
15	6.91	242	3.9	--	22	<0.12	27.5	1.3	<0.32	6.2	< 0.39
20	6.70	404	13	222	40	<0.12	35.2	< 0.57	<0.32	6.6	1.07
25	8.18	340	12	--	14	<0.12	41.6	1.2	<0.32	12.2	2.46
30	7.66	400	23	232	31	<0.12	37.4	< 0.57	<0.32	8.8	1.08
35	7.36	786	103	--	67	<0.12	58.5	1.5	<0.32	13.9	0.89
40	6.13	2552	429	2,020	279	<0.12	79.2	1.6	<0.32	33.3	< 0.39
45	6.50	2794	325	--	360	<0.12	41.5	< 0.57	<0.32	30.2	< 0.39
49.5	6.83	2630	290	1,870	324	<0.12	60.5	< 0.57	<0.32	16.1	1.11
55	7.59	2518	376	--	296	<0.12	36.6	< 0.57	<0.32	14.6	0.68
60	7.72	2802	1,525	2,220	204	<0.12	37.6	< 0.57	<0.32	20.3	< 0.39
64	7.09	886	502	--	49	<0.12	33.2	< 0.57	<0.32	22.1	8.07
70	6.64	976	862	76	37	<0.12	10.0	< 0.57	<0.32	10.2	< 0.39
75	6.85	714	661	--	21	<0.12	5.7	< 0.57	<0.32	6.5	< 0.39
80	7.33	1324	1,245	13.2	--	--	--	--	--	--	--
85	7.65	1284	1,118	--	58	<0.12	25	< 0.57	<0.32	23	< 0.39
89	7.42	886	776	2.4	--	--	--	--	--	--	--
100	8.42	640	441	104	4.4	<0.12	35.7	< 0.57	<0.32	24.8	1.16
105	7.67	560	367	--	--	--	--	--	--	--	--
110	7.96	610	542	--	--	--	--	--	--	--	--
115	7.99	576	437	--	--	--	--	--	--	--	--
119	7.75	554	406	3.4	13	<0.12	9	< 0.57	<0.32	28	< 0.39
125	7.88	842	636	--	--	--	--	--	--	--	--
130	8.13	628	428	--	--	--	--	--	--	--	--
135	8.24	646	469	--	--	--	--	--	--	--	--
139	8.57	446	267	0.66	12	<0.12	25	< 0.57	<0.32	17	< 0.39
144	8.57	514	319	--	--	--	--	--	--	--	--
150	8.53	412	250	--	--	--	--	--	--	--	--
155	8.41	414	235	--	--	--	--	--	--	--	--
159	8.66	420	231	0.67	11	<0.12	4.8	< 0.57	<0.32	15.5	< 0.39
164	8.63	432	227	--	--	--	--	--	--	--	--
170	8.41	492	240	--	--	--	--	--	--	--	--
175	8.89	324	48.4	--	--	--	--	--	--	--	--
180	8.94	244	1.15	0.10	0.97	<0.12	7.34	< 0.57	<0.32	22.47	< 0.39
185	8.87	214	< 0.4	--	--	--	--	--	--	--	--
189	7.84	624	7.4	--	--	--	--	--	--	--	--
195	9.12	204	< 0.4	--	--	--	--	--	--	--	--
197	9.04	280	0.06	0.10	0.77	<0.12	8.62	< 0.57	<0.32	32.99	< 0.39

Data Sourse: Status Update for Pre-Design Characterization Activities in Advance of a Pilot Test of In Situ Bioremediation for Perchlorate in Soils at the Former Water Bore-Out (WBO) Facility at Plant #3 at the Nammo Talley Site in Mesa, Arizona, Letter to Robert Blomberg, Environmental Quality Specialist, Nammo Talley, Inc., Mesa, Arizona, July

Abbreviations

"--" sample not analyzed
µS/cm - microsiemens per centimeter
ft bgs - feet below ground surface
EC - electrical conductivity
N - Nitrogen
mg/kg - milligrams per kilogram (dry weight basis)
SI - International System of Units
< - Laboratory method detection limit

Analytical Methods

Perchlorate — Modified EPA 314 Method (SiREM SOP # 025)
Anions — Modified EPA 300.1 Method (SiREM SOP #025)
Ammonium-N — Method SNL-035 (University of Guelph Laboratory Services)
- M4500-NH3 D; KCl extractable NH4-N and NO3-N

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TABLE 4:
2009 SOURCE AREA INVESTIGATION PLANT 3
Remedial Investigation Work Plan
Former WBO Facility, Nammo Defense Systems, Inc. Plant No. 3
Mesa, Arizona
September 2020

Location	Sample ID	Depth (ft bgs)	Perchlorate Concentrations	Metals Concentrations (mg/kg)			
			Field Screening	Cadmium	Chromium	Lead	Chromium VI
Former Grinding Facility & Storm Water Retention Pond	P3-B36-0.5	0.5	< 1.0	--	--	--	--
	P3-B36-2.5	2.5	< 1.0	--	--	--	--
	P3-B36-5.0A	5.0	< 1.0	--	--	--	--
	P3-B37-0.5	0.5	< 1.0	--	--	--	--
	P3-B37-2.5	2.5	< 1.0	--	--	--	--
	P3-B37-5.0A	5.0	< 1.0	--	--	--	--
	P3-B38-0.5	0.5	< 1.0	--	--	--	--
	P3-B38-2.5	2.5	< 1.0	--	--	--	--
	P3-B38-5.0	5.0	< 1.0	--	--	--	--
	P3-B41-0.5	0.5	< 1.0	--	--	--	--
	P3-B41-2.5	2.5	< 1.0	--	--	--	--
	P3-B41-5.0	5.0	< 1.0	--	--	--	--
	P3-B42-0.5	0.5	< 1.0	--	--	--	--
	P3-B42-2.5	2.5	< 1.0	--	--	--	--
	P3-B42-5.0	5.0	< 1.0	--	--	--	--
Former WBO Facility	P3-B24-0.5	0.5	< 1.0	--	--	--	--
	P3-B24-2.5	2.5	< 1.0	--	--	--	--
	P3-B24-5.0	5.0	< 1.0	--	--	--	--
	P3-B25-0.5	0.5	< 1.0	--	--	--	--
	P3-B25-2.5	2.5	< 1.0	--	--	--	--
	P3-B25-5.0A	5.0	< 1.0	--	--	--	--
	P3-B26-0.5	0.5	< 1.0	--	--	--	--
	P3-B26-2.5	2.5	< 1.0	--	--	--	--
	P3-B26-5.0	5.0	< 1.0	--	--	--	--
	P3-B33-0.5	0.5	< 1.0	--	--	--	--
	P3-B33-2.5	2.5	< 1.0	--	--	--	--
	P3-B33-5.0	5.0	< 1.0	--	--	--	--
Historical Pond Area	P3-B29-3.0A	3.0	7.5	--	--	--	--
	P3-B30-0.5	0.5	3000	--	--	--	--
	P3-B30-5.0	5.0	1200	--	--	--	--
	P3-B30-10.0A	10.0	230	--	--	--	--
	P3-B31-5.0	5.0	99	--	--	--	--
	P3-B31-8.0A	8.0	130	--	--	--	--
	P3-B32-5.0	5.0	410	--	--	--	--
	P3-B32-10.0A	10.0	120	--	--	--	--
	P3-B43-0.5	0.5	1.4	--	--	--	--
	P3-B43-4.5	4.5	2	--	--	--	--
	P3-B44-0.5	0.5	2.5	--	--	--	--
	P3-B44-5.0	5.0	88	--	--	--	--
	P3-B44-9.0	9.0	150	--	--	--	--
	P3-B45-0.5	0.5	1.7	--	--	--	--
	P3-B45-1.0	1.0	3.1	--	--	--	--
	P3-B45-4.5	4.5	40	--	--	--	--
	P3-B46-0.5	0.5	< 1.0	--	--	--	--
	P3-B46-5.0	5.0	< 1.0	--	--	--	--
	P3-B46-7.5	7.5	< 1.0	--	--	--	--
	P3-B47-0.5*	0.5	1.2	--	--	--	--
	P3-B47-5.0*	5.0	7.2	--	--	--	--
	P3-B47-8.0*	8.0	< 1.0	--	--	--	--
	P3-B48-0.5*	0.5	< 1.0	--	--	--	--
	P3-B48-5.0*	5.0	< 1.0	--	--	--	--
	P3-B49-0.5	0.5	< 1.0	--	--	--	--
	P3-B49-5.0	5.0	3.6	--	--	--	--
	P3-B49-8.5	8.5	140	--	--	--	--
	P3-B50-0.5	0.5	2.3	--	--	--	--
	P3-B50-5.0	5.0	< 1.0	--	--	--	--
	P3-B50-7.0	7.0	< 1.0	--	--	--	--
	P3-B51-0.5	0.5	< 1.0	--	--	--	--
	P3-B51-5.0	5.0	< 1.0	--	--	--	--
	P3-B51-9.0	9.0	< 1.0	--	--	--	--
	P3-B52-0.5	0.5	< 1.0	--	--	--	--
	P3-B52-4.0	4.0	< 1.0	--	--	--	--
	P3-B53-0.5	0.5	130	--	--	--	--
	P3-B53-5.0	5.0	420	--	--	--	--
	P3-B54-0.5	0.5	100	--	--	--	--
	P3-B54-5.0	5.0	170	--	--	--	--
	P3-B54-7.0	7.0	260	--	--	--	--
	P3-B55-0.5	0.5	1.0	--	--	--	--
	P3-B55-5.0	5.0	31	--	--	--	--
	P3-B56-0.5*	0.5	< 1.0	--	--	--	--
	P3-B56-5.0*	5.0	8.0	--	--	--	--
	P3-B56-10.0*	10.0	3.6	--	--	--	--
Historical Pond Area	P3-B57-0.5	0.5	< 1.0	--	--	--	--
	P3-B57-5.0	5.0	140	--	--	--	--
	P3-B57-8.0	8.0	260	--	--	--	--

Geosyntec consultants

TABLE 4:
2009 SOURCE AREA INVESTIGATION PLANT 3
Remedial Investigation Work Plan
Former WBO Facility, Nammo Defense Systems, Inc. Plant No. 3
Mesa, Arizona
September 2020

Location	Sample ID	Depth (ft bgs)	Perchlorate Concentrations	Metals Concentrations (mg/kg)			
			Field Screening	Cadmium	Chromium	Lead	Chromium VI
	P3-B58-0.5*	0.5	< 1.0	--	--	--	--
	P3-B58-5.0*	5.0	< 1.0	--	--	--	--
Historical Pond Area	P3-B59-0.5	0.5	< 1.0	--	--	--	--
	P3-B59-5.0	5.0	< 1.0	--	--	--	--
	P3-B60-0.5	0.5	< 1.0	--	--	--	--
	P3-B60-5.0	5.0	< 1.0	--	--	--	--
	P3-B61-0.5	0.5	< 1.0	--	--	--	--
	P3-B61-5.0	5.0	< 1.0	--	--	--	--
	P3-B61-7.0	7.0	< 1.0	--	--	--	--
	P3-B62-0.5	0.5	< 1.0	--	--	--	--
	P3-B62-5.0	5.0	< 1.0	--	--	--	--
	P3-B63-0.5	0.5	< 1.0	--	--	--	--
	P3-B63-5.0	5.0	7.6	--	--	--	--
	P3-B64-0.5*	0.5	< 1.0	--	--	--	--
	P3-B64-5.0*	5.0	< 1.0	--	--	--	--
	P3-B65-0.5	0.5	< 1.0	--	--	--	--
	P3-B65-5.0	5.0	1.9	--	--	--	--
	P3-B65-10.0	10.0	3.0	--	--	--	--
	P3-B66-0.5	0.5	< 1.0	--	--	--	--
	P3-B66-3.0	3.0	28	--	--	--	--
	P3-B66-5.0	5.0	12	--	--	--	--
	P3-B66-9.0	9.0	5.5	--	--	--	--
	P3-B67-0.5	0.5	< 1.0	--	--	--	--
	P3-B67-5.0	5.0	< 1.0	--	--	--	--
	P3-B67-10.0	10.0	< 1.0	--	--	--	--
	P3-B68-0.5	0.5	< 1.0	--	--	--	--
	P3-B68-5.0	5.0	< 1.0	--	--	--	--
	P3-B69-0.5	0.5	< 1.0	--	--	--	--
	P3-B69-5.0	5.0	55	--	--	--	--
	P3-B70-0.5	0.5	3.6	--	--	--	--
	P3-B70-5.0	5.0	230	--	--	--	--
	P3-B70-8.0	8.0	46	--	--	--	--
	P3-B71-0.5	0.5	--	< 0.50	12	7.5	< 1.0
	P3-B71-1.0*	1.0	1.8	--	--	--	--
	P3-B71-5.5*	5.5	< 1.0	--	--	--	--
	P3-B71-6.0*	6.0	< 1.0	--	--	--	--
	P3-B71-7.0*	7.0	< 1.0	--	--	--	--
	P3-B72-0.5	0.5	--	< 0.50	11	8.5	< 1.0
	P3-B72-1.0	1.0	130	--	--	--	--
	P3-B72-4.5	4.5	86	--	--	--	--
	P3-B72-8.0	8.0	27	--	--	--	--
	P3-B73-0.5	0.5	--	< 0.50	14	6.2	< 0.99
	P3-B73-1.0	1.0	7.5	--	--	--	--
	P3-B73-4.5	4.5	5.2	--	--	--	--
	P3-B74-0.5	0.5	--	0.56	8.5	< 5.0	< 0.99
	P3-B74-1.0	1.0	160	--	--	--	--
	P3-B74-5.5	5.5	230	--	--	--	--
	P3-B74-10.0	10.0	20	--	--	--	--
	P3-B74-11.0	11.0	79	--	--	--	--
	P3-B75-1.5	1.5	16	--	--	--	--
	P3-B75-2.0	2.0	--	6.7	14	10	< 1.0
	P3-B75-4.5	4.5	52	--	--	--	--
	P3-B75-7.5	7.5	110	--	--	--	--
	P3-B75-10.0	10.0	44	--	--	--	--
	P3-B76-0.5	0.5	< 1.0	--	--	--	--
	P3-B76-1.0	1.0	--	2.6	10	23	< 0.99
	P3-B76-5.5	5.5	110	--	--	--	--
	P3-B76-7.0	7.0	130	--	--	--	--
	P3-B77-0.5	0.5	-	< 0.50	7.7	< 5.0	< 1.0
	P3-B77-1.0	1.0	3.9	--	--	--	--
	P3-B77-5.5	5.5	360	--	--	--	--
	P3-B77-8.0	8.0	99	--	--	--	--
	P3-B83-0.5	0.5	5.0	--	--	--	--
	P3-B83-5.0	5.0	180	--	--	--	--
	P3-B83-7.5	7.5	32	--	--	--	--
	P3-B84-0.5	0.5	< 1.0	--	--	--	--
	P3-B84-5.0	5.0	290	--	--	--	--
	P3-B84-8.0	8.0	210	--	--	--	--
	P3-B85-0.5	0.5	< 1.0	--	--	--	--
	P3-B85-5.0	5.0	47	--	--	--	--
	P3-B85-7.0	7.0	26	--	--	--	--
Laundry Room/Septic	P3-B1-5.0	5.0	< 1.0	--	--	--	--
	P3-B1-10.0	10.0	< 1.0	--	--	--	--
	P3-B1-15.0	15.0	< 1.0	--	--	--	--
	P3-B1-20.0	20.0	< 1.0	--	--	--	--

TABLE 4:
2009 SOURCE AREA INVESTIGATION PLANT 3
Remedial Investigation Work Plan
Former WBO Facility, Nammo Defense Systems, Inc. Plant No. 3
Mesa, Arizona
September 2020

Location	Sample ID	Depth (ft bgs)	Perchlorate Concentrations	Metals Concentrations (mg/kg)			
			Field Screening	Cadmium	Chromium	Lead	Chromium VI
System	P3-B1-24.0A	24.0	< 1.0	--	--	--	--
	P3-B2-5.0	5.0	1.8	--	--	--	--
	P3-B2-10.0	10.0	1.4	--	--	--	--
	P3-B2-15.0	15.0	< 1.0	--	--	--	--
Laundry Room/Septic System	P3-B2-20.0	20.0	< 1.0	--	--	--	--
	P3-B2-24.0A	24.0	< 1.0	--	--	--	--
	P3-B3-5.0	5.0	< 1.0	--	--	--	--
	P3-B3-10.0	10.0	< 1.0	--	--	--	--
	P3-B3-15.0	15.0	< 1.0	--	--	--	--
	P3-B3-20.0	20.0	< 1.0	--	--	--	--
	P3-B3-25.0A	25.0	< 1.0	--	--	--	--
	P3-B4-5.0	5.0	< 1.0	--	--	--	--
	P3-B4-10.0	10.0	< 1.0	--	--	--	--
	P3-B4-15.0	15.0	< 1.0	--	--	--	--
	P3-B4-20.0	20.0	< 1.0	--	--	--	--
	P3-B4-25.0A	25.0	< 1.0	--	--	--	--
Storage Pads #1 - #6	P3-B12-0.5	0.5	< 1.0	--	--	--	--
	P3-B12-2.5	2.5	< 1.0	--	--	--	--
	P3-B12-5.0	5.0	< 1.0	--	--	--	--
	P3-B16-0.5	0.5	< 1.0	--	--	--	--
	P3-B16-2.5	2.5	< 1.0	--	--	--	--
	P3-B16-5.0	5.0	< 1.0	--	--	--	--
	P3-B17-0.5	0.5	< 1.0	--	--	--	--
	P3-B17-2.5	2.5	< 1.0	--	--	--	--
	P3-B17-5.0	5.0	< 1.0	--	--	--	--
	P3-B21-0.5	0.5	< 1.0	--	--	--	--
	P3-B21-2.5	2.5	< 1.0	--	--	--	--
	P3-B21-5.0	5.0	< 1.0	--	--	--	--
	P3-B22-0.5	0.5	< 1.0	--	--	--	--
	P3-B22-2.5	2.5	< 1.0	--	--	--	--
	P3-B22-5.0	5.0	< 1.0	--	--	--	--
	P3-B23-0.5	0.5	< 1.0	--	--	--	--
	P3-B23-2.5	2.5	< 1.0	--	--	--	--
	P3-B23-5.0A	5.0	< 1.0	--	--	--	--
	P3-B27-0.5	0.5	< 1.0	--	--	--	--
	P3-B27-2.5	2.5	2.1	--	--	--	--
	P3-B27-5.0	5.0	28	--	--	--	--
	P3-B28-0.5	0.5	6.5	--	--	--	--
	P3-B28-2.5	2.5	< 1.0	--	--	--	--
	P3-B28-5.0A	5.0	< 1.0	--	--	--	--
	P3-B34-0.5	0.5	< 1.0	--	--	--	--
	P3-B34-2.5	2.5	< 1.0	--	--	--	--
	P3-B34-5.0	5.0	< 1.0	--	--	--	--
	P3-B35-0.5	0.5	< 1.0	--	--	--	--
	P3-B35-2.5	2.5	< 1.0	--	--	--	--
	P3-B35-5.0	5.0	< 1.0	--	--	--	--
	P3-B39-0.5	0.5	2.7	--	--	--	--
	P3-B39-2.5	2.5	2.8	--	--	--	--
	P3-B39-5.0	5.0	< 1.0	--	--	--	--
	P3-B40-0.5	0.5	< 1.0	--	--	--	--
	P3-B40-2.5	2.5	< 1.0	--	--	--	--
	P3-B40-5.0	5.0	< 1.0	--	--	--	--
	P3-B78-0.5	0.5	1.7	--	--	--	--
	P3-B78-5.0	5.0	25	--	--	--	--
	P3-B78-10.0	10.0	96	--	--	--	--
	P3-B79-0.5	0.5	< 1.0	--	--	--	--
	P3-B79-1.5	1.5	< 1.0	--	--	--	--
	P3-B79-5.0	5.0	< 1.0	--	--	--	--
	P3-B79-10.0	10.0	1.2	--	--	--	--
	P3-B80-0.5	0.5	< 1.0	--	--	--	--
	P3-B80-5.0	5.0	7.7	--	--	--	--
	P3-B81-0.5	0.5	< 1.0	--	--	--	--
	P3-B81-5.0	5.0	2.2	--	--	--	--
	P3-B81-10.0	10.0	20	--	--	--	--
	P3-B82-0.5	0.5	< 1.0	--	--	--	--
	P3-B82-4.6	4.6	< 1.0	--	--	--	--
Manufacturing Line #2 Stormwater Area	P3-B13-0.5	0.5	< 1.0	--	--	--	--
	P3-B13-2.5	2.5	< 1.0	--	--	--	--
	P3-B13-5.0	5.0	< 1.0	--	--	--	--
Manufacturing Line #2	P3-B14-0.5	0.5	< 1.0	--	--	--	--
	P3-B14-2.5	2.5	< 1.0	--	--	--	--
	P3-B14-5.0	5.0	< 1.0	--	--	--	--
	P3-B15-0.5	0.5	< 1.0	--	--	--	--
	P3-B15-2.5	2.5	< 1.0	--	--	--	--
	P3-B15-5.0	5.0	< 1.0	--	--	--	--

Geosyntec consultants

TABLE 4:
2009 SOURCE AREA INVESTIGATION PLANT 3
Remedial Investigation Work Plan
Former WBO Facility, Nammo Defense Systems, Inc. Plant No. 3
Mesa, Arizona
September 2020

Location	Sample ID	Depth (ft bgs)	Perchlorate Concentrations	Metals Concentrations (mg/kg)			
			Field Screening	Cadmium	Chromium	Lead	Chromium VI
Stormwater Area	P3-B19-0.5	0.5	< 1.0	--	--	--	--
	P3-B19-2.5	2.5	140	--	--	--	--
	P3-B19-3.5	3.5	17	--	--	--	--
	P3-B19-5.0	5.0	1.2	--	--	--	--
	P3-B20-0.5	0.5	< 1.0	--	--	--	--
	P3-B20-2.5	2.5	< 1.0	--	--	--	--
Manufacturing Line #2 Stormwater Area	P3-B20-5.0	5.0	< 1.0	--	--	--	--
	P3-B86-0.5	0.5	< 1.0	--	--	--	--
	P3-B86-1.5	1.5	3.9	--	--	--	--
	P3-B86-5.0	5.0	< 1.0	--	--	--	--
	P3-B86-10.0	10.0	1.2	--	--	--	--
	P3-B87-0.5	0.5	< 1.0	--	--	--	--
	P3-B87-3.5	3.5	42	--	--	--	--
	P3-B87-5.0	5.0	4.8	--	--	--	--
	P3-B87-10.0	10.0	9.5	--	--	--	--
	P3-B88-0.5	0.5	< 1.0	--	--	--	--
	P3-B88-3.5	3.5	< 1.0	--	--	--	--
	P3-B88-5.0	5.0	< 1.0	--	--	--	--
	P3-B88-5.5	5.5	< 1.0	--	--	--	--
	P3-B89-0.5	0.5	< 1.0	--	--	--	--
	P3-B89-5.0	5.0	< 1.0	--	--	--	--
	P3-B89-10.0	10.0	< 1.0	--	--	--	--
	P3-B90-0.5	0.5	< 1.0	--	--	--	--
	P3-B90-5.0	5.0	< 1.0	--	--	--	--
	P3-B90-10.0	10.0	1.2	--	--	--	--
Northwest Storm Water Pond Areas	P3-B91-0.5	0.5	< 1.0	--	--	--	--
	P3-B91-5.0	5.0	< 1.0	--	--	--	--
	P3-B92-0.5	0.5	< 1.0	--	--	--	--
	P3-B92-5.0	5.0	< 1.0	--	--	--	--
	P3-B92-10.0	10.0	< 1.0	--	--	--	--
	P3-B93-0.5	0.5	< 1.0	--	--	--	--
	P3-B93-5.0	5.0	< 1.0	--	--	--	--
	P3-B93-10.0	10.0	< 1.0	--	--	--	--
	P3-B94-0.5	0.5	1.2	--	--	--	--
	P3-B94-5.0	5.0	< 1.0	--	--	--	--
	P3-B94-10.0	10.0	< 1.0	--	--	--	--
Test Department Firing Area	P3-B5-0.5	0.5	1.1	--	--	--	--
	P3-B5-2.5	2.5	1.6	--	--	--	--
	P3-B5-5.0	5.0	1.8	--	--	--	--
	P3-B6-0.5	0.5	< 1.0	--	--	--	--
	P3-B6-2.5	2.5	< 1.0	--	--	--	--
	P3-B6-5.0	5.0	< 1.0	--	--	--	--
	P3-B7-0.5	0.5	1.0	--	--	--	--
	P3-B7-2.5	2.5	< 1.0	--	--	--	--
	P3-B7-5.0	5.0	< 1.0	--	--	--	--
	P3-B8-0.5	0.5	< 1.0	--	--	--	--
	P3-B8-2.5	2.5	< 1.0	--	--	--	--
	P3-B8-5.0	5.0	< 1.0	--	--	--	--
	P3-B9-0.5	0.5	1.0	--	--	--	--
	P3-B9-2.5	2.5	< 1.0	--	--	--	--
	P3-B9-5.0	5.0	< 1.0	--	--	--	--
	P3-B10-0.5	0.5	< 1.0	--	--	--	--
	P3-B10-5.0	5.0	4.7	--	--	--	--
	P3-B10-2.5	2.5	< 1.0	--	--	--	--
	P3-B11-0.5	0.5	< 1.0	--	--	--	--
	P3-B11-2.5	2.5	1.0	--	--	--	--
	P3-B11-5.0	5.0	< 1.0	--	--	--	--
	P3-B18-10	10.0	< 1.0	--	--	--	--
	P3-B18-20	20.0	< 1.0	--	--	--	--

Notes:
ID = Identification
ft bgs = feet felow ground surface
mg/kg = milligram per killogram
WBO = water bore out
"--" Sample not analyzed
*-Portions of sample used to prepare composite extract submitted for laboratory confimation analysis;
Results provided in Appendix E, Certificates of Analysis.
Non-detect results are indicated by "<" followed by the laboratory reporting limit.

Geosyntec consultants

TABLE 5:
2010 SUPPLIMENTAL PERCHLORATE SOURCE AREA INVESTIGATION PLANT 3
SOIL FIELD SCREENING AND LABORATORY RESULTS
NAMMO DEFENSE SYSTEMS, INC. PLANT NO. 3
MESA, ARIZONA
SEPTEMBER 2020

Location	Boring ID	Sample ID	Depth (ft bgs)	Perchlorate Concentrations*	
				Field Screening (mg/kg)	Analytical Result (mg/kg)
Former Grinding Facility and Historical Stormwater Retention Pond	P3-B95	P3-B95-0.5	0.5	< 1.0	NA
		P3-B95-4.5	4.5	< 1.0	NA
		P3-B95-10	10	< 1.0	0.13
		P3-B95-15	15	< 1.0	NA
		P3-B95-20	20	< 1.0	0.18
		P3-B95-25	25	< 1.0	NA
		P3-B95-31	31	< 1.0	< 0.04
		P3-B95-35	35	< 1.0	NA
		P3-B95-40	40	< 1.0	< 0.04
		P3-B95-45	45	< 1.0	NA
		P3-B95-50	50	< 1.0	0.094
		P3-B95-55	55	< 1.0	NA
		P3-B95-60	60	< 1.0	0.38
		P3-B95-65	65	< 1.0	NA
		P3-B95-70	70	< 1.0	0.067
		P3-B95-75	75	< 1.0	NA
		P3-B95-80	80	< 1.0	0.068
	P3-B96	P3-B96-4.0	4.0	< 1.0	NA
		P3-B96-10	10	< 1.0	0.076
		P3-B96-15	15	< 1.0	NA
		P3-B96-20	20	< 1.0	0.30
		P3-B96-25	25	< 1.0	NA
		P3-B96-31	31	< 1.0	0.045
		P3-B96-35	35	< 1.0	NA
		P3-B96-40	40	< 1.0	< 0.04
		P3-B96-45	45	< 1.0	NA
		P3-B96-50	50	< 1.0	< 0.04
		P3-B96-55	55	< 1.0	NA
		P3-B96-60	60	< 1.0	0.043
Waste Propellant Storage Pad #4	P3-B97	P3-B97-2.5	2.5	< 1.0	NA
		P3-B97-5	5	< 1.0	2.5
		P3-B97-10	10	16.9	NA
		P3-B97-15	15	42.9	20
		P3-B97-20	20	47.1	NA
		P3-B97-25	25	12.7	7.2
		P3-B97-30	30	33.9	NA
		P3-B97-31	31	46.7	NA
		P3-B97-35	35	53.7	28
		P3-B97-40	40	49.6	NA
		P3-B97-45	45	96.9	**170**
		P3-B97-50	50	95.8	NA
		P3-B97-55	55	66.4	49
		P3-B97-60	60	39.7	NA
		P3-B97-65	65	< 1.0	15
		P3-B97-70	70	< 1.0	NA
		P3-B97-75	75	< 1.0	1.1
		P3-B97-80	80	< 1.0	NA
		P3-B97-85	85	< 1.0	0.32

Notes:
ID = Identification
ft bgs = feet below ground surface
mg/kg = milligrams per kilogram
NA = not analyzed
Non-detect results are indicated by "<" followed by the laboratory RL.
Concentrations exceeding GPL are in **boldface**.
GPL - Groundwater Protection Level: 143 mg/kg [B&C,2008]
* Results from analysis of soil extracts: The 1:1 extraction procedure provides a detection limit of 1 milligram per liter (mg/L) in the extract, equivalent to approximately 1 milligram per kilogram (mg/kg). The GPL is provided in mg/kg, therefore, the laboratory analytical results units have been converted to mg/kg herein.

Geosyntec consultants

TABLE 6:
DRAKE MATERIALS AND GOLF COURSES PERCHLORATE RESULTS

Remedial Investigation Work Plan

Former WBO Facility, Nammo Defense Systems, Inc. Plant No. 3

Mesa, Arizona

September 2020

Analyte	Perchlorate
Method	USEPA 314.0
Units	µg/l
HBGL	14

Location	Location	Sample Date	Sample Type	Concentration
Longbow-Pond 4	Longbow Golf Course	2019-11-12	Grab	**72.7**
Alta Mesa-Pond 10	Alta Mesa Golf Course	2019-11-12	Grab	11.6
Alta Mesa-Pond 13	Alta Mesa Golf Course	2019-11-12	Grab	12.0
Alta Mesa-Pond 14	Alta Mesa Golf Course	2019-11-12	Grab	11.0
Apache-Pond 4	Apache Wells Golf Course	2019-11-12	Grab	13.9
Apache-Pond 15	Apache Wells Golf Course	2019-11-12	Grab	**14.0**
Painted Mountain-Pond 1	Painted Mountains Golf Course	2019-11-12	Grab	2.84
Painted Mountain-Pond 18	Painted Mountains Golf Course	2019-11-12	Grab	<4.00
South Pond	Drake Materials	2019-11-15	Grab	**452**
Slump Rack		2019-11-15	Grab	**461**
Readymix Shop		2019-11-15	Grab	<4.00
East Well		2020-01-13	Grab	**1,280**
West Well		2020-01-13	Grab	**373**

Notes:

µg/l = micrograms per liter

HBGL = Health-Based Guidance Level

USEPA = United States Environmental Protection Agency
Concentrations exceeding the HBGL are indicated in **boldface**.

Concentrations which exceed the method detection limit (MDL) but do not meet the reporting limit (RL) are indicated by the "J" suffix.

Non-detect results are indicated by "<" followed by the laboratory RL.

TABLE 7:
SUMMARY OF PERCHLORATE
CONCENTRATIONS - 1Q 2019 THROUGH 1Q 2020
Remedial Investigation Work Plan
Former WBO Facility, Nammo Defense Systems, Inc. Plant No. 3
Mesa, Arizona
September 2020

Geosyntec consultants

			Analyte	**Perchlorate**
			Method	**EPA 314.0**
			Units	**µg/l**
			HBGL	**14**
Location	**Sample Date**	**Sample Type**	**Depth (ft btoc)**	**Concentration**
ADEQ MW-2	2019-03-20	Primary	392	0.79 J
	2019-06-26	Primary	392	< 4.00
	2019-09-23	Primary	392	< 4.00
	2019-11-11	Primary - Vertical Profile	385	< 4.00
		Primary - Vertical Profile	400	< 4.00
		Primary - Vertical Profile	420	< 4.00
	2020-03-10	Primary	392	< 4.00
ADEQ MW-3	2019-03-20	Primary	413	1.1 J
	2019-06-26	Primary	413	< 4.0
	2019-09-23	Primary	413	< 4.00
	2019-11-11	Primary - Vertical Profile	410	0.933 J
		Primary - Vertical Profile	435	1.03 J
		Primary - Vertical Profile	460	< 4.00
	2020-03-10	Primary	435	< 4.00
ADEQ MW-4	2019-03-20	Primary	412	**33.8 J**
	2019-03-20	Duplicate	412	**18.0 J**
	2019-06-26	Primary	412	< 4.0
	2019-09-23	Primary	412	< 4.00
	2019-11-11	Primary - Vertical Profile	405	0.975 J
		Primary - Vertical Profile	415	< 4.00
	2020-03-10	Primary	412	< 4.00
ADEQ MW-5	2019-03-21	Primary	278	**249**
	2019-06-27	Primary	278	**48.0**
	2019-09-23	Primary	278	**280**
	2019-11-12	Primary - Vertical Profile	260	**107**
		Primary - Vertical Profile	280	**200**
	2019-11-14 (1)	Primary - Vertical Profile	300	**339**
	2020-03-11	Primary	300	**254**
ADEQ MW-6	2019-03-20	Primary	332	**61.1**
	2019-06-26	Primary	332	**31.5**
	2019-09-23	Primary	332	**28.6**
	2019-11-11	Primary - Vertical Profile	325	**229**
		Primary - Vertical Profile	340	**217**
		Primary - Vertical Profile	360	**206**
		Primary - Vertical Profile	380	**165**
		Primary - Vertical Profile	400	**98.2**
		Primary - Vertical Profile	420	**87.3**
		Duplicate - Vertical Profile	420	**86.3**
		Primary - Vertical Profile	435	**109**
	2020-03-10	Primary	325	**20.7**

TABLE 7:
SUMMARY OF PERCHLORATE
CONCENTRATIONS - 1Q 2019 THROUGH 1Q 2020
Remedial Investigation Work Plan
Former WBO Facility, Nammo Defense Systems, Inc. Plant No. 3
Mesa, Arizona
September 2020

Geosyntec consultants

			Analyte	Perchlorate
			Method	EPA 314.0
			Units	µg/l
			HBGL	14
Location	**Sample Date**	**Sample Type**	**Depth (ft btoc)**	**Concentration**
ADEQ MW-7	2019-03-21	Primary	248	**15.2**
	2019-06-27	Primary	248	7.27
	2019-09-24	Primary	248	5.07
	2019-11-11	Primary - Vertical Profile	240	2.69 J
		Primary - Vertical Profile	260	3.01 J
		Primary - Vertical Profile	280	2.57 J
		Primary - Vertical Profile	300	2.62 J
		Duplicate - Vertical Profile	300	2.68 J
		Primary - Vertical Profile	320	2.52 J
		Primary - Vertical Profile	340	2.73 J
		Primary - Vertical Profile	365	2.97 J
	2020-03-10	Primary	248	1.90 J
ADEQ MW-8	2019-03-21	Primary	251	**617**
	2019-06-27	Primary	251	**576**
	2019-09-24	Primary	251	**398**
	2019-11-11	Primary - Vertical Profile	245	**461**
		Primary - Vertical Profile	260	**323**
		Primary - Vertical Profile	280	**159**
		Primary - Vertical Profile	300	**178**
		Primary - Vertical Profile	320	**324**
		Primary - Vertical Profile	340	**328**
		Primary - Vertical Profile	360	**236**
	2020-03-10	Primary	245	**494**
Alta Mesa	2019-03-19	Primary	--	13.5
	2019-06-26	Primary	--	13.4
	2019-09-30	Primary	--	**14.2**
	2019-11-12	Primary	--	11.2
	2020-03-16	Primary	--	11.0
Apache Wells Replacement Well	2019-03-19	Primary	--	**24.5**
	2019-06-26	Primary	--	**19.0**
	2019-09-30	Primary	--	**27.5**
	2019-11-27	Primary	--	8.40
	2020-03-16 (2)	Primary	--	**16.3**
EXT-1	2019-03-21	Primary	--	**631**
	2019-06-25	Primary	--	**399**
	2019-11-14	Primary	300	**236**
		Duplicate	300	**242**
	2019-09-24	Primary	300	**352**
EXT-2	2019-03-21	Primary	--	**354**
	2019-06-27	Primary	--	**165**
	2019-09-25	Primary	300	**96.7**
	2019-11-14	Primary	300	**20.4**
	2020-03-11	Primary	300	**189**
		Duplicate	300	**195**
HPA-1	2019-03-21	Primary	193	9.24
	2019-06-25	Primary	193	6.70
	2019-09-24	Primary	193	< 4.00
	2019-11-14	Primary	193	< 4.00
	2020-03-11	Primary	193	1.60 J

TABLE 7:
SUMMARY OF PERCHLORATE
CONCENTRATIONS - 1Q 2019 THROUGH 1Q 2020
Remedial Investigation Work Plan
Former WBO Facility, Nammo Defense Systems, Inc. Plant No. 3
Mesa, Arizona
September 2020

Geosyntec consultants

			Analyte	**Perchlorate**
			Method	**EPA 314.0**
			Units	**µg/l**
			HBGL	**14**
Location	**Sample Date**	**Sample Type**	**Depth (ft btoc)**	**Concentration**
Longbow Golf Club	2019-03-19	Primary	--	**92.7**
		Duplicate	--	**93.0**
	2019-06-26	Primary	--	**88.3**
	2019-09-23	Primary	--	**72.7**
	2019-11-12	Primary	--	**81.0**
		Duplicate	--	**81.3**
	2020-03-16	Primary	--	**72.7**
NT-1	2019-03-21	Primary	215	**93.4**
	2019-06-25	Primary	215	**446**
	2019-09-24	Primary	215	**533**
	2019-11-14	Primary	215	**328**
	2020-03-11	Primary	215	**159**
NT-2	2019-03-19	Primary	295	2.5 J
	2019-06-26	Primary	295	< 4.0
	2019-09-30	Primary	295	1.64 J
	2019-11-11	Primary - Vertical Profile	322	0.861 J
		Primary - Vertical Profile	340	1.84 J
		Duplicate - Vertical Profile	340	1.13 J
		Primary - Vertical Profile	360	< 4.00
	2020-03-10	Primary	340	2.11 J
		Duplicate	340	1.55 J
NT-3	2019-03-19	Primary	340	**18.3**
	2019-06-26	Primary	340	**19.5**
	2019-09-23	Primary	340	**18.7**
	2019-11-11	Primary - Vertical Profile	320	**18.8**
		Primary - Vertical Profile	340	**18.4**
		Primary - Vertical Profile	355	**20.9**
	2020-03-10	Primary	355	**21.3 J-**
NT-4	2019-03-19	Primary	295	< 4.0
	2019-06-26	Primary	295	< 4.0
	2019-09-25	Primary	295	< 4.00
	2019-11-13	Primary	295	< 4.00
	2020-03-10	Primary	295	< 4.00
NT-5	2019-03-19	Primary	287	**24.1**
	2019-06-26	Primary	287	**27.9**
	2019-09-23	Primary	287	**56.6**
		Duplicate	287	**57.5**
	2019-11-11	Primary - Vertical Profile	270	**23.4**
		Primary - Vertical Profile	285	**45.5**
		Primary - Vertical Profile	305	**57.6**
	2020-03-10	Primary	305	**357**
NT-6	2019-03-21	Primary	213	7.60
	2019-06-25	Primary	213	9.46
	2019-09-24	Primary	213	**23.2**
	2019-11-14	Primary	213	9.53
	2020-03-11	Primary	213	7.89

TABLE 7:
SUMMARY OF PERCHLORATE
CONCENTRATIONS - 1Q 2019 THROUGH 1Q 2020
Remedial Investigation Work Plan
Former WBO Facility, Nammo Defense Systems, Inc. Plant No. 3
Mesa, Arizona
September 2020

Geosyntec consultants

			Analyte	Perchlorate
			Method	EPA 314.0
			Units	µg/l
			HBGL	14
Location	**Sample Date**	**Sample Type**	**Depth (ft btoc)**	**Concentration**
NT-7	2019-03-21	Primary	214	**57.8**
	2019-06-25	Primary	214	**34.2**
	2019-09-24	Primary	214	**23.2**
	2019-11-14	Primary	214	12.4
	2020-03-11	Primary	214	7.78
NT-8	2019-03-25	Primary	192	5.55
	2019-06-25	Primary	192	< 4.0
	2019-09-24	Primary	192	< 4.00
	2019-11-13	Primary	192	< 4.00
		Duplicate	192	< 4.00
	2020-03-11	Primary	192	< 4.00
NT-9	2019-03-21	Primary	216	< 4.0
		Duplicate	216	< 4.0
	2019-06-25	Primary	216	< 4.0
	2019-09-24	Primary	216	< 4.00
	2019-11-13	Primary	216	< 4.00
	2020-03-11	Primary	216	< 4.00
NT-10	2019-03-21	Primary	181	0.76 J
	2019-06-25	Primary	181	< 4.00
	2019-09-24	Primary	181	0.773 J
	2020-03-11	Primary	181	< 4.00
	2019-11-13	Primary	181	< 4.00
NT-11	2019-03-21	Primary	196	1.1 J
	2019-06-25	Primary	196	0.989 J
	2019-09-24	Primary	196	0.888 J
	2019-11-13	Primary	196	< 4.00
	2020-03-11	Primary	196	< 4.00
NT-12D	2019-03-25	Primary	500	< 4.0
	2019-06-25	Primary	500	< 4.0
	2019-09-24	Primary	500	< 4.00 J
		Duplicate	500	0.652 J
	2019-11-13	Primary	500	< 4.00
	2020-03-11	Primary	500	< 4.00
NT-14	2019-06-27	Primary - Vertical Profile	220	10.5
		Primary - Vertical Profile	240	13.8
		Primary - Vertical Profile	260	13.4
		Primary - Vertical Profile	280	7.30
		Primary - Vertical Profile	300	7.45
		Primary - Vertical Profile	320	6.73
	2019-09-30	Primary	240	3.23 J
	2019-11-14	Primary	240	< 4.00
	2020-03-16	Primary	240	4.48
Painted Mountain	2019-03-19	Primary	--	2.7 J
	2019-06-26	Primary	--	2.95 J
	2019-09-30	Primary	--	1.34 J
		Duplicate	--	2.72 J
	2019-11-12	Primary	--	2.72 J
	2020-03-16	Primary	--	2.80 J
		Duplicate	--	2.77 J

TABLE 7:
SUMMARY OF PERCHLORATE
CONCENTRATIONS - 1Q 2019 THROUGH 1Q 2020
Remedial Investigation Work Plan
Former WBO Facility, Nammo Defense Systems, Inc. Plant No. 3
Mesa, Arizona
September 2020

Geosyntec consultants

			Analyte	**Perchlorate**
			Method	**EPA 314.0**
			Units	**µg/l**
			HBGL	**14**
Location	**Sample Date**	**Sample Type**	**Depth (ft btoc)**	**Concentration**
SRP 32.8E-7.2N	2019-07-01	Primary	--	< 4.0
	2019-09-25	Primary	--	< 4.00
		Duplicate	--	< 4.00
	2019-11-13	Primary	--	< 4.00
	2020-03-11	Primary	--	< 4.00
SRP 33.1E-7.3N	2019-07-01	Primary	--	< 4.0
	2019-09-25	Primary	--	0.712 J
	2019-11-13	Primary	--	< 4.00
		Duplicate	--	< 4.00
	2020-03-11	Primary	--	< 4.00
		Duplicate	--	< 4.00
SRP 33.3E-7.5N	2019-07-01	Primary	--	1.89 J
	2019-09-25	Primary	--	< 4.00
	2019-11-13	Primary	--	< 4.00
	2020-03-11	Primary	--	< 4.00
WBO-1	2019-03-21	Primary	193	**552**
	2019-06-25	Primary	193	**361**
	2019-09-24	Primary	193	**1,160**
	2019-11-14	Primary	193	**394**
	2020-03-11	Primary	193	**198**

Notes:

1Q = 1st quarter
EPA = Environmental Protection Agency
µg/l = micrograms per liter
HBCL = Health Based Guidence Level
Concentrations exceeding HBCL are in **boldface**.
Concentrations which exceed the method detection limit but do not meet the reporting limit (RL) are indicated by the "J" suffix.
Non-detect results are indicated by "<" followed by the laboratory RL.
ft btoc = feet below top of casing
(1) = Hydrasleeve tangled upon deployment, new Hydrasleeve was set and resampled.
(2) = Apache Wells Replacement Well was off for repairs. Apache Wells Golf #2 was sampled in its place.
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
J- = The analyte was positively identified; however, the associated numerical value is likely to be lower than the concentration of the analyte in the sample due to negative bias of associated QC or calibration data or attributable to matrix interference.

Geosyntec consultants

TABLE 8:
SUMMARY OF DETECTED VOLATILE ORGANIC COMPOUNDS CONCENTRATIONS
1Q 2019 THROUGH 1Q 2020
NAMMO DEFENSE SYSTEMS, INC. PLANT NO. 3
MESA, ARIZONA
SEPTEMBER 2020

			Analyte	1,1,2-Trichloroethane	1,1-Dichloroethane	1,1-Dichloroethene	1,2-Dichloroethane	Benzene	Chloroform	cis-1,2-Dichloroethene	n-Hexane	Methlycyclohexane	Propene	Tetrachloroethene (PCE)	Trichloroethene (TCE)
			Method	**EPA 8260B**											
			Units	**µg/l**											
			AWQS	**5**	**NE**	**7**	**5**	**5**	**100 (1)**	**70**	**NE**	**NE**	**NE**	**5**	**5**
Location	**Sample Date**	**Sample Type**	**Depth (ft btoc)**	**Concentrations**											
ADEQ MW-2	2019-06-26	Primary	392	< 1.00	< 1.00	1.02	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	2.21
	2019-09-23	Primary	392	< 1.00	< 1.00	0.812 J	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	1.58
	2019-11-11	Primary - Vertical Profile	385	< 1.00	< 1.00	1.13	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	1.77
		Primary - Vertical Profile	400	< 1.00	< 1.00	0.924 J	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	1.33
		Primary - Vertical Profile	420	< 1.00	< 1.00	1.08	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	1.50
	2020-03-10	Primary	392	< 1.00	< 1.00	0.705 J	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	1.45
ADEQ MW-3	2019-06-26	Primary	413	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	2.60 J	< 1.00	< 2.50	< 1.00	< 1.00
	2019-09-23	Primary	413	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	2.91 J	< 1.00	4.98	< 1.00	< 1.00
	2019-11-11	Primary - Vertical Profile	410	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
		Primary - Vertical Profile	435	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	1.03 J	< 1.00	< 1.00
		Primary - Vertical Profile	460	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
	2020-03-10	Primary	435	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
ADEQ MW-4	2019-06-26	Primary	412	< 1.00	< 1.00	0.727 J	< 1.00	< 1.00	< 5.00	< 1.00	0.772 J	< 1.00	< 2.50	< 1.00	2.26
	2019-09-23	Primary	412	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	2.08 J	< 1.00	4.07	< 1.00	< 1.00
	2019-11-11	Primary - Vertical Profile	405	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.15	1.34 J	< 1.00	< 1.00
		Primary - Vertical Profile	415	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.16	< 2.50	< 1.00	< 1.00
	2020-03-10	Primary	412	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
ADEQ MW-5	2019-06-27	Primary	278	< 1.00	1.02	**66.3**	< 1.00	< 1.00	0.961 J	0.354 J	< 10.0	< 1.00	< 2.50	1.04	**178**
	2019-09-23	Primary	278	0.677 J	1.95	**138**	0.578 J	0.542 J	2.03 J	0.642 J	< 10.0	< 1.00	1.37 J	1.61	**279**
	2019-11-12	Primary - Vertical Profile	260	0.431 J	1.53	**104**	< 1.00	0.368 J	1.17 J	0.686 J	< 10.0	< 1.00	< 2.50	1.03	**200**
		Primary - Vertical Profile	280	0.638 J	1.48	**120**	0.550 J	0.371 J	1.47 J	0.671 J	< 10.0	< 1.00	< 2.50	1.42	**212**
	2019-11-14 (2)	Primary - Vertical Profile	300	0.471 J	1.33	**116**	< 1.00	< 1.00	1.72 J	0.553 J	< 10.0	< 1.00	< 2.50	1.24	**200**
	2020-03-11	Primary	300	0.628 J	1.65	**117**	< 1.00	0.443 J	2.19 J	0.598 J	< 10.0	2.19	< 2.50	2.29	**218**

TABLE 8:
SUMMARY OF DETECTED VOLATILE ORGANIC COMPOUNDS CONCENTRATIONS
1Q 2019 THROUGH 1Q 2020
NAMMO DEFENSE SYSTEMS, INC. PLANT NO. 3
MESA, ARIZONA
SEPTEMBER 2020

Geosyntec consultants

			Analyte	1,1,2-Trichloroethane	1,1-Dichloroethane	1,1-Dichloroethene	1,2-Dichloroethane	Benzene	Chloroform	cis-1,2-Dichloroethene	n-Hexane	Methlycyclohexane	Propene	Tetrachloroethene (PCE)	Trichloroethene (TCE)
			Method	EPA 8260B											
			Units	µg/l											
			AWQS	5	NE	7	5	5	100 (1)	70	NE	NE	NE	5	5
Location	Sample Date	Sample Type	Depth (ft btoc)	Concentrations											
ADEQ MW-6	2019-06-26	Primary	332	< 1.00	< 1.00	0.662 J	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	0.776 J
	2019-09-23	Primary	332	< 1.00	< 1.00	0.589 J	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	0.509 J
	2019-11-11	Primary - Vertical Profile	325	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
		Primary - Vertical Profile	340	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
		Primary - Vertical Profile	360	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
		Primary - Vertical Profile	380	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
		Primary - Vertical Profile	400	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
		Primary - Vertical Profile	420	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
		Duplicate - Vertical Profile	420	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
		Primary - Vertical Profile	435	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
	2020-03-10	Primary	325	< 1.00	< 1.00	0.723 J	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	0.561 J
ADEQ MW-7	2019-03-21	Primary	248	< 1.00	< 1.00	1.01	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	0.80 J
	2019-06-27	Primary	248	< 1.00	< 1.00	0.557 J	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	0.466 J
	2019-09-24	Primary	248	< 1.00	< 1.00	0.400 J	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
	2019-11-11	Primary - Vertical Profile	240	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
		Primary - Vertical Profile	260	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
		Primary - Vertical Profile	280	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
		Primary - Vertical Profile	300	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
		Duplicate - Vertical Profile	300	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
		Primary - Vertical Profile	320	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
		Primary - Vertical Profile	340	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
		Primary - Vertical Profile	365	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
	2020-03-10	Primary	248	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00

TABLE 8:
SUMMARY OF DETECTED VOLATILE ORGANIC COMPOUNDS CONCENTRATIONS
1Q 2019 THROUGH 1Q 2020
NAMMO DEFENSE SYSTEMS, INC. PLANT NO. 3
MESA, ARIZONA
SEPTEMBER 2020

Geosyntec consultants

			Analyte	1,1,2-Trichloroethane	1,1-Dichloroethane	1,1-Dichloroethene	1,2-Dichloroethane	Benzene	Chloroform	cis-1,2-Dichloroethene	n-Hexane	Methylcyclohexane	Propene	Tetrachloroethene (PCE)	Trichloroethene (TCE)
			Method	**EPA 8260B**											
			Units	**µg/l**											
			AWQS	**5**	**NE**	**7**	**5**	**5**	**100 (1)**	**70**	**NE**	**NE**	**NE**	**5**	**5**
Location	**Sample Date**	**Sample Type**	**Depth (ft btoc)**	**Concentrations**											
ADEQ MW-8	2019-03-21	Primary	251	< 1.00	1.03	**88.1**	< 1.00	< 1.00	3.4 J	< 1.00	< 10.0	< 1.00	< 2.5	0.94 J	**144**
	2019-06-27	Primary	251	< 1.00	0.837 J	**75.9**	< 1.00	< 1.00	2.72 J	< 1.00	< 10.0	< 1.00	< 2.5	1.05	**140**
	2019-09-24	Primary	251	< 1.00	1.23	**118**	< 1.00	< 1.00	3.27 J	< 1.00	< 10.0	< 1.00	< 2.50	1.77 J	**175**
	2019-11-11	Primary - Vertical Profile	245	< 1.00	1.69	**159**	< 1.00	< 1.00	3.95 J	< 1.00	< 10.0	< 1.00	< 2.50	1.77	**217**
		Primary - Vertical Profile	260	< 1.00	1.10	**121**	< 1.00	< 1.00	2.67 J	< 1.00	< 10.0	< 1.00	< 2.50	1.17	**178**
		Primary - Vertical Profile	280	< 1.00	0.629 J	**62.5**	< 1.00	< 1.00	1.42 J	< 1.00	< 10.0	< 1.00	< 2.50	0.703 J	**91.7**
		Primary - Vertical Profile	300	< 1.00	0.607 J	**59.2**	< 1.00	< 1.00	1.49 J	< 1.00	< 10.0	< 1.00	< 2.50	0.635 J	**90.3**
		Primary - Vertical Profile	320	< 1.00	0.660 J	**66.8**	< 1.00	< 1.00	1.52 J	< 1.00	< 10.0	< 1.00	< 2.50	0.648 J	**103**
		Primary - Vertical Profile	340	< 1.00	0.617 J	**67.4**	< 1.00	< 1.00	1.69 J	< 1.00	< 10.0	< 1.00	< 2.50	0.777 J	**99.8**
		Primary - Vertical Profile	360	< 1.00	0.713 J	**68.7**	< 1.00	< 1.00	1.63 J	< 1.00	< 10.0	< 1.00	< 2.50	0.726 J	**105**
	2020-03-10	Primary	245	< 10.0	< 10.0	**104**	< 1.00	< 10.0	3.70 J	< 10.0	< 10.0	< 10.00	< 25.0	< 10.0	**289**
Alta Mesa	2019-06-26	Primary	--	< 1.00	< 1.00	0.505 J	< 1.0	< 1.0	< 5.0	< 1.0	< 10.0	< 1.00	< 2.50	< 1.00	4.99
	2019-09-30	Primary	--	< 1.00	< 1.00	0.425 J	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	3.46
	2019-11-12	Primary	--	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	2.57
	2020-03-16	Primary	--	< 1.00	< 1.00	0.477 J	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	2.92
Apache Wells Replacement Well	2019-06-26	Primary	--	< 1.0	< 1.00	< 1.00	< 1.00	< 1.00	< 5.0	< 1.0	< 10.0	< 1.00	< 2.50	< 1.00	0.558 J
	2019-09-30	Primary	--	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	0.591 J
	2019-11-27	Primary	--	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	0.807 J	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
	2020-03-16 (3)	Primary	--	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
Longbow Golf Club	2019-03-19	Primary	--	< 1.00	< 1.00	1.04	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	3.74
	2019-06-26	Primary	--	< 1.00	< 1.00	1.06	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	3.76
	2019-09-23	Primary	--	< 1.00	< 1.00	1.29	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	4.81
	2019-11-12	Primary	--	< 1.00	< 1.00	0.962 J	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	3.15
		Duplicate	--	< 1.00	< 1.00	1.17 J	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	3.21
	2020-03-16	Primary	--	< 1.00	< 1.00	1.64	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	4.46

TABLE 8:
SUMMARY OF DETECTED VOLATILE ORGANIC COMPOUNDS CONCENTRATIONS
1Q 2019 THROUGH 1Q 2020
NAMMO DEFENSE SYSTEMS, INC. PLANT NO. 3
MESA, ARIZONA
SEPTEMBER 2020

Geosyntec consultants

			Analyte	1,1,2-Trichloroethane	1,1-Dichloroethane	1,1-Dichloroethene	1,2-Dichloroethane	Benzene	Chloroform	cis-1,2-Dichloroethene	n-Hexane	Methlycyclohexane	Propene	Tetrachloroethene (PCE)	Trichloroethene (TCE)
			Method	**EPA 8260B**											
			Units	**µg/l**											
			AWQS	**5**	**NE**	**7**	**5**	**5**	**100 (1)**	**70**	**NE**	**NE**	**NE**	**5**	**5**
Location	**Sample Date**	**Sample Type**	**Depth (ft btoc)**	**Concentrations**											
Painted Mountain	2019-06-26	Primary	--	< 1.00	< 1.0	< 1.0	< 1.0	< 1.0	< 5.0	0.406 J	< 10.0	< 1.00	< 2.50	< 1.00	1.64
	2019-09-30	Primary	--	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	0.505 J	< 10.0	< 1.00	< 2.50	< 1.00	1.47
		Duplicate	--	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	0.456 J	< 10.0	< 1.00	< 2.50	< 1.00	1.54
	2019-11-12	Primary	--	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	0.446 J	< 10.0	< 1.00	< 2.50	< 1.00	1.41
	2020-03-16	Primary	--	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	0.598 J	< 10.0	< 1.00	< 2.50	< 1.00	1.54
		Duplicate	--	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	0.548 J	< 10.0	< 1.00	< 2.50	< 1.00	1.54
EXT-1	2019-03-21	Primary	--	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	0.80 J	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	0.86 J
EXT-2	2019-03-21	Primary	--	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	0.81 J
HPA-1	2019-03-21	Primary	193	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	0.73 J
	2019-11-27	Primary	193	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	0.389 J	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	0.569 J
NT-1	2019-03-21	Primary	215	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	0.52 J	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	0.87 J
	2019-11-27	Primary	215	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	1.28 J	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	1.64
NT-6	2019-03-21	Primary	213	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	0.98 J	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	1.73
	2019-11-27	Primary	213	< 1.00	< 1.00	0.498 J	< 1.00	< 1.00	2.26 J	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	3.95
NT-7	2019-03-21	Primary	214	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	0.62 J	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	1.00 J
	2019-11-27	Primary	214	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
NT-8	2019-03-25	Primary	192	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
	2019-11-27	Primary	192	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
	2019-11-13	Primary	192	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
		Duplicate	192	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
NT-9	2019-03-21	Primary	216	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
		Duplicate	216	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
	2019-12-03	Primary	246	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
NT-10	2019-03-21	Primary	181	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
	2019-11-27	Primary	181	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
	2019-11-13	Primary	181	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00

TABLE 8:
SUMMARY OF DETECTED VOLATILE ORGANIC COMPOUNDS CONCENTRATIONS
1Q 2019 THROUGH 1Q 2020
NAMMO DEFENSE SYSTEMS, INC. PLANT NO. 3
MESA, ARIZONA
SEPTEMBER 2020

Geosyntec consultants

			Analyte	1,1,2-Trichloroethane	1,1-Dichloroethane	1,1-Dichloroethene	1,2-Dichloroethane	Benzene	Chloroform	cis-1,2-Dichloroethene	n-Hexane	Methlycyclohexane	Propene	Tetrachloroethene (PCE)	Trichloroethene (TCE)
			Method	EPA 8260B											
			Units	µg/l											
			AWQS	5	NE	7	5	5	100 (1)	70	NE	NE	NE	5	5
Location	Sample Date	Sample Type	Depth (ft btoc)	Concentrations											
NT-11	2019-03-21	Primary	196	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
	2019-11-13	Primary	196	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
	2019-11-27	Primary	196	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
NT-12D	2019-11-27	Primary	500	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
NT-14	2019-06-27	Primary - Vertical Profile	240	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
		Primary - Vertical Profile	260	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
		Primary - Vertical Profile	280	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
		Primary - Vertical Profile	300	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
		Primary - Vertical Profile	320	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
	2019-09-30	Primary	240	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
	2020-03-16	Primary	240	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
WBO-1	2019-03-21	Primary	--	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	0.43 J
	2019-11-27	Primary	--	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	3.13 J	< 1.00	< 10.0	< 1.00	< 2.50	0.715 J	4.12
SRP 32.8E-7.2N	2019-07-01	Primary	--	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
	2019-09-25	Primary	--	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
		Duplicate	--	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
	2019-11-13	Primary	--	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
	2020-03-11	Primary	--	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
SRP 33.1E-7.3N	2019-07-01	Primary	--	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
	2019-09-25	Primary	--	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
	2019-11-13	Primary	--	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
		Duplicate	--	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
	2020-03-11	Primary	--	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
		Duplicate	--	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00

Geosyntec consultants

TABLE 8:
SUMMARY OF DETECTED VOLATILE ORGANIC COMPOUNDS CONCENTRATIONS
1Q 2019 THROUGH 1Q 2020
NAMMO DEFENSE SYSTEMS, INC. PLANT NO. 3
MESA, ARIZONA
SEPTEMBER 2020

			Analyte	**1,1,2-Trichloroethane**	**1,1-Dichloroethane**	**1,1-Dichloroethene**	**1,2-Dichloroethane**	**Benzene**	**Chloroform**	**cis-1,2-Dichloroethene**	**n-Hexane**	**Methlycyclohexane**	**Propene**	**Tetrachloroethene (PCE)**	**Trichloroethene (TCE)**
			Method	**EPA 8260B**											
			Units	**µg/l**											
			AWQS	**5**	**NE**	**7**	**5**	**5**	**100 (1)**	**70**	**NE**	**NE**	**NE**	**5**	**5**
Location	**Sample Date**	**Sample Type**	**Depth (ft btoc)**	**Concentrations**											
SRP 33.3E-7.5N	2019-07-01	Primary	--	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
	2019-09-25	Primary	--	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
	2019-11-13	Primary	--	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00
	2020-03-11	Primary	--	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 5.00	< 1.00	< 10.0	< 1.00	< 2.50	< 1.00	< 1.00

Notes:

(1) = AWQS established for total trihalomethanes, which include chloroform, dibromochloromethane, bromodichloromethane, and bromoform.

(2) = Hydrasleeve tangled upon deployment, new Hydrasleeve was set and resampled.

(3) = Apache Wells Replacement Well was off for repairs. Apache Wells Golf #2 was sampled in its place.

µg/l = micrograms per liter

AWQS = Arizona Aquifer Water Quality Standard

ft btoc = feet below top of casing

NE = Not established; no aquifer water quality standard is established.

Concentrations exceeding the AWQS are indicated in **boldface**.

Concentrations which exceed the method detection limit (MDL) but do not meet the reporting limit (RL) are indicated by the "J" suffix.

Non-detect results are indicated by "<" followed by the laboratory RL.

TABLE 9: DEPTH TO WATER AND PERCHLORATE CONCENTRATIONS IN WELL WBO-1 (2009 - 2020)

Former WBO Facility, Nammo Defense Systems, Inc. Plant No. 3

Mesa, Arizona

September 2020

Date	Depth To Water	Perchlorate Concentration (µg/L)
2/26/2009	175	**3000**
7/28/2009	172.86	**7900**
3/22/2011	164.13	**5949**
12/15/2011	169.85	**1800**
3/19/2012	175.15	**810**
6/18/2012	178.13	**860**
9/17/2012	181.87	**320**
12/17/2012	183.72	**68**
3/18/2013	184.3	**68**
6/17/2013	185.3	**76**
9/16/2013	187.4	**58**
12/16/2013	191.18	**34**
3/18/2014	192.37	**44**
6/19/2014	194.73	**160**
3/28/2018	190.92	**91.3**
9/11/2018	196.46	**810**
3/21/2019	192.64	**552**
6/25/2019	186.8	**361**
9/24/2019	183.77	**1,160**
11/14/2019	185.42	**394**
3/11/2020	193	**198**

µg/L - Micrograms per liter

ft bgs is feet below ground surface

TABLE 10: PROPOSED SUITE OF ANALYSES FOR GROUNDWATER MONITORING
Remedial Investigation Work Plan
Former WBO Facility, Nammo Defense Systems, Inc. Plant No. 3
Mesa, Arizona
September 2020

Groundwater Wells	DTW	Transducer download	Perchlorate	VOC
Container Quantity - Volume			**1-250mL**	**3-40mL**
Container Type			**poly**	**glass VOA**
Container Preservative			**None**	**HCl**
Holding Time (days)			**28**	**14**
EPA Analytical Test Method			**314.0**	**8260B**
NT-1	Q	Q	Q	Q
NT-6	Q	Q	Q	Q
NT-7	Q	Q	Q	Q
NT-8	Q	Q	Q	Q
NT-10	Q	Q	Q	Q
NT-11	Q	Q	Q	Q
NT-12D	Q	Q	Q	Q
NT-14	Q	Q	Q	Q
NT-2	Q	NA	Q	Q
NT-3	Q	NA	Q	--
NT-4	Q	NA	Q	--
NT-5	Q	NA	Q	Q
NT-9	Q	Q	Q	Q
WBO-1	Q	NA	Q	Q
HPA-1	Q	NA	Q	Q
ADEQ No.2	Q	NA	Q	Q
ADEQ No.3	Q	NA	Q	Q
ADEQ No.4	Q	NA	Q	Q
ADEQ No.5	Q	NA	Q	Q
ADEQ No.6	Q	NA	Q	Q
ADEQ No.7	Q	Q	Q	Q
ADEQ No.8	Q	Q	Q	Q
CC	--	NA	Q	Q
Replacement	--	NA	Q	Q
Longbow Golf C	--	NA	Q	Q
Painted Mt. Gol	--	NA	Q	Q
SRP 32.8E7.2N	--	NA	Q	Q
SRP 33.1E7.3N	--	NA	Q	Q
SRP 33.3E7.5N	--	NA	Q	Q
EXT-1	Q	Q	Q	--
EXT-2	Q	Q	Q	--

Abbreviations:

DTW- depth to water measurement
VOC- Volatile Organic Compound

mL- milliliter
L- liter
poly- polyethylene
HCl- Hydrochloric Acid
EPA- Environmental Protection Agency
NA-Not Applicable

WBO- Water Bore-out
HPA- Historical Pond Area
ADEQ- Arizona Department of Environmental Quality
MW- Monitor Well
CC- Country Club
Q- Quarterly
A- Annually

Notes:

1- Field Parameters include: pH, Dissolved Oxygen, Oxidation-Reduction Potential, Temperature, Specific Conductivity

TABLE 11: PROPOSED WELL CONSTRUCTION DETAILS AND SAMPLING PLAN
Remedial Investigation Work Plan
Former WBO Facility, Nammo Defense Systems, Inc. Plant No. 3
Mesa, Arizona
September 2020

Well	Proposed Total Depth[1] (ft bgs)	Proposed Casing and Screen Material	Estimated Screened Intervals[1] (ft bgs)	Rationale	Vertical Aquifer Profile Sampling (ft bgs)	Proposed Analyses of Vertical Profile Samples[2]
Area 1	TBD	3-inch Sch 80 PVC 0.020-inch slotted	250-350 550-650	Installed within or in the vicinity of the aaproximate central portion fo the plume away from production wells. This well is proposed to vertically profile extent of the plume.	270, 300, 350, 400, 450, 500, 550, 600, 650, 700	Perchlorate by USEPA Method 314.0 VOCs by USEPA Method 8260B
Area 2	TBD	4-inch Sch 80 PVC 0.020-inch slotted	250-350 550-650	Installed west of ADEQ MW-2, MW-3, and MW-4, which have compromised screens, and ADEQ-MW-06 where perchlorate exceeded the HGBL.	4 depths selected based on Areas 1 and 4 data, up to 500-ft bgs	Perchlorate by USEPA Method 314.0 VOCs by USEPA Method 8260B
Area 3	TBD	4-inch Sch 80 PVC 0.020-inch slotted	250-350 550-650	Installed to delineate the extent of the plume west of NT-5, where concentrations have been consistently above 14 ug/L and increasing every quarter since 2018.	4 depths selected based on Areas 1 and 4 data, up to 500-ft bgs	Perchlorate by USEPA Method 314.0 VOCs by USEPA Method 8260B
Area 4	TBD	3-inch Sch 80 PVC 0.020-inch slotted	250-350 550-650	Installed to delineate the extent of the plume southwest of NT-5, where concentrations have been consistently above 14 ug/L and increasing every quarter since 2018.	270, 300, 350, 400, 450, 500, 550, 600, 650, 700	Perchlorate by USEPA Method 314.0 VOCs by USEPA Method 8260B
Area 5	TBD	4-inch Sch 80 PVC 0.020-inch slotted	250-350 550-650	Installed to delineate the extent of the plume south of NT-5, where concentrations have been consistently above 14 ug/L and increasing every quarter since 2018. This well is proposed co-located with City of Mesa monitor well Falcon Field FF-07.	4 depths selected based on Areas 1 and 4 data, up to 600-ft bgs	Perchlorate by USEPA Method 314.0 VOCs by USEPA Method 8260B

Notes
1) Total depth of wells and screened intervals will be determined by vertical profiling samples collected at Areas 1 and 4. Depth of wells may be extended to the depth of impacted production wells in the area, or to the depth of discrete vertical profile samples that are below the HBGL.
2) Deth descreate vertical profile samples will be collected using a push-ahead type sampler during drilling.

Abbreviationss:
ft bgs = feet below ground sur
Sch = schedule
PVC = polyvinyl chloride
USEPA = United States Environmental Pr
ug/L = micrograms per liter
VOCs = volatile organic compounds
TBD = To Be Determined based on vertical profile samples

Geosyntec consultants

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30 June 2020

Angel Soto, HESS Director
Nammo Defense Systems, Inc.
4051 N. Higley Rd.
Mesa, AZ 85215

Subject: Soil Vapor VOC Source Area Investigation
Nammo Defense Systems, Plant No. 3
Mesa, Arizona

Dear Mr. Soto:

Geosyntec Consultants, Inc. (Geosyntec) has prepared this *Soil Vapor VOC Source Area Investigation Report* (Report) on behalf of Nammo Defense Systems, Inc. (NDS) to document the field activities and findings for construction and sampling of soil vapor probes at NDS Plant 3 in Mesa, Arizona (the site; Figure 1). The purpose of this work is to characterize a potential source area for volatile organic compounds (VOCs) in soil vapor and groundwater. Plant 3 is located upgradient and in the vicinity of a groundwater monitor well (ADEQ MW-8), where elevated concentrations of 1,1-dichloroethene (1,1-DCE) and trichloroethene (TCE) have been detected in groundwater and are the primary constituents of concern (COCs). This work was performed in general accordance with the Draft Remedial Investigation Work Plan[1] (Work Plan).

Chlorinated solvent storage and hazardous waste accumulation areas were historically documented in a Resource Conservation and Recovery Act (RCRA) Facility Assessment Report[2], which identified a total of 31 solid waste management units (SWMUs) at Plant 3. SWMUs where solvent waste storage was documented were targeted as part of this investigation. The RCRA Facility Assessment Report documents that Plant 3 has historically generated waste 1,1,1-Trichloroethyle (1,1,1-TCA) (waste code F001 and F002), M17M (a trade name of chlorinated solvent of unknown mixture – waste code F001), and TCE. 1,1-DCE is known to be a common byproduct of 1,1,1-TCA degradation

[1] Draft Remedial Investigation Work Plan, Former WBO Facility, Nammo Defense Systems, Inc. Mesa, Arizona. March 2020
[2] RCRA Facility Assessment Report for Talley Defense Systems, Inc. Mesa, Arizona. April, 1994.

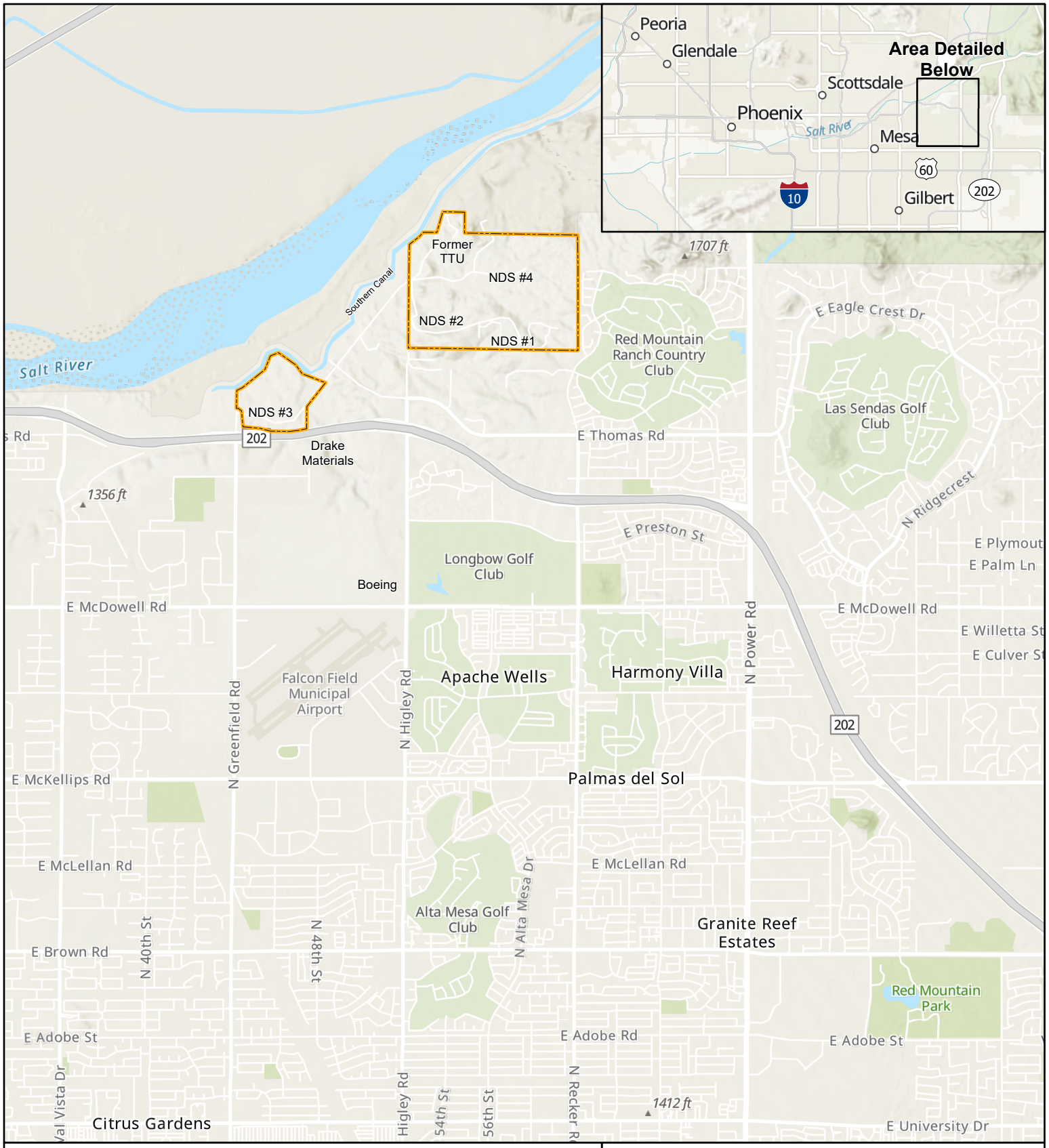
Figures:

Figure 1 Site Location Map
Figure 2 TCE Results 5’ Depth
Figure 3 TCE Results 15’ Depth
Figure 4 1,1 DCE Results 5’ Depth
Figure 5 1,1 DCE Results 15’ Depth

Attachments:

Attachment 1 SWMUs Locations and Select Pages from RCRA Facility Assessment Report
Attachment 2 Boring Log and As-Built Diagram
Attachment 3 IDW Records
Attachment 4 Soil Vapor Sampling Field Forms
Attachment 5 Summary of Detected VOCs
Attachment 6 Laboratory Analytical Results
Attachment 7 Data Validation Report

FIGURES



Approximate Property Boundary

Notes:
-NDS: Nammo Defense Systems, Inc.
-TTU: Thermal Treatment Unit

N

0 2,000 4,000 Feet

Site Location Map

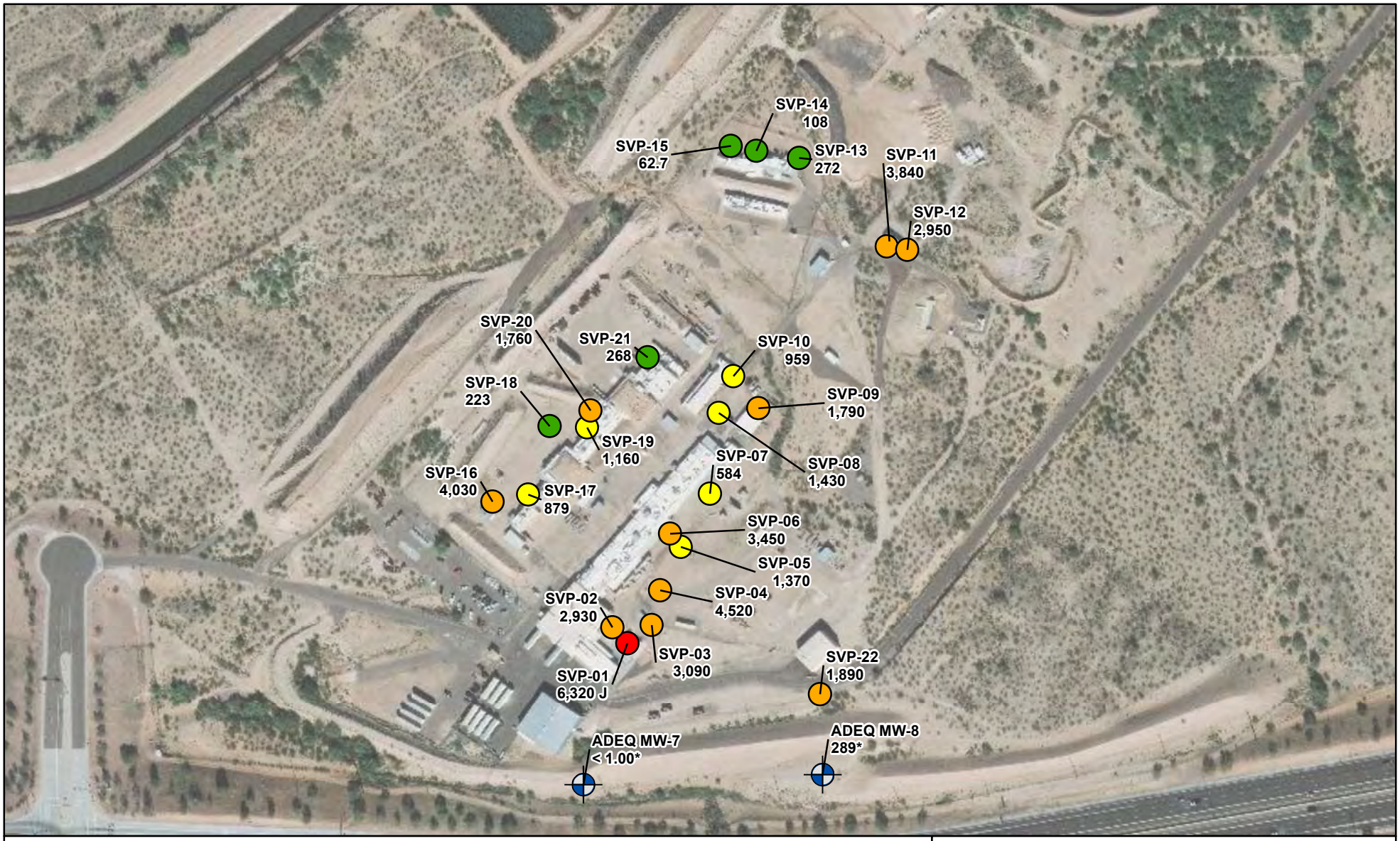
Nammo Defense Systems, Inc. Plant #3
Mesa, Arizona

Geosyntec consultants

Phoenix, AZ | June 2020

Figure 1

SantaBarbara-01\D:\WorkingFromSB\SP0101 - Nammo Talley\Projects\2020\PechContours1Q2020\PechContours1Q2020.aprx 6/4/2020 (Author: JGordon) 5:58 PM



Legend

- 0 - 291
- 292 - 1,500
- 1,501 - 5,000
- 5,001 - 10,000
- Monitoring Well

Notes:
Units are in µg/m^3
Non-detect results are indicated by ">" followed by the laboratory RL.
*Groundwater concentrations from 1Q 2020 groundwater quarterly sampling event in ug/L
J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample

N

0 300 Feet

TCE Results
5' Depth

Nammo Defense Systems, Inc. Plant 3
Mesa, Arizona

Geosyntec consultants

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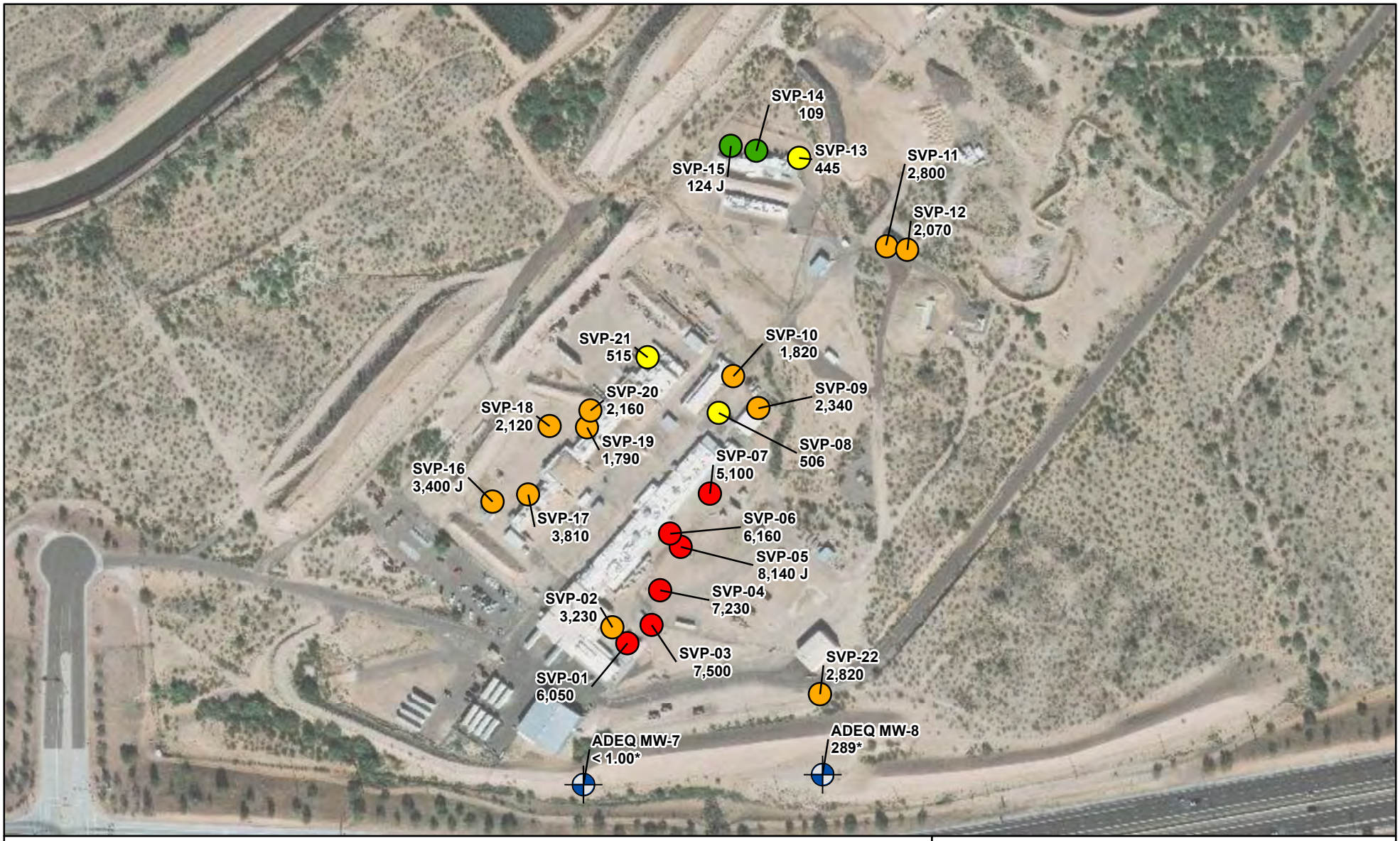
Figure 2

SantaBarbara-01\P:\GIS\SP0101 - Nammo Talley\Projects\2020 Plant 3 Soil Vapor Monitoring\Fig02_NammoTalley_SoilVapor_Heatmap_05ft_TCE.mxd 6/12/2020 (Author: PFitzgibbon) 2:23:13 PM



Legend

- 0 - 291
- 292 - 1,500
- 1,501 - 5,000
- 5,001 - 10,000
- Monitoring Well

Notes:
Units are in µg/m^3
Non-detect results are indicated by ">" followed by the laboratory RL.
*Groundwater concentrations from 1Q 2020 groundwater quarterly sampling event in ug/L
J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample

N

0 300 Feet

TCE Results
15' Depth

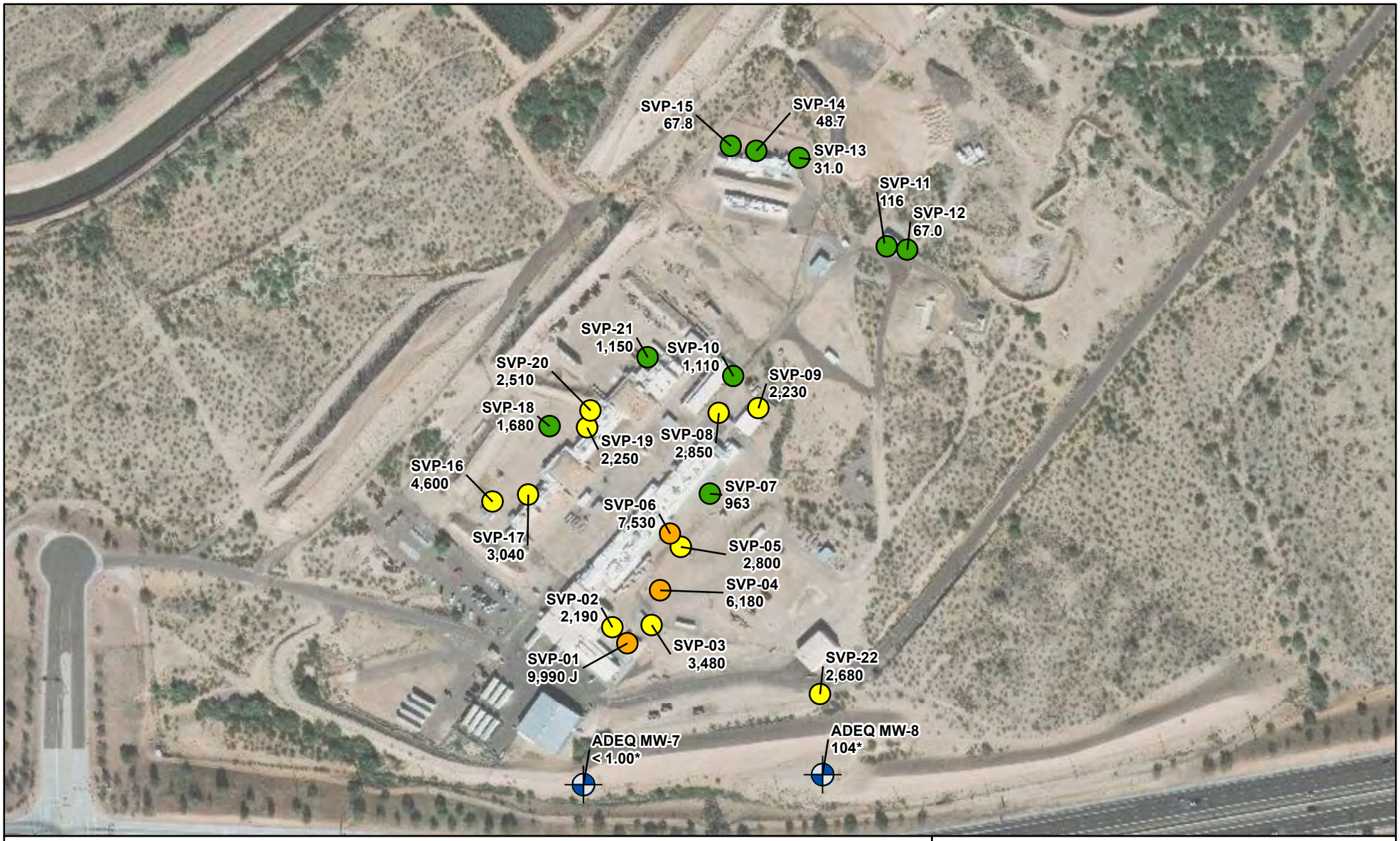
Nammo Defense Systems, Inc. Plant 3
Mesa, Arizona

Geosyntec consultants

Phoenix, AZ | June 2020

Figure 3

SantaBarbara-01\P:\GIS\SP0101 - Nammo Talley\Projects\2020 Plant 3 Soil Vapor Monitoring\Fig03_NammoTalley_SoilVapor_Heatmap_15ft_TCE.mxd 6/12/2020 (Author: PFitzgibbon) 2:26:55 PM



Legend

- 0 - 2,000
- 2,001 - 5,000
- 5,001 - 10,000
- 10,001 - 20,000
- Monitoring Well

Notes:
Units are in µg/m^3
Non-detect results are indicated by ">" followed by the laboratory RL.
*Groundwater concentrations from 1Q 2020 groundwater quarterly sampling event in ug/L
J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample

N

0 300 Feet

1,1-DCE Results
5' Depth

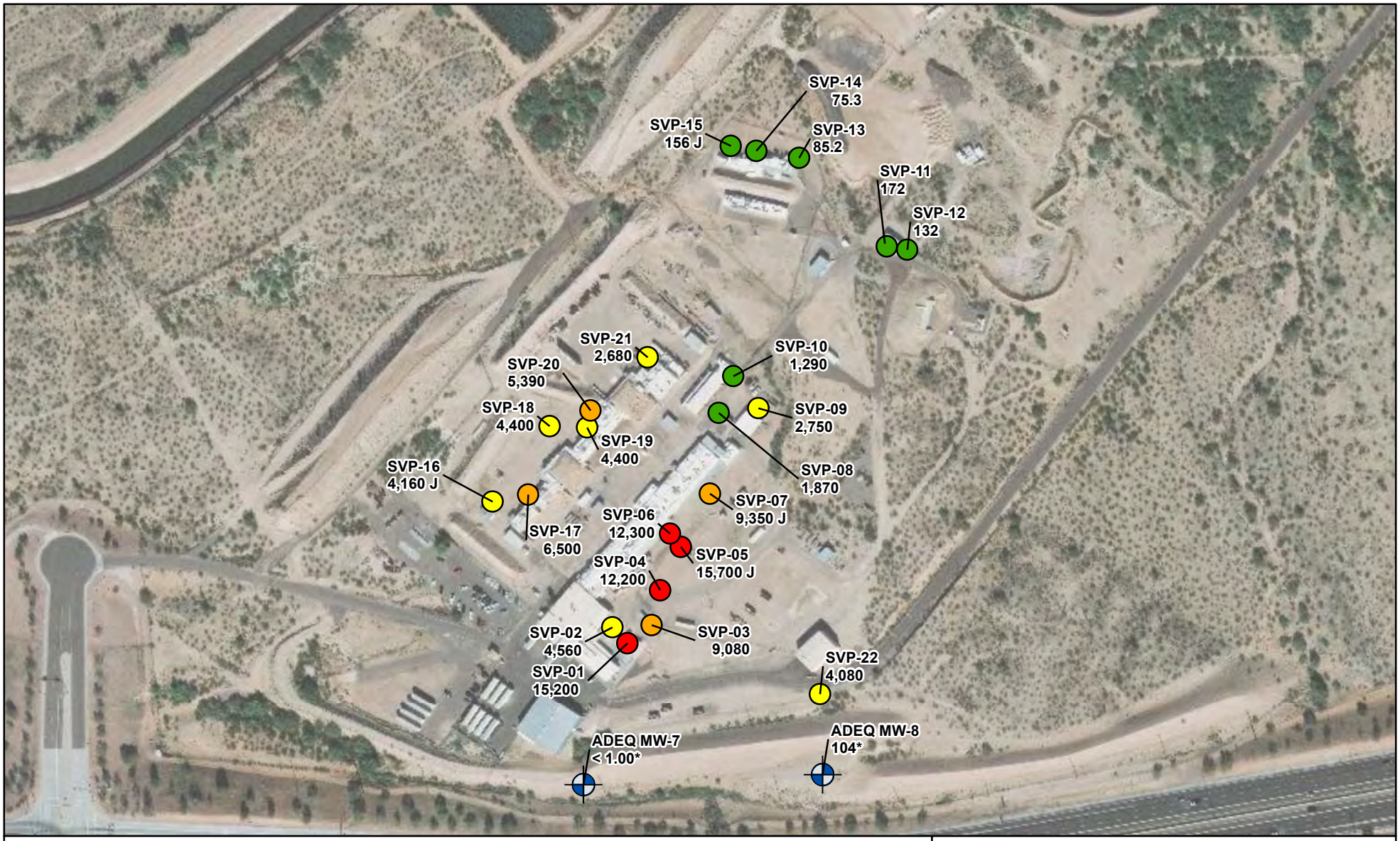
Nammo Defense Systems, Inc. Plant 3
Mesa, Arizona

Geosyntec consultants

Phoenix, AZ | June 2020

Figure 4

SantaBarbara-01\P:\GIS\SP0101 - Nammo Talley\Projects\2020 Plant 3 Soil Vapor Monitoring\Fig04_NammoTalley_SoilVapor_Heatmap_05ft_11DCE.mxd 6/12/2020 (Author: PFitzgibbon) 2:36:30 PM



Legend

- 0 - 2,000
- 2,001 - 5,000
- 5,001 - 10,000
- 10,001 - 20,000
- Monitoring Well

Notes:
Units are in µg/m^3
Non-detect results are indicated by ">" followed by the laboratory RL.
*Groundwater concentrations from 1Q 2020 groundwater quarterly sampling event in ug/L
J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample

N

0 300 Feet

1,1-DCE Results
15' Depth

Nammo Defense Systems, Inc. Plant 3
Mesa, Arizona

Geosyntec consultants

Phoenix, AZ | June 2020

Figure 5

SantaBarbara-01\P:\GIS\SP0101 - Nammo Talley\Projects\2020 Plant 3 Soil Vapor Monitoring\Fig05_NammoTalley_SoilVapor_Heatmap_15ft_11DCE.mxd 6/12/2020 (Author: PFitzgibbon) 2:40:41 PM

EPA 530-R-10-002
March 16, 2012

EPA's Vapor Intrusion Database: Evaluation and Characterization of Attenuation Factors for Chlorinated Volatile Organic Compounds and Residential Buildings

Office of Solid Waste and Emergency Response
U.S. Environmental Protection Agency
Washington, DC 20460

Table of Contents

Disclaimer iii

Authors and Contributors iv

List of Acronyms and Abbreviations xi

1.0 Introduction 1
- 1.1 Background 1
- 1.2 Report Content and Purpose 2
- 1.3 Report Development and Peer Review 2
- 1.4 Report Organization 2

2.0 Database Development 3
- 2.1 Database Structure 3
- 2.2 Data Entry Criteria 3
- 2.3 Database Contents 4
- 2.4 Data Limitations 5

3.0 Vapor Attenuation Factors 9
- 3.1 Factors Influencing Empirical Vapor Attenuation Estimations 10
- 3.2 Spatial and Temporal Variability 10
- 3.3 Background Indoor Air Concentrations 15
- 3.4 Handling Data Below Reporting Limits 21

4.0 Attenuation Factor Screening: Criteria and Results 22
- 4.1 Screening for Chlorinated Hydrocarbons and Residential Settings— CHC in Residences Screen 23
- 4.2 Identifying Chemicals of Site-Specific Concern—Subsurface Concentration Screen 23
- 4.3 Identifying the Presence of Indoor Sources of VOCs—Data Consistency Screen 24
- 4.4 Identifying Empirical Attenuation Factors Minimally Biased by Background Contributions 26
  - 4.4.1 Identifying Indoor Air Concentrations Above Typical Background Levels—Indoor Air Screen 27
  - 4.4.2 Identifying Appropriately High Subsurface Vapor Concentrations—Source Strength Screen 28
- 4.5 Application of Screening Criteria to the Database 29
  - 4.5.1 Subslab Soil Gas Data 30
  - 4.5.2 Groundwater Data 36
  - 4.5.3 Exterior Soil Gas Data 41
  - 4.5.4 Crawlspace Data 45

5.0 Discussion of Findings 49
- 5.1 Subslab Soil Gas-to-Indoor-Air Attenuation Factors 49
- 5.2 Groundwater-to-Indoor-Air Attenuation Factors 56

5.3 Exterior Soil-Gas-to-Indoor-Air Attenuation Factors.....61
5.4 Crawlspace-to-Indoor-Air Attenuation Factors 64

6.0 Summary and Conclusions 66
6.1 Subslab Soil Gas Attenuation Factors.....68
6.2 Groundwater Attenuation Factors.....68
6.3 Exterior Soil Gas Attenuation Factors 69
6.4 Crawlspace Attenuation Factors 70

7.0 Citations and References.....71

Appendices

Appendix A – Peer Review Report
Appendix B – Vapor Intrusion Database Structure Documentation
Appendix C – Vapor Intrusion Database Site Information
Appendix D – Correcting the Henry's Law Constant for Groundwater Temperature

List of Tables

Number **Page**

1. Summary of information in EPA's vapor intrusion database. 6
2. Summary statistics for background indoor air concentrations of common VOCs measured in North American residences between 1990 and 2005 (all concentrations expressed in μg/m^3) (EPA, 2011a). 17
3. Indoor air concentrations in residences at sites included in EPA's vapor intrusion database.....19
4. Number of attenuation factors remaining after each successive data-screening step. 23
5. Upper-end background indoor air concentrations of common VOCs measured in North American residences between 1990 and 2005 used to screen EPA's vapor intrusion database.....28
6. Descriptive statistics of subslab soil gas attenuation factor distributions after application of various database screens. 31
7. Descriptive statistics of groundwater attenuation factor distributions after application of various database screens. 37
8. Descriptive statistics of exterior soil gas attenuation factor distributions after application of various database screens. 41
9. Descriptive statistics of crawlspace attenuation factor distributions after application of various database screens. 45
10. Descriptive statistics summarizing subslab soil gas attenuation factor distributions for individual sites after Source Strength Screen (subslab soil gas concentrations > 50 times "background"). 51

11. Descriptive statistics summarizing subslab soil gas attenuation factor distributions for two foundation types after Source Strength Screen (subslab soil gas concentrations > 50 times "background").....54
12. Descriptive statistics summarizing subslab soil gas attenuation factor distributions for specific VOCs after Source Strength Screen (subslab soil gas concentrations > 50 times "background").....55
13. Descriptive statistics summarizing groundwater attenuation factor distributions for individual sites compared with the combined data set after Source Strength Screen (groundwater vapor concentrations > 1,000 times "background").....57
14. Descriptive statistics summarizing groundwater attenuation factor distributions for specific soil types after Source Strength Screen.....59
15. Descriptive statistics summarizing groundwater attenuation factor distributions for various depth to groundwater categories after Source Strength Screen.....60
16. Descriptive statistics summarizing groundwater attenuation factor distributions for specific VOCs after Source Strength Screen.....62
17. Descriptive statistics summarizing exterior soil gas attenuation factor distributions for individual sites after Source Strength Screen (exterior soil gas concentrations > 50 times "background").....63
18. Descriptive statistics summarizing crawlspace attenuation factor distributions for individual sites after Indoor Air Screen (indoor air concentrations > one times "background").....65
19. Descriptive statistics summarizing attenuation factor distributions for groundwater, exterior soil gas, subslab soil gas, and crawlspace vapor after application of the database screens considered most effective at minimizing the influence of background sources on indoor air concentrations.....67

List of Figures

Number **Page**

1. Spatial and temporal variability of TCE in indoor air at six residential buildings at the Lowry Air Force Base, Colorado, with similar groundwater concentration and depth to water.....12
2. Variability in TCE groundwater-to-indoor air attenuation factors for six residential buildings at the Lowry Air Force Base, Colorado.....12
3. Spatial variability of TCE in exterior soil gas adjacent to six residential buildings in Grants, New Mexico.....13
4. Spatial variability of TCE in subslab soil gas within six residential buildings at the Raymark Superfund site, Connecticut.....13
5. Spatial and temporal variability of TCE in subslab soil gas at six residential buildings at the Lowry Air Force Base, Colorado.....14
6. Exterior soil gas versus subslab soil gas concentrations for buildings with both types of data in EPA's vapor intrusion database differentiated qualitatively by horizontal distance to building and depth to the exterior soil gas sample.....15

7a. Hypothetical case illustrating the influence of background sources on observed indoor air concentrations....20
7b. Hypothetical case illustrating the influence of background sources on empirical attenuation factors....20
8. Empirical attenuation factors for individual chemicals in two buildings at the Endicott, NY, site....26
9. Box-and-whisker plots summarizing subslab soil gas attenuation factor distributions after application of various database screens....32
10. Frequency plots summarizing subslab soil gas attenuation factor distributions after application of various database screens....33
11. Cumulative probability plots summarizing subslab soil gas attenuation factor distributions after application of various database screens....33
12. Scatter plots of paired indoor air and subslab soil gas concentrations for CHCs and residential buildings in EPA's vapor intrusion database after application of various database screens....35
13. Box-and-whisker plots summarizing groundwater attenuation factor distributions after application of various database screens....38
14. Frequency plots summarizing groundwater attenuation factor distributions after application of various database screens....39
15. Cumulative probability plots summarizing groundwater attenuation factor distributions after application of various database screens....39
16. Scatter plots of paired indoor air and groundwater (vapor) concentrations for CHCs and residential buildings in EPA's vapor intrusion database after application of various database screens....40
17. Box-and-whisker plots summarizing exterior soil gas attenuation factor distributions after application of various database screens....42
18. Frequency plots summarizing exterior soil gas attenuation factor distributions after application of various database screens....43
19. Cumulative probability plots summarizing exterior soil gas attenuation factor distributions after application of various database screens....43
20. Scatter plots of paired indoor air and exterior soil gas concentrations for CHCs and residential buildings in EPA's vapor intrusion database after application of various database screens....44
21. Box-and-whisker plots summarizing crawlspace attenuation factor distributions after application of various database screens....46
22. Frequency plots summarizing crawlspace attenuation factor distributions after application of various database screens....47
23. Cumulative probability plots summarizing crawlspace attenuation factor distributions after application of various database screens....47
24. Scatter plots of paired indoor air and crawlspace concentrations for CHCs and residential buildings in EPA's vapor intrusion database after application of various database screens....48

25. Box-and-whisker plots summarizing subslab soil gas attenuation factor distributions for individual sites after Source Strength Screen (subslab soil gas concentrations > 50 times "background")....52
26. Box-and-whisker plots summarizing subslab soil gas attenuation factor distributions for two foundation types after Source Strength Screen (subslab soil gas concentrations > 50 times "background")....54
27. Box-and-whisker plots summarizing subslab soil gas attenuation factor distributions for specific VOCs after Source Strength Screen (subslab soil gas concentrations > 50 times "background")....55
28. Box-and-whisker plots summarizing groundwater attenuation factor distributions for individual sites compared with the combined data set after Source Strength Screen (groundwater vapor concentrations > 1,000 times "background")....58
29. Box-and-whisker plots summarizing groundwater attenuation factor distributions for specific soil types after Source Strength Screen....59
30. Box-and-whisker plots summarizing groundwater attenuation factor distributions for various depth to groundwater categories after Source Strength Screen....60
31. Box-and-whisker plots summarizing groundwater attenuation factor distributions for specific VOCs after Source Strength Screen....62
32. Box-and-whisker plots summarizing exterior soil gas attenuation factor distributions for individual sites after Source Strength Screen (exterior soil gas concentrations > 50 times "background")....63
33. Box-and-whisker plots summarizing crawlspace attenuation factor distributions for individual sites after Indoor Air Screen (indoor air concentrations > one times "background")....65
34. Box-and-whisker plots summarizing attenuation factor distributions for groundwater, exterior soil gas, subslab soil gas, and crawlspace vapor after application of the database screens considered most effective at minimizing the influence of background sources on indoor air concentrations....67

Table 1. Summary of information in EPA's vapor intrusion database.

Site Name	City	State	EPA Region	Vapor Source Type	General Soil Type [1]	No. of Bldgs	Building Use[2]		Foundation Type[3]			Media Sampled[4]				Chemicals[5]					
							Residential	Commercial/ Institutional	Basement	Slab on Grade	Crawlspace	Groundwater	Exterior Soil Gas	Subslab Soil Gas	Crawlspace	TCE	PCE	11DCE	111TCA	Other CHCs	PHCs
Alameda Air Station	Alameda	CA	9	LNAPL	Coarse	1		1		1			1	1							●
Aleppo	Mountain View	CA	9	GW	Fine	4	4			4		4	1	3		●					
Alliant*	Littleton	CO	8	GW	Fine	6 (1 in '02)	6		3			9	7			●		●			
Billings PCE	Billings	MT	8	GW	Fine/v. coarse	32	29	3	32			32		32			●				
BP Site	Paulsboro	NJ	2	GW	Coarse	1	1		1			1	1								●
CDOT*	Denver	CO	8	GW	Fine	6	6			6		6				●		●	●	●	
Davis	Troy	MI	5	DNAPL	Coarse	1	1		1			2				●				●	
Denver PCEBB	Denver	CO	8	GW	Fine	7	6	1	7					9		●	●		●	●	●
Eau Claire*	Eau Claire	WI	5	GW	Coarse	3	3		3			6				●				●	
Endicott	Endicott	NY	2	GW	Coarse	232	180	52	145	14		36	36	259		●	●	●	●	●	
Fresh Water Lens	(not available)	MA	1	VZ, GW	Coarse	2		2		2		8	8			●					
Georgetown	Seattle	WA	10	GW	(not available)	2	2		NA	NA	NA		2	2			●		●	●	
Grants	Grants	NM	8	GW	Fine	8	8		2	1	5	8	7		4	●	●			●	
Hamilton-Sundstrand*	Denver	CO	8	GW	Coarse	32 (13 in '02)	32		NA	NA	NA	32						●			
Harcros/Tri State	Wichita	KS	7	GW	Coarse	7	7		4		3	7	6	4			●				

(continued)

Table 1. Summary of information in EPA's vapor intrusion database (continued)

Site Name	City	State	EPA Region	Vapor Source Type	General Soil Type (1)	No. of Bldgs	Building Use(2)		Foundation Type(3)			Media Sampled(4)				Chemicals(5)					
							Residential	Commercial/ Institutional	Basement	Slab on Grade	Crawlspace	Groundwater	Exterior Soil Gas	Subslab Soil Gas	Crawlspace	TCE	PCE	11DCE	111TCA	Other CHCs	PHCs
Hopewell Precision	Hopewell Junction	NY	2	GW	Coarse	19	19		19			18		25		●			●		
Jackson	Jackson	WY	8	GW	Coarse	2	2			1	1	1	2	1	1		●				
LAFB*	Aurora	CO	8	GW	Coarse	13	13		8	1	4	6		38	47	●	●	●	●	●	
Lakeside Village	Houston	TX	6	VZ, GW	Fine	1		1		1		1				●					
Lockwood	Lockwood	MT	8	GW	Fine	13	13			4	9	11			1	●	●	●		●	
MADEP1*	NA	MA	1	GW	Coarse	2	2		2			2	2			●					
MADEP2*	NA	MA	1	GW	Coarse	1	1		1			1				●					
MADEP3*	NA	MA	1	GW	Coarse	3	3		2	1		2									●
MADEP4*	NA	MA	1	GW	Coarse	1	1		1			2									●
MADEP5*	NA	MA	1	GW	Coarse	1	1		1			1									●
MADEP6*	NA	MA	1	GW	Coarse	2	2		1		1	2									●
MADEP7*	NA	MA	1	GW	Coarse	1	1		1			1									●
Moffett MCH	Mountain View	CA	9	GW	Fine	3	3			3		3				●					
Mount Holly	Mt. Holly	NJ	2	GW	Coarse	1	1		1			1									●
Mountain View*	Mountain View	CA	9	GW	Coarse	5 (7 in '02)	5			5		5	3			●					
Orion Park	Mountain View	CA	9	GW	Fine	8	8			8				9		●	●				
Rapid City	Rapid City	SD	8	GW	Fine	3	3		3			2	1			●					
Raymark	Raymark	CT	2	GW	Coarse	14	14		14					45		●		●	●	●	

(continued)

Table 1. Summary of information in EPA's vapor intrusion database (continued)

Site Name	City	State	EPA Region	Vapor Source Type	General Soil Type (1)	No. of Bldgs	Building Use(2)		Foundation Type(3)			Media Sampled(4)				Chemicals(5)					
							Residential	Commercial/ Institutional	Basement	Slab on Grade	Crawlspace	Groundwater	Exterior Soil Gas	Subslab Soil Gas	Crawlspace	TCE	PCE	11DCE	111TCA	Other CHCs	PHCs
Redfield*	Denver	CO	8	GW	Fine to Coarse	330 (14 in '02)	330		241	15	73	330						●			
SCM—Cortlandville	Cortlandville	NY	2	GW	V. coarse	40	40		40			40	29	40		●					
Stafford	Stafford	NJ	2	LNAPL	Coarse	3	1	2	1	1	1	3	5	1							●
Twins Inn	Arvada	CO	8	GW	Fine	2	1	1	1	1		2				●	●		●	●	
Uncasville*	Uncasville	CT	1	GW	Coarse	4	4		4			10	8				●		●		
Wall	Wall Township	NJ	2	GW	Coarse	43	43		43			43					●				
West Side Corporation	Brooklyn	NY	2	GW	V. coarse	53	53		53			53	51	52			●				
Wz CA Bay	Mountain View	CA	9	GW	Fine	1		1		1		1				●					

* Site in 2002 database

Abbreviations: DNAPL = dense non-aqueous phase liquid, GW = groundwater, VZ = vadose zone, LNAPL = light non-aqueous phase liquid, TCE = trichloroethylene, PCE = tetrachloroethylene, 11DCE = 1,1,-dichloroethylene, 111TCA = 1,1,1-trichloroethane, CHCs = chlorinated hydrocarbons, PHCs = petroleum hydrocarbons

Notes:

(1) Soil type representing the coarsest soils described in the vadose zone near the sample location unless stratigraphic information is available to indicate finer sediments are laterally continuous.

(2) For each site, the respective entry is the number of buildings in each use category. The database contains indoor air sampling data for each of these buildings.

(3) For each site, the respective entry is the number of buildings in each foundation category.

(4) For each site, the respective entry is the number of pairings in the database of concurrent sampling data from the stated medium with the indoor air sampling data. The number of pairings exceeds the number of buildings at sites when there are multiple chemicals of concern or where paired data were collected at multiple times.

(5) For each site, the symbol "●" designates the VOCs for which paired data are held in the database.

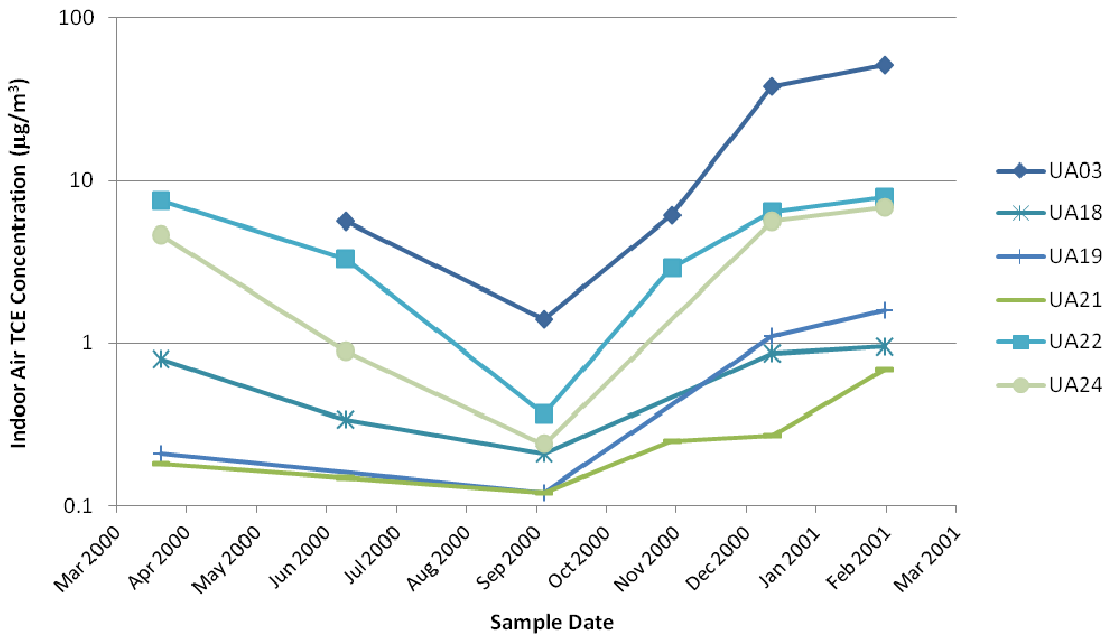


Figure 1. Spatial and temporal variability of TCE in indoor air at six residential buildings at the Lowry Air Force Base, Colorado, with similar groundwater concentration and depth to water.

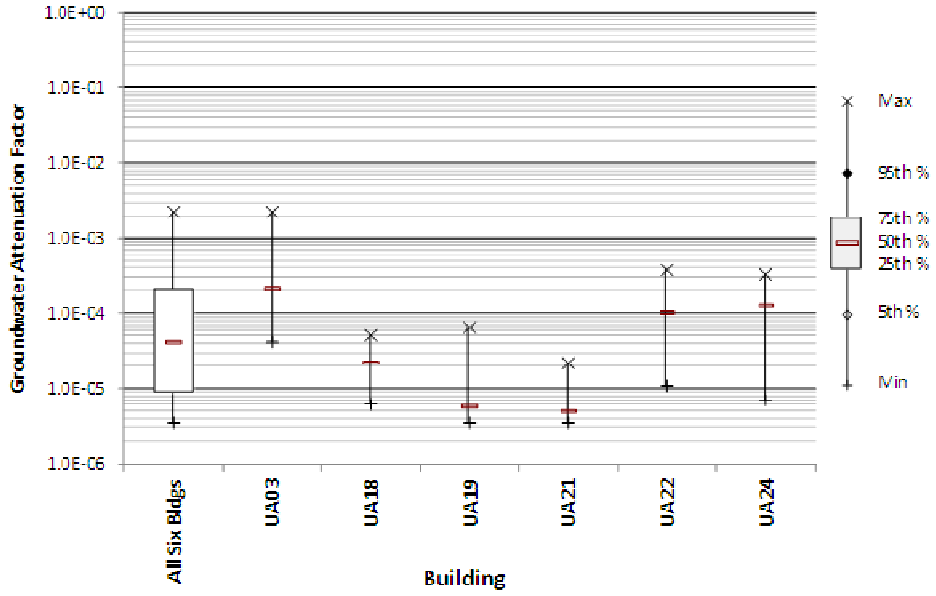


Figure 2. Variability in TCE groundwater-to-indoor air attenuation factors for six residential buildings at the Lowry Air Force Base, Colorado.

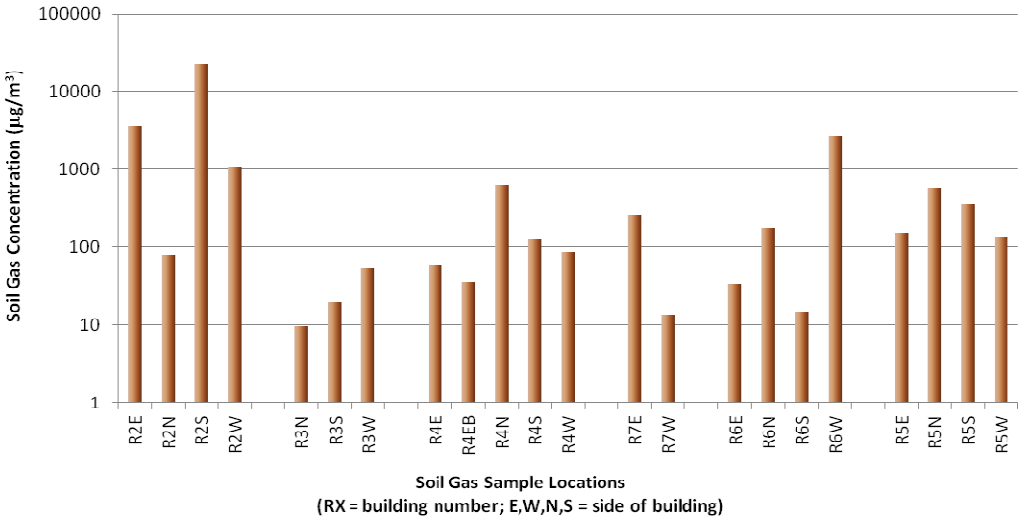


Figure 3. Spatial variability of TCE in exterior soil gas adjacent to six residential buildings in Grants, New Mexico.

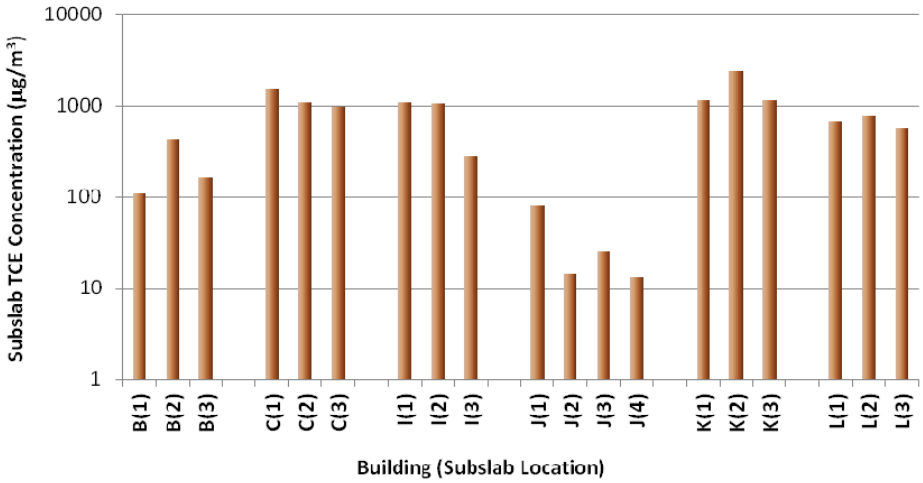


Figure 4. Spatial variability of TCE in subslab soil gas within six residential buildings at the Raymark Superfund site, Connecticut.

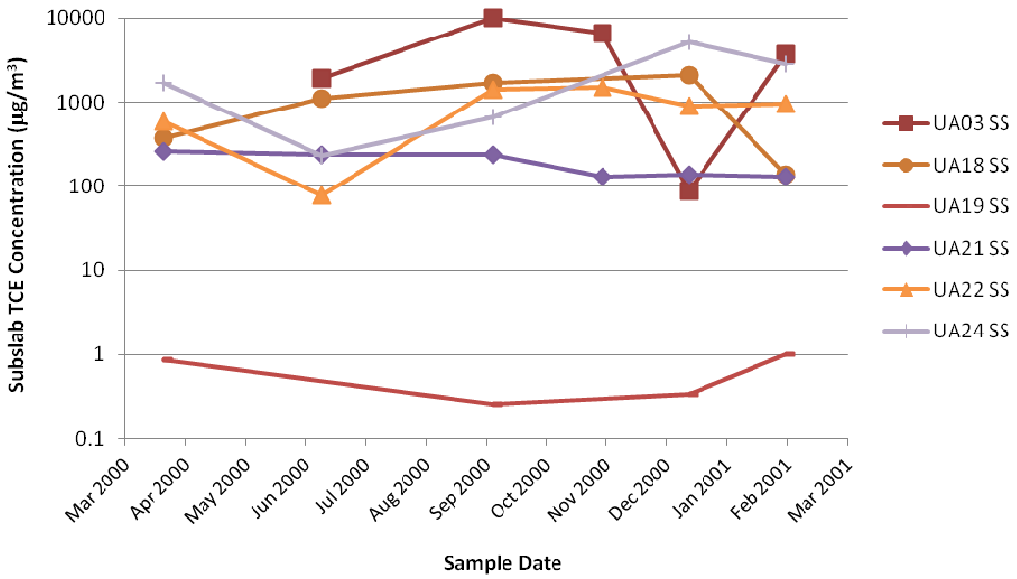


Figure 5. Spatial and temporal variability of TCE in subslab soil gas at six residential buildings at the Lowry Air Force Base, Colorado.

There also may be significant differences between subslab soil gas concentrations underlying a building and soil gas concentrations measured exterior to the building. For example, there are six sites with a total of 98 buildings in EPA's vapor intrusion database for which concentrations were measured in both subslab soil gas (beneath the building foundation) and exterior soil gas samples (**Figure 6**). Four of the six sites and about a third of the buildings (27 buildings), subslab soil gas concentrations exceed the measured exterior soil gas concentrations. In other words, the exterior soil gas concentrations were lower than the concentration directly under the building for approximately a third of the buildings at which both subslab soil gas and exterior soil gas samples were collected. Differentiating the data by horizontal distance and depth to the exterior soil gas sample (**Figure 6**) shows that soil gas samples collected at depths greater than 3 meters (called deep in the figure; see orange circles and red squares) tend to provide better results (exterior soil gas concentrations greater than subslab soil gas concentrations). These data suggest that exterior soil gas concentrations collected at depths shallower than 3 meters may not be representative of soil gas concentrations measured directly beneath the building foundation.

Groundwater concentrations typically are not measured directly below buildings. In some cases, interpolated values are used; in other cases, the value of the nearest sample is used. The result is the possible introduction of high or low bias in concentration when a nearby or interpolated value does not accurately represent conditions under the respective building. Interpolation of groundwater concentrations underlying buildings is particularly difficult when steep concentration gradients are present. Additional variability may be introduced by different groundwater well-screen lengths and sampling depths and by temporal variability in groundwater concentrations.

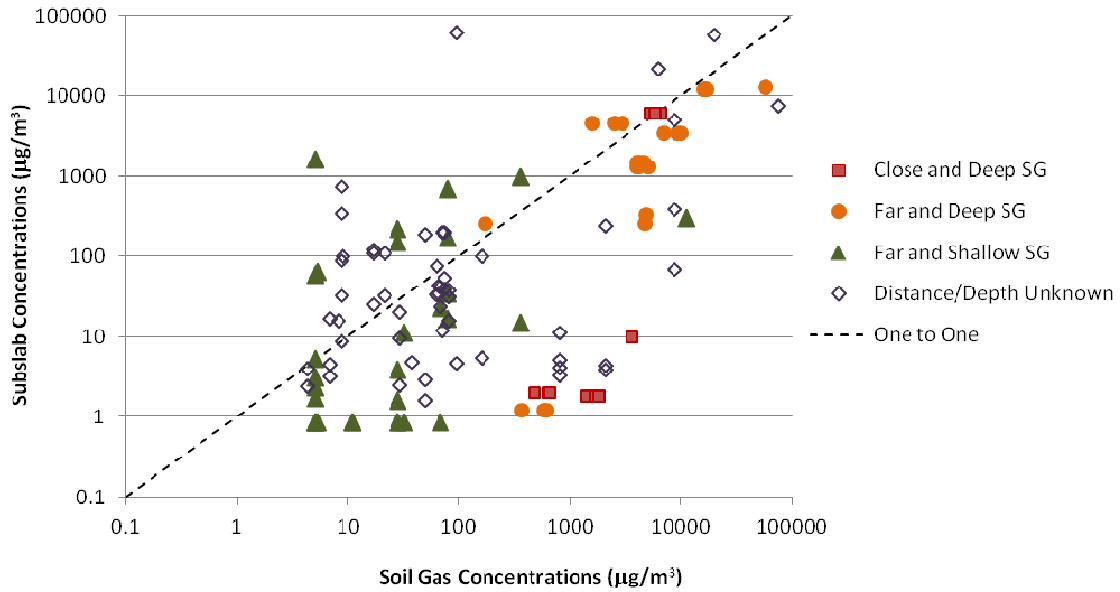


Figure 6. Exterior soil gas versus subslab soil gas concentrations for buildings with both types of data in EPA's vapor intrusion database differentiated qualitatively by horizontal distance to building and depth to the exterior soil gas sample.

In summary, many factors can influence the observed concentrations in environmental media. Factors such as heterogeneous geologic conditions, sample design and collection issues, and seasonal effects can lead to significant spatial and temporal variability in subsurface concentrations. Factors such as variable building conditions and occupant habits can lead to significant spatial and temporal variability in concentrations in indoor air. These factors may impart bias when calculating concentration ratios, depending on the extent to which the samples accurately represent the spatial and temporal variability of the indoor air concentrations and the subsurface vapor concentrations affecting the building. Because the factors influencing subsurface vapor and indoor air variability are largely independent, ratios of the indoor air and surface vapor concentrations (i.e., the calculated empirical attenuation factors) will likely exhibit even greater variability.

The spatial and temporal variability in observed subsurface and indoor air concentrations within and among buildings mean that for every site, and every structure in an area of similar subsurface contamination, a range of empirical attenuation factors would likely be calculated from a series of discrete indoor air and subsurface vapor concentrations measured at different points in space or at different times. Considering this variability, a statistical approach to characterizing the empirical attenuation factors was adopted in the 2002 Draft VI Guidance and a similar approach is used in this report, as described in Section 4.0 and documented in Section 5.0.

3.3 Background Indoor Air Concentrations

Many volatile chemicals that could present a potential vapor intrusion issue at contaminated sites can also be found indoors due to sources unrelated to subsurface contamination (EPA, 2011a). These sources may include emissions from consumer products,

Table 2. Summary statistics[4] for background indoor air concentrations of common VOCs measured in North American residences between 1990 and 2005 (all concentrations expressed in µg/m^3) (EPA, 2011a).

Compound	Number		Range Percent Detect	Total percent Detects	RL Range	Range of 50th Percent	N*	Range of 75th Percent	N	Range of 90th Percent	N	Range of 95th Percent	N
	Studies	Samples											
Benzene	14	2,615	31–100	91.1	0.05–1.6	<RL–4.7	14	1.9–7.0	9	5.2–15	11	9.9–29	5
Carbon tetrachloride	6	1248	1–100	53.5	0.15–1.3	<RL–0.68	6	<RL–0.72	3	<RL–0.94	5	<RL–1.1	2
Chloroform	11	2,278	9–100	68.5	0.02–2.4	<RL–2.4	11	<RL–3.4	7	<RL–6.2	9	4.1–7.5	5
Dichloroethane, 1,1-	2	682	1	1	0.08–0.25	<RL	2	<RL	2	<RL	2	<RL	2
Dichloroethane, 1,2-	7	1,432	1-25	13.8	0.08–2.0	<RL	7	<RL–0.08	6	<RL–0.4	7	<RL–0.2	4
Dichloroethylene, 1,1-	2	475	7-45	13	0.01–0.25	<RL	2	<RL-0.37	2	<RL-0.8	2	0.7	1
Dichloroethylene, cis 1,2-	3	875	1–9	4.9	0.25–2.0	<RL	3	<RL	3	<RL	3	<RL–1.2	3
Ethylbenzene	10	1,484	26–100	85.7	0.01–2.2	1–3.7	10	2–5.6	5	4.8–13	7	12–17	3
Methyl tert-butyl ether (MTBE)	4	502	9–70	54.5	0.05–1.8	0.025–3.5	4	0.03–11	4	0.03–41	4	71–72	2
Methylene chloride	8	1,724	29–100	79.1	0.12–3.5	0.68–61	8	1.0–8.2	6	2.0–510	8	2.9–45	4
Tetrachloroethylene	13	2,312	5–100	62.5	0.03–3.4	<RL–2.2	13	<RL–4.1	8	<RL–7	10	4.1–9.5	5
Toluene	12	2,065	86–100	96.4	0.03–1.9	4.8–24	12	12–41	7	25–77	9	79–144	4
Trichloro-1,2,2-trifluoroethane, 1,1,2- (Freon 113)	3	600	1–56	37.5	0.25–3.8	<RL–0.5	3	<RL–1.1	3	<RL–1.8	3	<RL–3.4	2
Trichloroethane, 1,1,1-	9	1,877	4–100	53.4	0.12–2.7	<RL–5.9	9	<RL–7	7	<RL–68	8	3.4–28	5
Trichloroethylene	14	2503	1–100	42.6	0.02–2.7	<RL–1.1	14	<RL–1.2	9	<RL–2.1	11	0.56–3.3	5
Vinyl chloride	4	1484	0–25	9.2	0.01–0.25	<RL	4	<RL	4	<RL–0.04	4	<RL–0.09	4
Xylene, m/p-	10	1,920	52–100	92.9	0.4–2.2	1.5–14	10	4.6–21	7	12–56	9	21–63.5	4
Xylene, o-	12	2,004	31–100	89.0	0.11–2.2	1.1–3.6	12	2.4–6.2	7	5.5–16	9	13–20	4

* N = Number of studies reporting the percentile.

[4] All summary statistics reported by an individual study for an individual chemical were included in this compilation, with the following exceptions: if all statistics, including the maximum reported value, for a chemical were below an individual study's reporting limit for that chemical, the statistics for that chemical in that study were not included in this compilation.

Table 3. Indoor air concentrations in residences at sites included in EPA's vapor intrusion database.

Compound	Summary of EPA Database of Residential Indoor Air Concentrations				Indoor Air Concentrations (µg/m^3) at Selected Percentiles				
	Number of Sites	Number of Samples	Percent Detect	Range of Reporting Limits (µg/m^3)	25th Percentile	50th Percentile	75th Percentile	95th Percentile	Maximum
Benzene	7	14	100	0.3	1.2	2.0	6.8	19	26
Carbon tetrachloride	1	1	100	Unknown	—	—	—	—	1
Chloroform	2	4	100	0.2	—	1.3	—	—	1.4
Dichloroethane,1,1-	5	50	64	0.01–0.16	0.02	0.05	0.22	0.88	17
Dichloroethylene, 1,1-	8	466	92	0.01–0.11	1.4	4.2	14	49	131
Dichloroethylene, cis 1,2-	7	105	74	0.01–0.97	0.03	0.22	1.1	6.3	31
Dichloroethylene, trans 1,2-	2	7	71	<0.1 – 0.7	—	0.12	—	—	8.7
Ethylbenzene	7	9	100	0.1	1.9	3.0	5.4	15	15
Methyl tert-butyl ether (MTBE)	1	1	100	Unknown	—	—	—	—	1.8
Tetrachloroethylene	13	378	87	0.018–2.7	0.55	1.5	5.3	44	1,896
Toluene	9	15	100	0.1	5.9	12	35	63	87
Trichloro-1,2,2-trifluoroethane, 1,1,2-	1	124	95	0.22–2.6	0.49	0.63	0.70	0.88	4.3
Trichloroethane, 1,1,1-	7	245	95	0.17–1.8	0.32	1.0	2.4	20	140
Trichloroethylene	20	435	77	0.011–1.8	0.14	0.8	4.5	32	850
Vinyl chloride	4	19	47	0.04–0.55	0.03	0.03	0.07	1.0	1.1
Xylenes	8	15	100	0.1–0.3	2.1	7.5	16	41	100

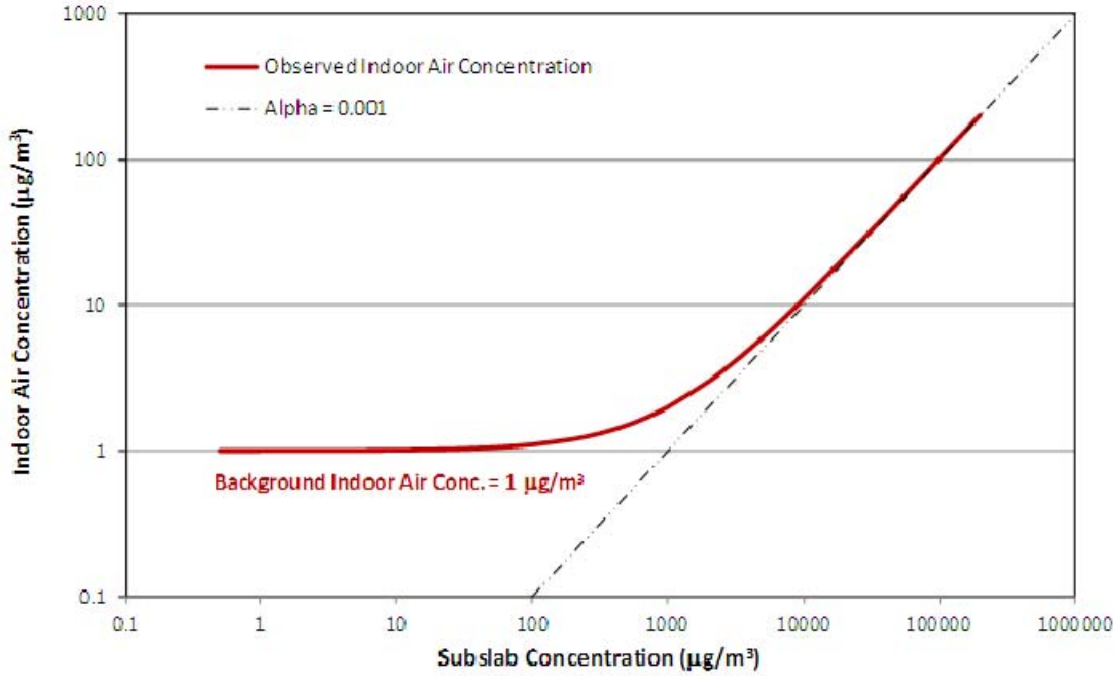


Figure 7a. Hypothetical case illustrating the influence of background sources on observed indoor air concentrations.

The hypothetical background indoor air concentration is 1 µg/m^3 and the hypothetical "true" vapor intrusion building attenuation factor is 0.001.

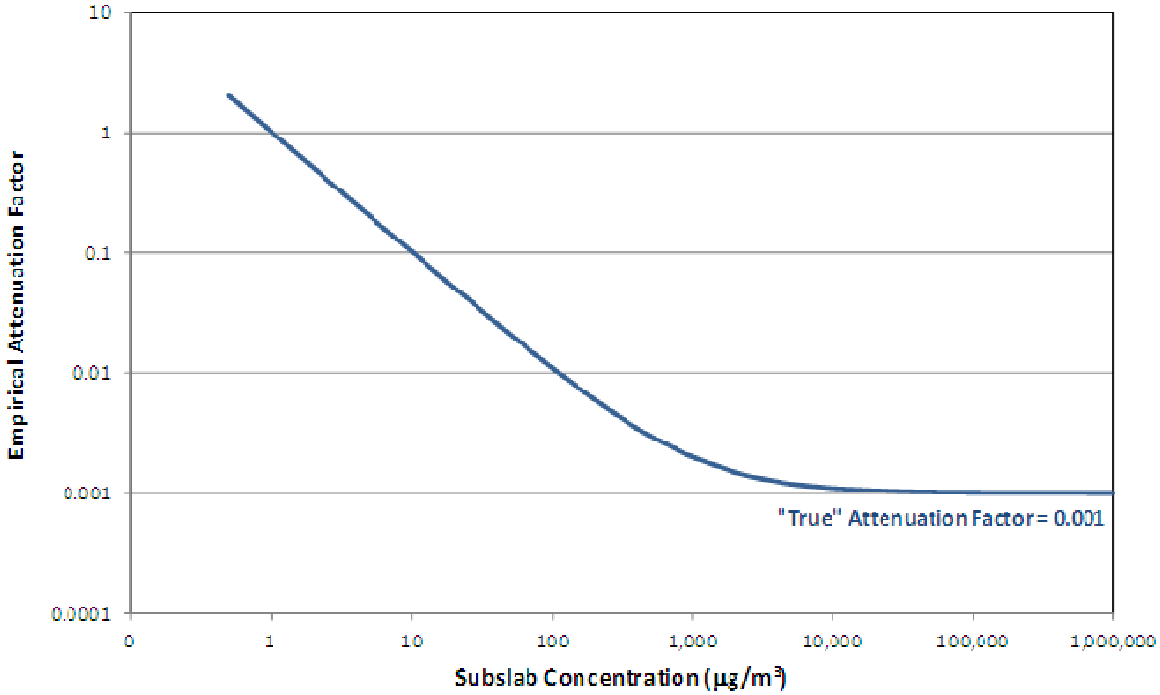


Figure 7b. Hypothetical case illustrating the influence of background sources on empirical attenuation factors.

The hypothetical background indoor air concentration is 1 µg/m^3 and the hypothetical "true" vapor intrusion building attenuation factor is 0.001.

Table 4. Number of attenuation factors remaining after each successive data-screening step.

Attenuation Factor Type	EPA VI Database	Baseline Screens			Indoor Air Screen[d,e]	Source Strength Screen[d.f]
		CHCs in Residences Screen[a]	Subsurface Concentration Screen[b]	Data Consistency Screen[c]		
Groundwater to indoor air	1,021	952	920	810	634	774
Exterior soil gas to indoor air	235	213	202	176	89	106
Subslab soil gas to indoor air	1,582	1,231	1,207	767	320	431
Crawlspace to indoor air	91	91	90	51	41	45
Total	2,929	2,487	2,419	1,804	1,084	1,356

[a] **CHCs in Residences Screen**: Subset of database remaining after screening chemicals other than chlorinated hydrocarbons (CHCs) measured in residential settings.

[b] **Subsurface Concentration Screen**: Subset of **CHCs in Residences Screen Data Set** remaining after further screening out subsurface concentrations less than reporting limits (RLs).

[c] **Data Consistency Screen**: Subset of **Subsurface Concentration Screen Data Set** remaining after further screening out samples for which field notes indicate the presence of indoor ("background") sources of VOCs, indoor air concentrations are greater than the corresponding subsurface concentration, or attenuation factors for an individual chemical are inconsistent with the attenuation factors for other chemicals reported for the same pair of samples. The resulting data are also referred to as the **Baseline Screens Data Set** in the remainder of this document.

[d] Counts reflect application of either the **Indoor Air Screen** or the **Source Strength Screen**.

[e] **Indoor Air Screen**: Subset of **Baseline Screens Data Set** remaining after further screening out indoor air concentrations less than the 90th percentile of background levels or less than the RLs (if RL is greater than the 90th percentile). The rationale for using these background levels is described in Section 4.4.

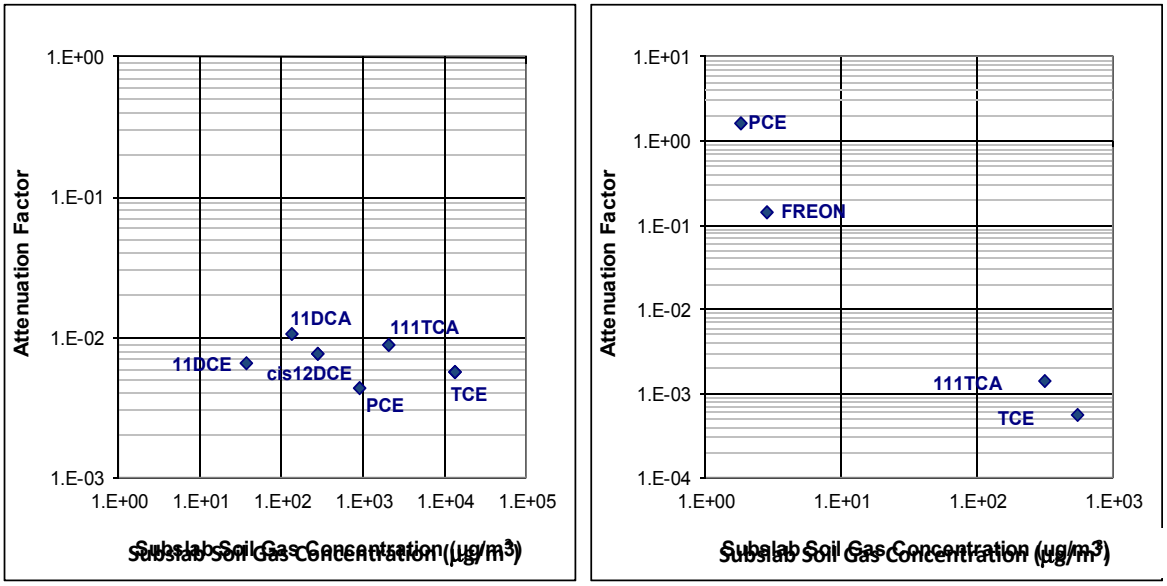
[f] **Source Strength Screen**: Subsets of **Baseline Screens Data Set** remaining after further screening out source-strength concentrations less than certain multipliers of the 90th percentile of background levels. The selected multipliers are 1,000X for groundwater, 50X for exterior soil gas, 50X for subslab soil gas, and 1X for crawlspace.

4.1 Screening for Chlorinated Hydrocarbons and Residential Settings—CHC in Residences Screen

EPA's vapor intrusion database was screened to focus on those attenuation factors calculated for CHCs in residential settings, which are the focus of this report. This included screening out any chemicals labeled as a PHC and any buildings labeled as "commercial," "commercial/residential," "residential/commercial," and "multi-use." After this screening step, there remained a total of 2,487 attenuation factors: 952 paired groundwater and indoor air concentrations, 213 paired exterior soil gas and indoor air concentrations, 1,231 paired subslab soil gas and indoor air concentrations, and 91 paired crawlspace and indoor air measurements (as shown in **Table 4**). These data comprise the majority (85 percent) of EPA's vapor intrusion database: 93 percent of the paired groundwater and indoor air measurements, 90 percent of the paired exterior soil gas and indoor air measurements, 78 percent of the paired subslab soil gas and indoor air measurements, and 100 percent of the paired crawlspace and indoor air measurements. The subset of data is referred to as the CHC in **Residences Screen Data Set**.

4.2 Identifying Chemicals of Site-Specific Concern—Subsurface Concentration Screen

Subsurface samples with concentrations less than the reporting limit were flagged and excluded from further analysis. For purposes of this document, such low-level subsurface concentrations were considered to represent cases where the chemical either is not present under the building or is present at levels unlikely to result in a detectable indoor air concentration via the vapor intrusion pathway. Nevertheless, the same chemical may be present in the indoor air of



(a) Residence 002 **(b) Residence 005**

Note: 11DCA = 1,1-dichloroethane; 11DCE = 1,1-dichloroethylene; 11DCE = 1,1-dichloroethylene; cis12DCE = cis-1,2-dichloroethylene; FREON = 1,1,2-trichloro-1,2,2-trifluoroethane; PCE = tetrachloroethylene; 111TCA = 1,1,1-trichloroethane; TCE = trichloroethylene

Figure 8. Empirical attenuation factors for individual chemicals in two buildings at the Endicott, NY, site.

(a) Because the attenuation factors are similar for all chemicals for Residence 002, little or no background influence is suggested for this building; (b) The attenuation factors for PCE and Freon in Residence 005 are significantly higher than those for 111TCA and TCE, suggesting there is background influence on PCE and Freon. The attenuation factors are similar for 111TCA and TCE in Residence 005.

After the screening criteria described above (field notes indicating background sources, attenuation factors greater than one, and inconsistent attenuation factors), the previous screening of subsurface concentrations less than RLs, and screening to focus on CHCs in residences, there remained 810 paired groundwater and indoor air concentrations, 176 paired exterior soil gas and indoor air concentrations, 767 paired subslab soil gas and indoor air concentrations, and 51 paired crawlspace and indoor air concentrations (as shown in **Table 4**). This subset of data remaining after the **Data Consistency Screen** is referred to as the **Baseline Screens Data Set** in the remainder of this document, because the three screening criteria described above (Sections 4.1, 4.2, and 4.3) are collectively referred to as the Baseline Screens.

4.4 Identifying Empirical Attenuation Factors Minimally Biased by Background Contributions

Two approaches were separately employed to further identify empirical attenuation factors minimally biased by background contributions to indoor air concentrations. As described in Section 3.3, attenuation factors representing vapor intrusion may be best observed when indoor air concentrations are greater than background levels and/or when source (e.g., exterior or subslab soil gas) concentrations are high. Section 4.4.1 describes an analysis focusing on

Table 5. Upper-end background indoor air concentrations of common VOCs measured in North American residences between 1990 and 2005 used to screen EPA's vapor intrusion database.

Compound	Median of 90th Percentile Conc.[a] (µg/m^3)	N[b]
Benzene	9.5	11
Carbon tetrachloride	0.8	5
Chloroform	4.0	9
Dichloroethane, 1,1-	<RL	2
Dichloroethane, 1,2-	0.1	7
Dichloroethylene, 1,1-	0.8	2
Dichloroethylene, cis 1,2-	<RL	3
Ethylbenzene	8.9	7
Methyl tert-butyl ether (MTBE)	38	4
Methylene chloride	10.5	8
Tetrachloroethylene	3.8	10
Toluene	54	9
Trichloro-1,2,2-trifluoroethane, 1,1,2- (Freon 113)	1.8	3
Trichloroethane, 1,1,1-	3.1	8
Trichloroethylene	0.5	9
Vinyl chloride	0.01	4
Xylene, m/p-	21	9
Xylene, o-	10.8	9

[a] Data source is the Background Indoor Air Report (EPA, 2011a).
[b] N = Number of studies reporting the 90th percentile.

4.4.2 Identifying Appropriately High Subsurface Vapor Concentrations—Source Strength Screen

The **Baseline Screens Data Set** (i.e., the data remaining after applying the **Baseline Screens** described above [Sections 4.1, 4.2, and 4.3]) was screened to identify empirical attenuation factors likely to represent the effects of vapor intrusion with minimal bias from background contributions. This screening approach uses a multiplier of "background" to screen the subsurface concentrations. In other words, the data set was screened by selecting those subsurface concentrations that exceed "background" by a specific multiplicative factor, for example 10, 50, 100, 500, or 1,000. The theoretical foundation for the **Source Strength Screen** is described in Section 3.3. This screening approach minimizes the influence of the second term on the right-hand side of Equations 3 and 4a by eliminating smaller source concentrations (C_{SV}) and considering only those source concentrations that theoretically reflect only vapor intrusion (right-hand part of **Figure 7b**).

For this analysis, several multipliers of "background" were applied and statistically evaluated as described below for each medium. The multipliers ultimately selected for screening the subsurface concentrations are 1,000X for groundwater, 50X for exterior soil gas, 50X for subslab soil gas, and 1X for crawlspace vapor, because these provide data sets that appear

Table 6. Descriptive statistics of subslab soil gas attenuation factor distributions after application of various database screens.

Statistic	Applied Database Screen								
	CHCs in Residences	Subsurface Concentration	Data Consistency	IA > Bkgd	SS > 10X Bkgd	SS > 50X Bkgd	SS > 100X Bkgd	SS > 500X Bkgd	SS > 1,000X Bkgd
Min	2.5E-05	2.5E-05	2.5E-05	9.6E-05	2.5E-05	2.5E-05	2.5E-05	2.5E-05	2.5E-05
5%	6.2E-04	6.2E-04	4.7E-04	4.7E-04	3.9E-04	3.2E-04	3.0E-04	2.6E-04	2.5E-04
25%	2.7E-03	2.7E-03	2.0E-03	1.9E-03	1.7E-03	1.5E-03	1.3E-03	1.1E-03	1.1E-03
50%	1.3E-02	1.3E-02	6.2E-03	5.0E-03	3.9E-03	2.7E-03	2.5E-03	2.5E-03	2.5E-03
75%	2.3E-01	2.2E-01	3.0E-02	1.2E-02	9.3E-03	6.8E-03	6.3E-03	6.3E-03	5.8E-03
95%	1.5E+00	1.4E+00	5.3E-01	1.8E-01	5.2E-02	2.6E-02	2.0E-02	1.8E-02	1.5E-02
Max	1.3E+02	1.3E+02	9.6E-01	9.4E-01	9.4E-01	9.4E-01	9.4E-01	9.4E-01	9.4E-01
Mean	6.5E-01	6.5E-01	7.5E-02	3.6E-02	1.9E-02	9.2E-03	8.1E-03	8.2E-03	8.5E-03
StdDev	5.2E+00	5.3E+00	1.8E-01	1.1E-01	7.1E-02	5.0E-02	4.9E-02	5.8E-02	6.2E-02
95UCL	9.0E-01	9.0E-01	8.5E-02	4.6E-02	2.4E-02	1.3E-02	1.2E-02	1.4E-02	1.5E-02
No. of AFs	1,231	1,207	767	320	577	431	379	262	232
No. of AFs > RL	981	972	677	308	532	411	363	248	220
No. of AFs < RL	250	235	90	12	45	20	16	14	12
No. of sites	13	13	13	11	13	12	11	10	10

CHCs in Residences Screen: Subset of database remaining after screening chemicals other than CHCs measured in residential settings.

Subsurface Concentration Screen: Subset of **CHCs in Residences Data Set** remaining after further screening out subsurface concentrations less than RLs.

Data Consistency Screen: Subset of **Subsurface Concentration Screen Data Set** remaining after further screening out samples for which field notes indicate the presence of indoor (background) sources of VOCs, indoor air concentrations are significantly greater than the corresponding subsurface concentration, or attenuation factors for an individual chemical are inconsistent with the attenuation factors for other chemicals reported for the same pair of samples. The resulting data are also referred to as the **Baseline Screens Data Set** in the remainder of this document.

Indoor Air Screen (IA > Bkgd): Subset of **Baseline Screens Data Set** remaining after further screening out indoor air concentrations less than "background" levels or less than the RLs (if RL is greater). The rationale for using the "background" levels is described in Section 4.4.

Source Strength Screen (SS > 10X Bkgd, SS > 50X Bkgd, SS > 100X Bkgd, SS > 500X Bkgd, SS > 1,000X Bkgd): Subsets of the Baseline Screens Data Set remaining after further screening out subslab soil gas concentrations less than certain multipliers (10, 50, 100, 500, and 1,000) of "background" levels.

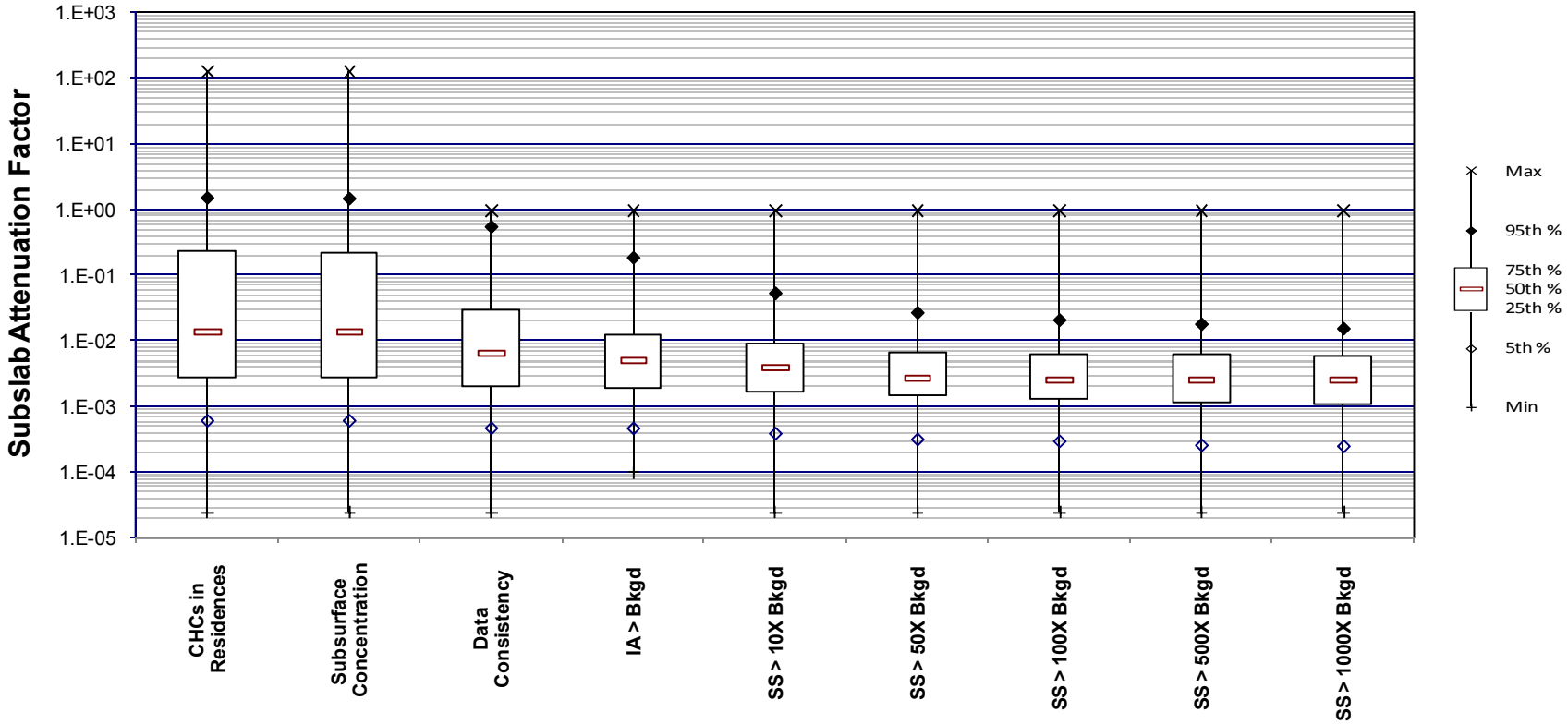


Figure 9. Box-and-whisker plots summarizing subslab soil gas attenuation factor distributions after application of various database screens.

(Data sets and screens are summarized in footnotes to Table 6 and described in Sections 4.1 through 4.4.)

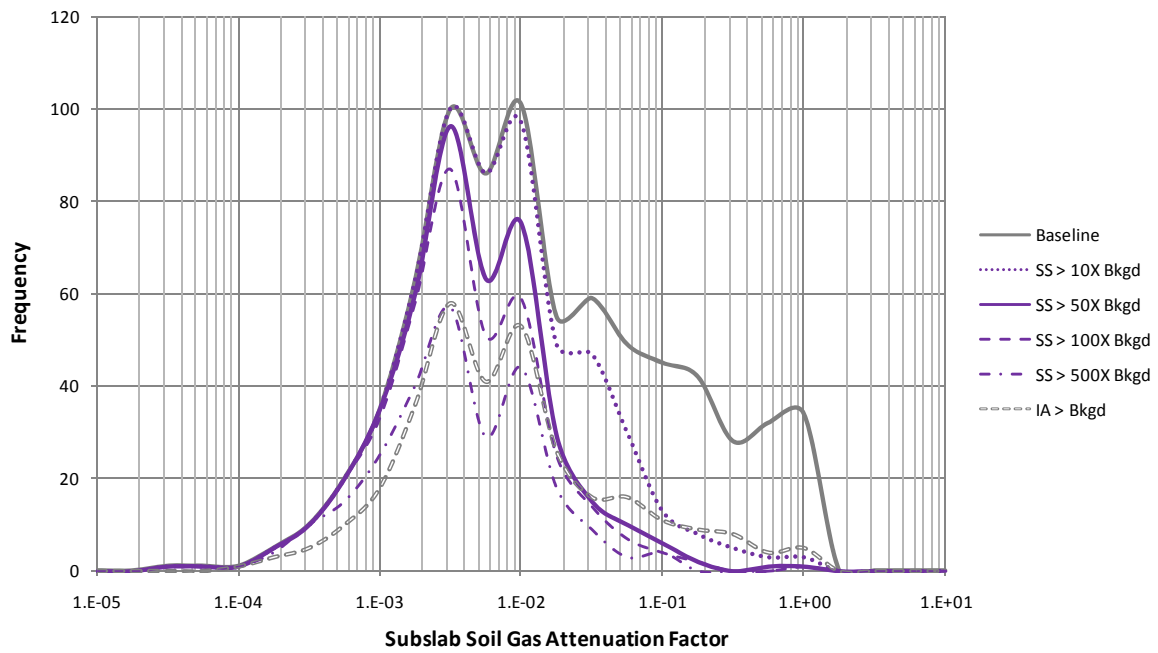


Figure 10. Frequency plots summarizing subslab soil gas attenuation factor distributions after application of various database screens.

(Data sets and screens are summarized in footnotes to Table 6 and described in Sections 4.1 through 4.4.)

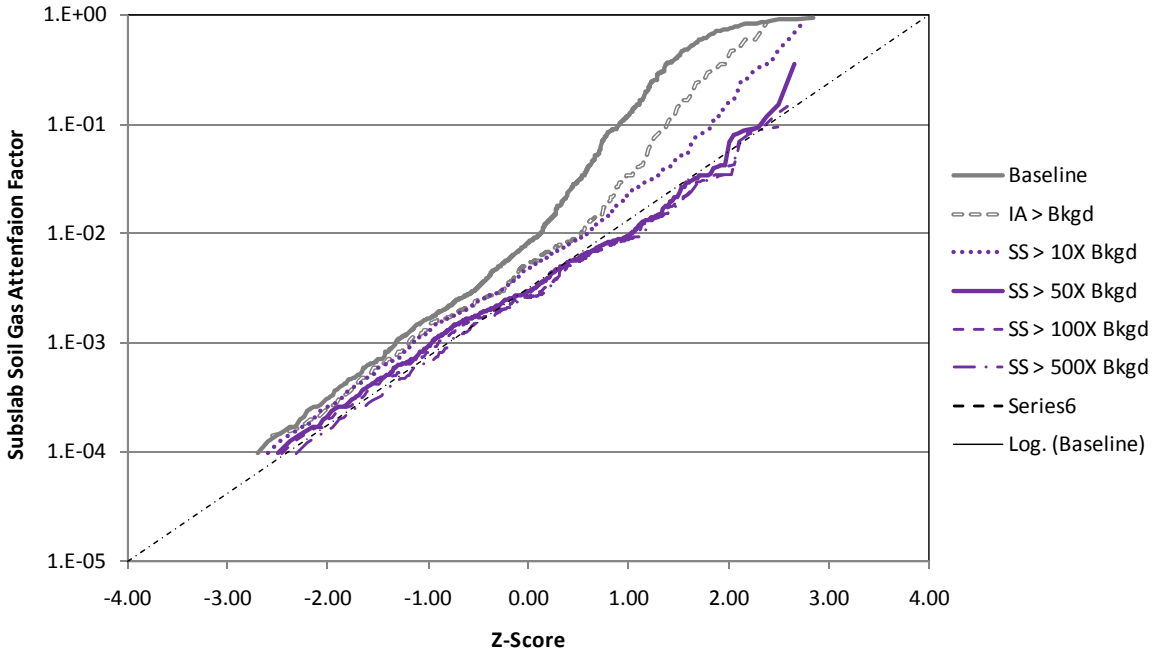
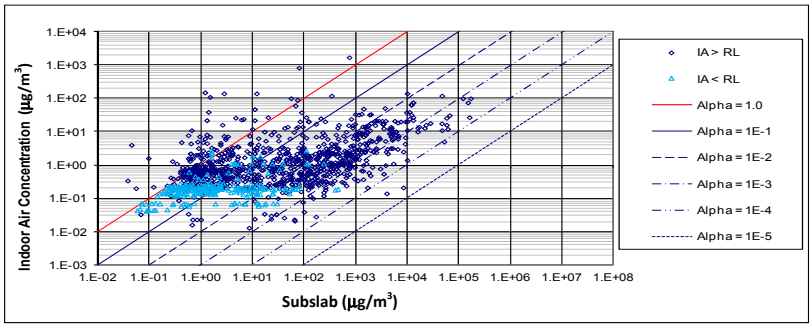


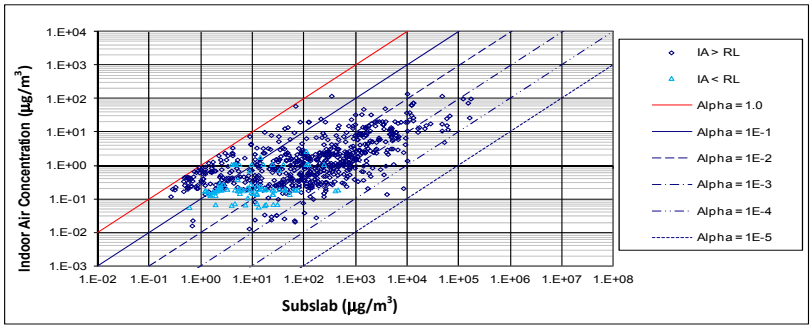
Figure 11. Cumulative probability plots summarizing subslab soil gas attenuation factor distributions after application of various database screens.

(Data sets and screens are summarized in footnotes to Table 6 and described in Sections 4.1 through 4.4.)

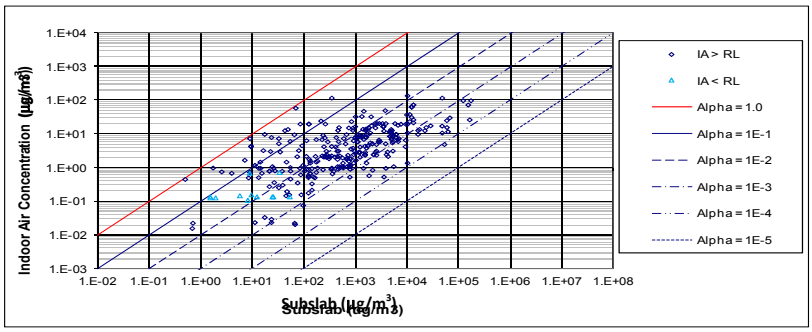
a) CHCs in Residences Data Set:



b) Baseline Data Set:



c) Indoor Air Screen Data Set (IA > Bkgd):



d) Source Strength Screen Data Set (SS > 50X Bkgd):

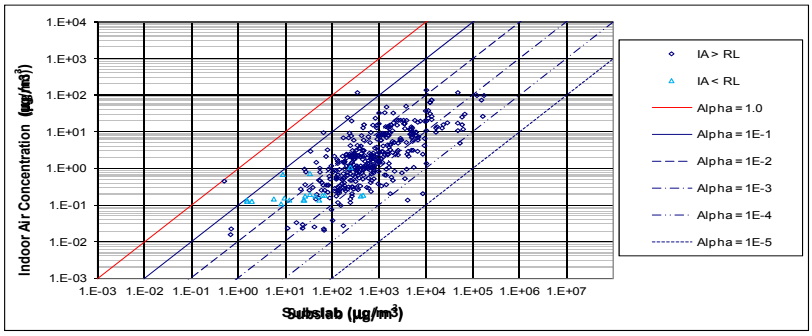


Figure 12. Scatter plots of paired indoor air and subslab soil gas concentrations for CHCs and residential buildings in EPA's vapor intrusion database after application of various database screens.

(Data sets and screens are summarized in footnotes to Table 6 and described in Sections 4.1 through 4.4.)

Table 7. Descriptive statistics of groundwater attenuation factor distributions after application of various database screens.

Statistic	Applied Database Screen							
	CHCs in Residences	Subsurface Concentration	Data Consistency	IA > Bkgd	GW > 100X Bkgd	GW > 500X Bkgd	GW > 1,000X Bkgd	GW > 5,000X Bkgd
Min	1.0E-07	1.0E-07	1.0E-07	8.6E-07	1.0E-07	1.0E-07	1.0E-07	1.0E-07
5%	3.6E-06	3.6E-06	3.7E-06	7.6E-06	3.7E-06	3.7E-06	3.6E-06	3.7E-06
25%	2.7E-05	2.7E-05	2.4E-05	3.3E-05	2.4E-05	2.4E-05	2.3E-05	2.3E-05
50%	9.2E-05	9.1E-05	7.7E-05	1.0E-04	7.6E-05	7.6E-05	7.4E-05	7.2E-05
75%	3.1E-04	3.1E-04	2.2E-04	2.6E-04	2.2E-04	2.1E-04	2.0E-04	1.9E-04
95%	2.5E-03	2.3E-03	1.3E-03	1.5E-03	1.2E-03	1.2E-03	1.2E-03	1.0E-03
Max	7.4E-02	7.4E-02	7.4E-02	7.4E-02	4.3E-02	4.3E-02	2.1E-02	2.1E-02
Mean	8.2E-04	7.3E-04	5.6E-04	6.8E-04	4.0E-04	3.5E-04	2.8E-04	2.5E-04
StdDev	4.1E-03	3.9E-03	3.9E-03	4.4E-03	2.2E-03	1.8E-03	1.0E-03	9.7E-04
95UCL	1.0E-03	9.4E-04	7.8E-04	9.7E-04	5.3E-04	4.6E-04	3.4E-04	3.1E-04
Count All	952	920	810	634	806	803	774	715
Count >RL	887	875	768	634	766	764	743	697
Count <RL	65	45	42	0	40	39	31	18
No. of sites	25	25	24	23	24	24	24	23

CHCs in Residences Screen: Subset of database remaining after screening chemicals other than CHCs measured in residential settings.

Subsurface Concentration Screen: Subset of **CHCs in Residences Data Set** remaining after further screening out subsurface concentrations less than RLs.

Data Consistency Screen: Subset of **Subsurface Concentration Screen Data Set** remaining after further screening out samples for which field notes indicate the presence of indoor (background) sources of VOCs, indoor air concentrations are significantly greater than the corresponding subsurface concentration, or attenuation factors for an individual chemical are inconsistent with the attenuation factors for other chemicals reported for the same pair of samples. The resulting data are also referred to as the **Baseline Screens Data Set** in the remainder of this document.

Indoor Air Screen (IA > Bkgd): Subset of **Baseline Screens Data Set** remaining after further screening out indoor air concentrations less than the "background" levels or less than the reporting limits (if RL is greater). The rationale for using the "background" levels is described in Section 4.4.

Source Strength Screens (GW > 100X Bkgd, GW > 500X Bkgd, GW > 1,000X Bkgd, GW > 5,000X Bkgd): Subsets of the Baseline Screens Data Set remaining after further screening out groundwater vapor concentrations less than certain multipliers (100, 500, 1,000, and 5,000) of "background" levels.

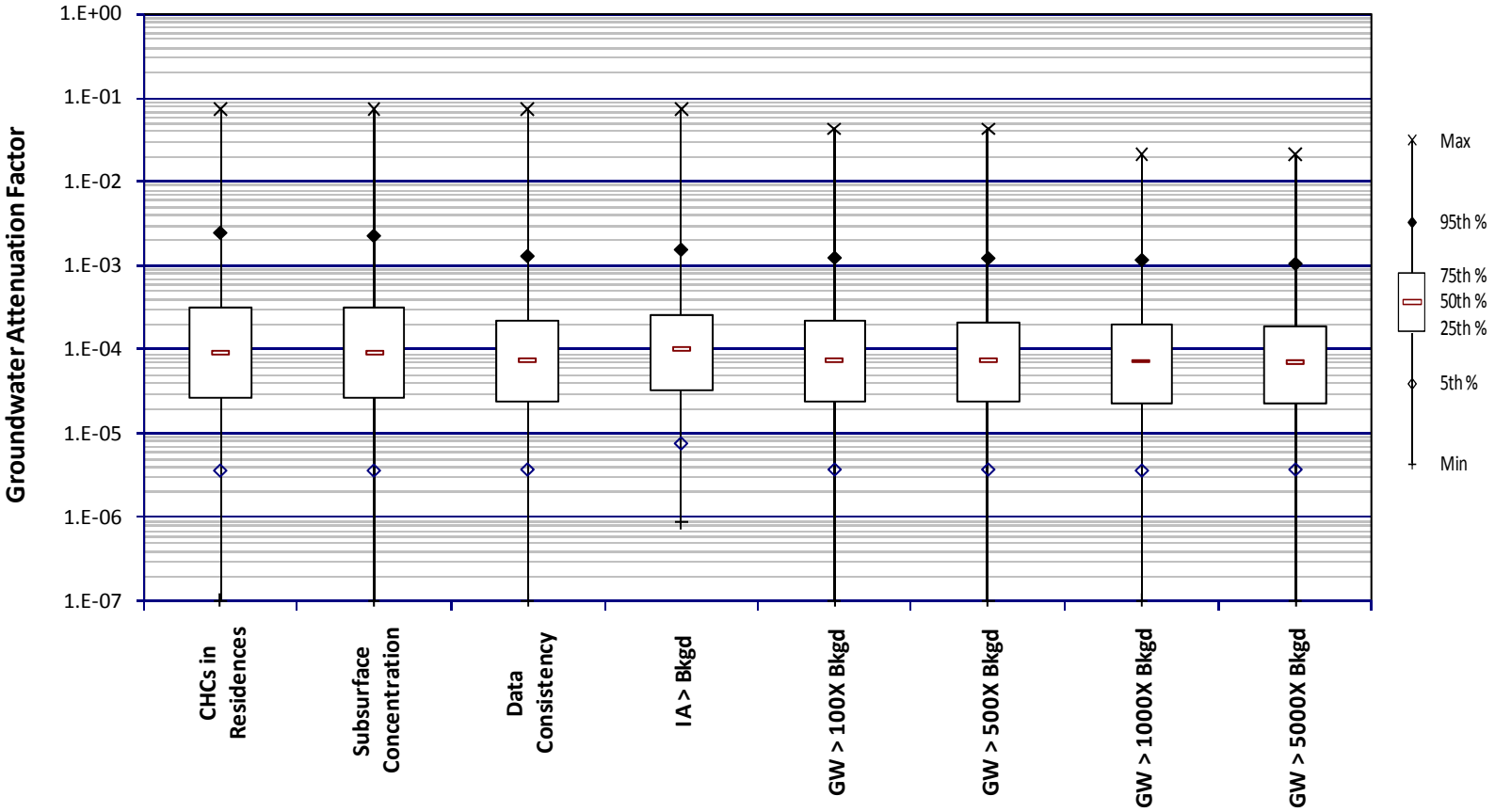


Figure 13. Box-and-whisker plots summarizing groundwater attenuation factor distributions after application of various database screens.

(Data sets and screens are summarized in footnotes to Table 7 and described in Sections 4.1 through 4.4.)

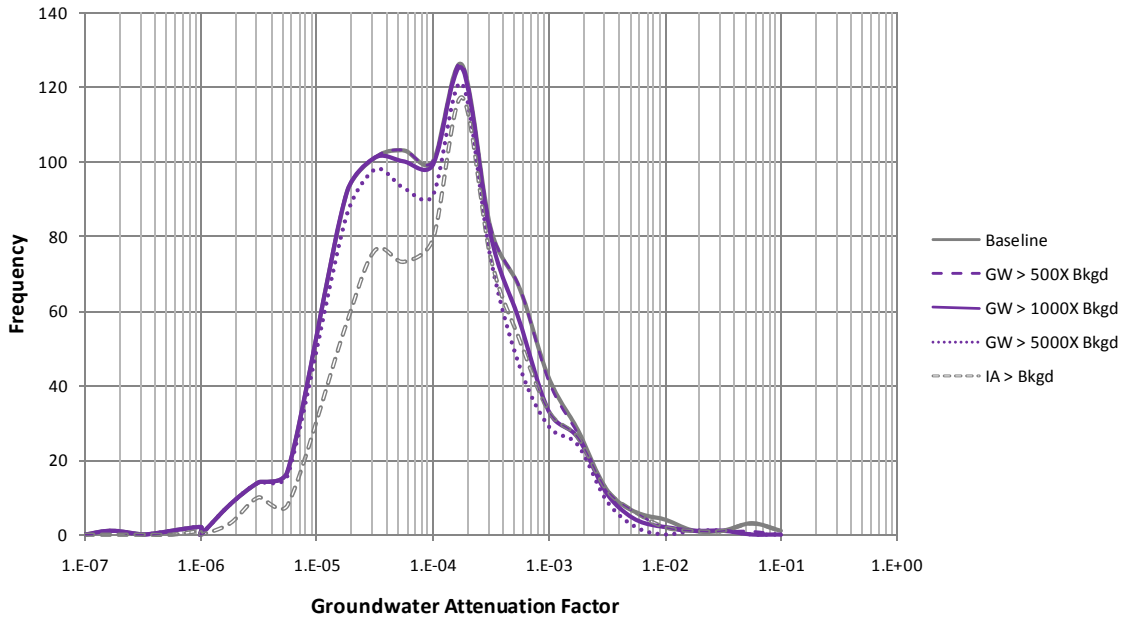


Figure 14. Frequency plots summarizing groundwater attenuation factor distributions after application of various database screens.

(Data sets and screens are summarized in footnotes to Table 7 and described in Sections 4.1 through 4.4.)

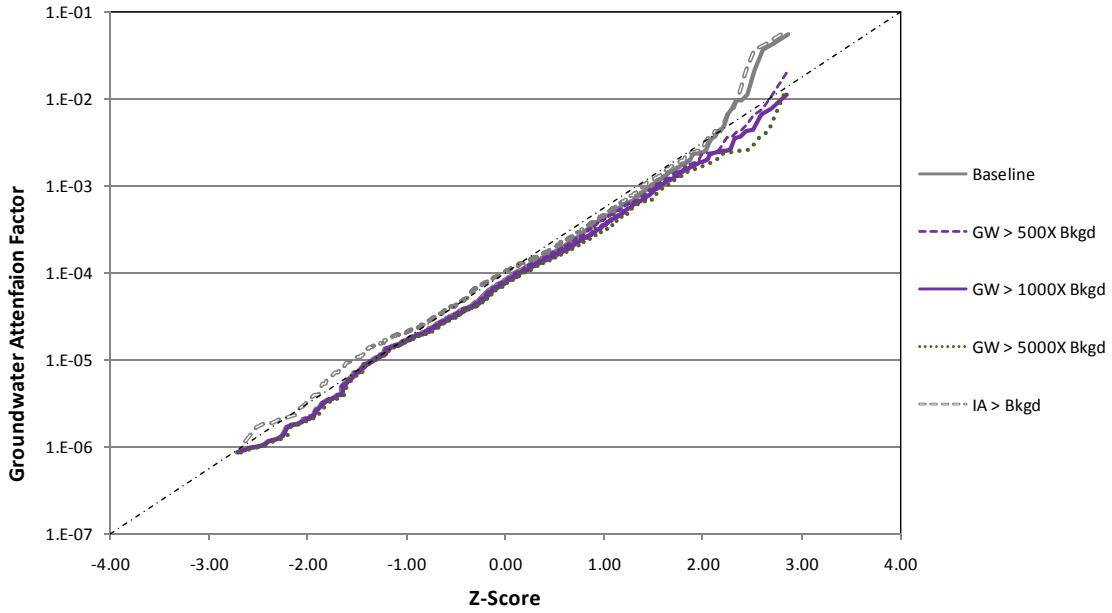
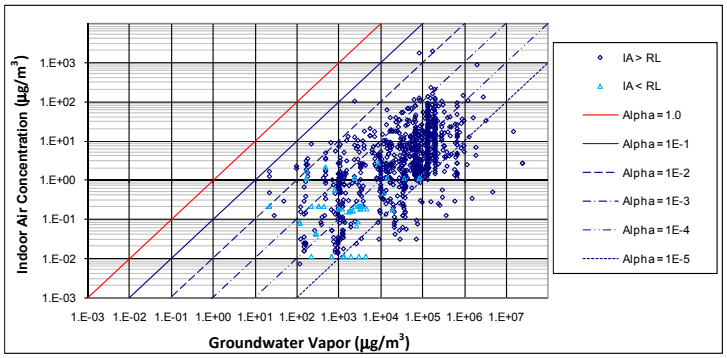


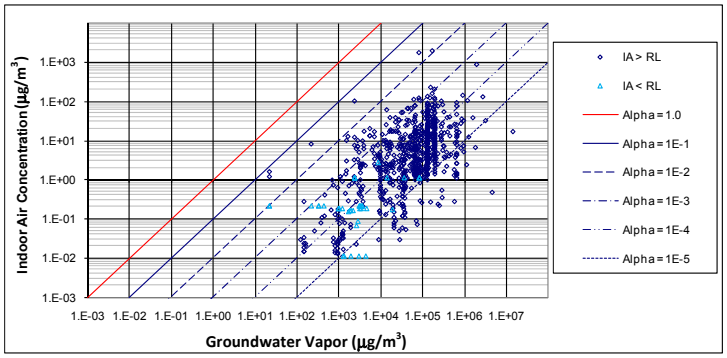
Figure 15. Cumulative probability plots summarizing groundwater attenuation factor distributions after application of various database screens.

(Data sets and screens are summarized in footnotes to Table 7 and described in Sections 4.1 through 4.4.)

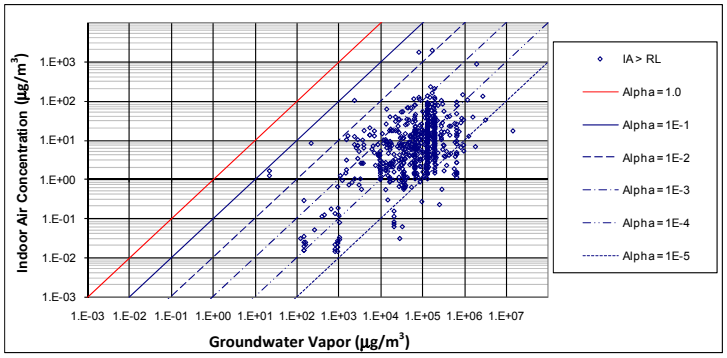
a) CHCs in Residences Data Set:



b) Baseline Data Set:



c) Indoor Air Screen Data Set (IA > Bkgd):



d) Source Strength Screen Data Set (GW > 1000X Bkgd):

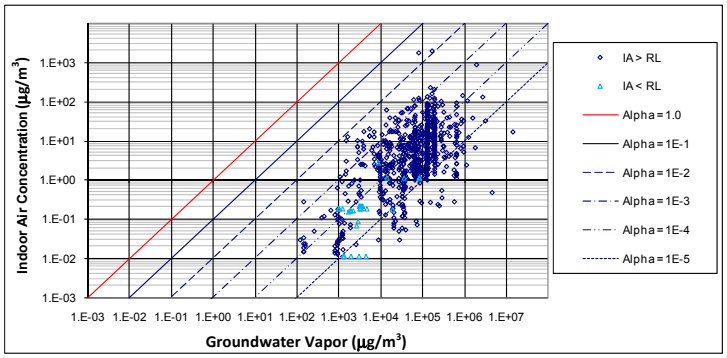


Figure 16. Scatter plots of paired indoor air and groundwater (vapor) concentrations for CHCs and residential buildings in EPA's vapor intrusion database after application of various database screens.

(Data sets and screens are summarized in footnotes to Table 7 and described in Sections 4.1 through 4.4.)

4.5.3 Exterior Soil Gas Data

The descriptive statistics and box-and-whisker plots generated for the exterior soil gas attenuation factors and the screening criteria described above are shown in **Table 8** and **Figure 17**, respectively. Several multipliers of "background" were used to screen the indoor air or exterior soil gas concentrations in the **Baseline Screens Data Set**. Frequency plots and cumulative probability plots illustrating the distributions resulting from applying the screening criteria are shown in **Figures 18** and **19**, respectively. The corresponding scatter plots are shown in **Figure 20**.

Applying similar reasoning as for the subslab soil gas data, a **Source Strength Screen** with a multiplier of 50 times "background" (see solid line marked SG > 50X Bkgd) is the best screening criterion for minimizing the influence of background sources on the data set of exterior soil gas attenuation factors. This **Source Strength Screen** also has the advantage of retaining a greater number of attenuation factors than does the **Indoor Air Screen**. The source-strength screening criterion of 50 times "background" is used in the remainder of this report to further evaluate the exterior soil gas attenuation factors, as discussed in Section 5.0.

Table 8. Descriptive statistics of exterior soil gas attenuation factor distributions after application of various database screens.

	Applied Database Screen						
Statistic	CHCs in Residences	Subsurface Concentration	Data Consistency	IA > Bkgd	SG > 50X Bkgd	SG > 100X Bkgd	SG > 500X Bkgd
Min	5.0E-06	5.0E-06	5.0E-06	1.2E-05	5.0E-06	5.0E-06	5.0E-06
5%	9.4E-05	1.1E-04	9.4E-05	5.4E-04	7.6E-05	6.8E-05	6.0E-05
25%	2.1E-03	2.2E-03	2.1E-03	3.2E-03	6.0E-04	5.2E-04	3.1E-04
50%	1.6E-02	1.6E-02	1.6E-02	2.4E-02	3.8E-03	2.5E-03	1.5E-03
75%	8.2E-02	8.7E-02	8.4E-02	1.0E-01	2.7E-02	1.6E-02	6.7E-03
95%	6.0E-01	6.0E-01	3.6E-01	6.0E-01	2.5E-01	2.5E-01	9.7E-02
Max	1.9E+02	1.9E+02	3.5E+00	3.5E+00	1.3E+00	1.3E+00	1.1E+00
Mean	1.1E+00	1.1E+00	1.0E-01	1.4E-01	5.0E-02	5.0E-02	3.4E-02
StdDev	1.3E+01	1.4E+01	3.1E-01	4.2E-01	1.7E-01	1.8E-01	1.5E-01
95UCL	2.6E+00	2.7E+00	1.4E-01	2.1E-01	7.8E-02	8.1E-02	6.4E-02
Count All	213	202	176	89	106	94	67
Count >RL	202	202	176	89	106	94	67
Count <RL	11	0	0	0	0	0	0
No. of sites	13	13	13	10	11	10	10

CHCs in Residences Screen: Subset of database remaining after screening chemicals other than CHCs measured in residential settings.

Subsurface Concentration Screen: Subset of **CHCs in Residences Data Set** remaining after further screening out subsurface concentrations less than RLs.

Data Consistency Screen: Subset of **Subsurface Concentration Screen Data Set** remaining after further screening out samples for which field notes indicate the presence of indoor (background) sources of VOCs, indoor air concentrations are significantly greater than the corresponding subsurface concentration, or attenuation factors for an individual chemical are inconsistent with the attenuation factors for other chemicals reported for the same pair of samples. The resulting data are also referred to as the **Baseline Screens Data Set** in the remainder of this document.

Indoor Air Screen (IA > Bkgd): Subset of **Baseline Screens Data Set** remaining after further screening out indoor air concentrations less than the "background" levels or less than the RLs (if RL is greater than the 90th percentile). The rationale for using the "background" levels is described in Section 4.4.

Source Strength Screens (SG > 50X Bkgd, SG > 100X Bkgd, SG > 500X Bkgd): Subsets of the **Baseline Screens Data Set** remaining after further screening out exterior soil gas concentrations less than certain multipliers (50, 100, and 500) of "background" levels.

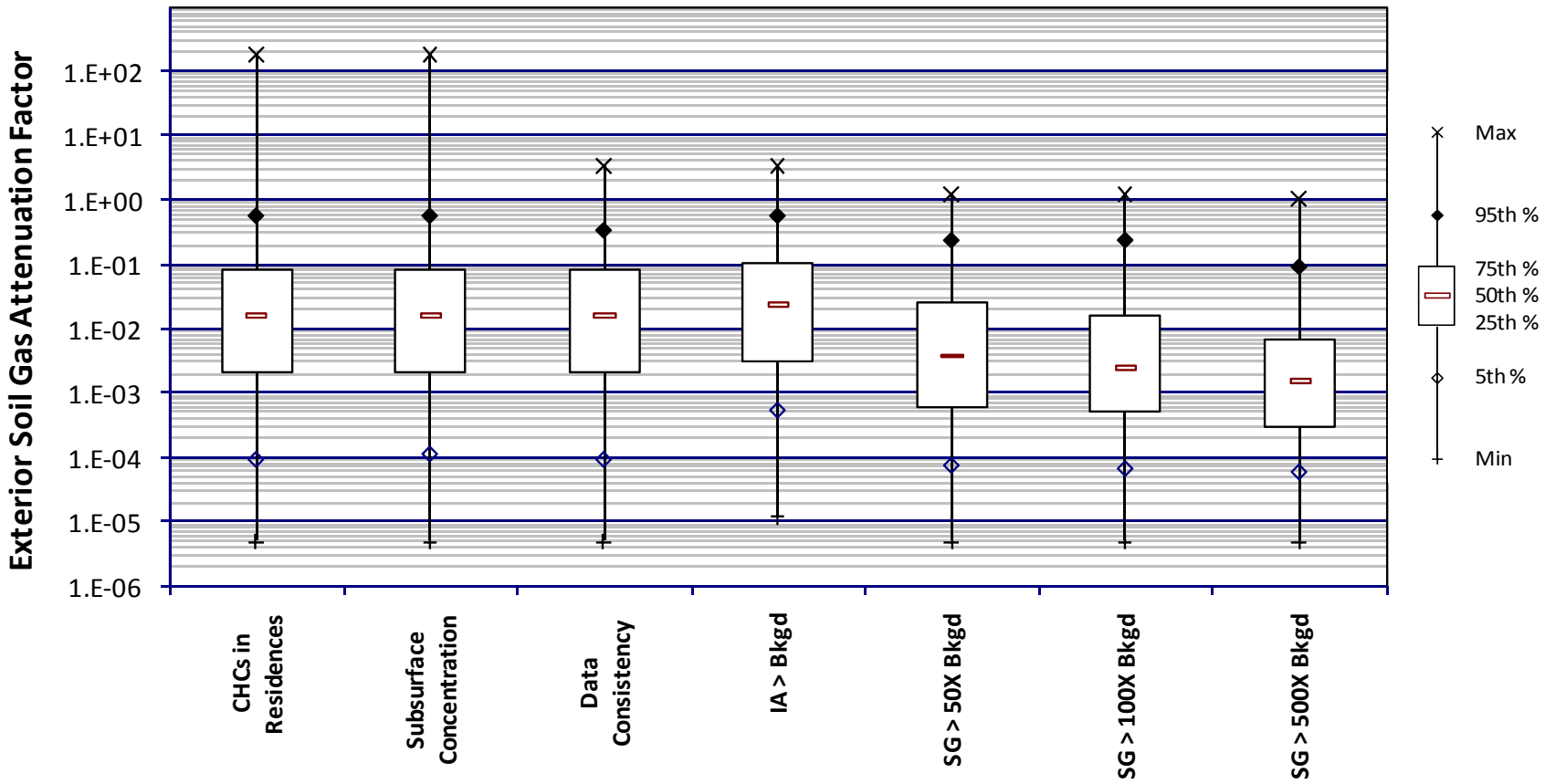


Figure 17. Box-and-whisker plots summarizing exterior soil gas attenuation factor distributions after application of various database screens.

(Data sets and screens are summarized in footnotes to Table 8 and described in Sections 4.1 through 4.4.)

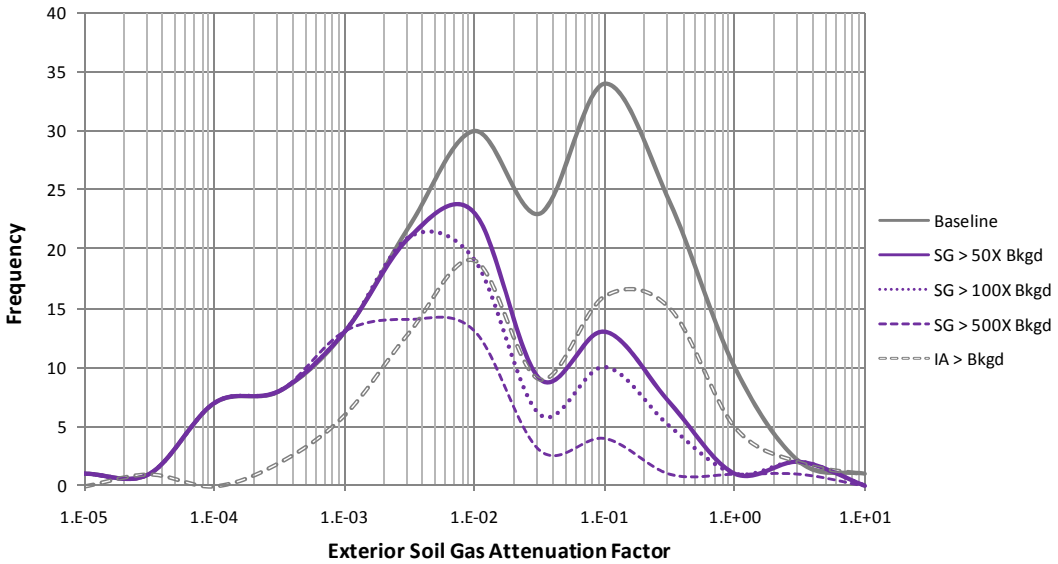


Figure 18. Frequency plots summarizing exterior soil gas attenuation factor distributions after application of various database screens.

(Data sets and screens are summarized in footnotes to Table 8 and described in Sections 4.1 through 4.4.)

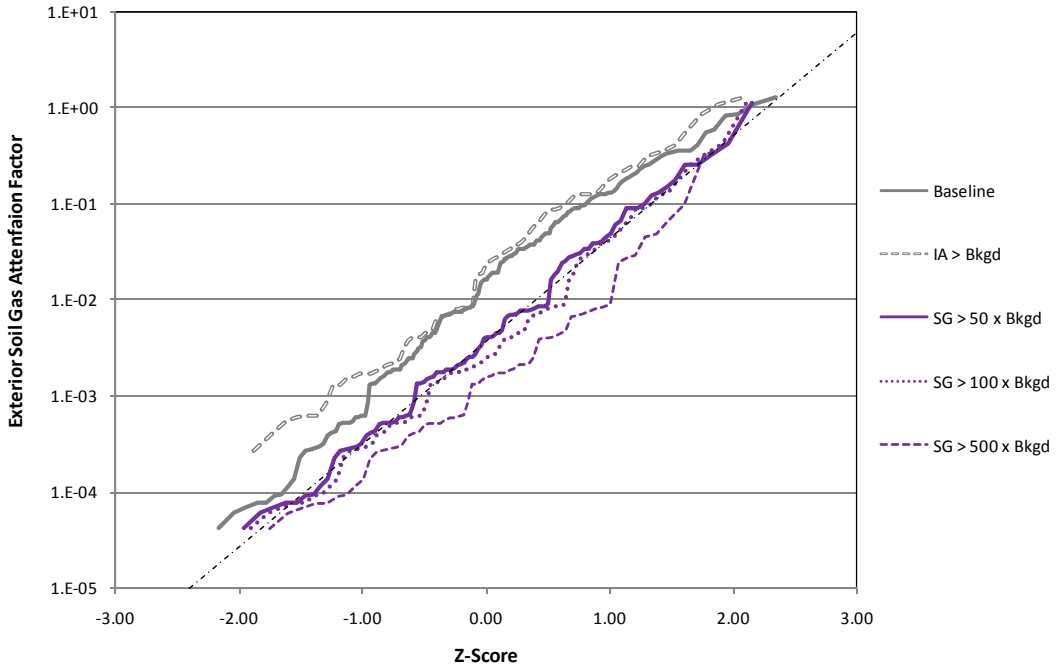
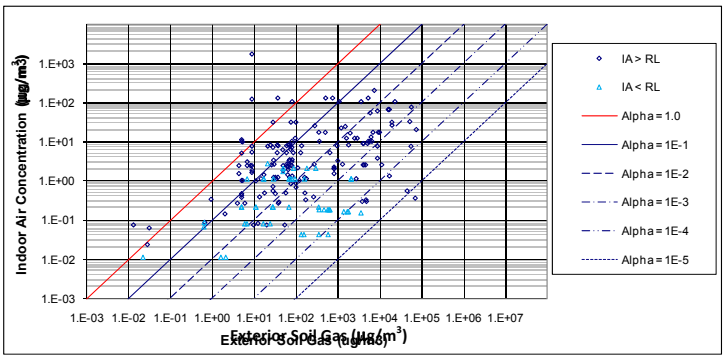


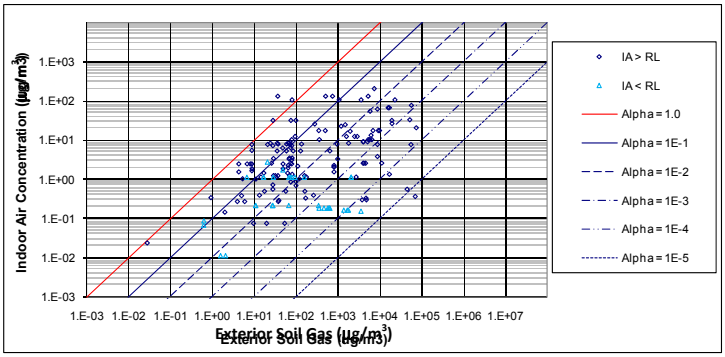
Figure 19. Cumulative probability plots summarizing exterior soil gas attenuation factor distributions after application of various database screens.

(Data sets and screens are summarized in footnotes to Table 8 and described in Sections 4.1 through 4.4.)

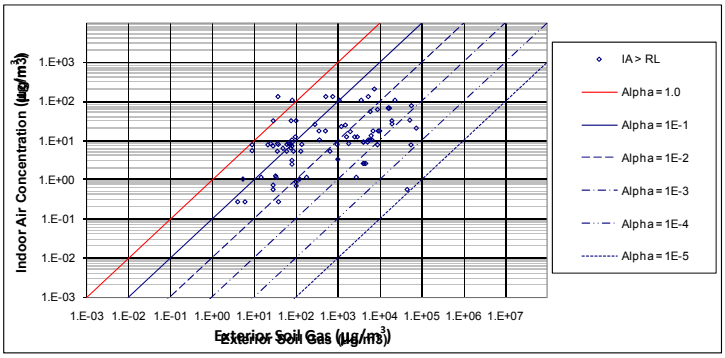
a) CHCs in Residences Data Set:



b) Baseline Data Set:



c) Indoor Air Screen Data Set (IA > Bkgd):



d) Source Strength Screen Data Set (SG > 50X Bkgd):

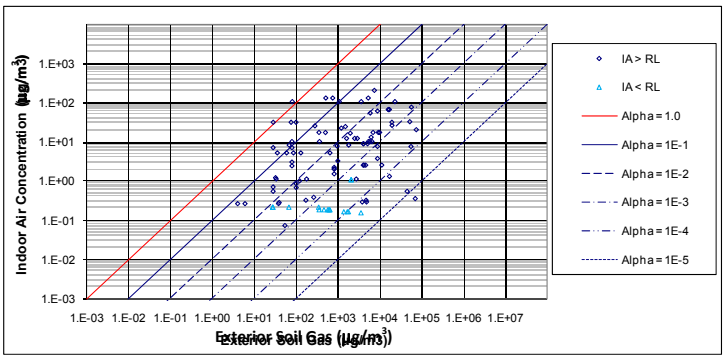


Figure 20. Scatter plots of paired indoor air and exterior soil gas concentrations for CHCs and residential buildings in EPA's vapor intrusion database after application of various database screens.

(Data sets and screens are summarized in footnotes to Table 8 and described in Sections 4.1 through 4.4.)

4.5.4 Crawlspace Data

The descriptive statistics and box-and-whisker plots generated for the crawlspace attenuation factors and the screening criteria described above are shown in **Table 9** and **Figure 21**, respectively. Several multipliers of "background" were used to screen the **Baseline Screens Data Set**. Frequency plots and cumulative probability plots illustrating the distributions resulting from applying the screening criteria are shown in **Figures 22** and **23**, respectively. The corresponding scatter plots are shown in **Figure 24**.

Table 9. Descriptive statistics of crawlspace attenuation factor distributions after application of various database screens.

	Applied Database Screen						
Statistic	CHCs in Residences	Subsurface Concentration	Data Consistency	IA > Bkgd	CS > Bkgd	CS > 5X Bkgd	CS > 10X Bkgd
Min	3.2E-02	3.2E-02	3.2E-02	5.7E-02	3.2E-02	3.2E-02	3.2E-02
5%	6.5E-02	6.5E-02	3.3E-02	1.0E-01	3.3E-02	3.3E-02	3.3E-02
25%	2.9E-01	2.9E-01	1.8E-01	2.2E-01	1.8E-01	1.8E-01	1.8E-01
50%	6.6E-01	6.6E-01	3.7E-01	3.9E-01	3.5E-01	3.5E-01	3.5E-01
75%	1.1E+00	1.1E+00	6.1E-01	6.9E-01	6.1E-01	6.1E-01	5.5E-01
95%	4.1E+00	4.0E+00	9.2E-01	9.0E-01	9.0E-01	9.0E-01	9.0E-01
Max	1.0E+01	8.5E+00	1.0E+00	9.2E-01	9.2E-01	9.2E-01	9.2E-01
Mean	1.2E+00	1.1E+00	4.3E-01	4.6E-01	4.3E-01	4.1E-01	3.9E-01
StdDev	1.7E+00	1.5E+00	2.9E-01	2.8E-01	2.9E-01	2.9E-01	2.7E-01
95UCL	1.5E+00	1.3E+00	4.9E-01	5.3E-01	5.0E-01	4.9E-01	4.7E-01
Count All	91	90	51	41	45	39	33
Count >RL	91	90	51	41	45	39	33
Count <RL	0	0	0	0	0	0	0
No. of sites	4	4	4	4	4	3	3

CHCs in Residences Screen: Subset of database remaining after screening chemicals other than CHCs measured in residential settings.

Subsurface Concentration Screen: Subset of **CHCs in Residences Data Set** remaining after further screening out subsurface concentrations less than RLs.

Data Consistency Screen: Subset of **Subsurface Concentration Screen Data Set** remaining after further screening out samples for which field notes indicate the presence of indoor (background) sources of VOCs, indoor air concentrations are significantly greater than the corresponding subsurface concentration, or attenuation factors for an individual chemical are inconsistent with the attenuation factors for other chemicals reported for the same pair of samples. The resulting data are also referred to as the **Baseline Screens Data Set** in the remainder of this document.

Indoor Air Screen (IA > Bkgd): Subset of **Baseline Screens Data Set** remaining after further screening out indoor air concentrations less than the "background" levels or less than the RLs (if RL is greater). The rationale for using the "background" levels is described in Section 4.4.

Source Strength Screens (CS > Bkgd, CS > 5X Bkgd, CS > 10X Bkgd): Subsets of the **Baseline Screens Data Set** remaining after further screening out crawlspace concentrations less than certain multipliers (1, 5, and 10) of "background" levels.

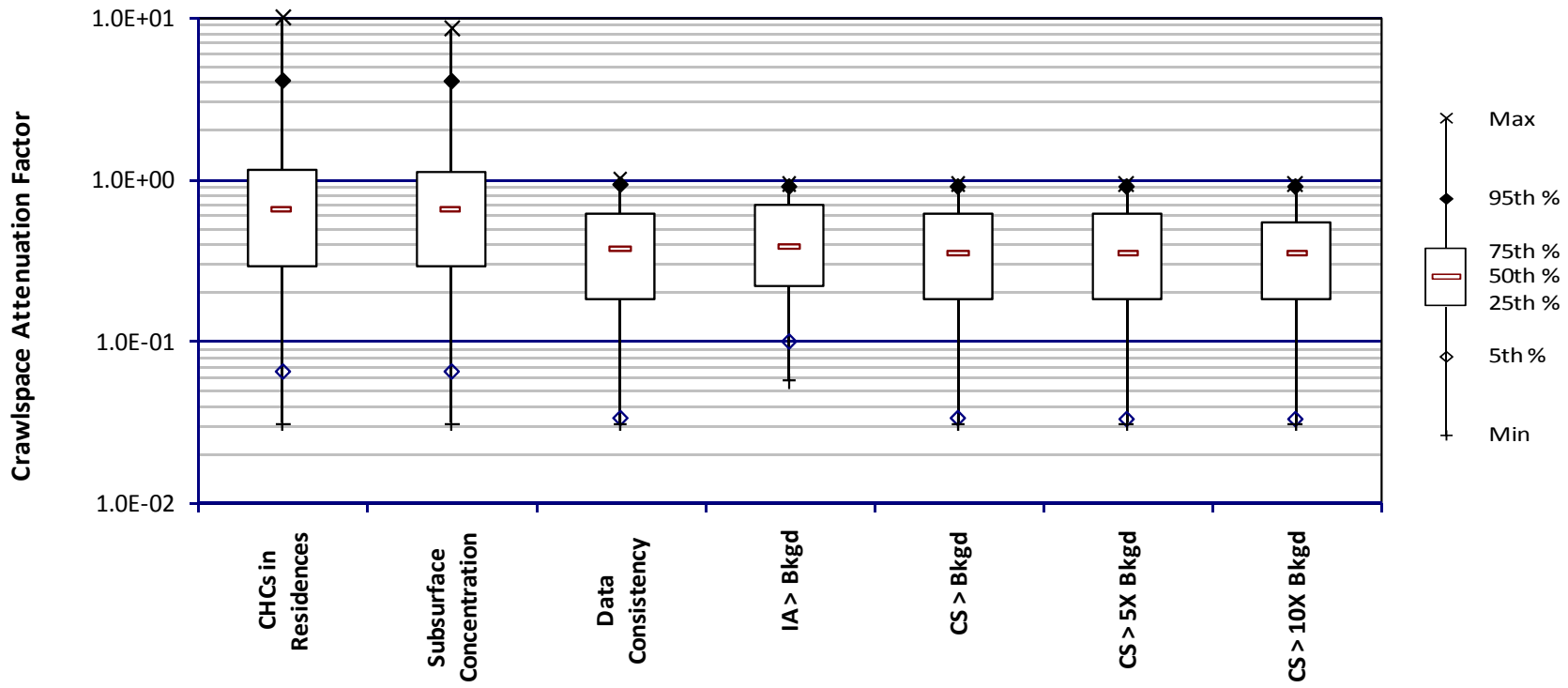


Figure 21. Box-and-whisker plots summarizing crawlspace attenuation factor distributions after application of various database screens.

(Data sets and screens are summarized in footnotes to Table 9 and described in Sections 4.1 through 4.4.)

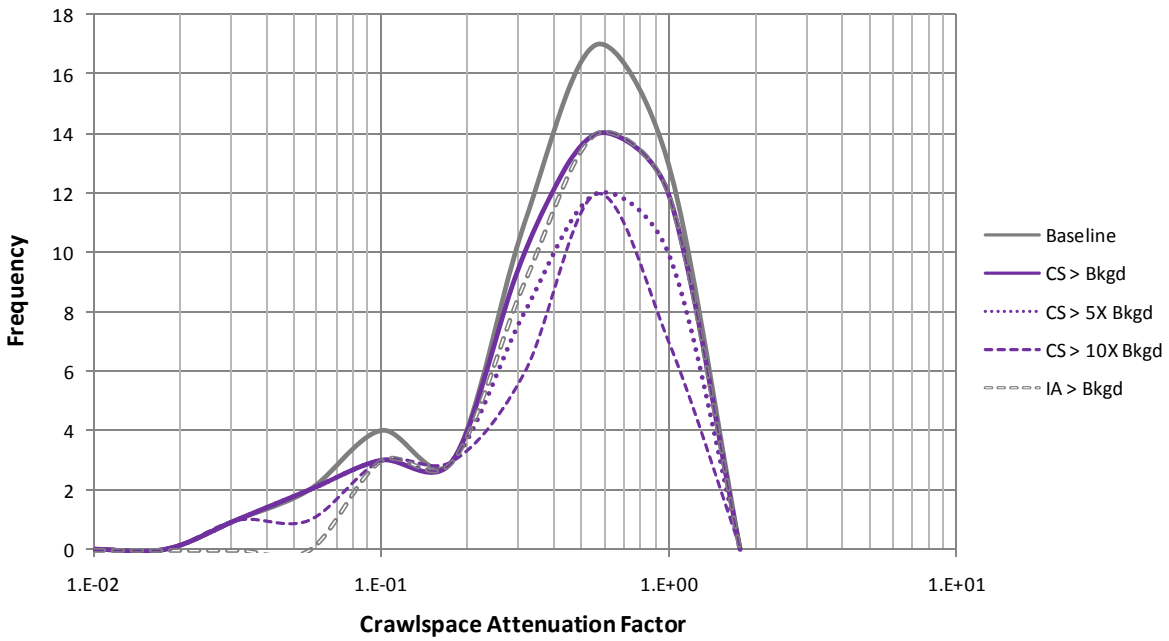


Figure 22. Frequency plots summarizing crawlspace attenuation factor distributions after application of various database screens.

(Data sets and screens are summarized in footnotes to Table 9 and described in Sections 4.1 through 4.4.)

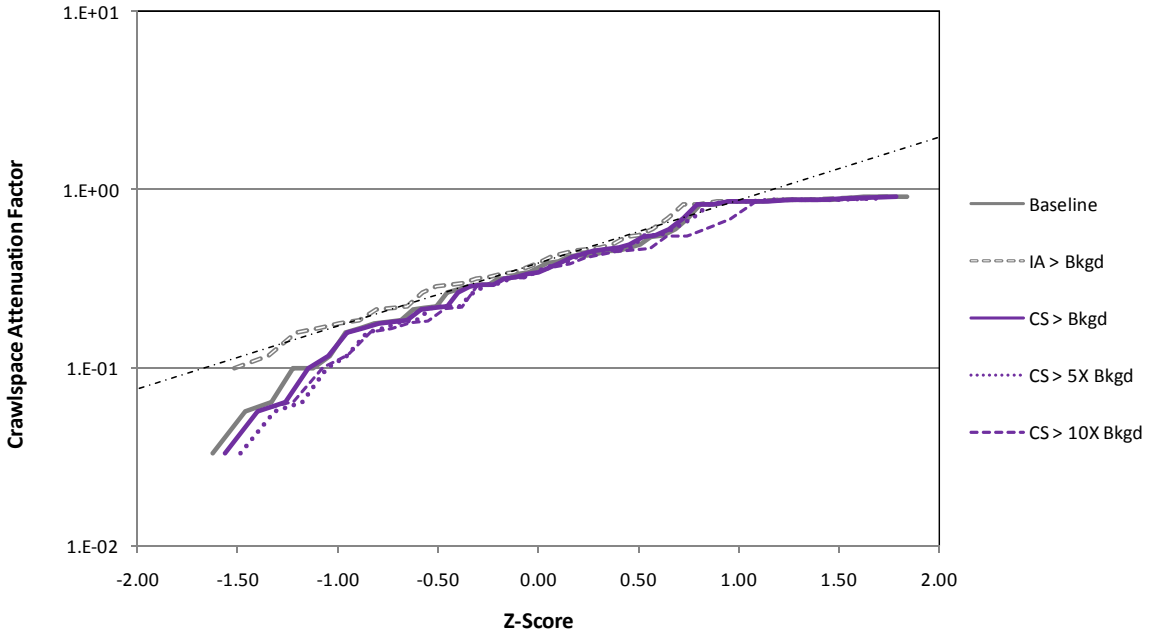
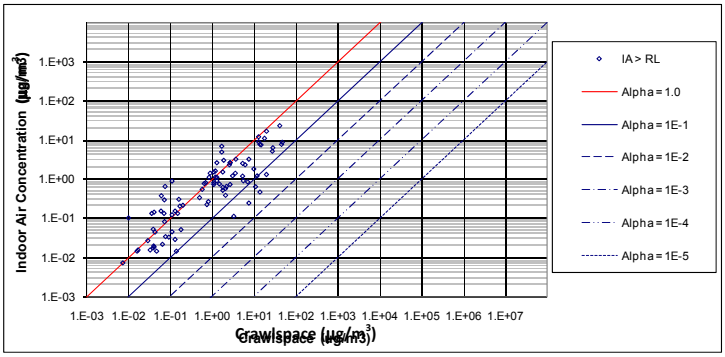


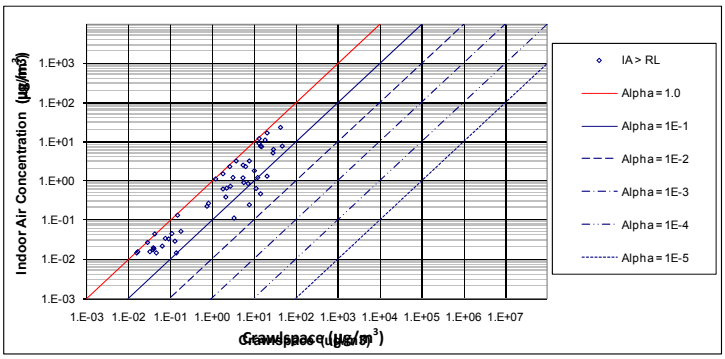
Figure 23. Cumulative probability plots summarizing crawlspace attenuation factor distributions after application of various database screens.

(Data sets and screens are summarized in footnotes to Table 9 and described in Sections 4.1 through 4.4.)

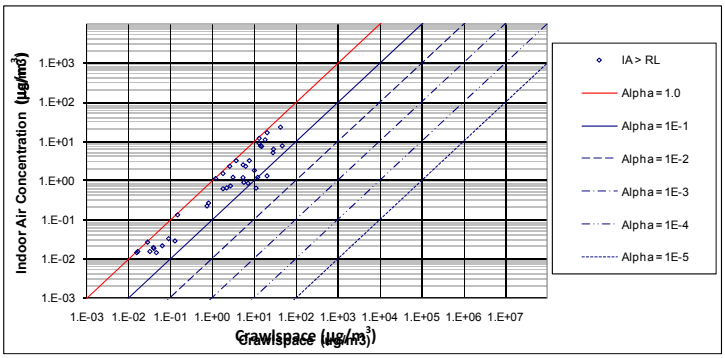
a) CHCs in Residences Data Set:



b) Baseline Data Set:



c) Indoor Air Screen Data Set (IA > Bkgd):



d) Source Strength Screen Data Set (CS > Bkgd):

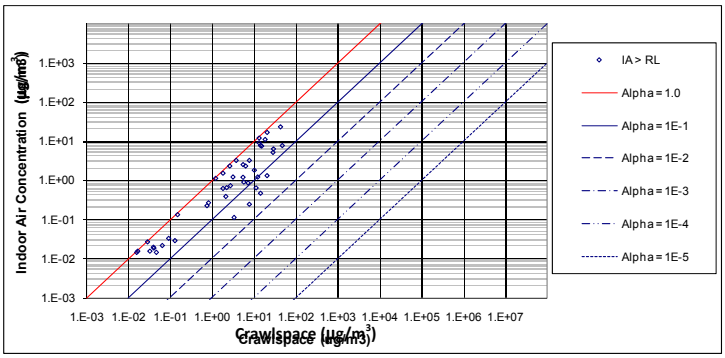


Figure 24. Scatter plots of paired indoor air and crawlspace concentrations for CHCs and residential buildings in EPA's vapor intrusion database after application of various database screens.

(Data sets and screens are summarized in footnotes to Table 9 and described in Sections 4.1 through 4.4.)

Table 10. Descriptive statistics summarizing subslab soil gas attenuation factor distributions for individual sites after Source Strength Screen (subslab soil gas concentrations > 50 times "background").

Statistic	SS > 50X Bkgd	BillingsPCE	DenverPCEBB	Endicott	Georgetown	Harcros/Tri State	Hopewell Precision	Jackson	LAFB	Orion Park	Raymark	SCM-Cortlandville	West Side Corporation
Min	2.5E-05	2.5E-05	1.1E-03	2.6E-04	1.3E-03	3.8E-04	1.5E-03		3.5E-05	5.0E-04	2.5E-04	3.4E-03	2.0E-04
5%	3.2E-04	9.6E-05		6.9E-04			1.9E-03		1.4E-04		1.2E-03	3.6E-03	
25%	1.5E-03	4.6E-04		1.7E-03			5.0E-03		4.1E-04	1.8E-03	2.0E-03	7.1E-03	5.9E-04
50%	2.7E-03	7.0E-04	6.4E-03	2.6E-03	1.9E-03	4.5E-04	1.0E-02	8.4E-03	1.9E-03	2.8E-03	5.5E-03	1.8E-02	1.5E-03
75%	6.8E-03	1.5E-03		5.0E-03			1.8E-02		5.3E-03	8.8E-03	8.3E-03	4.1E-02	9.7E-03
95%	2.6E-02	2.6E-03		1.1E-02			3.4E-02		3.2E-02		2.1E-02	1.5E-01	
Max	9.4E-01	2.7E-03	4.1E-02	9.4E-01	2.9E-03	2.7E-03	3.4E-02		4.2E-02	3.3E-02	7.9E-02	1.5E-01	3.5E-01
Mean	9.2E-03	9.5E-04	1.7E-02	8.5E-03	2.0E-03	1.0E-03	1.3E-02	8.4E-03	5.0E-03	7.6E-03	7.4E-03	4.1E-02	4.3E-02
StdDev	5.0E-02	7.7E-04	1.9E-02	6.5E-02	8.4E-04	1.1E-03	1.0E-02		9.0E-03	1.1E-02	1.0E-02	5.0E-02	1.2E-01
95UCL	1.3E-02	1.2E-03	3.5E-02	1.6E-02	3.5E-03	2.3E-03	1.7E-02		7.1E-03	1.4E-02	9.2E-03	6.8E-02	1.2E-01
No. of AFs	431	27	5	207	3	4	19	1	52	9	83	12	9
No. of AFs > RL	411	27	5	188	3	4	19	1	52	9	83	12	8
No. of AFs < RL	20	0	0	19	0	0	0	0	0	0	0	0	1

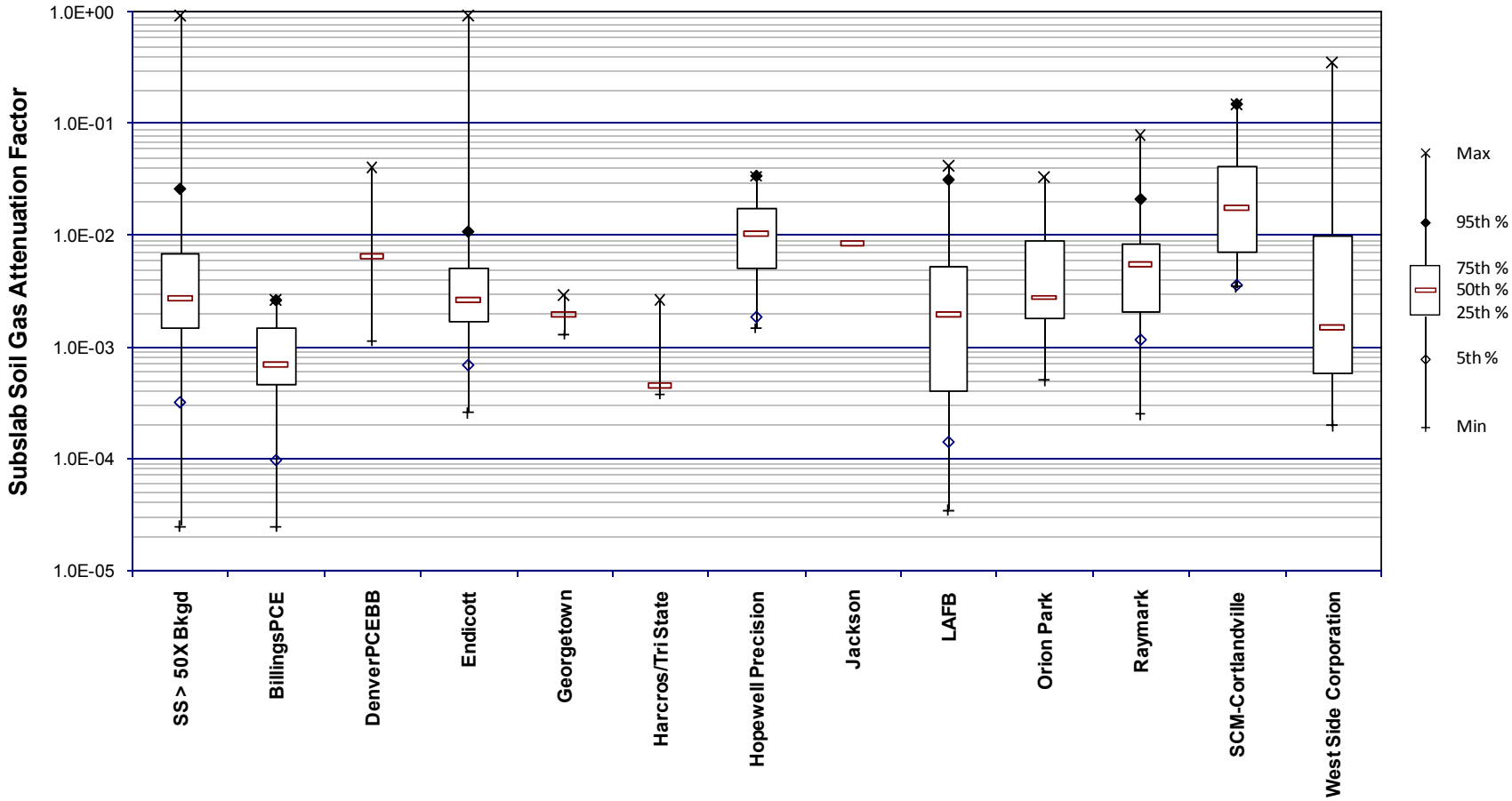


Figure 25. Box-and-whisker plots summarizing subslab soil gas attenuation factor distributions for individual sites after Source Strength Screen (subslab soil gas concentrations > 50 times "background").

Table 11. Descriptive statistics summarizing subslab soil gas attenuation factor distributions for two foundation types after Source Strength Screen (subslab soil gas concentrations > 50 times "background").

		Foundation	
Statistic	**SS > 50X Bkgd**	**Basement**	**Slab-On-Grade**
Min	2.5E-05	2.5E-05	4.5E-04
5%	3.2E-04	3.1E-04	5.0E-04
25%	1.5E-03	1.5E-03	8.7E-04
50%	2.7E-03	2.8E-03	2.8E-03
75%	6.8E-03	7.1E-03	7.0E-03
95%	2.6E-02	2.9E-02	1.4E-02
Max	9.4E-01	9.4E-01	3.3E-02
Mean	9.2E-03	1.0E-02	5.3E-03
StdDev	5.0E-02	5.3E-02	7.6E-03
95UCL	1.3E-02	1.4E-02	8.2E-03
No. of AFs	431	377	20
No. of AFs > RL	411	365	18
No. of AFs < RL	20	12	2
No. of sites	12	9	3

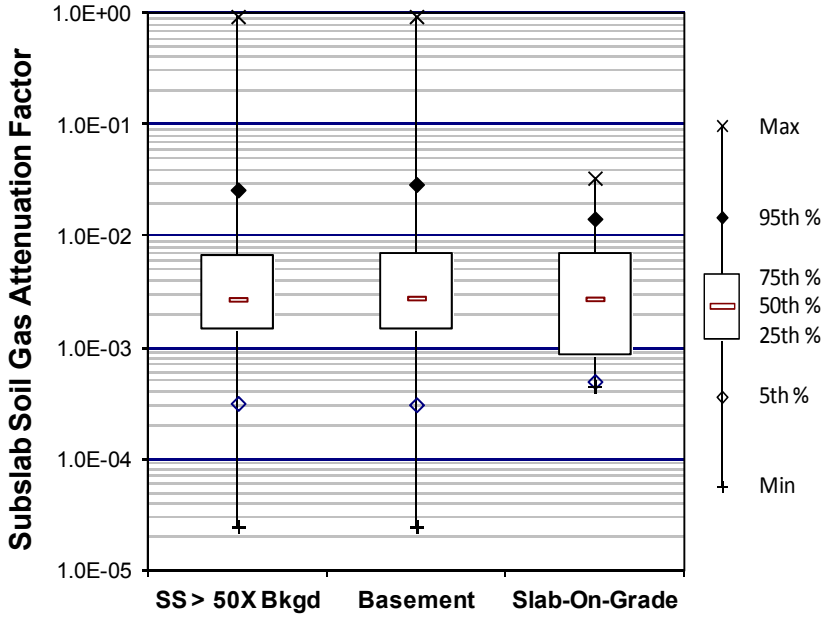


Figure 26. Box-and-whisker plots summarizing subslab soil gas attenuation factor distributions for two foundation types after Source Strength Screen (subslab soil gas concentrations > 50 times "background").

Table 12. Descriptive statistics summarizing subslab soil gas attenuation factor distributions for specific VOCs after Source Strength Screen (subslab soil gas concentrations > 50 times "background").

Abbreviations: TCE = trichloroethylene; PCE = tetrachloroethylene; 111TCA = 1,1,1-trichloroethane; and 11DCE = 1,1-dichloroethylene.

		Chemical			
Statistic	**SS > 50X Bkgd**	**TCE**	**PCE**	**111TCA**	**11DCE**
Min	2.5E-05	3.5E-05	2.5E-05	2.6E-04	1.6E-04
5%	3.2E-04	3.1E-04	2.0E-04	1.1E-03	2.5E-04
25%	1.5E-03	1.6E-03	6.4E-04	2.0E-03	9.2E-04
50%	2.7E-03	2.8E-03	1.5E-03	3.6E-03	2.4E-03
75%	6.8E-03	6.8E-03	3.0E-03	7.0E-03	7.7E-03
95%	2.6E-02	3.2E-02	3.2E-02	1.3E-02	1.8E-02
Max	9.4E-01	1.5E-01	3.5E-01	7.9E-02	1.9E-02
Mean	9.2E-03	7.4E-03	8.6E-03	6.1E-03	4.7E-03
StdDev	5.0E-02	1.6E-02	4.2E-02	1.0E-02	5.0E-03
95UCL	1.3E-02	9.4E-03	1.7E-02	8.1E-03	6.3E-03
No. of AFs	431	194	71	70	28
No. of AFs > RL	411	187	70	70	28
No. of AFs < RL	20	7	1	0	0
No. of sites	12	6	7	4	4

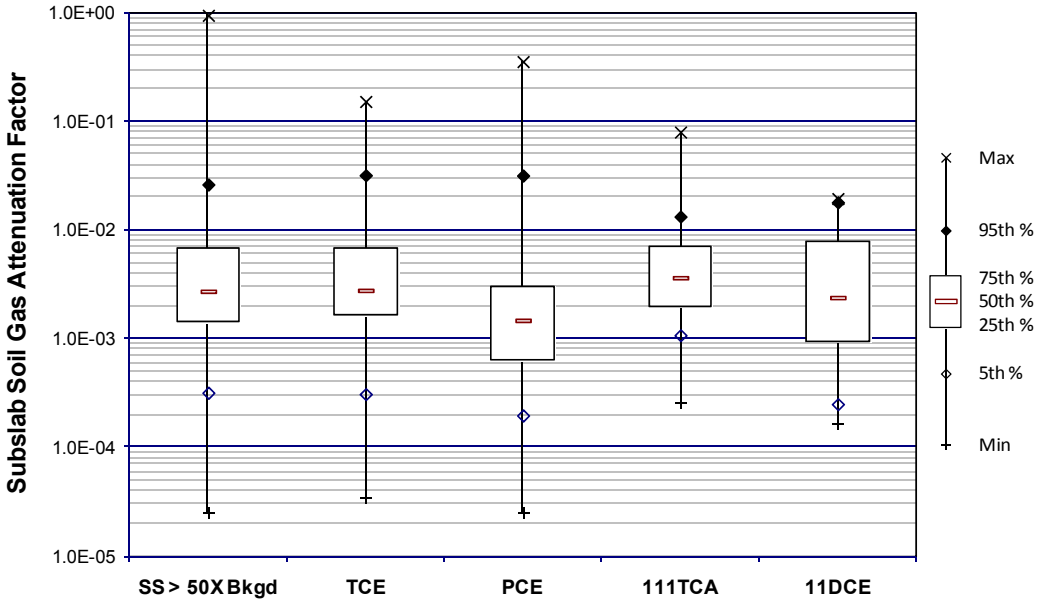


Figure 27. Box-and-whisker plots summarizing subslab soil gas attenuation factor distributions for specific VOCs after Source Strength Screen (subslab soil gas concentrations > 50 times "background").

Abbreviations: TCE = trichloroethylene; PCE = tetrachloroethylene; 111TCA = 1,1,1-trichloroethane; and 11DCE = 1,1-dichloroethylene.

Table 13. Descriptive statistics summarizing groundwater attenuation factor distributions for individual sites compared with the combined data set after Source Strength Screen (groundwater vapor concentrations > 1,000 times "background").

Statistic	GW > 1,000 X Bkgd	Allepo	Alliant	BillingsPCE	CDOT	Davis	Eau Claire	Endicott	Grants	Hamilton-Sundstrand	Harcros/Tri State	Hopewell Precision	Jackson	LAFB	Lockwood	MADEP 1	MADEP 2	Moffet	Mountain View	Rapid City	Redfield	SCM - Cortlandville	Uncasville	Wall	West Side Corp.
Min	1.0E-07	9.1E-06	2.5E-06	1.0E-06	1.8E-06	4.7E-05	3.6E-06	1.9E-05	1.0E-07	9.6E-06	1.2E-06	2.5E-05		2.9E-06	8.6E-07	1.6E-04		1.3E-06	4.8E-07	9.9E-06	1.7E-06	5.9E-05	3.3E-05	1.4E-06	2.1E-06
5%	3.6E-06			1.1E-05	3.4E-06			2.8E-05	9.7E-07	1.2E-05		1.7E-04		4.0E-06	2.9E-06						7.6E-06	5.9E-05		1.7E-05	1.3E-05
25%	2.3E-05			2.1E-05	9.9E-06			2.8E-05	2.7E-06	5.8E-05		2.9E-04		1.7E-05	1.9E-05						2.8E-05	5.9E-05	3.5E-04	2.9E-05	1.5E-05
50%	7.4E-05		3.7E-06	3.9E-05	2.2E-05		2.5E-04	1.7E-04	1.2E-05	1.0E-04	2.5E-04	5.6E-04	4.7E-04	3.4E-05	8.8E-05		4.0E-05	4.0E-06	3.3E-06	3.1E-05	7.3E-05	3.1E-04	4.8E-04	8.2E-05	3.7E-05
75%	2.0E-04			8.9E-05	1.5E-04			7.0E-04	8.7E-05	1.5E-04		1.2E-03		1.4E-04	2.7E-04						1.5E-04	1.7E-03	6.5E-04	3.2E-04	2.7E-04
95%	1.2E-03			6.8E-04	5.4E-04			1.4E-03	2.9E-04	2.9E-04		7.7E-03		6.8E-04	1.3E-03						4.8E-04	4.2E-03		1.4E-03	4.3E-03
Max	2.1E-02	1.4E-05	1.1E-03	8.0E-04	5.4E-04	4.3E-04	1.9E-03	1.5E-03	2.9E-04	5.2E-04	3.7E-03	7.7E-03		2.3E-03	2.4E-03	1.0E-03		1.9E-05	3.3E-05	4.0E-05	1.8E-03	6.6E-03	1.8E-03	1.1E-02	2.1E-02
Mean	2.8E-04		1.1E-04	1.2E-04	1.1E-04	2.4E-04	7.7E-04	4.3E-04	7.5E-05	1.2E-04	7.1E-04	1.2E-03		1.6E-04	2.6E-04	6.0E-04		7.9E-06	9.7E-06	2.7E-05	1.3E-04	1.1E-03	6.0E-04	4.9E-04	1.1E-03
StdDev	1.0E-03		3.4E-04	2.1E-04	1.7E-04		8.1E-04	4.8E-04	1.1E-04	9.8E-05	1.3E-03	1.8E-03		3.6E-04	4.5E-04			9.3E-06	1.4E-05	1.6E-05	1.9E-04	1.6E-03	5.1E-04	1.7E-03	4.0E-03
95UCL	3.4E-04		2.8E-04	1.9E-04	1.8E-04		1.4E-03	5.7E-04	1.2E-04	1.5E-04	1.7E-03	2.0E-03		2.2E-04	3.5E-04			2.4E-05	2.3E-05	5.4E-05	1.5E-04	1.6E-03	9.2E-04	9.2E-04	2.3E-03
Count All	774	2	12	25	17	2	6	32	14	32	7	17	1	93	63	2	1	3	5	3	329	28	9	43	28
Count >RL	743	1	5	25	17	2	6	22	14	32	7	17	1	93	63	2	1	3	5	3	329	21	9	43	22
Count <RL	31	1	7	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	6

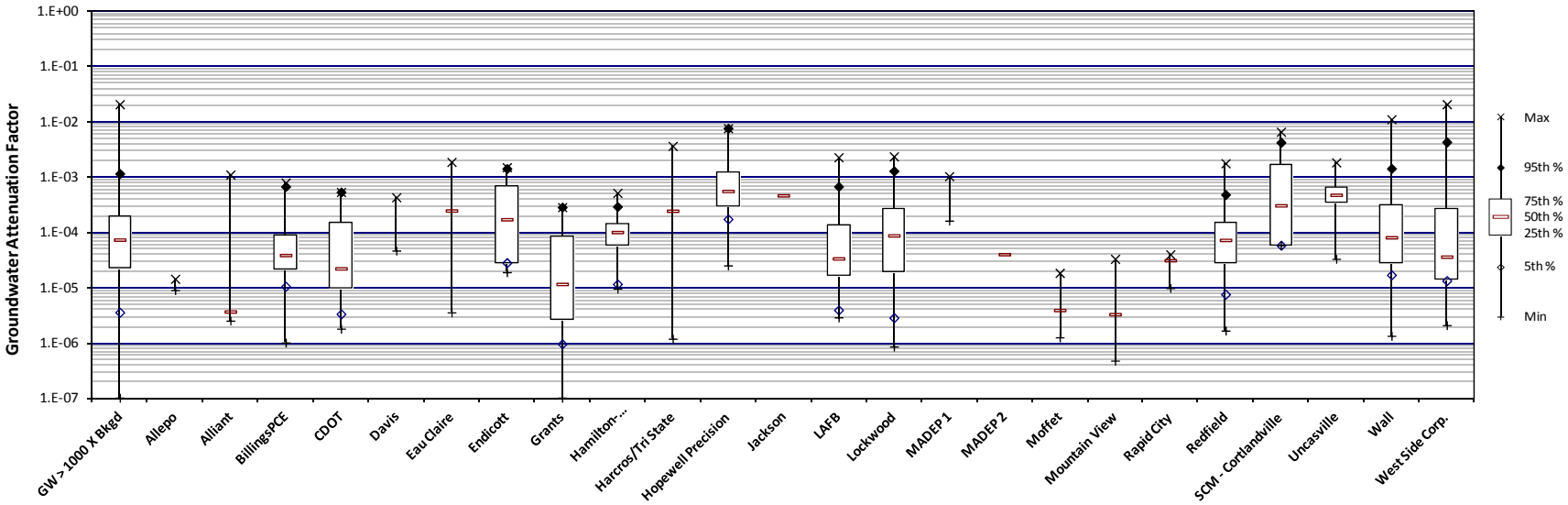


Figure 28. Box-and-whisker plots summarizing groundwater attenuation factor distributions for individual sites compared with the combined data set after Source Strength Screen (groundwater vapor concentrations > 1,000 times "background").

Table 14 provides selected statistics, and **Figure 29** shows the box-and-whisker plots for the groundwater attenuation factors for three soil types. Comparing each descriptive statistic (except for the 25th percentile values) indicates that the attenuation factor values for residences overlying soils classified as "very coarse" are larger than those for residences overlying soils classified as "coarse," which are larger than those for soils classified as "fine." This pattern is consistent with the conceptual model for vapor intrusion; smaller attenuation factors, which indicate greater reduction in vapor concentration, would be expected in vadose zones with finer grained soils, when all other factors (e.g., depth to groundwater, biodegradability of the volatile chemicals) are the same.

Table 14. Descriptive statistics summarizing groundwater attenuation factor distributions for specific soil types after Source Strength Screen.

	Soil Type Below Foundation		
Statistic	**Fine**	**Coarse**	**V.Coarse**
Min	1.0E-07	4.8E-07	2.1E-06
5%	2.3E-06	7.6E-06	1.3E-05
25%	1.9E-05	3.1E-05	2.0E-05
50%	4.6E-05	1.0E-04	1.5E-04
75%	1.4E-04	2.5E-04	6.8E-04
95%	4.5E-04	1.4E-03	4.2E-03
Max	2.4E-03	1.1E-02	2.1E-02
Mean	1.3E-04	3.3E-04	9.7E-04
StdDev	2.4E-04	8.9E-04	3.0E-03
95UCL	1.5E-04	4.1E-04	1.7E-03
Count All	353	369	52
Count >RL	344	359	40
Count <RL	9	10	12
No. of sites	10	15	3

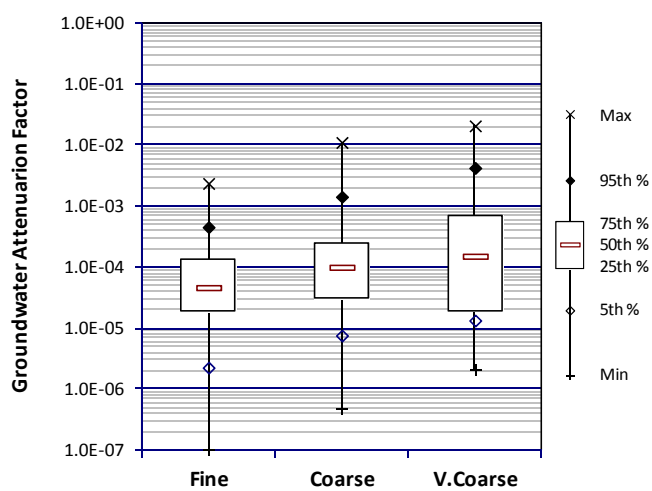


Figure 29. Box-and-whisker plots summarizing groundwater attenuation factor distributions for specific soil types after Source Strength Screen.

Table 15 provides selected statistics, and **Figure 30** shows the box-and-whisker plots for the groundwater attenuation factors for four categories of depth to groundwater. Comparing each descriptive statistic, the attenuation factors generally decrease (i.e., indicate greater reduction in vapor concentration) with increasing depth to groundwater. For example, the 95th and 75th percentile values of the empirical attenuation factors calculated for depth to water less than 1.5 meters are greater (indicating less attenuation/dilution) than those for depth to water between 1.5 and 3 meters. The 95th and 75th percentile attenuation factors continue to decrease for depth to water between 3 and 5 meters and depth to water greater than 5 meters. This pattern is consistent with the conceptual model for vapor intrusion; smaller attenuation factors, which indicate greater reduction in vapor concentration, would be expected in thicker vadose zones (as indicated by greater depths to groundwater), when all other factors (e.g., soil type, biodegradability of the volatile chemicals) are the same.

Table 15. Descriptive statistics summarizing groundwater attenuation factor distributions for various depth to groundwater categories after Source Strength Screen.

	Depth to Groundwater			
Statistic	**< 1.5 m**	**1.5 - 3 m**	**3 - 5 m**	**> 5 m**
Min	3.6E-06	8.6E-07	1.2E-06	1.0E-07
5%	1.6E-05	2.9E-06	1.3E-06	2.9E-06
25%	2.9E-04	3.2E-05	1.4E-05	1.9E-05
50%	6.1E-04	1.2E-04	4.2E-05	4.8E-05
75%	1.5E-03	3.2E-04	2.5E-04	1.6E-04
95%	6.6E-03	2.4E-03	1.7E-03	6.4E-04
Max	7.7E-03	4.2E-03	3.7E-03	1.1E-02
Mean	1.2E-03	3.9E-04	3.3E-04	2.1E-04
StdDev	1.6E-03	7.2E-04	6.6E-04	8.5E-04
95UCL	1.6E-03	5.3E-04	4.4E-04	3.2E-04
Count All	36	77	97	181
Count >RL	36	76	83	171
Count <RL	0	1	14	10
No. of sites	4	5	9	6

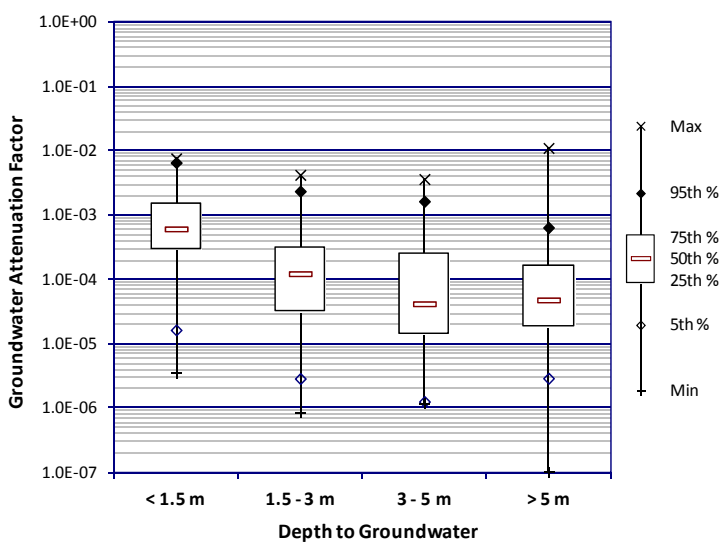


Figure 30. Box-and-whisker plots summarizing groundwater attenuation factor distributions for various depth to groundwater categories after Source Strength Screen.

Table 16. Descriptive statistics summarizing groundwater attenuation factor distributions for specific VOCs after Source Strength Screen.

Abbreviations: TCE = trichloroethylene; PCE = tetrachloroethylene; 11DCE = 1,1-dichloroethylene; 12DCE = 1,2-dichloroethylene; CHC = chlorinated hydrocarbon.

Statistic	GW > 1000 x Bkgd	Chemical				
		TCE	PCE	11DCE	cis12DCE	Other CHCs
Min	1.0E-07	4.8E-07	1.0E-07	1.7E-06	8.6E-07	1.1E-06
5%	3.6E-06	3.6E-06	1.7E-06	6.4E-06	1.8E-06	2.0E-05
25%	2.3E-05	1.7E-05	2.7E-05	2.6E-05	1.6E-05	1.0E-04
50%	7.4E-05	1.0E-04	6.8E-05	7.0E-05	2.7E-05	1.5E-04
75%	2.0E-04	4.2E-04	3.2E-04	1.5E-04	1.3E-04	2.6E-04
95%	1.2E-03	2.4E-03	1.5E-03	4.7E-04	1.5E-03	5.4E-04
Max	2.1E-02	7.7E-03	2.1E-02	1.8E-03	1.9E-03	1.9E-03
Mean	2.8E-04	4.6E-04	5.1E-04	1.3E-04	1.8E-04	2.6E-04
StdDev	1.0E-03	9.7E-04	2.1E-03	1.9E-04	4.0E-04	3.9E-04
95UCL	3.4E-04	5.8E-04	8.0E-04	1.4E-04	2.9E-04	4.0E-04
Count All	774	190	138	388	36	22
Count >RL	743	170	132	383	36	22
Count <RL	31	20	6	5	0	0
No. of sites	24	16	8	6	5	3

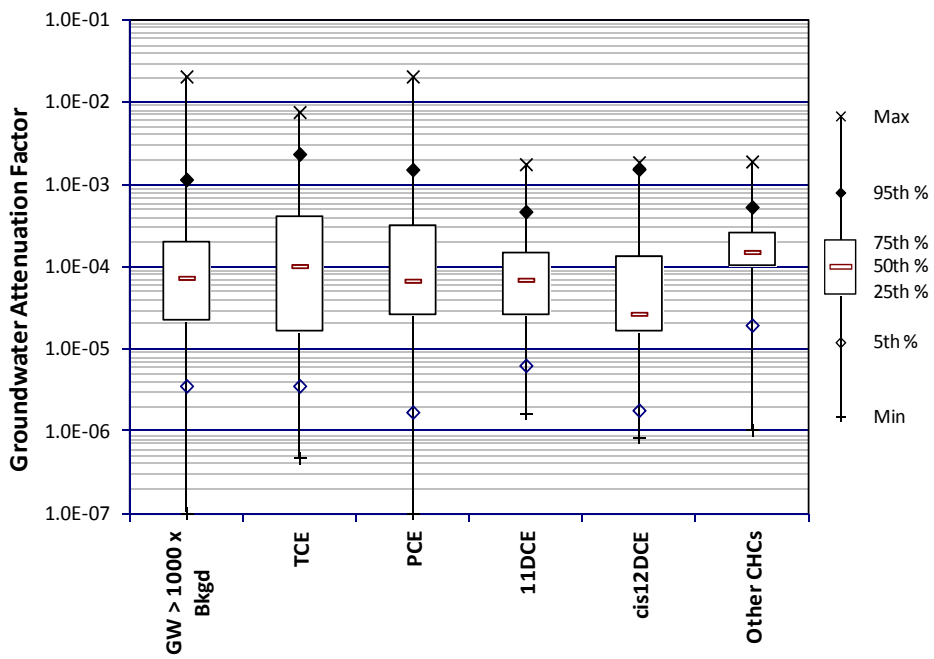


Figure 31. Box-and-whisker plots summarizing groundwater attenuation factor distributions for specific VOCs after Source Strength Screen.

Abbreviations: TCE = trichloroethylene; PCE = tetrachloroethylene; 11DCE = 1,1-dichloroethylene; 12DCE = 1,2-dichloroethylene; CHC = chlorinated hydrocarbon.

Table 17. Descriptive statistics summarizing exterior soil gas attenuation factor distributions for individual sites after Source Strength Screen (exterior soil gas concentrations > 50 times "background").

		Site										
Statistic	SG > 50X Bkgd	Alliant	Endicott	Georgetown	Grants	Harcros/Tri State	Jackson	MADEP1	Mountain View	SCM - Cortlandville	Uncasville	West Side Corporation
Min	5.0E-06		4.2E-05	3.2E-03	4.1E-04	5.0E-06	1.3E-04	9.0E-03	1.2E-05	6.0E-04	7.6E-05	4.2E-04
5%	7.6E-05		6.0E-05		1.4E-03					3.1E-03		
25%	6.0E-04		2.8E-04		6.3E-03	2.7E-04				7.5E-03	1.6E-02	5.2E-04
50%	3.8E-03	7.2E-03	1.3E-03	6.7E-03	4.0E-02	1.3E-03			6.1E-04	3.0E-02	1.8E-02	8.5E-04
75%	2.7E-02		2.1E-03		1.4E-01	8.3E-03				8.9E-02	2.8E-02	2.5E-03
95%	2.5E-01		4.8E-03		1.1E+00					2.5E-01		
Max	1.3E+00		7.5E-03	8.3E-03	1.3E+00	3.4E-02	2.3E-04	2.7E-02	8.4E-03	2.5E-01	8.9E-02	6.8E-03
Mean	5.0E-02		1.6E-03	6.1E-03	1.6E-01	7.6E-03	1.8E-04	1.8E-02	3.0E-03	5.4E-02	3.0E-02	1.9E-03
StdDev	1.7E-01		1.8E-03	2.6E-03	3.2E-01	1.3E-02			4.7E-03	6.8E-02	3.4E-02	2.0E-03
95UCL	7.8E-02		2.1E-03	1.0E-02	2.7E-01	1.9E-02	4.7E-04		1.1E-02	8.5E-02	6.3E-02	3.1E-03
Count All	106	1	33	3	26	6	2	2	3	15	5	10
Count >RL	106	1	33	3	26	6	2	2	3	15	5	10
Count <RL	0	0	0	0	0	0	0	0	0	0	0	0

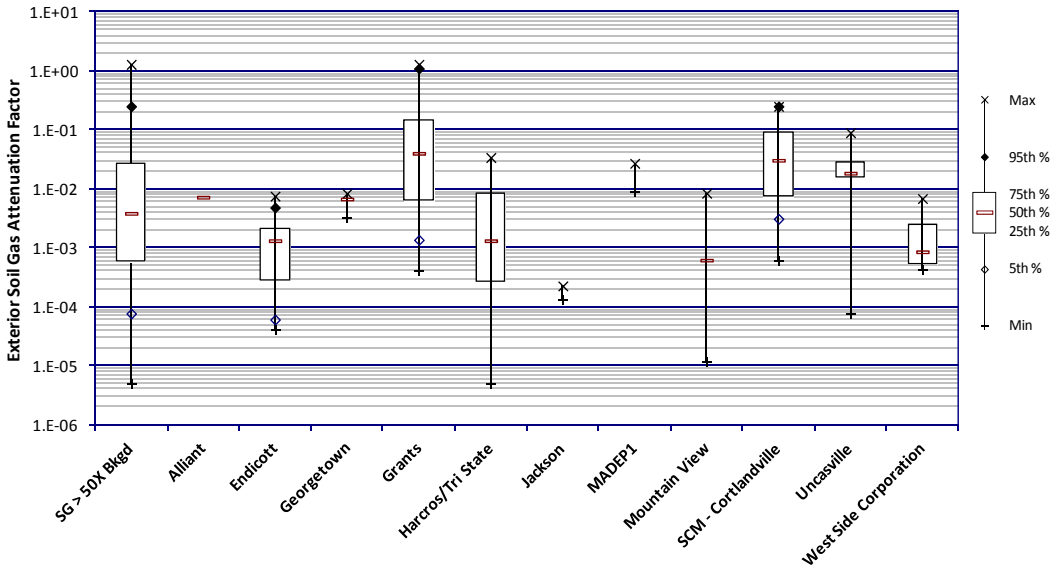


Figure 32. Box-and-whisker plots summarizing exterior soil gas attenuation factor distributions for individual sites after Source Strength Screen (exterior soil gas concentrations > 50 times "background").

Table 18. Descriptive statistics summarizing crawlspace attenuation factor distributions for individual sites after Indoor Air Screen (indoor air concentrations > one times "background").

		Site			
Statistic	**IA > Bkgd**	**Grants**	**Jackson**	**LAFB**	**Lockwood**
Min	5.7E-02	1.7E-01		5.7E-02	2.2E-01
5%	1.0E-01			6.5E-02	
25%	2.2E-01			2.7E-01	
50%	3.9E-01	3.9E-01	5.0E-01	4.2E-01	2.2E-01
75%	6.9E-01	8.3E-01		8.3E-01	
95%	9.0E-01			9.0E-01	
Max	9.2E-01	9.2E-01		9.2E-01	2.9E-01
Mean	4.6E-01	4.8E-01		4.8E-01	2.4E-01
StdDev	2.8E-01	3.0E-01		2.9E-01	4.2E-02
95UCL	5.3E-01	7.0E-01		5.7E-01	3.2E-01
Count All	41	7	1	30	3
Count >RL	41	7	1	30	3
Count <RL	0	0	0	0	0

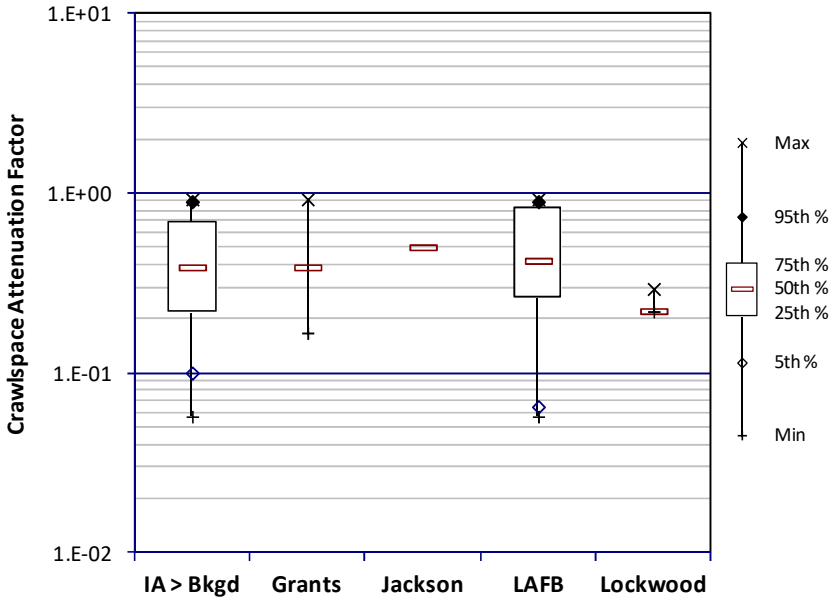


Figure 33. Box-and-whisker plots summarizing crawlspace attenuation factor distributions for individual sites after Indoor Air Screen (indoor air concentrations > one times "background").

Table 19. Descriptive statistics summarizing attenuation factor distributions for groundwater, exterior soil gas, subslab soil gas, and crawlspace vapor after application of the database screens considered most effective at minimizing the influence of background sources on indoor air concentrations.

Statistic	Groundwater (GW > 1,000X Bkgd)	Exterior Soil Gas (SG > 50X Bkgd)	Subslab Soil Gas (SS > 50X Bkgd)	Crawlspace (IA > Bkgd)
Min	1.0E-07	5.0E-06	2.5E-05	5.7E-02
5%	3.6E-06	7.6E-05	3.2E-04	1.0E-01
25%	2.3E-05	6.0E-04	1.5E-03	2.2E-01
50%	7.4E-05	3.8E-03	2.7E-03	3.9E-01
75%	2.0E-04	2.7E-02	6.8E-03	6.9E-01
95%	1.2E-03	2.5E-01	2.6E-02	9.0E-01
Max	2.1E-02	1.3E+00	9.4E-01	9.2E-01
Mean	2.8E-04	5.0E-02	9.2E-03	4.6E-01
StdDev	1.0E-03	1.7E-01	5.0E-02	2.8E-01
95UCL	3.4E-04	7.8E-02	1.3E-02	5.3E-01
Count All	774	106	431	41
Count >RL	743	106	411	41
Count <RL	31	0	20	0
No. of sites	24	11	12	4

Note: The applied database screens are groundwater (vapor) concentrations > 1,000X "background," exterior soil gas > 50X "background," subslab soil gas > 50X "background," and for crawlspace, indoor air concentrations > 1X "background."

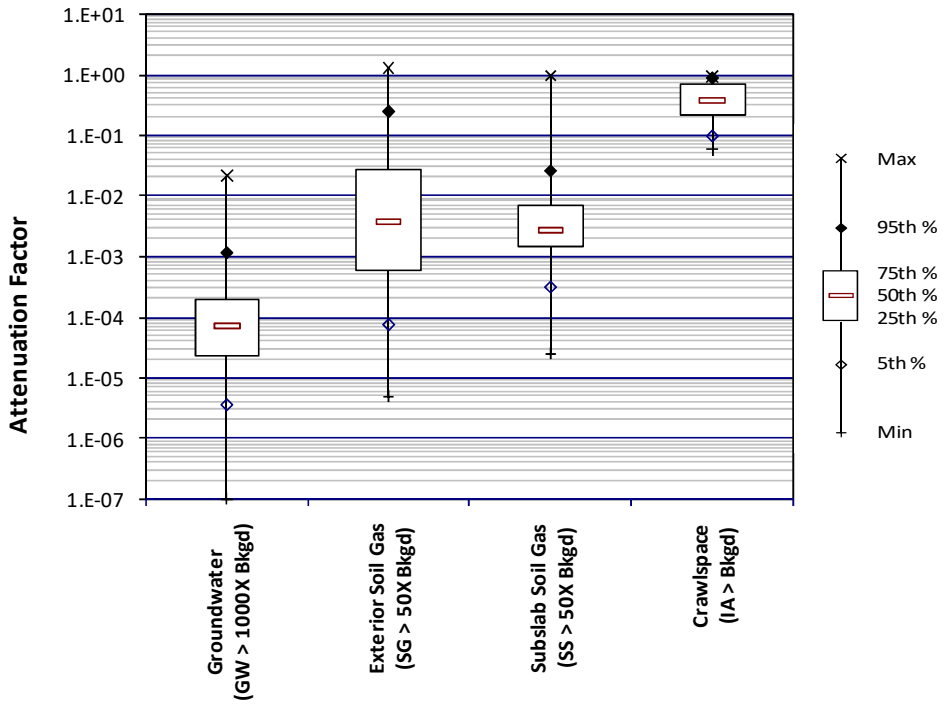


Figure 34. Box-and-whisker plots summarizing attenuation factor distributions for groundwater, exterior soil gas, subslab soil gas, and crawlspace vapor after application of the database screens considered most effective at minimizing the influence of background sources on indoor air concentrations.

CAS	Chemical	Type of Observation	vol	muta-gen	GIABS	ABS	Csat (mg/kg)	RfDo (mg/kg-day)	key	RfCi (mg/m3)	key	SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m3)$^{-1}$	key	Resident Soil (mg/kg)	key	Industrial Soil (mg/kg)	key	Resident Air (ug/m^3)	key	Industrial Air (ug/m^3)	key	Tapwater (ug/L)	key	MCL (ug/L)	Risk-based SSL (mg/kg)	MCL-based SSL (mg/kg)
121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	Spring 2018			1.00	0.02		0.003	I			0.11	I			6.1	c*	28	c					0.7	c*		0.00027	
121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	Fall 2018			1.00	0.02		0.004	I			0.08	I			8.3	c*	38	c					0.97	c*		0.00037	
	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	Change Effect						0.001				-0.03				2.2		10						0.27				
7439-91-0	Lanthanum	Fall 2018			1.00			0.00005	P							3.9	n	58	n					1	n			
100587-90-4	Lanthanum Acetate Hydrate	Fall 2018			1.00	0.10		0.000021	P							1.3	n	17	n					0.42	n			
10025-84-0	Lanthanum Chloride Heptahydrate	Fall 2018			1.00			0.000019	P							1.5	n	22	n					0.37	n			
10099-58-8	Lanthanum Chloride, Anhydrous	Fall 2018			1.00			0.000028	P							2.2	n	33	n					0.57	n			
10277-43-7	Lanthanum Nitrate Hexahydrate	Fall 2018			1.00			0.000016	P							1.3	n	19	n					0.32	n			
75-44-5	Phosgene	Spring 2018	V		1.00		1610			0.0003	I					0.31	n	1.3	n	0.31	n	1.3	n					
75-44-5	Phosgene	Fall 2018	V		1.00		1610			0.0003	I					0.31	n	1.3	n	0.31	n	1.3	n	0.63	n		0.00016	
	Phosgene	Change Effect																							X.			
23950-58-5	Pronamide	Fall 2018			1.00	0.10		0.075	I							4700	n	62000	n					1200	n		1.2	
23950-58-5	Propyzamide	Spring 2018			1.00	0.10		0.075	I							4700	n	62000	n					1200	n		1.2	
E715557	Refractory Ceramic Fibers	Spring 2018			1.00					0.03	A					43000000	nm	180000000	nm	31	n	130	n					
E715557	Refractory Ceramic Fibers (units in fibers)	Fall 2018			1.00					0.03	A									31	S	130	S					
7681-49-4	Sodium Fluoride	Spring 2018			1.00			0.05	A	0.013	C					3900	n	58000	n	14	n	57	n	1000	n	4000		
7681-49-4	Sodium Fluoride	Fall 2018			1.00			0.05	A	0.013	C					3900	n	58000	n	14	n	57	n	1000	n	4000	150	600
	Sodium Fluoride	Change Effect																										
540-88-5	Tert-Butyl Acetate	Fall 2018	V		1.00	0.10						0.005	C	0	C	8	c	35	c	2.2	c	9.4	c	3.3	c		0.00076	
8001-35-2	Toxaphene	Spring 2018			1.00	0.10						1.1	I	0.00032	I	0.49	c	2.1	c	0.0088	c	0.038	c	0.071	c	3	0.011	0.46
8001-35-2	Toxaphene	Fall 2018			1.00	0.10		0.00009	P			1.1	I	0.00032	I	0.49	c*	2.1	c*	0.0088	c	0.038	c	0.071	c*	3	0.011	0.46
	Toxaphene	Change Effect							X.								.X		.X						.X			
E1841606	Toxaphene, Weathered	Fall 2018			1.00	0.10		0.00003	X							1.9	n	25	n					0.6	n		0.093	
39635-31-9	~Heptachlorobiphenyl, 2,3,3',4,4',5,5'- (PCB 189)	Spring 2018	V		1.00	0.14		0.000023	E	0.0013	E	3.9	E	0.0011	E	0.13	c*	0.52	c*	0.0025	c	0.011	c	0.004	c		0.0028	
39635-31-9	~Heptachlorobiphenyl, 2,3,3',4,4',5,5'- (PCB 189)	Fall 2018	V		1.00	0.14		0.000023	W	0.0013	W	3.9	W	0.0011	W	0.13	c*	0.52	c*	0.0025	c	0.011	c	0.004	c		0.0028	
	~Heptachlorobiphenyl, 2,3,3',4,4',5,5'- (PCB 189)	Change Effect							X.		X.		X.		X.													
52663-72-6	~Hexachlorobiphenyl, 2,3',4,4',5,5'- (PCB 167)	Spring 2018	V		1.00	0.14		0.000023	E	0.0013	E	3.9	E	0.0011	E	0.12	c*	0.51	c*	0.0025	c	0.011	c	0.004	c		0.0017	
52663-72-6	~Hexachlorobiphenyl, 2,3',4,4',5,5'- (PCB 167)	Fall 2018	V		1.00	0.14		0.000023	W	0.0013	W	3.9	W	0.0011	W	0.12	c*	0.51	c*	0.0025	c	0.011	c	0.004	c		0.0017	
	~Hexachlorobiphenyl, 2,3',4,4',5,5'- (PCB 167)	Change Effect							X.		X.		X.		X.													
69782-90-7	~Hexachlorobiphenyl, 2,3,3',4,4',5'- (PCB 157)	Spring 2018	V		1.00	0.14		0.000023	E	0.0013	E	3.9	E	0.0011	E	0.12	c*	0.5	c*	0.0025	c	0.011	c	0.004	c		0.0017	
69782-90-7	~Hexachlorobiphenyl, 2,3,3',4,4',5'- (PCB 157)	Fall 2018	V		1.00	0.14		0.000023	W	0.0013	W	3.9	W	0.0011	W	0.12	c*	0.5	c*	0.0025	c	0.011	c	0.004	c		0.0017	
	~Hexachlorobiphenyl, 2,3,3',4,4',5'- (PCB 157)	Change Effect							X.		X.		X.		X.													
38380-08-4	~Hexachlorobiphenyl, 2,3,3',4,4',5- (PCB 156)	Spring 2018	V		1.00	0.14		0.000023	E	0.0013	E	3.9	E	0.0011	E	0.12	c*	0.5	c*	0.0025	c	0.011	c	0.004	c		0.0017	
38380-08-4	~Hexachlorobiphenyl, 2,3,3',4,4',5- (PCB 156)	Fall 2018	V		1.00	0.14		0.000023	W	0.0013	W	3.9	W	0.0011	W	0.12	c*	0.5	c*	0.0025	c	0.011	c	0.004	c		0.0017	
	~Hexachlorobiphenyl, 2,3,3',4,4',5- (PCB 156)	Change Effect							X.		X.		X.		X.													
32774-16-6	~Hexachlorobiphenyl, 3,3',4,4',5,5'- (PCB 169)	Spring 2018	V		1.00	0.14		0	E	0	E	3900	E	1.1	E	0.00012	c*	0.00051	c*	0	c	0.000011	c	0	c		0	
32774-16-6	~Hexachlorobiphenyl, 3,3',4,4',5,5'- (PCB 169)	Fall 2018	V		1.00	0.14		0	W	0	W	3900	W	1.1	W	0.00012	c*	0.00051	c*	0	c	0.000011	c	0	c		0	
	~Hexachlorobiphenyl, 3,3',4,4',5,5'- (PCB 169)	Change Effect							X.		X.		X.		X.													
65510-44-3	~Pentachlorobiphenyl, 2',3,4,4',5- (PCB 123)	Spring 2018	V		1.00	0.14		0.000023	E	0.0013	E	3.9	E	0.0011	E	0.12	c*	0.49	c*	0.0025	c	0.011	c	0.004	c		0.001	
65510-44-3	~Pentachlorobiphenyl, 2',3,4,4',5- (PCB 123)	Fall 2018	V		1.00	0.14		0.000023	W	0.0013	W	3.9	W	0.0011	W	0.12	c*	0.49	c*	0.0025	c	0.011	c	0.004	c		0.001	
	~Pentachlorobiphenyl, 2',3,4,4',5- (PCB 123)	Change Effect							X.		X.		X.		X.													
31508-00-6	~Pentachlorobiphenyl, 2,3',4,4',5- (PCB 118)	Spring 2018	V		1.00	0.14		0.000023	E	0.0013	E	3.9	E	0.0011	E	0.12	c*	0.49	c*	0.0025	c	0.011	c	0.004	c		0.001	
31508-00-6	~Pentachlorobiphenyl, 2,3',4,4',5- (PCB 118)	Fall 2018	V		1.00	0.14		0.000023	W	0.0013	W	3.9	W	0.0011	W	0.12	c*	0.49	c*	0.0025	c	0.011	c	0.004	c		0.001	
	~Pentachlorobiphenyl, 2,3',4,4',5- (PCB 118)	Change Effect							X.		X.		X.		X.													
32598-14-4	~Pentachlorobiphenyl, 2,3,3',4,4'- (PCB 105)	Spring 2018	V		1.00	0.14		0.000023	E	0.0013	E	3.9	E	0.0011	E	0.12	c*	0.49	c*	0.0025	c	0.011	c	0.004	c		0.001	
32598-14-4	~Pentachlorobiphenyl, 2,3,3',4,4'- (PCB 105)	Fall 2018	V		1.00	0.14		0.000023	W	0.0013	W	3.9	W	0.0011	W	0.12	c*	0.49	c*	0.0025	c	0.011	c	0.004	c		0.001	
	~Pentachlorobiphenyl, 2,3,3',4,4'- (PCB 105)	Change Effect							X.		X.		X.		X.													
74472-37-0	~Pentachlorobiphenyl, 2,3,4,4',5- (PCB 114)	Spring 2018	V		1.00	0.14		0.000023	E	0.0013	E	3.9	E	0.0011	E	0.12	c*	0.5	c*	0.0025	c	0.011	c	0.004	c		0.001	
74472-37-0	~Pentachlorobiphenyl, 2,3,4,4',5- (PCB 114)	Fall 2018	V		1.00	0.14		0.000023	W	0.0013	W	3.9	W	0.0011	W	0.12	c*	0.5	c*	0.0025	c	0.011	c	0.004	c		0.001	
	~Pentachlorobiphenyl, 2,3,4,4',5- (PCB 114)	Change Effect							X.		X.		X.		X.													
57465-28-8	~Pentachlorobiphenyl, 3,3',4,4',5- (PCB 126)	Spring 2018	V		1.00	0.14		0	E	0	E	13000	E	3.8	E	0.000036	c*	0.00015	c*	0	c	0	c	0	c		0	
57465-28-8	~Pentachlorobiphenyl, 3,3',4,4',5- (PCB 126)	Fall 2018	V		1.00	0.14		0	W	0	W	13000	W	3.8	W	0.000036	c*	0.00015	c*	0	c	0	c	0	c		0	
	~Pentachlorobiphenyl, 3,3',4,4',5- (PCB 126)	Change Effect							X.		X.		X.		X.													
32598-13-3	~Tetrachlorobiphenyl, 3,3',4,4'- (PCB 77)	Spring 2018			1.00	0.14		0	E	0.0004	E	13	E	0.0038	E	0.038	c*	0.16	c*	0.00074	c	0.0032	c	0.006	c*		0.00094	
32598-13-3	~Tetrachlorobiphenyl, 3,3',4,4'- (PCB 77)	Fall 2018			1.00	0.14		0	W	0.0004	W	13	W	0.0038	W	0.038	c*	0.16	c*	0.00074	c	0.0032	c	0.006	c*		0.00094	
	~Tetrachlorobiphenyl, 3,3',4,4'- (PCB 77)	Change Effect							X.		X.		X.		X.													
70362-50-4	~Tetrachlorobiphenyl, 3,4,4',5- (PCB 81)	Spring 2018	V		1.00	0.14		0	E	0.00013	E	39	E	0.011	E	0.012	c*	0.048	c*	0.00025	c	0.0011	c	0.0004	c		0.000062	
70362-50-4	~Tetrachlorobiphenyl, 3,4,4',5- (PCB 81)	Fall 2018	V		1.00	0.14		0	W	0.00013	W	39	W	0.011	W	0.012	c*	0.048	c*	0.00025	c	0.0011	c	0.0004	c		0.000062	
	~Tetrachlorobiphenyl, 3,4,4',5- (PCB 81)	Change Effect							X.		X.		X.		X.													

Former TTU Documents

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RCRA FACILITY INVESTIGATION REPORT FOR THE THERMAL TREATMENT UNIT

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MESA, ARIZONA

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November 2016

Table of Contents

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		Page
List of Tables		**iv**
List of Figures		**iv**
1.	**Introduction**	**1**
1.1	REPORT ORGANIZATION	1
1.2	FACILITY BACKGROUND	2
2.	**Historical Operations**	**3**
2.1	HISTORICAL TTU OPERATIONS	3
2.1.1	TTU Operating History	4
2.1.2	Unit Description	5
2.1.3	Maximum Waste Inventory	6
3.	**Environmental Setting**	**7**
3.1	CURRENT TTU OPERATIONS	7
3.2	LAND USE AND DEMOGRAPHICS	7
3.3	CLIMATE	7
3.4	NATURAL RESOURCES	7
3.5	ECOLOGICAL ASSESSMENT	7
3.6	CULTURAL FEATURES	7
3.7	SITE TOPOGRAPHY, DRAINAGE, AND STORM WATER RUNOFF	7
3.8	SURFACE WATER	8
3.9	GEOLOGY	9
3.10	HYDROGEOLOGY	9
3.10.1	Regional Hydrogeology	9
3.10.2	Local Hydrogeology	10
4.	**Site Investigations and Interim Corrective Actions**	**11**
4.1	SOIL	11
4.1.1	Soil Assessment for Metals (1986 – 1991)	11
4.1.2	RCRA Facility Assessment (1994)	13
4.1.3	Site Assessment (1996)	13
4.1.4	Site-Specific Risk Assessment for Lead (1997)	15
4.1.5	SRPMIC Soil Investigation (2000)	15
4.1.6	Voluntary Clean-Up Action Plan Implementation (2002 – 2004)	17
4.1.6.1	Hot Spot Removal (2002)	17
4.1.6.2	Depth Sampling (2003)	18
4.1.6.3	In-Situ Soil Stabilization (2003)	19
4.1.6.4	Treated Soil Removal and Confirmation Sampling (2004)	20
4.1.7	Additional Assessment and Soil Removal Activities (2004 - 2005)	21

HALEY ALDRICH

Table of Contents
(continued) **Page**

4.1.8 Storm Water Retention Improvements (2005) 23
4.1.9 Removal of Berms and Remaining TTU Burn Equipment (2008) 23
4.1.10 Revised Draft Closure Plan Activities (2009) 24
4.1.10.1 Initial Soil Characterization (2009) 25
4.1.11 Storm Water Accumulation Area Soil Removal (2011) 28
4.1.12 Storm Water Accumulation Area Soil and Bedrock Investigation (2011) 29
4.1.13 Additional Perchlorate Soil Sampling in the Storm Water Accumulation Area (2013-2014) 31
4.2 GROUNDWATER 31
4.2.1 Primate Foundation of Arizona Wells 31
4.2.2 Monitoring Well Drilling, Construction, and Sampling (2012-2016) 31
4.2.3 Monitoring Well TTU-1 (2012) 32
4.2.3.1 TTU-1 Borehole Sampling and Analytical Results 32
4.2.3.2 TTU-1 Borehole Testing 33
4.2.3.3 TTU-1 Well Construction and Completion 34
4.2.4 TTU Monitoring Wells TTU-2 through TTU-7 (2013-2015) 34
4.2.5 TTU Monitoring Wells TTU-8 Through TTU-11 (2015-2016) 34
4.2.6 Fracture Evaluation 35
4.2.7 Aquifer Testing 37
4.2.7.1 Pulse Testing 37
4.2.7.2 Slug Testing 37

5. Nature and Extent Characterization 39

5.1 CURRENT CONDITIONS – SOIL 39
5.1.1 Lead 40
5.1.2 Barium 41
5.1.3 Cadmium 41
5.1.4 Chromium 42
5.1.5 Perchlorate 43
5.1.6 2,3,7,8-TCDD 45
5.1.7 HMX 46
5.1.8 RDX 46
5.1.9 Sodium Azide 46
5.1.10 Nitrate 47
5.1.11 Confirmed COCs and Eliminated COPCs 47
5.2 CURRENT CONDITIONS – GROUNDWATER 48
5.2.1 Groundwater Elevations 48
5.2.2 Groundwater Quality 49
5.2.2.1 Perchlorate 50
5.2.2.2 Volatile Organic Compounds and 1,4-Dioxane 50
5.2.2.3 Metals 52
5.2.3 Fate and Transport of VOCs and Perchlorate in Groundwater 52
5.2.4 Conceptual Hydrogeologic Model 53

HALEY ALDRICH

Table of Contents
(continued)

		Page
6.	**Conceptual Site Model**	**56**
6.1	CURRENT CONDITIONS	56
6.1.1	Anticipated Actions for Soil	56
6.1.2	Anticipated Actions for Groundwater	56
6.2	CONCEPTUAL SITE MODEL	57
6.2.1	Known or Potential Exposure Pathways	57
6.2.2	Chemical Source and Release and Transport Mechanisms	57
6.2.3	Potential Routes of Exposure	58
6.2.4	Potential Exposure Points and Exposure Media	58
6.2.4.1	Complete or Potentially-Complete Exposure Pathways	58
7.	**Environmental Indicators Determination**	**60**
7.1	CURRENT HUMAN EXPOSURES UNDER CONTROL	60
7.1.1	Soil	60
7.1.2	Groundwater	61
7.2	MIGRATION OF CONTAMINATED GROUNDWATER UNDER CONTROL	61
8.	**Summary and Conclusions**	**64**
8.1	SOIL CHARACTERIZATION AND POTENTIAL RECEPTOR EXPOSURE	64
8.2	GROUNDWATER CHARACTERIZATION AND POTENTIAL RECEPTOR EXPOSURE	64
9.	**References**	**66**

Tables
Figures
Appendix A – Well As-Built Diagrams and Boring Logs
Appendix B – Downhole Geophysical Logs

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TABLES

TABLE 4-1
Chronological Summary of Closure-Related Activities Completed to Date
Thermal Treatment Unit RFI
Nammo Talley, Inc.

Date	Activity	Reference Report
Dec. 1986 Jan. / Feb. 1987	Confirmation soil sampling at the TTU during overall removal of lead-contaminated soil from the base of burn pits, the pit berms, and graded and undisturbed areas enclosed by the TTU fence. Samples analyzed for arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver using extraction procedure - toxicity (EP-TOX).	*Investigation of Metals in Soils, Talley Defense Systems, Inc.*, TRC Environmental Consultants (TRC), February 9, 1988
Aug. 1987	Additional lead contaminated soil removal.	
Sep. 1989	13 soil samples from visibly discolored soils in the eastern portion of the TTU graded area (northeast of the Burn Pits). 10 samples analyzed for cadmium, chromium, and lead using EP-TOX.	*Collection of Soil Samples at Talley Defense Systems, Inc.*, Sunshine Environmental Services, September 25, 1989
Aug. 1990	SA burning equipment from Pit #6 to Pit #1 and soil removal completed in Pit #6. Soil sampling of Pits #1 to #6, Old Burn Box Area, and drummed soils excavated from Pit #6. Collected samples analyzed for total and TCLP chromium.	Two TRC reports both dated November 6, 1990; one presents pit sampling results and the other the Old Burn Box Area and drummed soil sampling.
Sep. 1991	Consent Judgment executed between Talley and the State of Arizona (represented by ADEQ and the Arizona Attorney General) to assess TTU by submitting the Site Assessment Plan.	*Consent Judgment # CV 90-26811* , ADEQ, September 6, 1991
Sep. 1991	Berms separating Pits #2 - #5 were removed and the steel boxes at the Old Burn Box Area were moved to the reconfigured Pit# 2 - #5. Assessment of materials formerly comprising the berms, and sampling within the base of the Old Burn Box Area was completed. Nine samples collected and analyzed for TCLP barium, cadmium, chromium, and lead. Soil in base of Old Burn Box Area removed due to high lead concentrations.	*Site Assessment Plan, Talley Defense Systems' Thermal Treatment Unit,* Basin & Range, November 1, 1991.
Nov. 1991	Site Assessment Plan for TTU submitted to ADEQ.	
Dec. 1996	The Site Assessment Plan and revisions were approved by the ADEQ	
Dec. 1996	Site-wide assessment of the TTU in an effort to characterize the site in accordance with 1991 Site Assessment Plan. 107 Samples were collected and analyzed for total barium, cadmium, chromium, and lead. Limited analyses also conducted for TCLP lead and chromium, and for perchlorate.	*Site Assessment Report, Talley Defense Systems' Thermal Treatment Unit,* Basin & Range, February 21, 1997.

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Nammo Talley, Inc.

Date	Activity	Reference Report
1997	Basin & Range calculated a site-specific risk level of 9,600 mg/kg for lead; highest lead concentration measured at TTU was 4,000 mg/kg, therefore these soils are considered to be a very low exposure risk.	*Thermal Treatment Unit Assessment of Risks Associated with Adult Exposure to Lead in TTU Soils,* Basin & Range, March 3, 1997.
2000	Assessment of soils on SRPMIC land adjacent to TTU. 80 soil samples collected; all analyzed for lead and some analyzed for TCLP lead and/or priority pollutant metals. Some of the samples also analyzed for cadmium and chromium.	*Soil Investigation on Salt River Pima-Maricopa Indian Community Lands Near Talley Defense Systems Burn Pits,* Smith Consultants, July 25, 2000.
Jun. 2000	Berms and retention areas constructed to contain all run-off from TTU within Talley property.	*Clean-up Action Plan for TTU at Talley Defense Systems,* Talley, November 13, 2002
Jul. 2000 Jan. – Jul. 2001	Talley meets with ADEQ (July 5, 2000) to discuss performing voluntary remedial action in an effort to reduce future environmental response actions when the site undergoes final closure. Agreement reached that the project required a Cleanup Action Plan (CAP) or Remedial Action Plan (RAP) for ADEQ approval. Remedial alternatives evaluation performed and meetings conducted between Talley and the ASLD (property owner) to determine an acceptable alternative for both parties. The proposed action was to perform on-site soil stabilization of soils containing lead above NR-SRLs and removal of "hot spots" before stabilization. The ASLD agreed with the approach.	*TTU Hot Spot Removal Report* – Talley, April 25, 2003 *Clean-up Action Plan for TTU at Talley Defense Systems*, Talley, November 13, 2002
Oct. 2001	Draft RAP (dated 9-30-2001) submitted to ADEQ for review in a meeting between Talley and ADEQ on October 3, 2001.	*TTU Hot Spot Removal Report* – Talley, April 25, 2003 *Clean-up Action Plan for TTU at Talley Defense Systems*, Talley, November 13, 2002
Mar. 2002	ADEQ provides comments to draft RAP on March 19, 2002 (HWP.EX-1581). One suggestion was to split the RAP into two plans: a.) CAP and b.) Partial Closure Plan.	*TTU Hot Spot Removal Report* – Talley, April 25, 2003 *Clean-up Action Plan for TTU at Talley Defense Systems*, Talley, November 13, 2002
May 2002	Talley discussed (by telephone) the RAP with ADEQ and agreed that the RAP should be split into two plans, but requested that ADEQ provide additional comments to the RAP so appropriate information could incorporated into the new CAP.	*TTU Hot Spot Removal Report* – Talley, April 25, 2003 *Clean-up Action Plan for TTU at Talley Defense Systems*, Talley, November 13, 2002

TABLE 4-1
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Thermal Treatment Unit RFI
Nammo Talley, Inc.

Date	Activity	Reference Report
Jul. 2002	ADEQ provides additional comment to draft RAP on July 25, 2002 (HWICU02-282).	*TTU Hot Spot Removal Report* – Talley, April 25, 2003 *Clean-up Action Plan for TTU at Talley Defense Systems*, Talley, November 13, 2002
Sep. 2002	Technical Assistance Meeting (TEAM) held on September 26, 2002 between ADEQ, Talley, and Talley's Consultant to discuss CAP development. All agreed that a Quality Assurance Project Plan (QAPP) would be completed, sampling would be limited to lead only, and that a Partial Closure Plan will be submitted after the CAP is complete.	*TTU Hot Spot Removal Report* – Talley, April 25, 2003 *Clean-up Action Plan for TTU at Talley Defense Systems*, Talley, November 13, 2002
Oct. 2002	Excavation of lead hot-spot contaminated soil in area designated as GA14 completed.	*TTU Hot Spot Removal Report* – Talley, April 25, 2003 *Clean-up Action Plan for TTU at Talley Defense Systems*, Talley, November 13, 2002
Nov. 2002	CAP and QAPP (dated November 13, 2002) to perform hot-spot removal, soil stabilization, and removal of soils contaminated with lead above NR-SRLs or TCLP toxicity levels submitted to ADEQ.	*TTU Hot Spot Removal Report* – Talley, April 25, 2003 *Clean-up Action Plan for TTU at Talley Defense Systems*, Talley, November 13, 2002
Dec. 2002	ADEQ provides comments to CAP and QAPP.	*Cleanup Action Plan and Quality Assurance Project Plan dated November 13, 2002 (Ref: HWICU02-496),* ADEQ, December 23, 2002
Feb. 2003	ADEQ approval of revised CAP and QAPP.	*Cleanup Action Plan and Quality Assurance Project Plan dated November 13, 2003 (Ref: HWICU03-061)*, ADEQ, February 24, 2003
Feb. / Mar. 2003	Pre-soil stabilization depth sampling completed to confirm the planned treatment depths. Additional sampling conducted to include locations not assessed during December 1996 site assessment of TTU. 18 samples collected; all analyzed for lead and some analyzed for perchlorate, sodium azide, and nitrate/nitrite as N.	*Soil Sampling For Lead at Talley Defense Systems Thermal Treatment Unit,* ERMS, April 28, 2003 *Stabilization of Lead Impacted Soil Thermal Treatment Unit Mesa, Arizona*, Conestoga-Rovers & Associates (CRA), May 13, 2003 *Clean-up Action Plan Completion Report for TTU at Talley Defense Systems*, Talley, June 6, 2003 *Partial Closure Plan – Two Old Solid Waste Management Units at the Thermal Treatment Unit*, Talley Defense Systems, ERMS, July 2004

TABLE 4-1
Chronological Summary of Closure-Related Activities Completed to Date
Thermal Treatment Unit RFI
Nammo Talley, Inc.

Date	Activity	Reference Report
Apr. 2003	In-situ soil stabilization was completed for the following areas, GA-1, soil near GA-2, GA-3, GA-4, GA-7, GA-11, GA-12, GA-14, GA-16, GA-22, GA-23, BP-2, BP-5, BP-6, BP-17, BP-18, BP-19, BP-22, BP-23, BP-24, BP-25, BP-26, and burn box (BB) areas. 16 soil samples collected to confirm treatment analyzed for total and TCLP lead. 60 cubic yards of treated soil from the BB grid area and the soil near GA-2 was excavated loaded into six 20-cubic yard soil bins and two waste profile soil samples were also collected from the soil bins and analyzed for total and TCLP lead.	*Soil Sampling For Lead at Talley Defense Systems Thermal Treatment Unit,* ERMS, April 28, 2003 *Stabilization of Lead Impacted Soil Thermal Treatment Unit Mesa, Arizona*, Conestoga-Rovers & Associates (CRA), May 13, 2003 *Clean-up Action Plan Completion Report for TTU at Talley Defense Systems*, Talley, June 6, 2003 *Partial Closure Plan – Two Old Solid Waste Management Units at the Thermal Treatment Unit*, Talley Defense Systems, ERMS, July 2004
Apr. 2004	Concrete and cement block removed from Pit #6 and disposed off site with treated soil excavated from the BB grid area and the soil near GA-2. Six post excavation soil samples collected and analyzed for lead, perchlorate, sodium azide, and nitrate.	
Dec. 2004	One composite soil sample formed from five discrete samples collected at base of Pit #2 - #5 analyzed for explosives.	*Partial Closure Plan Supplement for Talley Defense Systems Inc. Thermal Treatment Unit 1 mile N. of 411 N. Higley Road, Mesa, Az,* Talley, September 2005
Feb. / Mar. 2005	Additional soil excavation completed to remove remaining lead impacted soils exceeding former NR-SRL of 2,000 mg/kg, followed by confirmation soil sampling where eight collected samples were analyzed for total and TCLP lead and one sample was analyzed for perchlorate.	
Oct. 2005	Inspection of existing berms at TTU indicates that certain portions of some of the berms needed to be slightly higher and/or longer.	*Berm Integrity and Earthwork, Talley Defense Systems Burn Ground*, BC, January 16, 2006
Dec. 2005	Modifications made to berms and retention structures at TTU.	
Dec. 2005	Storm water modeling of modified berms and retention areas at TTU to demonstrate on-site containment of all storm water.	*Storm Water Control Measure, Talley Defense Systems Burn Ground*, BC, January 16, 2006
Nov. 2005	Evaluation of the Part B Application Closure Sampling and Analyses Plan for the TTU regarding the analytes, number of samples and volume of soil that would require sampling at closure as discussed and agreed upon during the November 21, 2005 meeting between Talley and ADEQ.	*Review of Closure Sampling Plan, Talley Defense Systems, Burn Ground*, BC, January 16, 2006

TABLE 4-1
Chronological Summary of Closure-Related Activities Completed to Date
Thermal Treatment Unit RFI
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Date	Activity	Reference Report
Feb. 2008	Removal of berms and decontamination and removal of all burn equipment (i.e., burn boxes, cages, and pans) and concrete pad. Off-site disposal of berm soils and concrete and recycling of steel burn equipment.	2008 *Partial Closure Plan Supplement for Nammo-Talley, Inc. Thermal Treatment Unit,* Talley, February 2008 (Appendix D of this Closure Plan),
Mar. 2009	Preparation of a revised draft closure plan for the TTU including delineation of additional soil characterization activities to address data gaps.	
Jul. / Aug. 2009	Initial soil characterization sampling activities of surficial and subsurface soils throughout the TTU Area, the Area surrounding the TTU, and the Storm Water Accumulation Area West of the TTU.	2009 *Summary of Initial Soil Characterization Activities at the Thermal Treatment Unit, Nammo Talley Facility,* prepared for Talley by Brown & Caldwell, *October 30, 2009* AND *Update to Summary of Initial Soil Characterization Activities at the Thermal Treatment Unit, Nammo Talley Facility,* prepared for Talley by Brown & Caldwell, *November 20, 2009 AND 2010 Response to ADEQ comment Letter dated December 24, 2009 regarding Soil Characterization Activities Reports (above) dated February 19, 2010 AND* 2009 *Revised Draft Closure Plan, Thermal Treatment Unit, Nammo Talley Facility,* prepared for Talley by Brown & Caldwell, *March 2, 2009*
Dec. 2010	Electrical resistivity soil testing to determine bedrock contours and provide boring location guidance.	*Results were inaccurate and were not corroborated by physical testing.*
Jan. 2011	Surface soil lead remediation in the Storm Water Accumulation Area (SRPMIC land) West of the TTU.	2011 *Soil Remediation Summary Report, SRP-MIC Land Located West of Nammo Talley's TTU, prepared for Talley by Arcadis, June 2, 2011* AND *Soil Remediation Work Plan, dated November 16, 2010.*
May 2011	Soil and bedrock drilling in the Storm Water Accumulation Area (SRPMIC land) West of the TTU.	2011 *Soil Sampling and Bedrock Investigation Report, SRP-MIC Land Located West of Nammo Talley's TTU, prepared for Talley by Arcadis, August 11, 2011* AND *Soil Boring & Coring Work Plan, dated March 3, 2011.*
Jun. 2012	Well installation and groundwater sampling in the Storm Water Accumulation Area (SRPMIC land) West of the TTU	2012 *Thermal Treatment Unit Area Well Installation, prepared for Talley by Haley & Aldrich, Inc., dated August 9, 2012.*

Notes:

ADEQ = Arizona Department of Environmental Quality
ASLD = Arizona State Land Department
mg/kg = milligrams per kilogram
NR-SRL = non-residential soil remediation level
SRPMIC = Salt River Pima-Maricopa Indian Community
TCLP = Tosicity Characteristic Leaching Procedure
TTU = Thermal Treatment Unit

TABLE 4-2
Analytical Results for Soil Sampling Conducted Between 1986 and 1991
Thermal Treatment Unit RFI
Nammo Talley, Inc.

Sample Location	Sample Type	Sample ID	Date Sampled	Sample Depth (bgs)	Metals (mg/L except Total Chromium which is mg/kg)								
					EP Tox Barium	TCLP Barium	EP Tox Cadmium	TCLP Cadmium	EP Tox Chromium	Total Chromium	TCLP Chromium	EP Tox Lead	TCLP Lead
Burn Pits Area													
Pit #1	TTU Original	Pit 1 Berm	12/17/1986	2"								<0.5	
Pit 1 Berm	TTU Post Removal	Pit 1 Berm	1/5/1987	2"								3.5	
	TTU Post Removal	Pit 1 Berm	8/29/1987	2"								0.34	
Pit 1 Bottom	TTU Post Removal	Pit 1 Bottom	1/5/1987	2"								8.5	
			8/29/1987	2"								0.73	
Pit #1 Bottom/Sides	TTU Original	SS-4	8/28/1990	2"						60			
Pit #1 N End	TTU Original	SS-12	8/28/1990	2"						53			
Pit #2	TTU Original	Pit 2 Berm	12/17/1986	2"								2.79	
Pit 2 Berm	TTU Post Removal	Pit 2 Berm	1/5/1987	2"								2.8	
			8/29/1987	2"								0.55	
Pit 2 Bottom	TTU Post Removal	Pit 2 Bottom	1/5/1987	2"								16	
			8/29/1987	2"								1.9	
Pit #2 Bottom/Sides	TTU Original	SS-5	8/28/1990	2"						104	<0.05		
Pit #3	TTU Original	Pit 3 Berm	12/17/1986	2"								6.8	
Pit 3 Berm	TTU Post Removal	Pit 3 Berm	1/5/1987	2"								1.3	
			8/29/1987	2"								0.45	
Pit 3 Bottom (A)	TTU Post Removal	Pit 3 Bottom (A)	1/5/1987	2"	0.6		0.03		<0.017			0.33	
Pit 3 Bottom (B)	TTU Post Removal	Pit 3 Bottom (B)	1/5/1987	2"	0.6		0.03		<0.017			0.33	
Pit #3 Bottom/Sides	TTU Original	SS-6	8/28/1990	2"						56			
Pit #4	TTU Original	Pit 4 Berm	12/17/1986	2"								0.75	
Pit 4 Berm (A)	TTU Post Removal	Pit 4 Berm (A)	1/5/1987	2"								1.1	
Pit 4 Berm (B)	TTU Post Removal	Pit 4 Berm (B)	1/5/1987	2"								6.2	
Pit 4 Berm	TTU Post Removal	Pit 4 Berm	8/29/1987	2"								0.41	
Pit 4 Bottom	TTU Post Removal	Pit 4 Bottom	1/5/1987	2"								1.8	
			8/29/1987	2"								0.56	
Pit #4 Bottom/Sides	TTU Original	SS-7	8/28/1990	2"						32	<0.05		
Pit #5	TTU Original	Pit 5 Berm	12/17/1986	2"								1.35	
Pit 5 Berm	TTU Post Removal	Pit 5 Berm	1/5/1987	2"								8.4	
			8/29/1987	2"								0.37	
Pit 5 Bottom	TTU Post Removal	Pit 5 Bottom	1/5/1987	2"								2.6	
			8/29/1987	2"								0.25	
Pit #5 Bottom/Sides	TTU Original	SS-8	8/28/1990	2"						41			
Pits #1-#5 S Berm	TTU Original	SS-3	8/28/1990	2"						266			
Pit 6	TTU Post Removal	Pit 6	1/6/1987	2"	0.5		0.022		0.12		<0.005	1.43	
Pit #6 S End	TTU Original	SS-9	8/28/1990	2"						161	<0.05		
Pit #6 N End	TTU Original	SS-10	8/28/1990	2"						83			
Pit 7	TTU Post Removal	Pit 7	1/6/1987	2"								4.2	
			8/29/1987	2"								0.37	
Pit 8	TTU Post Removal	Pit 8	1/6/1987	2"								0.6	
Pit 9	TTU Post Removal	Pit 9	1/6/1987	2"								0.2	
Pit 10	TTU Post Removal	Pit 10	1/6/1987	2"								0.2	

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Sample Location	Sample Type	Sample ID	Date Sampled	Sample Depth (bgs)	Metals (mg/L except Total Chromium which is mg/kg)								
					EP Tox Barium	TCLP Barium	EP Tox Cadmium	TCLP Cadmium	EP Tox Chromium	Total Chromium	TCLP Chromium	EP Tox Lead	TCLP Lead
Graded Area													
S-1	TTU Post Removal	S-1	1/5/1987	2"								0.19	
S-2	TTU Post Removal	S-2	1/5/1987	2"	<0.2		<0.003		<0.017			0.18	
	TTU Original	3-TDS-SB	9/12/1989	6"			<0.1		<0.3			<0.7	
S-3	TTU Post Removal	S-3	1/5/1987	2"								0.25	
	TTU Original	1-TDS-SB	9/12/1989	6"			<0.1		<0.3			1.6	
		2-TDS-SB	9/12/1989	6"			<0.1		<0.3			<0.7	
S-4	TTU Post Removal	S-4	1/5/1987	2"								0.12	
S-5A	TTU Post Removal	S-5A	1/5/1987	2"								0.11	
S-5B	TTU Post Removal	S-5B	1/5/1987	2"								0.14	
S-6	TTU Post Removal	S-6	1/5/1987	2"								0.09	
	TTU Original	4-TDS-SB	9/12/1989	6"			<0.1		<0.3			<0.7	
		7-TDS-SB	9/12/1989	6"			<0.1		<0.3			<0.7	
S-7A	TTU Post Removal	S-7A	1/5/1987	2"								0.06	
S-7B	TTU Post Removal	S-7B	1/5/1987	2"								0.04	
	TTU Original	5-TDS-SB	9/12/1989	6"			<0.1		<0.3			<0.7	
		6-TDS-SB	9/12/1989	6"			<0.1		<0.3			0.85	
S-8	TTU Post Removal	S-8	1/5/1987	2"								0.32	
S-9A	TTU Post Removal	S-9A	1/5/1987	2"								0.32	
S-9B	TTU Post Removal	S-9B	1/5/1987	2"								0.11	
S-9C	TTU Post Removal	S-9C	1/5/1987	2"								0.11	
S-10A	TTU Post Removal	S-10A	1/5/1987	2"	0.5		0.01		0.017			0.28	
	TTU Original	8-TDS-SB	9/12/1989	6"			<0.1		<0.3			<0.7	
S-10B	TTU Post Removal	S-10B	1/5/1987	2"								0.05	
S-10C	TTU Post Removal	S-10C	1/5/1987	2"								0.08	
S-10D	TTU Post Removal	S-10D	1/5/1987	2"								0.11	
S-11A	TTU Post Removal	S-11A	1/5/1987	2"								0.79	
S-11B	TTU Post Removal	S-11B	1/5/1987	2"								1.0	
S-12	TTU Post Removal	S-12	1/5/1987	2"								0.05	
S-13	TTU Post Removal	S-13	1/5/1987	2"								0.08	
S-14	TTU Post Removal	S-14	1/5/1987	2"								0.18	
S-15	TTU Post Removal	S-15	1/5/1987	2"								0.56	
S-16	TTU Post Removal	S-16	1/5/1987	2"								0.31	
S-17	TTU Post Removal	S-17	1/5/1987	2"								0.05	
S-18	TTU Post Removal	S-18	1/6/1987	2"								0.1	
S-19	TTU Post Removal	S-19	1/6/1987	2"								0.2	
S-20A	TTU Post Removal	S-20A	1/6/1987	2"	0.2		0.017		<0.033			0.48	
S-20B	TTU Post Removal	S-20B	1/6/1987	2"	0.2		0.028		<0.033			0.65	
S-22A	TTU Post Removal	S-22A	1/6/1987	2"								0.1	
S-22B	TTU Post Removal	S-22B	1/6/1987	2"								0.1	
S-23	TTU Post Removal	S-23	1/6/1987	2"	0.4		0.003		<0.017			0.05	
S-24	TTU Post Removal	S-24	1/6/1987	2"								0.1	
S-25A	TTU Post Removal	S-25A	1/6/1987	2"								6.2	

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Sample Location	Sample Type	Sample ID	Date Sampled	Sample Depth (bgs)	Metals (mg/L except Total Chromium which is mg/kg)								
					EP Tox Barium	TCLP Barium	EP Tox Cadmium	TCLP Cadmium	EP Tox Chromium	Total Chromium	TCLP Chromium	EP Tox Lead	TCLP Lead
Graded Area (continued)													
S-25B	TTU Post Removal	S-25B	1/6/1987	2"								12	
S-25	TTU Post Removal	S-25	8/29/1987	2"								4.2	
S-27A	TTU Post Removal	S-27A	1/6/1987	2"	0.2		<0.003		<0.017			0.033	
S-27B	TTU Post Removal	S-27B	1/6/1987	2"								0.3	
S-28	TTU Post Removal	S-28	1/6/1987	2"								<0.1	
S-29	TTU Post Removal	S-29	1/6/1987	2"								0.2	
S-30	TTU Post Removal	S-30	2/25/1987	2"								0.15	
S-31	TTU Post Removal	S-31	2/25/1987	2"								0.07	
S-32	TTU Post Removal	S-32	1/6/1987	2"								<0.1	
S-33	TTU Post Removal	S-33	1/6/1987	2"								0.1	
S-34	TTU Post Removal	S-34	1/6/1987	2"	0.5		0.003		<0.017			0.23	
Former Burn Boxes Area													
Burn Boxes	TTU Original	SS-11	8/28/1990	2"						181			
Former Burn Boxes	TTU Original	108-SS-2	9/25/1991	2"		<1.0		0.23			0.71		38.3
		108-SS-3	9/25/1991	2"		1.66		0.22			0.35		38.3
		108-SS-4	9/25/1991	2"		<1.0		0.17			0.38		29.1
		108-SS-5	9/25/1991	2"		<1.0		0.15			0.21		13
Excavated Soil In Drums, Stockpiles, and Waste Piles													
Graded Area Waste Pile	TTU Removal	10-TDS-SB	9/12/1989	NA			<0.1		0.43			<0.7	
		10C-TDS-SB	9/12/1989	NA			<0.1		<0.3			<0.7	
Pit #6 (7 Drums of Soil)	TTU Removal	SS-1	8/28/1990	NA						115	<0.05		
Pit #6 (7 Drums of Soil)		SS-2	8/28/1990	NA						64			
Pits #2-#5 Berms Stockpile	TTU Removal	108-SP-7	9/25/1991	NA		<1.0		<0.05			0.1		7.05
		108-SP-8	9/25/1991	NA		<1.0		0.16			0.88		56.7
		108-SP-10	9/25/1991	NA		<1.0		0.14			0.79		42.9
		108-SP-11	9/25/1991	NA		<1.0		0.09			0.85		47.5
	TTU Removal DUP	108-SS-13	9/25/1991	NA		<1.0		0.09			<0.05		38.3
Background Samples													
TTU Background Location	TTU Original Bkgrd	S-33	1/6/1987	2"								0.1	
		S-34	1/6/1987	2"	0.5		0.003		<0.017			0.23	
TTU NW Corner	TTU Original Bkgrd	TDSBG-LJ-1	9/6/1990	2"						14			
		TDSBG-LJ-2	9/6/1990	2"						17			

Acronyms/Abbreviations:

< = not detected (associated value is detection limit)
bgs = below ground surface
DUP = duplicate
EP Tox = Extraction Procedure Toxicity
ft = feet
mg/kg = milligrams per kilogram
mg/L = milligrams per liter
NA = not applicable
TCLP = Toxicity Characteristic Leaching Procedure
TTU = Thermal Treatment Unit

TABLE 4-3
Analytical Results for Soil Sampling Conducted Between 1996 and 2008
Thermal Treatment Unit RFI
Nammo Talley, Inc.

Sample Location	Sample Type	Sample ID	Date Sampled	Sample Depth (bgs)	Metals (mg/kg except TCLP reported as mg/L)						Propellant Constituents/Explosives (mg/kg)				
					Barium	Cadmium	Chromium	TCLP Chromium	Lead	TCLP Lead	Perchlorate	Sodium Azide	Nitrate	HMX	RDX
		Lower of Arizona R-SRL or GPL Value Shown			**12,000**	**29**	**30[a]**		**400**		**55[b]**	**310**	[b]	**66**	**0.68**
		USEPA TCLP Limit						**5.0**		**5.0**					
Burn Pits Area															
BP1	TTU Original	TTU-BP1-0.2	12/9/1996	2.5"	260	2.65	**104[c]**	0.011	**1,110**	<1.0					
BP2	TTU Original	TTU-BP2-0.2	12/9/1996	2.5"	135	0.57	28.2		256	<1.0					
BP3	TTU Original	TTU-BP3-0.2	12/9/1996	2.5"	172	0.83	24.3		307	<1.0					
	TTU Original DUP	TTU-BP3-0.3	12/9/1996	3.5	182	0.93	17.6		160	1.34					
BP4	TTU Original	TTU-BP4-0.2	12/9/1996	2.5"	191	1.4	22.5		291	3.47					
BP5	TTU Original	TTU-BP5-0.2	12/9/1996	2.5"	182	1.17	29		310	**5.53**					
	TTU Pre-Stabilization	BP5-6"	3/3/2003	6"								<0.155			
BP6	TTU Original	TTU-BP6-0.2	12/9/1996	2.5"	294	7	**128**	0.128	**1,620**	**22.3**					
		TTU-BP6-1	12/10/1996	12"					**451**	2.83					
	TTU Post Stabilization	BP6-Q-6"	4/3/2003	6"					**2,400**	1.7					
BP7	TTU Original	TTU-BP7-0.2	12/9/1996	2.5"	218	1.4	27.9		**433**	3.34					
BP8	TTU Original	TTU-BP8-0.2	12/9/1996	2.5"	246	1.58	29.5		189	<1.0					
BP9	TTU Original	TTU-BP9-0.2	12/9/1996	2.5"	76.2	<0.17	4.42		<3.30						
BP10	TTU Original	TTU-BP10-0.2	12/9/1996	2.5"	304	1.19	29.9		354	2.74					
BP11	TTU Original	TTU-BP11-0.2	12/9/1996	2.5"	777	2.26	**48.2**		164	0.25	**9,530**				
		TTU-BP11-1	12/10/1996	12"							1.54				
BP11/11S	TTU Post Removal	BPSW042604-3"	4/26/2004	3"							23.4	<0.100	59		
BP12	TTU Original	TTU-BP12-0.2	12/9/1996	2.5"	139	1.13	23.6		105	0.15					
BP13	TTU Original	TTU-BP13-0.2	12/9/1996	2.5"	990	2.35	**56.3**		331	0.28	**6,886**				
		TTU-BP13-1	12/10/1996	12"							**69.2**				
BP13S/14	TTU Post Removal	BPCTR042604-3"	4/26/2004	3"							**453**	<0.199	480		
BP11, BP11S, BP13S, BP14, BP17, BP17S	TTU Original	BG-Pit 25A-04	12/15/2004	3"										ND	ND
BP14	TTU Original	TTU-BP14-0.2	12/9/1996	2.5"	295	1.49	**41.4**		387	3.35					
	TTU Original DUP	TTU-BP14-0.3	12/9/1996	3.5"	679	2.05	**59.3**		**725**	4.32					
BP15	TTU Original	TTU-BP15-0.2	12/9/1996	2.5"	561	1.53	**34.2**		392	0.82					
BP16	TTU Original	TTU-BP16-0.2	12/9/1996	2.5"	1,060	2.24	**62**		**478**	3.29					
BP17	TTU Original	TTU-BP17-0.2	12/9/1996	2.5"	947	4.73	**158**	0.096	**3,220**	**23.9**	**239.5**				
		TTU-BP17-1	12/10/1996	12"					88.2		**68.3**				
	TTU Post Stabilization	BP17-Q-6"	4/3/2003	6"					**1,300**	<1.0					
BP17/17S	TTU Post Removal	BPNW042604-3"	4/26/2004	3"							34.2	<0.100	50		
BP18	TTU Original	TTU-BP18-0.2	12/9/1996	2.5"	387	5.3	**271**	0.112	**2,220**	**78**					
		TTU-BP18-1	12/10/1996	12"					**719**	4.28					
BP19	TTU Original	TTU-BP19-0.2	12/9/1996	2.5"	329	1.13	**35.7**		**550**	**12.2**					
	TTU Post Stabilization	BP19-Q-6"	4/3/2003	6"					290	1.3					
BP20	TTU Original	TTU-BP20-0.2	12/9/1996	2.5"	198	0.99	25		**454**	**7.8**					
BP21	TTU Original	TTU-BP21-0.2	12/9/1996	2.5"	205	0.46	19.3		166	1.14					
BP22	TTU Original	TTU-BP22-0.2	12/9/1996	2.5"	194	0.95	28.6		308	**8.9**					
BP22W, BP23W	TTU Post Removal	BGS-C07-05	2/14/2005						**660**	<0.5					

TABLE 4-3
Analytical Results for Soil Sampling Conducted Between 1996 and 2008
Thermal Treatment Unit RFI
Nammo Talley, Inc.

Sample Location	Sample Type	Sample ID	Date Sampled	Sample Depth (bgs)	Metals (mg/kg except TCLP reported as mg/L)						Propellant Constituents/Explosives (mg/kg)				
					Barium	Cadmium	Chromium	TCLP Chromium	Lead	TCLP Lead	Perchlorate	Sodium Azide	Nitrate	HMX	RDX
Lower of Arizona R-SRL or GPL Value Shown					12,000	29	30[a]		400		55[b]	310	[b]	66	0.68
USEPA TCLP Limit								5.0		5.0					
Burn Pits Area (continued)															
BP23	TTU Original	TTU-BP23-0.2	12/9/1996	2.5"	722	9.1	**171**	0.054	**3,870**	**10.9**					
		TTU-BP23-1	12/9/1996	12"					**3,130**	**21.9**					
	TTU Pre-Stabilization	BP23-3"	3/3/2003	3"							**68**	<0.155	530		
		BP23-18"	3/3/2003	18"					39	<1.0	5.89	<0.155	31		
	TTU Post Stabilization	BP23-Q-12"	4/3/2003	12"					**810**	<1.0					
		BP23-QD-12"	4/3/2003	12"					**1,300**	1.6					
BP24	TTU Original	TTU-BP24-0.2	12/9/1996	2.5"	156	<0.17	10.8		46.7						
	TTU Original DUP	TTU-BP24-0.3	12/9/1996	3.5"	159	<0.17	10.1		97.4						
BP25	TTU Original	TTU-BP25-0.2	12/9/1996	2.5"	264	1.17	**60.3**		**920**	**16.7**					
	TTU Post Stabilization	BP25-Q-6"	4/3/2003	6"					**910**	<1.0					
BP26	TTU Original	TTU-BP26-0.2	12/9/1996	2.5"	125	0.23	**23.2**		**611**	**11.2**					
BP27	TTU Original	TTU-BP27-0.2	12/9/1996	2.5"	299	1.2	**53.8**		318	4.07					
	TTU Post Removal	BP27-6" (Pit #6)	2/28/2003	6"								<0.154			
		PIT6042604-3"	4/26/2004	3"							5.43		7.7		
BP28	TTU Original	TTU-BP28-0.2	12/9/1996	2.5"	293	1.28	**51.3**		**809**	2.34					
Graded Area															
GA1	TTU Original	TTU-GA1-0.2	12/9/1996	2.5"	252	3.14	**94**		**844**	**7.7**					
	TTU Post Stabilization	GA1-Q-6"	4/3/2003	6"					190	<1.0					
GA2	TTU Original	TTU-GA2-0.2	12/9/1996	2.5"	138	0.6	7.84		42.8						
GA2W	TTU Pre-Stabilization	SS-NE	3/3/2003	3"					**18,000**	**140**					
		SS-NE-A	3/19/2003	3"					**43,000**	**71**					
		SS-NE-12"	3/19/2003	12"					**6,000**	**37**					
	TTU Post Stabilization	GA2-Q-6"	4/3/2003	6"					**3,500**	<1.0					
	TTU Post Removal	WESTGA2042604-3"	4/26/2004	3"					**2,500**	0.58	0.543	<0.100	718		
		GA2W-CLR-F03	3/3/2005						320	<0.5					
GA2S	TTU Pre-Stabilization	FSS-6	3/19/2003	3"					58	<1.0					
GA3	TTU Original	TTU-GA3-0.2	12/9/1996	2.5"	295	0.93	11.7		**2,370**	<1.0					
	TTU Pre-Stabilization	GA 3-18"	2/28/2003	18"					6.8	<1.0	7.81		41		
	TTU Post Stabilization	GA3-Q-6"	4/3/2003	6"					42	<1.0					
GA4	TTU Original	TTU-GA4-0.2	12/9/1996	2.5"	480	8.6	**159**	0.105	**1,720**	<1.0					
GA5	TTU Original	TTU-GA5-0.2	12/9/1996	2.5"	122	0.66	15.2		191	1.02					
GA6	TTU Original	TTU-GA6-0.2	12/9/1996	2.5"	752	9.2	**183**	0.018	**1,500**	3.27					
GA7	TTU Original	TTU-GA7-0.2	12/9/1996	2.5"	261	0.87	**42.7**		**943**	2.68					
GA8	TTU Original	TTU-GA8-0.2	12/9/1996	2.5"	1,080	4.47	**118**	<0.01	**913**	<1.0					
	TTU Original DUP	TTU-GA8-0.3	12/9/1996	3.5"	1,000	4.5	**126**	<0.01	**950**	<1.0					
GA8, GA13	TTU Post Stabilization	GA813-Q-6"	4/3/2003	6"					**490**	<1.0					
GA8W	TTU Pre-Stabilization	SS-NW	3/3/2003	3"					79	<1.0					
GA8S	TTU Pre-Stabilization	FSS-4	3/19/2003	3"					**1,400**	2.3					
	TTU Post Removal	GA8S-TST-G04	3/3/2005						**600**	<0.5	0.5				

TABLE 4-3
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Thermal Treatment Unit RFI
Nammo Talley, Inc.

Sample Location	Sample Type	Sample ID	Date Sampled	Sample Depth (bgs)	Metals (mg/kg except TCLP reported as mg/L)						Propellant Constituents/Explosives (mg/kg)				
					Barium	Cadmium	Chromium	TCLP Chromium	Lead	TCLP Lead	Perchlorate	Sodium Azide	Nitrate	HMX	RDX
Lower of Arizona R-SRL or GPL Value Shown					**12,000**	**29**	**30[a]**		**400**		**55[b]**	**310**	[b]	**66**	**0.68**
USEPA TCLP Limit								**5.0**		**5.0**					
Graded Area (continued)															
GA8SW	TTU Pre-Stabilization	FSS-3	3/19/2003	3"					360	<1.0					
GA9	TTU Original	TTU-GA9-0.2	12/9/1996	2.5"	222	0.8	11.2		154	0.33					
GA9E	TTU Pre-Stabilization	FSS-5	3/19/2003	3"					300	1.4					
GA10	TTU Original	TTU-GA10-0.2	12/9/1996	2.5"	52	<0.17	6.57		71	0					
GA10W	TTU Pre-Stabilization	SS-SW	3/3/2003	3"					75	<1.0					
	TTU Post Removal	GA10W-TST-H05	3/3/2005						150	<0.5					
GA11	TTU Original	TTU-GA11-0.2	12/9/1996	2.5"	159	1.53	**108**	0.01	**1,650**	**14**					
GA12	TTU Original	TTU-GA12-0.2	12/9/1996	2.5"	192	2.29	**32.2**		**2,020**	1.22					
	TTU Pre-Stabilization	GA 12-18"	2/28/2003	18"					39	<1.0	20.1		120		
	TTU Pre-Stabilization DUP	GA12-18" DUP	2/28/2003	18"					59	<1.0					
GA12S	TTU Pre-Stabilization	FSS-7	3/19/2003	3"					**430**	<1.0					
GA13	TTU Original	TTU-GA13-0.2	12/9/1996	2.5"	1,740	9.93	**186**	<0.01	**1,540**	<1.0					
GA14	TTU Original	TTU-GA14-0.2	12/9/1996	2.5"	**217**	4.19	**383**	0.01	**7,520**	**73.9**					
	TTU Original DUP	TTU-GA14-0.3	12/9/1996	3.5"	250	4.93	**669**	0.01	**8,210**	**88.6**					
	TTU Post Removal	BG-14GA-01	10/25/2002	6"					**550**	1.1					
		BG-14GA-02	10/25/2002	3"					180	<1.0					
		BG-14GA-03	10/25/2002	3"					**450**	<1.0					
		BG-14GA-04	10/25/2002	3"					**1,700**	1.7					
	TTU Pre-Stabilization	GA14-18"	2/28/2003	18"					7.9	<1.0					
	TTU Post Stabilization	GA14-Q-6"	4/3/2003	6"					190	<1.0					
GA15	TTU Original	TTU-GA15-0.2	12/9/1996	2.5"	267	4.3	**32.5**		233	<0.10					
GA16	TTU Original	TTU-GA16-0.2	12/9/1996	2.5"	263	3.13	**114**	0.017	**2,600**	**12.3**					
	TTU Pre-Stabilization	GA16-3"	2/28/2003	3"								<0.154			
		GA16-18"	2/28/2003	18"					6.2	<1.0		<0.155			
	TTU Post Stabilization	GA16-Q-12"	4/3/2003	12"					340	<1.0					
GA16W	TTU Pre-Stabilization	FSS-1	3/19/2003	3"					170	<1.0					
GA17	TTU Original	TTU-GA17-0.2	12/9/1996	2.5"	145	0.9	<3.33		255	1.72					
GA18	TTU Original	TTU-GA18-0.2	12/9/1996	2.5"	182	2.63	19.3		168	1.61					
GA19	TTU Original	TTU-GA19-0.2	12/9/1996	2.5"	312	1.26	19.2		158	<0.10					
GA19E	TTU Pre-Stabilization	FSS-2	3/19/2003	3"					140	<1.0					
GA20	TTU Original	TTU-GA20-0.2	12/9/1996	2.5"	189	0.93	27.9		343	2.39					
GA21	TTU Original	TTU-GA21-0.2	12/9/1996	2.5"	350	2	**30.4**		159	<0.10					
GA22	TTU Original	TTU-GA22-0.2	12/9/1996	2.5"	146	1.23	**40.7**		**700**	**7.78**					
	TTU Original DUP	TTU-GA22-0.3	12/9/1996	3.5"	412	1.33	**46.8**		**870**	**7.8**					
	TTU Post Stabilization	GA22-Q-6"	4/3/2003	6"					**500**	<1.0					
GA23	TTU Original	TTU-GA23-0.2	12/9/1996	2.5"	699	2.55	**110**	0.013	**2,340**	**6.91**					
	TTU Pre-Stabilization	GA23-3"	2/28/2003	3"							1.87				
		GA23-18"	2/28/2003	18"					22	<1.0	31.5				
	TTU Post Stabilization	GA23-Q-6"	4/3/2003	6"					**3,200**	<1.0					
	TTU Post Removal	GA23-CLR-D01	3/3/2005						**820**	<0.5					

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Sample Location	Sample Type	Sample ID	Date Sampled	Sample Depth (bgs)	Metals (mg/kg except TCLP reported as mg/L)						Propellant Constituents/Explosives (mg/kg)				
					Barium	Cadmium	Chromium	TCLP Chromium	Lead	TCLP Lead	Perchlorate	Sodium Azide	Nitrate	HMX	RDX
		Lower of Arizona R-SRL or GPL Value Shown			12,000	29	30[a]		400		55[b]	310	[b]	66	0.68
		USEPA TCLP Limit						5.0		5.0					
Graded Area (continued)															
BB4, BB6, GA23,GA23W, GA23NW, GA25	TTU Post Removal	BGS-B06-05	2/14/2005						180	<0.5					
GA23E	TTU Post Removal	GA23E-CLR-E02	3/3/2005						**430**	1.1					
GA24	TTU Original	TTU-GA24-0.2	12/9/1996	2.5"	92.3	0.23	11.1		25.3						
GA25	TTU Original	TTU-GA25-0.2	12/9/1996	2.5"	189	0.73	11.8		81.7						
GA26	TTU Original	TTU-GA26-0.2	12/9/1996	2.5"	257	1	26.4		390	3.25					
GA27	TTU Original	TTU-GA27-0.2	12/9/1996	2.5"	587	2.13	**107**	0.01	**543**	1.22					
Former Burn Boxes Area															
BB1	TTU Original	TTU-BB1-0.2	12/9/1996	2.5"	326	2.09	**87.4**		**581**	1.72					
BB2	TTU Original	TTU-BB2-0.2	12/9/1996	2.5"	341	3.05	**81.3**		**882**	4.41					
BB3	TTU Original	TTU-BB3-0.2	12/9/1996	2.5"	795	6.49	**125**	0.092	**2,620**	0.4					
		TTU-BB3-1	12/9/1996	12"					**803**	2.01					
BB4	TTU Original	TTU-BB4-0.2	12/9/1996	2.5"	480	6.27	**72.7**		**1,570**	**25.4**					
		TTU-BB4-1	12/10/1996	12"					**1,440**	**7.01**					
BB5	TTU Original	TTU-BB5-0.2	12/9/1996	2.5"	857	7.51	**195**	0.138	**3,240**	4.89					
		TTU-BB5-1	12/10/1996	12"					**3,010**	**5.2**					
	TTU Pre-Stabilization	BB 5-3"	2/28/2003	3"							5.83	<0.155	3.6		
		BB 5-18"	2/28/2003	18"					320	<1.0	49.2	<0.155	28		
BB6	TTU Original	TTU-BB6-0.2	12/9/1996	2.5"	513	7.9	**142**	0.136	**2,690**	2.64					
		TTU-BB6-1	12/10/1996	12"					**1,760**	3.93					
BB1-BB6	TTU Post Stabilization	BB-Q-6"	4/3/2003	6"					**640**	<1.0					
		BB-QD-6"	4/3/2003	6"					**1,300**	<1.0					
	TTU Post Removal	BB042604-3"	4/26/2004	3"					**540**	<0.5	16.1				
BB1, BB2, BB3, BB5	TTU Post Removal	BGS-A05-05	2/14/2005						**1,600**	<0.5					
Excavated Soil In Stockpiles															
BP22W, BP23W, BB1, BB2, BB3, BB4, BB5, BB6, GA23,GA23W, GA23NW, GA25	TTU Removal	SPN-01-05	2/14/2005	NA					**470**	<0.5					
		SPS-02-05	2/14/2005	NA					**580**	<0.5					
		SPE-03-05	2/14/2005	NA					250	<0.5					
		SPW-04-05	2/14/2005	NA					140	<0.5					
GA2W, GA8S, GA10W, GA23, GA23E	TTU Removal	SP2-01-05	3/1/2005	NA					**420**	<0.5					
		SP2-02-05	3/1/2005	NA					**580**	<0.5					
		SP2-03-05	3/1/2005	NA					**2,600**	3.8					
NE, NW, SW, and SE Parts of Pit #1 - #5 Berms	TTU Removal	BG-NEP-01-Soil	1/10/2008	NA					**510**	<0.5	46				
		BG-NWP-02-Soil	1/10/2008	NA					**1,700**	<0.5	**100**				
		BG-SWP-03-Soil	1/10/2008	NA					**2,100**	<0.5	**84**				
		BG-SEP-04-Soil	1/10/2008	NA					**4,700**	<0.5	**170**				

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Sample Location	Sample Type	Sample ID	Date Sampled	Sample Depth (bgs)	Metals (mg/kg except TCLP reported as mg/L)						Propellant Constituents/Explosives (mg/kg)				
					Barium	Cadmium	Chromium	TCLP Chromium	Lead	TCLP Lead	Perchlorate	Sodium Azide	Nitrate	HMX	RDX
Lower of Arizona R-SRL or GPL Value Shown					12,000	29	30[a]		400		55[b]	310	[b]	66	0.68
USEPA TCLP Limit								5.0		5.0					
Background Locations															
BG1	Original Bkgrd	TTU-BG1-1	12/9/1996	12"	56	<0.167	4.53		11						
BG2	Original Bkgrd	TTU-BG2-1	12/9/1996	12"	68.3	0.567	8.23		<3.33						
BG3	Original Bkgrd	TTU-BG3-1	12/9/1996	12"	111	<0.164	9.38		<3.28						
BK1	Off-Site Original Bkgrd	BK1	2/17/2000	0.8"		<1	10		11						
BK2	Off-Site Original Bkgrd	BK2	2/17/2000	0.8"		<1	6		<5						
BK3	Off-Site Original Bkgrd	BK3	2/17/2000	0.8"		<1	8		5						
BK4	Off-Site Original Bkgrd	BK4	2/17/2000	0.8"		<1	8		230						
BK5	Off-Site Original Bkgrd	BK5	2/17/2000	0.8"		<1	13		70						
BK6	Off-Site Original Bkgrd	BK6	2/17/2000	0.8"		<1	18		5						
BK7	Off-Site Original Bkgrd	BK7	4/1/2000	0.8"		<1	17		47						
BK8	Off-Site Original Bkgrd	BK8	4/1/2000	0.8"					170						
BK9	Off-Site Original Bkgrd	BK9	4/1/2000	0.8"					160						
BK10	Off-Site Original Bkgrd	BK10	4/1/2000	0.8"		<1	12		68						
BK11	Off-Site Original Bkgrd	BK11	4/1/2000	0.8"					9						
BK12	Off-Site Original Bkgrd	BK12	4/1/2000	0.8"					9						
Off-Site Locations (Salt River Pima-Maricopa Indian Community)															
EA1	Off-Site Original	EA1	3/27/2000	0.8"					7						
EA2	Off-Site Original	EA2	3/27/2000	0.8"					10						
EA3	Off-Site Original	EA3	3/27/2000	0.8"		<1	16		130						
EA4	Off-Site Original	EA4	3/27/2000	0.8"					19						
EB1	Off-Site Original	EB1	3/27/2000	0.8"					8						
EB2	Off-Site Original	EB2	3/27/2000	0.8"					14						
EB3	Off-Site Original	EB3	3/27/2000	0.8"					13						
EB4	Off-Site Original	EB4	3/27/2000	0.8"		<1	11		24						
EB5	Off-Site Original	EB5	3/27/2000	0.8"					25						
EC1	Off-Site Original	EC1	3/27/2000	0.8"					8						
EC2	Off-Site Original	EC2	3/27/2000	0.8"					12						
EC3	Off-Site Original	EC3	3/27/2000	0.8"		<1	15		27						
EC4	Off-Site Original	EC4	3/27/2000	0.8"					19						
A1	Off-Site Original	A1	2/16/2000	0.8"					5						
A2	Off-Site Original	A2	2/16/2000	0.8"		<1	7		<5						
A3	Off-Site Original	A3	2/16/2000	0.8"					<5						
A4	Off-Site Original	A4	2/16/2000	0.8"		<1	17		9						
A5	Off-Site Original	A5	2/16/2000	0.8"					9						
A6	Off-Site Original	A6	2/16/2000	0.8"		<1	11		12						
A7	Off-Site Original	A7	2/16/2000	0.8"					8						
A7.1	Off-Site Original	A7.1	2/16/2000	0.8"					<5						
A8	Off-Site Original	A8	2/16/2000	0.8"		<1	9		6						
A9	Off-Site Original	A9	2/16/2000	0.8"					13						
A10	Off-Site Original	A10	2/16/2000	0.8"		<1	11		36						

TABLE 4-3
Analytical Results for Soil Sampling Conducted Between 1996 and 2008
Thermal Treatment Unit RFI
Nammo Talley, Inc.

Sample Location	Sample Type	Sample ID	Date Sampled	Sample Depth (bgs)	Metals (mg/kg except TCLP reported as mg/L)						Propellant Constituents/Explosives (mg/kg)				
					Barium	Cadmium	Chromium	TCLP Chromium	Lead	TCLP Lead	Perchlorate	Sodium Azide	Nitrate	HMX	RDX
Lower of Arizona R-SRL or GPL Value Shown					12,000	29	30[a]		400		55[b]	310	[b]	66	0.68
USEPA TCLP Limit								5.0		5.0					
Off-Site Locations (Salt River Pima-Maricopa Indian Community) - continued															
A11	Off-Site Original	A11	2/16/2000	0.8"					<5						
A12	Off-Site Original	A12	2/16/2000	0.8"		<1	24		18						
B1	Off-Site Original	B1	2/16/2000	0.8"					9						
B2	Off-Site Original	B2	2/16/2000	0.8"					24						
B3	Off-Site Original	B3	2/16/2000	0.8"					7						
B4	Off-Site Original	B4	2/16/2000	0.8"					52						
B5	Off-Site Original	B5	2/16/2000	0.8"					15						
B6	Off-Site Original	B6	2/16/2000	0.8"					19						
B7	Off-Site Original	B7	2/16/2000	0.8"					22						
B8	Off-Site Original	B8	2/16/2000	0.8"					6						
B9	Off-Site Original	B9	2/16/2000	0.8"					12						
B10	Off-Site Original	B10	2/16/2000	0.8"					11						
B11	Off-Site Original	B11	2/16/2000	0.8"					20						
B12	Off-Site Original	B12	2/16/2000	0.8"					7						
C1	Off-Site Original	C1	2/17/2000	0.8"		<1	14		6						
C2	Off-Site Original	C2	2/17/2000	0.8"					10						
C3	Off-Site Original	C3	2/17/2000	0.8"		<1	23		52						
C4	Off-Site Original	C4	2/17/2000	0.8"					18						
C5	Off-Site Original	C5	2/17/2000	0.8"		<1	10		8						
C6	Off-Site Original	C6	2/17/2000	0.8"					11						
D1	Off-Site Original	D1	2/17/2000	0.8"					17						
D2	Off-Site Original	D2	2/17/2000	0.8"		<1	21		15						
D3	Off-Site Original	D3	2/17/2000	0.8"					11						
D4	Off-Site Original	D4	2/17/2000	0.8"		<1	17		11						
D5	Off-Site Original	D5	2/17/2000	0.8"					20						
D6	Off-Site Original	D6	2/17/2000	0.8"					11						
R1	Off-Site Original	R1	2/17/2000	0.8"		2	**54**		**460**						
R2	Off-Site Original	R2	2/17/2000	0.8"		<1	**35**		300						
RA1	Off-Site Original	RA1	3/30/2000	0.8"					8						
RA2	Off-Site Original	RA2	3/30/2000	0.8"					13						
RA3	Off-Site Original	RA3	3/30/2000	0.8"					24						
RA4	Off-Site Original	RA4	3/30/2000	0.8"					18						
RA5	Off-Site Original	RA5	3/30/2000	0.8"					12						
RA6	Off-Site Original	RA6	3/30/2000	0.8"					12						
RA7	Off-Site Original	RA7	3/30/2000	0.8"		<1	17		19						
RA8	Off-Site Original	RA8	3/30/2000	0.8"		2	**50**		**420**						
RA9	Off-Site Original	RA9	3/30/2000	0.8"					22						
RA10	Off-Site Original	RA10	3/30/2000	0.8"					200						
RA11	Off-Site Original	RA11	3/30/2000	0.8"					120						
RA12	Off-Site Original	RA12	3/30/2000	0.8"		3	**63**		**760**						

TABLE 4-3
Analytical Results for Soil Sampling Conducted Between 1996 and 2008
Thermal Treatment Unit RFI
Nammo Talley, Inc.

Sample Location	Sample Type	Sample ID	Date Sampled	Sample Depth (bgs)	Metals (mg/kg except TCLP reported as mg/L)						Propellant Constituents/Explosives (mg/kg)				
					Barium	Cadmium	Chromium	TCLP Chromium	Lead	TCLP Lead	Perchlorate	Sodium Azide	Nitrate	HMX	RDX
Lower of Arizona R-SRL or GPL Value Shown					12,000	29	30[a]		400		55[b]	310	[b]	66	0.68
USEPA TCLP Limit								5.0		5.0					
Off-Site Locations (Salt River Pima-Maricopa Indian Community) - continued															
RA13	Off-Site Original	RA13	3/30/2000	0.8"					**410**						
RA14	Off-Site Original	RA14	3/30/2000	0.8"					**950**						
RA15	Off-Site Original	RA15	3/30/2000	0.8"					**530**						
RA16	Off-Site Original	RA16	3/30/2000	0.8"		3	**67**		**790**						
RB1	Off-Site Original	RB1	4/1/2000	0.8"		<1	11		16						
RB2	Off-Site Original	RB2	4/1/2000	0.8"					26						
RB3	Off-Site Original	RB3	4/1/2000	0.8"		<1	8		19						
RB4	Off-Site Original	RB4	4/1/2000	0.8"		<1	17		73						
RB5	Off-Site Original	RB5	4/1/2000	0.8"					25						
RB6	Off-Site Original	RB6	4/1/2000	0.8"					10						
RB7	Off-Site Original	RB7	4/1/2000	0.8"		<1	20		25						
RB8	Off-Site Original	RB8	4/1/2000	0.8"					11						
RB9	Off-Site Original	RB9	4/1/2000	0.8"					7						
RB10	Off-Site Original	RB10	4/1/2000	0.8"		<1	2		<5						
RB11	Off-Site Original	RB11	4/1/2000	0.8"					22						
RC1	Off-Site Original	RC1	6/20/2000	0.8"					200						

Notes:

[a] *Since total chromium results were not speciated between Cr^{+3} and Cr^{+6}, the more conservative residential SRL value (for Cr^{+6}) is used*

[b] *A GPL has not yet to be determined for this compound*

[c] ***Bold** values exceed applicable regulatory criteria (R-SRL, GPL, or TCLP limit)*

Acronyms/Abbreviations:

< = not detected (associated value is detection limit)
bgs = below ground surface
DUP = duplicate
GPL - Groundwater Protection Level
HMX = High Melting eXplosive (octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine)
mg/kg = milligrams per kilogram
mg/L = milligrams per liter
NA = not applicable
NE = not established
RDX = Research Demolition eXplosive (hexahydro-1,3,5-trinitro-1,3,5-triazine)
R-SRL = Residential Soil Remediation Level
TCLP = Toxicity Characteristic Leaching Procedure
TTU = Thermal Treatment Unit

TABLE 4-4
Soil Sample Results for TTU Area - 2009
Thermal Treatment Unit RFI
Nammo Talley, Inc.

Soil Sample Information			Analytical Results (in mg/kg unless indicated otherwise)								
Sample ID	Sample Date	Sample Depth (ft)	Total Perchlorate (USEPA 314.0)	Total Lead (USEPA 6010B)	Total Chromium (USEPA 6010B)	Chromium VI (USEPA 3060A/7196A)	2,3,7,8-TCDD (USEPA 1613B) (pg/g)	HMX (USEPA 8330)	RDX (USEPA 8330)	Sodium Azide (SOP 4150 Rev. 5)	Total Nitrate (USEPA 9056)
Characterization Screening Level (lower value of R-SRL or GPL)		R-SRL	55	**400**	NE	**30**	**4.5**	3,100	50	310	NE
		GPL	**12.4[a]/49.5[b]**	2,717	**105,237**	NR	NR	**66**	**0.68**	NR	**7,970[a]/31,860[b]**
TTU-R1/C2	07/28/2009	0.25	<0.2	**750**	-	-	-	-	-	-	-
TTU-R1/C2-Sub	07/28/2009	1.8	<0.2	270	-	-	-	-	-	-	-
TTU-R1/C3	07/28/2009	0.25	3.6	<5	-	-	-	-	-	-	-
TTU-R1/C3-Sub	07/28/2009	2.2	4.2	<5	-	-	-	-	-	-	-
TTU-R1/C4	07/28/2009	0.25	0.16	<5	-	-	-	-	-	-	-
TTU-R1/C4-Sub	07/28/2009	2.8	3.2	<5	-	-	-	-	-	-	-
TTU-R1/C5	07/28/2009	0.25	0.11	18	-	-	-	-	-	-	-
TTU-R1/C5-Sub	07/28/2009	2	0.18	5.8	-	-	-	-	-	-	-
TTU-R1/C5-Ext	07/28/2009	2	0.12	7.7	-	-	-	-	-	-	-
TTU-R1/C6	07/28/2009	0.25	<0.04	9.5	-	-	-	-	-	-	-
TTU-R1/C6-Sub	07/28/2009	2	<0.04	7.2	-	-	-	-	-	-	-
TTU-R1/C7	07/28/2009	0.25	0.14	27	-	-	-	-	-	-	-
TTU-R1/C7-Sub	07/28/2009	1.8	0.27	11	-	-	-	-	-	-	-
TTU-R1/C8	07/28/2009	0.25	<0.04	12	-	-	-	-	-	-	-
TTU-R1/C8-Sub	07/28/2009	2.5	<0.04	7	-	-	-	-	-	-	-
TTU-R2/C2	07/28/2009	0.25	2	<5	-	-	-	-	-	-	-
TTU-R2/C2-Ext	07/28/2009	0.25	2.2	<5	-	-	-	-	-	-	-
TTU-R2/C3	07/29/2009	0.25	3.7	34	-	-	-	-	-	-	5.2
TTU-R2/C4	07/28/2009	0.25	1.5	21	-	-	-	-	-	-	-
TTU-R2/C4-Sub	07/28/2009	4	7.2	23	-	-	-	-	-	-	-
TTU-R2/C5	07/28/2009	0.25	<0.04	120	-	-	-	-	-	-	-
TTU-R2/C5-Sub	07/28/2009	1.8	0.056	140	-	-	-	-	-	-	-
TTU-R2/C6	07/28/2009	0.25	0.43	240	-	-	-	-	-	-	-

TABLE 4-4
Soil Sample Results for TTU Area - 2009
Thermal Treatment Unit RFI
Nammo Talley, Inc.

Soil Sample Information			Analytical Results (in mg/kg unless indicated otherwise)								
Sample ID	Sample Date	Sample Depth (ft)	Total Perchlorate (USEPA 314.0)	Total Lead (USEPA 6010B)	Total Chromium (USEPA 6010B)	Chromium VI (USEPA 3060A/7196A)	2,3,7,8-TCDD (USEPA 1613B) (pg/g)	HMX (USEPA 8330)	RDX (USEPA 8330)	Sodium Azide (SOP 4150 Rev. 5)	Total Nitrate (USEPA 9056)
Characterization Screening Level (lower value of R-SRL or GPL)		R-SRL	55	**400**	NE	**30**	**4.5**	3,100	50	310	NE
		GPL	**12.4[a]/49.5[b]**	2,717	**105,237**	NR	NR	**66**	**0.68**	NR	**7,970[a]/31,860[b]**
TTU-R2/C6-Sub	07/28/2009	1.5	3.7	220	-	-	-	-	-	-	-
TTU-R2/C7	07/29/2009	0.25	<0.2	140	34	<1	-	-	-	-	-
TTU-R2/C8	07/29/2009	0.25	<0.02	53	-	-	-	-	-	-	2.5
TTU-R3/C1	07/28/2009	0.25	0.44	200	-	-	-	-	-	-	-
TTU-R3/C1-Sub	07/28/2009	2	3.8	210	-	-	-	-	-	-	-
TTU-R3/C2	07/28/2009	0.25	0.54	**1,100**	-	-	-	-	-	-	-
TTU-R3/C2-Sub	07/28/2009	3	0.85	**860**	-	-	-	-	-	-	-
TTU-R3/C3	07/28/2009	0.25	2	270	-	-	-	-	-	-	-
TTU-R3/C4	07/28/2009	0.25	2.6	**730**	-	-	-	-	-	-	-
TTU-R3/C5	07/28/2009	0.25	2.7	**1,900**	-	-	-	-	-	-	-
TTU-R3/C6	07/28/2009	0.25	<0.2	58	-	-	-	-	-	-	-
TTU-R3/C6-Ext	07/28/2009	0.25	<0.2	120	-	-	-	-	-	-	-
TTU-R3/C6-Sub	07/28/2009	1.5	<0.2	50	-	-	-	-	-	-	-
TTU-R3/C7	07/29/2009	0.25	0.069	**960**	58	4.2	-	-	-	-	-
TTU-R3/C7-Sub	07/29/2009	1.5	9.1	63	13	1.8	-	-	-	-	-
TTU-R3/C8	07/29/2009	0.25	<0.02	20	-	-	-	-	-	-	1.6
TTU-R4/C1	07/28/2009	0.25	0.76	**590**	-	-	-	-	-	-	-
TTU-R4/C1-Sub	07/28/2009	2.5	1.5	280	-	-	-	-	-	-	-
TTU-R4/C2	07/29/2009	0.25	9.3	67	10	<1	0.38	<0.25	<0.25	<1	18
TTU-R4/C2-Sub	07/29/2009	2	4.9	47	8.2	<1	0.48	<0.25	<0.25	<1	8
TTU-R4/C3	07/28/2009	0.25	10	**470/1,000***	-	-	-	-	-	-	-
TTU-R4/C3-Ext	07/28/2009	0.25	8.5	**1,400/1,100***	-	-	-	-	-	-	-
TTU-R4/C4	07/29/2009	0.25	**34**	180	-	-	-	-	-	-	59

TABLE 4-4
Soil Sample Results for TTU Area - 2009
Thermal Treatment Unit RFI
Nammo Talley, Inc.

Soil Sample Information			Analytical Results (in mg/kg unless indicated otherwise)								
Sample ID	Sample Date	Sample Depth (ft)	Total Perchlorate (USEPA 314.0)	Total Lead (USEPA 6010B)	Total Chromium (USEPA 6010B)	Chromium VI (USEPA 3060A/7196A)	2,3,7,8-TCDD (USEPA 1613B) (pg/g)	HMX (USEPA 8330)	RDX (USEPA 8330)	Sodium Azide (SOP 4150 Rev. 5)	Total Nitrate (USEPA 9056)
Characterization Screening Level (lower value of R-SRL or GPL)		R-SRL	55	**400**	NE	**30**	**4.5**	3,100	50	310	NE
		GPL	**12.4[a]/49.5[b]**	2,717	**105,237**	NR	NR	**66**	**0.68**	NR	**7,970[a]/31,860[b]**
TTU-R4/C5	07/28/2009	0.25	0.84	230	-	-	-	-	-	-	-
TTU-R4/C6	07/29/2009	0.25	2.2	7.6	7.4	<1	-	-	-	-	-
TTU-R4/C6-Sub	07/29/2009	3	**25**	160	14	<1	-	-	-	-	-
TTU-R4/C7	07/29/2009	0.25	0.059	69	-	-	-	-	-	-	-
TTU-R4/C7-Sub	07/29/2009	1.5	<0.02	6.5	-	-	-	-	-	-	-
TTU-R4/C7-Ext	07/29/2009	1.5	<0.02	9.5	-	-	-	-	-	-	-
TTU-R4/C8	07/29/2009	0.25	<0.02	98	16	<1	-	-	-	-	-
TTU-R5/C1	07/29/2009	0.25	8.9	**1,000**	88	3.7	**7.9**	0.1	0.095	<1	54
TTU-R5/C1-Ext	07/29/2009	0.25	**44**	**880**	98	3.9	**5.8**	0.14	0.11	<1	200
TTU-R5/C2	07/29/2009	0.25	**39**	**1,100**	-	-	-	-	-	-	110
TTU-R5/C3	07/29/2009	0.25	0.41	290	36	1.4	1.2	0.23	0.37	<1	2.5
TTU-R5/C4	07/29/2009	0.25	1.9	**870**	61	8.5	3.1	0.19	0.054	<1	9.1
TTU-R5/C5	07/28/2009	0.25	<0.04	76	-	-	-	-	-	-	-
TTU-R5/C5-Ext	07/28/2009	0.25	<0.04	33	-	-	-	-	-	-	-
TTU-R5/C5-Sub	07/28/2009	2	<0.04	17	-	-	-	-	-	-	-
TTU-R5/C6	07/28/2009	0.25	<0.04	110	-	-	-	-	-	-	-
TTU-R5/C6-Sub	07/28/2009	2	<0.04	130	-	-	-	-	-	-	-
TTU-R5/C7	07/29/2009	0.25	<0.02	**5,600**	-	-	-	-	-	-	2.2
TTU-R5/C8	07/29/2009	0.25	<0.02	25	-	-	-	-	-	-	-
TTU-R6/C1	07/29/2009	0.25	0.33	210	28	<0.99	-	-	-	-	-
TTU-R6/C2	07/28/2009	0.25	<0.2	200	-	-	-	-	-	-	-
TTU-R6/C3	07/28/2009	0.25	<0.2	21	-	-	-	-	-	-	-
TTU-R6/C4	07/28/2009	0.25	0.33	**770**	-	-	-	-	-	-	-

TABLE 4-4
Soil Sample Results for TTU Area - 2009
Thermal Treatment Unit RFI
Nammo Talley, Inc.

Soil Sample Information			Analytical Results (in mg/kg unless indicated otherwise)								
Sample ID	**Sample Date**	**Sample Depth (ft)**	**Total Perchlorate (USEPA 314.0)**	**Total Lead (USEPA 6010B)**	**Total Chromium (USEPA 6010B)**	**Chromium VI (USEPA 3060A/7196A)**	**2,3,7,8-TCDD (USEPA 1613B) (pg/g)**	**HMX (USEPA 8330)**	**RDX (USEPA 8330)**	**Sodium Azide (SOP 4150 Rev. 5)**	**Total Nitrate (USEPA 9056)**
Characterization Screening Level (lower value of R-SRL or GPL)		**R-SRL**	55	**400**	NE	**30**	**4.5**	3,100	50	310	NE
		GPL	**12.4[a]/49.5[b]**	2,717	**105,237**	NR	NR	**66**	**0.68**	NR	**7,970[a]/31,860[b]**
TTU-R6/C4-Sub	07/28/2009	2	1.9	**610**	-	-	-	-	-	-	-
TTU-R7/C2	07/28/2009	0.25	<0.4	**480**	-	-	-	-	-	-	-
TTU-R7/C2-Sub	07/28/2009	2	<0.02	230	-	-	-	-	-	-	-
TTU-R7/C2-Ext	07/28/2009	2	<0.2	89	-	-	-	-	-	-	-
TTU-R7/C3	07/29/2009	0.25	<0.2	**870**	64	3	-	-	-	-	-

Notes:

[a] *Site Specific Screening GPL based on a single dilution factor as calculated and submitted in Brown & Caldwell's February 19, 2010 letter to ADEQ.*

[b] *Site Specific GPL based on the double dilution factor (used in ADEQ's 9-26-2006 Perchlorate GPL memo) as calculated and submitted in Brown & Caldwell's February 19, 2010 letter to ADEQ.*

Bold *result values indicate analyte concentration exceeds the soil characterization screening level (lower value of R-SRL or minimum GPL)*

"Ext" at end of Sample ID indicates a duplicate sample

"Sub" at the end of the Sample ID indicates a subsurface soil sample

- = Not Analyzed
< = Analyte was not detected at concentration above the laboratory reporting limit
** = Sample reanalysis result*
GPL = Groundwater Protection Level
mg/kg = milligrams per kilogram
NR = Not required
NE = Not established
pg/g = picograms per gram
R-SRL = Residential Soil Remediation Level
TBD = To be determined
USEPA = United States Environmental Protection Agency

TABLE 4-5
Soil Sample Results for Area Surrounding the TTU - 2009
Thermal Treatment Unit RFI
Nammo Talley, Inc.

Soil Sample Information			Analytical Results (in mg/kg)	
Sample ID	Sample Date	Sample Depth (ft)	Total Perchlorate (USEPA 314.0)	Total Lead (USEPA 6010B)
Characterization Screening Level (lower value of R-SRL or GPL)		R-SRL	55	400
		GPL	12.4[a]/49.5[b]	2,717
OA-R1/C3	08/18/2009	0.25	<0.02	-
OA-R1/C5	08/18/2009	0.25	0.036	-
OA-R1/C7	08/18/2009	0.25	<0.02	-
OA-R2/C2	08/18/2009	0.25	0.025	-
OA-R2/C3	08/18/2009	0.25	0.11	-
OA-R2/C3-Sub	08/18/2009	1.8	0.31	-
OA-R2/C3-Ext	08/18/2009	1.8	0.37	-
OA-R2/C4	08/18/2009	0.25	0.031	-
OA-R2/C5	08/18/2009	0.25	0.035	-
OA-R2/C6	08/18/2009	0.25	<0.02	-
OA-R2/C7	08/18/2009	0.25	<0.02	-
OA-R2/C7-Sub	08/18/2009	3	<0.02	-
OA-R2/C7-Ext	08/18/2009	3	<0.02	-
OA-R2/C8	08/18/2009	0.25	0.04	-
OA-R3/C7	08/19/2009	0.25	<0.4	-
OA-R4/C2	08/18/2009	0.25	0.057	<5
OA-R4/C2-Sub	08/18/2009	2	0.025	<5
OA-R4/C7	08/19/2009	0.25	<0.04	-
OA-R4/C7-Ext	08/19/2009	0.25	<0.04	-
OA-R4/C8	08/18/2009	0.25	<0.02	-
OA-R5/C1	08/19/2009	0.25	0.068	7.5
OA-R5A/C2	07/30/2009	0.25	0.024	<5
OA-R5A/C2-Sub	07/30/2009	3	0.036	7.3
OA-R5A/C2-Ext	07/30/2009	3	0.03	8.7
OA-R5B/C2	07/30/2009	0.25	<0.02	9
OA-R5B/C2-Sub	07/30/2009	2	0.035	7.4
OA-R5/C6	08/19/2009	0.25	<0.04	16
OA-R5/C7	08/19/2009	0.25	<0.04	-
OA-R5/C7-Sub	08/19/2009	1.5	<0.04	-
OA-R6/C2	08/19/2009	0.25	0.35	20
OA-R6/C2-Ext	08/19/2009	0.25	0.46	19
OA-R6A/C3	07/30/2009	0.25	<0.02	34
OA-R6A/C3-Sub	07/30/2009	1.8	<0.02	23
OA-R6B/C3	07/30/2009	0.25	0.035	15
OA-R6B/C3-Sub	07/30/2009	1.5	0.029	7.1
OA-R6/C4	07/30/2009	0.25	0.023	30
OA-R6/C5	08/19/2009	0.25	<0.04	9.7
OA-R6/C7	08/19/2009	0.25	<0.04	-

TABLE 4-5
Soil Sample Results for Area Surrounding the TTU - 2009
Thermal Treatment Unit RFI
Nammo Talley, Inc.

Soil Sample Information			Analytical Results (in mg/kg)	
Sample ID	**Sample Date**	**Sample Depth (ft)**	**Total Perchlorate (USEPA 314.0)**	**Total Lead (USEPA 6010B)**
Characterization Screening Level (lower value of R-SRL or GPL)		**R-SRL**	55	**400**
		GPL	**12.4[a]/49.5[b]**	2,717
OA-R7/C1	08/18/2009	0.25	0.2	8.3
OA-R7/C3	07/29/2009	0.25	<0.02	17
OA-R7/C3-Ext	07/29/2009	0.25	<0.02	21
OA-R7/C5	07/29/2009	0.25	<0.02	7.1
OA-R7/C7	08/19/2009	0.25	<0.04	<5
OA-R7/C7-Sub	08/19/2009	1.8	<0.04	<5

Notes:

[a] Site Specific Screening GPL based on a single dilution factor as calculated and submitted in Brown & Caldwell's February 19, 2010 letter to ADEQ.

[b] Site Specific GPL based on the double dilution factor (used in ADEQ's 9-26-2006 Perchlorate GPL memo) as calculated and submitted in Brown & Caldwell's February 19, 2010 letter to ADEQ.

***Bold** result values indicate analyte concentration exceeds the soil characterization screening level (lower value of R-SRL or minimum GPL)*

"Ext" at end of Sample ID indicates a duplicate sample

"Sub" at the end of the Sample ID indicates a subsurface soil sample

- = Not Analyzed

< = Analyte was not detected at concentration above the laboratory reporting limit

GPL = Groundwater Protection Level

mg/kg = milligrams per kilogram

R-SRL = Residential Soil Remediation Level

TBD = To be determined

USEPA = United States Environmental Protection Agency

TABLE 4-6
Soil Sample Results for Storm Water Accumulation Area - 2009
Thermal Treatment Unit RFI
Nammo Talley, Inc.

Soil Sample Information				Analytical Results (in mg/kg)		
Sample ID	Sample Date	Sample Type	Sample Depth (ft)	Total Perchlorate (USEPA 314.0)	Total Lead (USEPA 6010B)	Total Nitrate (USEPA 9056)
Characterization Screening Level (lower value of R-SRL or GPL)			R-SRL	55	**400**	NE
			GPL	**12.4[a]/49.5[b]**	2,717	**7,970[a]/31,860[b]**
SRA-R1/C3-3"	08/26/2009	R	0.25	0.024	-	4.1
SRA-R1/C3-6"	08/26/2009	D	0.25	0.028	-	5
SRA-R1/C3-5'	08/26/2009	R	5	0.026	-	8.1
SRA-R1/C3-10'	08/26/2009	R	10	<0.02	-	2.2
SRA-R1/C4-3"	08/26/2009	R	0.25	<0.04	-	-
SRA-R1/C4-5'	08/26/2009	R	5	<0.04	-	-
SRA-R1/C4-9'	08/26/2009	R	9	<0.04	-	-
SRA-R1/C5-3"	08/26/2009	R	0.25	<0.04	-	-
SRA-R1/C5-5'	08/26/2009	R	5	0.14	-	-
SRA-R1/C5-10'	08/26/2009	R	10	<0.04	-	-
SRA-R2/C2-3"	08/26/2009	R	0.25	0.099	**930**	8.5
SRA-R2/C2-5'	08/26/2009	R	5	<0.02	<5	<1
SRA-R2/C2-10'	08/26/2009	R	10	<0.02	<5	<1
SRA-R2/C3-3"	08/26/2009	R	0.25	<0.04	-	-
SRA-R2/C3-5'	08/26/2009	R	5	0.25	-	-
SRA-R2/C3-10'	08/26/2009	R	10	0.14	-	-
SRA-R2/C4-3"	08/26/2009	R	0.25	<0.04	-	-
SRA-R2/C4-5'	08/26/2009	R	5	0.45	-	-
SRA-R2/C4-10'	08/26/2009	R	10	<0.04	-	-
SRA-R2/C5-3"	08/26/2009	R	0.25	0.2	-	-
SRA-R2/C5-5'	08/26/2009	R	5	10	-	-
SRA-R2/C5-10'	08/26/2009	R	10	0.62	-	-
SRA-R3/C2-3"	08/26/2009	R	0.25	0.048	-	-
SRA-R3/C2-5'	08/26/2009	R	5	1.1	-	-
SRA-R3/C2-10'	08/26/2009	R	10	3.4	-	-
SRA-R3/C2B-10'	08/27/2009	R	10	0.19	<5	1.2
SRA-R3/C2B-13'	08/27/2009	R	13	0.2	<5	<1
SRA-R3/C3-3"	08/26/2009	R	0.25	<0.04	-	-
SRA-R3/C3-5'	08/26/2009	R	5	<0.04	-	-
SRA-R3/C3-9'	08/26/2009	D	10	0.083	-	-
SRA-R3/C3-10'	08/26/2009	R	10	0.091	-	-
SRA-R3/C4-3"	08/26/2009	R	0.25	<0.02	-	<1
SRA-R3/C4-5'	08/26/2009	R	5	0.19	-	1.6
SRA-R3/C4-10'	08/26/2009	R	10	0.42	-	4.2
SRA-R4/C1-3"	08/27/2009	R	0.25	4.6	320	47
SRA-R4/C1-5'	08/27/2009	R	5	0.1	<5	2
SRA-R4/C1-10'	08/27/2009	R	10	7.8	5.8	38
SRA-R4A/C2-3"	08/26/2009	R	0.25	0.45	310	5.5
SRA-R4A/C2-4'	08/26/2009	D	5	0.45	<5	6.5
SRA-R4A/C2-5'	08/26/2009	R	5	0.39	<5	5.3
SRA-R4A/C2-10'	08/26/2009	R	10	1.1	<5	3.3
SRA-R4A/C2-13'	08/26/2009	R	13	0.1	23	<1
SRA-R4B/C2-3"	08/27/2009	R	0.25	<0.02	<5	<1
SRA-R4B/C2-5'	08/27/2009	R	5	0.32	<5	1.4
SRA-R4B/C2-10'	08/27/2009	R	10	4.6	<5	9.9
SRA-R4/C3-3"	08/26/2009	R	0.25	0.087	**410**	7.1
SRA-R4/C3-5'	08/26/2009	R	5	**36**	<5	250
SRA-R4/C3-8.5'	08/26/2009	R	8.5	2.9	<5	4.2
SRA-R4/C3B-3"	08/27/2009	R	0.25	<0.02	<5	<1
SRA-R4/C3B-5'	08/27/2009	R	5	0.046	<5	<1
SRA-R4/C3B-8'	08/27/2009	R	8	0.034	40	<1
SRA-R4/C4-3"	08/26/2009	R	0.25	0.58	-	-
SRA-R4/C4-4.5'	08/26/2009	R	4.5	0.068	-	-
SRA-R5/C1-3"	08/27/2009	R	0.25	<0.02	-	-

TABLE 4-6
Soil Sample Results for Storm Water Accumulation Area - 2009
Thermal Treatment Unit RFI
Nammo Talley, Inc.

Soil Sample Information				Analytical Results (in mg/kg)		
Sample ID	**Sample Date**	**Sample Type**	**Sample Depth (ft)**	**Total Perchlorate (USEPA 314.0)**	**Total Lead (USEPA 6010B)**	**Total Nitrate (USEPA 9056)**
Characterization Screening Level (lower value of R-SRL or GPL)			**R-SRL**	55	**400**	NE
			GPL	**12.4[a]/49.5[b]**	2,717	**7,970[a]/31,860[b]**
SRA-R5/C1-4'	08/27/2009	D	5	0.038	-	-
SRA-R5/C1-5'	08/27/2009	R	5	0.04	-	-
SRA-R5/C1-10'	08/27/2009	R	10	0.055	-	-
SRA-R5/C1-11'	08/27/2009	R	11	<0.02	-	-
SRA-R5/C2-3"	08/27/2009	R	0.25	0.075	120	4.4
SRA-R5/C2-5'	08/27/2009	R	5	<0.02	<5	<1
SRA-R5/C2-8'	08/27/2009	R	8	0.041	<5	<1
SRA-R5/C3-3"	08/27/2009	R	0.25	0.033	190	2.7
SRA-R5/C3-8"	08/27/2009	D	0.25	0.036	220	2.8
SRA-R5/C3-5'	08/27/2009	R	5	<0.02	<5	<1
SRA-R5/C3-9'	08/27/2009	D	10	<0.02	<5	<1
SRA-R5/C3-10'	08/27/2009	R	10	<0.02	<5	<1
SRA-R5/C4-3"	08/26/2009	R	0.25	0.18	12	8.2
SRA-R5/C4-5'	08/26/2009	R	5	**17**	<5	32
SRA-R5/C4-7.5'	08/26/2009	R	7.5	1.6	<5	3
SRA-R5/C5-3"	08/27/2009	R	0.25	0.17	370	1.4
SRA-R6/C2-3"	08/27/2009	R	0.25	0.033	-	1.6
SRA-R6/C2-5'	08/27/2009	R	5	<0.1	-	45
SRA-R6/C2-10'	08/27/2009	R	10	0.099	-	28
SRA-R6/C3-3"	08/27/2009	R	0.25	<0.02	-	-
SRA-R6/C3-5'	08/27/2009	R	5	0.65	-	-
SRA-R6/C3-10'	08/27/2009	R	10	0.43	-	-
SRA-R7/C2-3"	08/27/2009	R	0.25	<0.02	-	-
SRA-R7/C2-4'	08/27/2009	D	5	0.11	-	-
SRA-R7/C2-5'	08/27/2009	R	5	<0.02	-	-
SRA-R7/C2-10'	08/27/2009	R	10	<0.02	-	-
SRA-R7/C3-3"	08/27/2009	R	0.25	<0.02	-	-
SRA-R7/C3-5'	08/27/2009	R	5	0.34	-	-
SRA-R7/C3-9'	08/27/2009	R	9	<0.02	-	-

Notes:

[a] Site Specific Screening GPL based on a single dilution factor as calculated and submitted in Brown & Caldwell's February 19, 2010 letter to ADEQ.

[b] Site Specific GPL based on the double dilution factor (used in ADEQ's 9-26-2006 Perchlorate GPL memo) as calculated and submitted in Brown & Caldwell's February 19, 2010 letter to ADEQ.

Bold *result values indicate analyte concentration exceeds the soil characterization screening level (lower value of R-SRL or minimum GPL)*

- = Not Analyzed
< = Analyte was not detected at concentration above the reporting limit
D = Duplicate sample
GPL = Groundwater Protection Level
mg/kg = milligrams per kilogram
NE = Not established
R = Regular sample
R-SRL = Residential Soil Remediation Level
TBD = To be determined
USEPA = United States Environmental Protection Agency

TABLE 4-7
Soil Sample Summary, Arcadis Soil Remediation Summary Report - 2011
Thermal Treatment Unit RFI
Nammo Talley, Inc.

Sample ID:	Date Collected:	Time Collected:	Sample Depth:	Lead Results (mg/kg)	Location			
					Latitude	Longitude	Northing	Easting
Phase 1 Soil Removal Area Samples								
SRA-R3/C1	1/11/2011	9:20	0" - 6"	**670**	33.49984168	-111.7157244	909451.994	761254.111
FD-011111-01	1/11/2011	--	0" - 6"	**800**	same as SRA-R3/C1			
SRA-B1-3	1/11/2011	10:15	3" - 6"	<5.0	33.49969169	-111.7155462	909397.523	761308.525
SRA-B2-3	1/11/2011	10:20	3" - 6"	<5.0	33.4996779	-111.7155063	909392.528	761320.704
SRA-B3-0	1/11/2011	10:22	0" - 6"	7.6	33.49966672	-111.7154772	909388.478	761329.574
SRA-B4-0	1/11/2011	10:24	0" - 6"	11	33.49964253	-111.7155438	909379.637	761309.276
SRA-B5-0	1/11/2011	10:26	0" - 6"	86	33.49970065	-111.7155695	909400.768	761301.420
SRA-B6-0	1/11/2011	10:28	0" - 6"	37	33.49972605	-111.7155065	909410.047	761320.600
SRA-C1-6	1/11/2011	11:25	6" - 9"	6.5	33.49999651	-111.7155591	909508.424	761304.388
FD-011111-02	1/11/2011	--	6" - 9"	7.8	same as SRA-C1-6			
SRA-C2-6	1/11/2011	11:27	6" - 9"	22	33.50003153	-111.7155325	909521.183	761312.464
SRA-C3-0	1/11/2011	11:29	0" - 6"	26	33.50004998	-111.7155099	909527.908	761319.346
SRA-C4-0	1/11/2011	11:31	0" - 6"	34	33.49999724	-111.7155173	909508.715	761317.130
SRA-C5-0	1/11/2011	11:33	0" - 6"	**480**	33.4999827	-111.7155759	909503.389	761299.278
SRA-C6-0	1/11/2011	11:35	0" - 6"	**530**	33.50004193	-111.7155746	909524.942	761299.627
SRA-D1-6	1/11/2011	12:30	6" - 9"	<5.0	33.49944343	-111.7151229	909307.443	761437.732
SRA-D2-6	1/11/2011	12:32	6" - 9"	<5.0	33.49942777	-111.7150811	909301.768	761450.488
SRA-D3-0	1/11/2011	12:34	0" - 6"	9.6	33.49941868	-111.7150581	909298.475	761457.515
SRA-D4-0	1/11/2011	12:36	0" - 6"	310	33.49939874	-111.7151218	909291.184	761438.092
SRA-D5-0	1/11/2011	12:38	0" - 6"	**650**	33.49945177	-111.7151432	909310.465	761431.533
SRA-D6-0	1/11/2011	12:40	0" - 6"	5.6	33.49947449	-111.7150834	909318.766	761449.750
SRA-A1-0	1/11/2011	13:15	0" - 6"	260	33.49935992	-111.7151899	909277.017	761417.379
SRA-A2-0	1/11/2011	13:20	0" - 6"	76	33.49936794	-111.7153269	909279.855	761375.614
SRA-A3-3	1/11/2011	13:25	3" - 6"	**840**	33.49936026	-111.7153354	909277.053	761373.028
SRA-A4-0	1/11/2011	13:30	0" - 6"	**480**	33.49934835	-111.7153364	909272.719	761372.718
SRA-A5-0	1/11/2011	13:45	0" - 6"	260	33.49944544	-111.7154998	909307.950	761322.845
SRA-A6-3	1/11/2011	13:47	3" - 6"	230	33.49943364	-111.7155069	909303.655	761320.686
SRA-A7-0	1/11/2011	13:50	0" - 6"	130	33.49942175	-111.7155147	909299.321	761318.319
SRA-A8-0	1/11/2011	14:00	0" - 6"	140	33.49951831	-111.7156774	909334.360	761268.664
SRA-A9-0	1/11/2011	14:02	0" - 6"	7.7	33.49949636	-111.7156898	909326.366	761264.887
SRA-A10-3	1/11/2011	14:10	3" - 6"	20	33.49957019	-111.7158623	909353.128	761212.260
FD-011111-03	1/11/2011	--	3" - 6"	18	same as SRA-A10-3			
SRA-A11-0	1/11/2011	14:15	0" - 6"	90	33.49957142	-111.715873	909353.568	761208.977
Phase 2 Soil Removal Area Samples								
SRA-E1-6	1/17/2011	10:35	6" - 9"	130 J	33.49982756	-111.7157361	909446.848	761250.536
SRA-E2-6	1/17/2011	10:37	6" - 9"	42 J	33.49985695	-111.7157096	909457.558	761258.603
SRA-E3-0	1/17/2011	10:39	0" - 6"	**600 J**	33.4998715	-111.7156968	909462.860	761262.494

TABLE 4-7
Soil Sample Summary, Arcadis Soil Remediation Summary Report - 2011
Thermal Treatment Unit RFI
Nammo Talley, Inc.

Sample ID:	Date Collected:	Time Collected:	Sample Depth:	Lead Results (mg/kg)	Location			
					Latitude	Longitude	Northing	Easting
Phase 2 Soil Removal Area Samples (continued)								
SRA-E4-0	1/17/2011	10:43	0" - 6"	**950 J**	33.49981299	-111.7156777	909441.580	761268.352
SRA-C7-6	1/17/2011	12:20	6" - 9"	**1,000 J**	33.50001335	-111.7156241	909512.650	761287.897
SRA-C8-6	1/17/2011	12:24	6" - 9"	46 J	33.5000479	-111.7156073	909527.097	761289.639
SRA-C9-0	1/17/2011	12:26	0" - 6"	360 J	33.50006467	-111.7156033	909533.198	761290.842
SRA-C10-6	1/17/2011	12:28	6" - 9"	32 J	33.50001037	-111.7156634	909513.405	761272.558
SRA-C11-0	1/17/2011	12:30	0" - 6"	**540 J**	33.50005884	-111.7156534	909531.049	761275.580
SRA-C12-6	1/17/2011	12:35	6" - 9"	24 J	33.49994858	-111.715605	909490.958	761290.420
SRA-C13-6	1/17/2011	12:37	6" - 9"	40 J	33.49997008	-111.7156272	909498.767	761283.650
SRA-C14-0	1/17/2011	12:39	0" - 6"	**600 J**	33.49994188	-111.715576	909488.538	761299.275
SRA-C15-0	1/17/2011	12:44	0" - 6"	**660 J**	33.49992725	-111.7156369	909483.178	761280.694
SRA-C16-6	1/17/2011	12:46	6" - 9"	83 J	33.50000213	-111.7156832	909510.398	761266.543
SRA-C17-0	1/17/2011	12:48	0" - 6"	**840 J**	33.50001554	-111.7156203	909515.312	761285.702
SRA-C18-0	1/17/2011	12:50	0" - 6"	170 J	33.50002853	-111.7156987	909519.995	761261.799
FD-011711-02	1/17/2011	--	0" - 6"	**670 J**	same as SRA-C18-0			
SRA-E5-0	1/17/2011	13:26	0" - 6"	**670 J**	33.49979671	-111.7157562	909435.612	761244.443
SRA-E6-0	1/17/2011	13:30	0" - 6"	260 J	33.49987109	-111.7157751	909462.663	761238.616
FD-011711-01	1/17/2011	--	0" - 6"	260 J	same as SRA-E6-0			
SRA-D7-6	1/17/2011	14:02	6" - 9"	<5.0	33.49944942	-111.7151935	909309.582	761416.196
SRA-D8-6	1/17/2011	14:05	6" - 9"	<5.0	33.49948504	-111.7151752	909322.551	761421.776
FD-011711-03	1/17/2011	--	6" - 9"	<5.0	same as SRA-D8-6			
SRA-D9-0	1/17/2011	14:14	0" - 6"	6.7	33.49950527	-111.7151627	909329.920	761425.562
SRA-D10-0	1/17/2011	14:16	0" - 6"	<5.0	33.49942754	-111.7152066	909301.613	761412.227
SRA-D11-0	1/17/2011	14:18	0" - 6"	5.2	33.49948463	-111.7152281	909322.371	761405.627
SRA-A12-6	1/17/2011	14:45	6" - 9"	350	33.49934757	-111.715374	909270.552	761364.599
SRA-A13-6	1/17/2011	14:47	6" - 9"	9.4	33.49933495	-111.7153424	909267.843	761370.896
SRA-A14-0	1/17/2011	14:50	0" - 6"	370	33.49932624	-111.7153136	909264.691	761379.674
SRA-A15-0	1/17/2011	14:52	0" - 6"	15	33.4993055	-111.7153824	909257.105	761358.738
SRA-A16-0	1/17/2011	14:54	0" - 6"	**850**	33.49936148	-111.7154019	909277.459	761352.755
Phase 3 Soil Removal Area Samples								
SRA-A17-12	1/31/2011	9:15	12" - 15"	110	33.49936052	-111.7153389	909277.148	761371.959
SRA-A19-6	1/31/2011	10:24	6" - 9"	120	33.49936611	-111.7153525	909279.173	761367.799
SRA-A18-6	1/31/2011	10:28	6" - 9"	270	33.49935102	-111.7153225	909273.700	761376.952
SRA-C19-0	1/31/2011	12:10	0" - 6"	54	33.50003828	-111.7157329	909523.520	761251.353
SRA-C20-0	1/31/2011	12:12	0" - 6"	5.6	33.50009278	-111.7156956	909543.371	761262.692
SRA-C21-0	1/31/2011	12:15	0" - 6"	16	33.500122	-111.7156397	909554.036	761279.728
SRA-C22-6	1/31/2011	12:18	0" - 6"	5.7	33.50010259	-111.7156445	909546.970	761278.257

TABLE 4-7
Soil Sample Summary, Arcadis Soil Remediation Summary Report - 2011
Thermal Treatment Unit RFI
Nammo Talley, Inc.

Sample ID:	Date Collected:	Time Collected:	Sample Depth:	Lead Results (mg/kg)	Location			
					Latitude	Longitude	Northing	Easting
Phase 3 Soil Removal Area Samples (continued)								
SRA-C23-6	1/31/2011	12:21	6" - 9"	13	33.50007914	-111.715672	909538.425	761269.914
FD-013111-01	1/31/2011	--	6" - 9"	14	same as SRA-C23-6			
SRA-C24-6	1/31/2011	12:25	6" - 9"	5.9	33.50005027	-111.7157005	909527.901	761261.248
SRA-C25-0	1/31/2011	12:49	0" - 6"	260	33.49996982	-111.7157633	909498.595	761242.133
SRA-C26-0	1/31/2011	12:51	0" - 6"	48	NA	NA	NA	NA
SRA-C27-6	1/31/2011	12:54	6" - 9"	230	33.49995778	-111.7157378	909494.229	761249.927
SRA-C28-6	1/31/2011	12:57	6" - 9"	220	33.49993564	-111.715703	909486.194	761260.544
SRA-C29-6	1/31/2011	13:22	6" - 9"	140	33.49990213	-111.7157228	909473.987	761254.541
SRA-C30-6	1/31/2011	13:25	6" - 9"	42	33.49989879	-111.715759	909472.752	761243.518
SRA-C31-6	1/31/2011	13:56	6" - 9"	<5.0	33.49992592	-111.7155531	909482.744	761306.253
SRA-C32-6	1/31/2011	13:59	6" - 9"	<5.0	33.49990776	-111.7155274	909476.151	761314.098
SRA-C33-0	1/31/2011	14:01	0" - 6"	7.6	33.49989168	-111.7155008	909470.317	761322.211
SRA-C34-0	1/31/2011	14:05	0" - 6"	**590**	33.49994738	-111.7155179	909490.575	761316.966
SRA-C35-12	1/31/2011	14:52	12" - 15"	7.5	33.50003226	-111.7156317	909521.389	761282.225
SRA-C36-12	1/31/2011	14:55	12" - 15"	8.8	33.49999791	-111.7156064	909508.908	761289.959
FD-013111-02	1/31/2011	--	12" - 15"	8.7	same as SRA-C36-12			
SRA-C37-6	2/1/2011	10:20	6" - 9"	87	33.50004272	-111.71565	909523.321	761279.960
SRA-C38-6	2/1/2011	10:23	6" - 9"	35	33.49990999	-111.7156751	909476.877	761269.082
SRA-C39-6	2/1/2011	10:26	6" - 9"	<5.0	33.4998879	-111.7156498	909468.852	761276.818
SRA-C40-6	2/1/2011	10:29	6" - 9"	<5.0	33.49987284	-111.7156143	909463.394	761287.636
SRA-C41-6	2/1/2011	10:32	6" - 9"	<5.0	33.49985394	-111.7155864	909456.536	761296.145
SRA-C42-0	2/1/2011	10:35	0" - 6"	11	33.49983367	-111.7155533	909449.178	761306.249
SRA-E11-0	2/1/2011	11:38	0" - 6"	42	33.49979279	-111.7155503	909434.307	761307.196
SRA-E10-6	2/1/2011	11:40	6" - 9"	6.4	33.49975861	-111.7155809	909421.850	761297.900
SRA-E9-6	2/1/2011	11:42	6" - 9"	15	33.49977632	-111.7156084	909428.278	761289.496
SRA-E7-6	2/1/2011	12:30	6" - 9"	26	33.49981835	-111.7156325	909443.556	761282.141
FD-020111-01	2/1/2011	--	6" - 9"	27	same as SRA-E7-6			
SRA-E8-6	2/1/2011	12:45	6" - 9"	110	33.49978482	-111.715662	909431.342	761273.172
SRA-E12-0	2/1/2011	12:48	0" - 6"	13	33.49972543	-111.7156152	909409.760	761287.462
SRA-E13-0	2/1/2011	13:10	0" - 6"	**420**	33.49971343	-111.7156567	909405.367	761274.819
SRA-E14-0	2/1/2011	13:12	0" - 6"	160	33.49965883	-111.7157136	909385.466	761257.511
SRA-E15-0	2/1/2011	13:15	0" - 6"	**650**	33.49964553	-111.7157916	909380.584	761233.744
SRA-E16-0	2/1/2011	13:17	0" - 6"	330	33.49969238	-111.7158216	909397.613	761224.583
SRA-E17-0	2/1/2011	13:19	0" - 6"	13	33.49973566	-111.7158369	909413.352	761219.871
SRA-E18-0	2/1/2011	13:21	0" - 6"	17	33.49977289	-111.7158121	909426.909	761227.409
SRA-E19-6	2/2/2011	9:45	6" - 9"	13	33.4996624	-111.7157706	909386.735	761240.136
SRA-E20-6	2/2/2011	9:49	6" - 9"	69	33.49967849	-111.7157542	909392.597	761245.128

TABLE 4-7
Soil Sample Summary, Arcadis Soil Remediation Summary Report - 2011
Thermal Treatment Unit RFI
Nammo Talley, Inc.

Sample ID:	Date Collected:	Time Collected:	Sample Depth:	Lead Results (mg/kg)	Location			
					Latitude	Longitude	Northing	Easting
Phase 3 Soil Removal Area Samples (continued)								
FD-020211-01	2/2/2011	--	6" - 9"	77	same as SRA-E20-6			
SRA-E21-6	2/2/2011	9:52	6" - 9"	10	33.49973107	-111.7156811	909411.771	761267.363
SRA-E22-6	2/2/2011	9:55	6" - 9"	14	33.49974421	-111.7157014	909416.542	761261.186
SRA-E23-6	2/2/2011	9:57	6" - 9"	25	33.49972045	-111.7157969	909407.840	761232.091
SRA-E24-6	2/2/2011	10:00	6" - 9"	13	33.49973141	-111.7157784	909411.838	761237.710
SRA-E25-6	2/2/2011	10:02	6" - 9"	24	33.49976653	-111.7157812	909424.613	761236.823
SRA-E26-6	2/2/2011	10:04	6" - 9"	11	33.49976283	-111.7157557	909423.283	761244.608
SRA-E27-6	2/2/2011	10:06	6" - 9"	20	33.49972095	-111.7157376	909408.056	761250.168
SRA-E28-6	2/2/2011	10:08	6" - 9"	16	33.49969961	-111.7157163	909400.303	761256.654
SRA-A20-6	2/2/2011	10:38	6" - 9"	7.1	33.49936271	-111.7154434	909277.883	761340.107
SRA-A21-6	2/2/2011	10:40	6" - 9"	14	33.49939593	-111.715422	909289.983	761346.601
SRA-A22-0	2/2/2011	10:43	0" - 6"	**620**	33.49941598	-111.7154129	909297.282	761349.342
SRA-A23-0	2/2/2011	10:46	0" - 6"	21	33.49934039	-111.7154584	909269.754	761335.526
SRA-A24-0	2/2/2011	10:50	0" - 6"	260	33.49939271	-111.7154787	909288.779	761329.324
FD-020211-02	2/2/2011	--	0" - 6"	340	same as SRA-A24-0			
Phase 4 Soil Removal Area Samples								
SRA-C43-6	2/9/2011	10:28	6" - 9"	6.5	33.49998775	-111.715505	909503.406	761324.207
SRA-C44-6	2/9/2011	10:30	6" - 9"	5.6	33.4999724	-111.7154839	909497.834	761330.665
SRA-C45-0	2/9/2011	10:34	0" - 6"	38	33.49994788	-111.7154461	909488.936	761342.203
SRA-C46-0	2/9/2011	10:37	0" - 6"	46	33.50001727	-111.7154514	909514.180	761340.512
SRA-E29-0	2/9/2011	14:55	0" - 6"	<5.0	33.49964695	-111.7158858	909379.180	761208.368
SRA-E30-3	2/9/2011	14:57	3" - 9"	15	33.49958455	-111.7158682	909356.484	761213.760
SRA-E31-6	2/9/2011	15:00	6" - 9"	11	33,49961923	-111.7158583	909369.110	761216.783
SRA-E32-6	2/9/2011	15:02	6" - 9"	30	33.49965116	-111.715844	909380.737	761221.115
SRA-E33-6	2/9/2011	15:04	6" - 9"	14	33.49967185	-111.7158361	909388.267	761223.510
SRA-A25-6	2/10/2011	8:37	6" - 9"	100	33.49943342	-111.7153797	909301.785	761362.793
SRA-A26-6	2/10/2011	8:39	6" - 9"	360	33.49944541	-111.715412	909306.127	761352.936
FD-021011-01	2/10/2011	--	6" - 9"	290	same as SRA-A26-6			
SRA-A27-3	2/10/2011	8:44	3" - 9"	7.8	33.49947414	-111.7154319	909316.571	761346.849
SRA-A28-3	2/10/2011	8:48	3" - 9"	100	33.49942224	-111.7153604	909297.723	761368.703
SRA-A29-0	2/10/2011	8:50	0" - 6"	6.9	33.49947906	-111.7153726	909318.395	761364.924
SRA-E34-6	2/10/2011	9:47	6" - 9"	<5.0	33.49962136	-111.7157884	909369.925	761238.068
SRA-E35-6	2/10/2011	9:50	6" - 9"	10	33.49959282	-111.7158019	909359.534	761233.975
SRA-E36-3	2/10/2011	9:52	3" - 9"	12	33.49957172	-111.7158099	909351.850	761231.549
SRA-E37-3	2/10/2011	13:55	3" - 9"	7.4	33.49953989	-111.7157407	909340.312	761252.665
SRA-E38-0	2/10/2011	13:57	0" - 6"	280	33.49954892	-111.715666	909343.643	761275.448
SRA-E39-6	2/10/2011	14:02	6" - 9"	6.4	33.49957999	-111.7157197	909354.915	761259.039

TABLE 4-7
Soil Sample Summary, Arcadis Soil Remediation Summary Report - 2011
Thermal Treatment Unit RFI
Nammo Talley, Inc.

Sample ID:	Date Collected:	Time Collected:	Sample Depth:	Lead Results (mg/kg)	Location			
					Latitude	Longitude	Northing	Easting
Phase 4 Soil Removal Area Samples (continued)								
SRA-E40-6	2/10/2011	14:05	6" - 9"	<5.0	NA	NA	NA	NA
FD-021011-02	2/10/2011	--	6" - 9"	<5.0	same as SRA-E40-6			
SRA-E41-0	2/11/2011	8:15	0" - 6"	5.9	33.49960035	-111.7156177	909362.379	761290.142
SRA-E42-0	2/11/2011	8:20	0" - 6"	13	33.49965292	-111.7155715	909381.539	761304.159
SRA-E43-6	2/11/2011	8:24	6" - 9"	5.1	33.4996172	-111.715641	909368.498	761283.000
SRA-E44-6	2/11/2011	8:26	6" - 9"	5.5	33.49963525	-111.7156676	909375.051	761274.877
SRA-E45-6	2/11/2011	8:30	6" - 9"	<5.0	33.49966631	-111.7155935	909386.396	761297.468
SRA-E46-6	2/11/2011	8:32	6" - 9"	<5.0	33.49968571	-111.7156208	909393.439	761289.122
SRA-E47-0	2/11/2011	8:35	0" - 6"	<5.0	33.49971354	-111.7155825	909403.588	761300.772

Notes:

J = estimated value

NA = not available

Bold = detections that are greater than 400 milligrams per kilograms

TABLE 4-8
Soil Sample Summary, Soil and Bedrock Investigation Report - 2011
Thermal Treatment Unit RFI
Nammo Talley, Inc.

Sample ID	Date Collected	Sample Depth	Perchlorate Results (mg/kg)	Comments
SRA-BC-1	5/2/2011	1	0.14	
SRA-BC-5	5/2/2011	5	0.51	
SRA-BC-10	5/2/2011	10	0.067	
SRA-BC-12	5/4/2011	12	0.55	
SRA-BC-15	5/2/2011	15	0.023	
SRA-BC-20	5/2/2011	20	0.047	
SRA-BC-25	5/2/2011	25	0.7	
SRA-BA-1	5/3/2011	1	<0.020	
SRA-BA-5	5/3/2011	5	5.4	
SRA-BA-10	5/3/2011	10	5.3	
SRA-B2-2	5/4/2011	2	12	
SRA-F-2.2	5/4/2011	2	12	same as SRA-B2-2
SRA-B2-5	5/4/2011	5	**29**	
SRA-B2-10	5/4/2011	10	2.4	
SRA-B2-12	5/4/2011	12	8.2	
SRA-B1-1	5/4/2011	1	0.089	
SRA-B1-5	5/4/2011	5	3.8	
SRA-B1-10	5/4/2011	10	0.1	
SRA-B4-2	5/5/2011	2	3.7	
SRA-B4-5	5/5/2011	5	6.9	
SRA-B4-10	5/5/2011	10	0.45	
SRA-F-10.4	5/5/2011	10.4	0.47	same as SRA-B4-10
SRA-B4-15	5/5/2011	15	0.94	
SRA-B4-20	5/5/2011	20	9	
SRA-B4-25	5/5/2011	25	8.5	
SRA-B4-26.5	5/5/2011	26.5	3.7	
SRA-B3-2	5/5/2011	2	0.077	
SRA-B3-5	5/5/2011	5	0.12	
SRA-B3-10	5/5/2011	10	0.039	
SRA-B3-15	5/5/2011	15	0.12	
SRA-B3-20	5/5/2011	20	0.022	
SRA-B5-1	5/5/2011	1	<0.020	
SRA-B5-5	5/5/2011	5	0.48	
SRA-F-5.5	5/5/2011	5	0.6 J	same as SRA-B5-5
SRA-B5-10	5/5/2011	10	0.043 J	
SRA-B-5-12.5	5/5/2011	12.5	0.044 J	
SRA-BB-1	5/5/2011	1	<0.020 UJ	
SRA-BB-5	5/5/2011	5	0.56 J	
SRA-BB-10	5/5/2011	10	0.67 J	
SRA-BB-13	5/5/2011	13	0.78 J	
SRA-F-13.8	5/5/2011	13	0.8 J	same as SRA-BB-13

Notes:

Bold *result value indicates analyte concentration exceeds the GPL of 16 mg/kg*

"--" = not analyzed

J = estimated value

mg/kg = milligrams per kilogram

UJ= estimated reporting limit

TABLE 4-9
Summary of Analytical Results for Soil Samples in the Storm Water Retention Area - 2013-2014
Thermal Treatment Unit RFI
Nammo Talley, Inc.

	Boring No.	Depth (feet bgs)	Total Perchlorate (mg/kg)	Data Qualifier	SPLP Perchlorate (mg/L)	Data Qualifier
H&A Confirmation Sampling (2013)	SRA-B2-1	0.25	0.011	E4	<0.00078	
		5.0	9.3 / 12		0.44 / 0.61	
		10.0	19		0.53	
	SRA-B2-2	0.25	0.013	E4	<0.00078	E8
		5.0	31		1.7	
		10.0	6.0		0.19	
	SRA-B2-3	0.25	0.023		0.0012	E4
		5.0	4.0	M4	0.17	
		10.0	1.1		0.024	
H&A Confirmation Sampling (2014)	SRA-B2-4	5.0	0.44		NA	
		7.0	0.18		NA	
	SRA-B2-5	5.0	33		NA	
		9.0	3.1	D2	NA	
	SRA-B2-6	5.0	11.0	D2	NA	
		7.5	2.2	D2	NA	
	SRA-B2-7	5.0	27	D2	NA	
		8.5	63	D2	NA	
	SRA-B2-8	5.0	12	D2	NA	
		8.5	0.18		NA	
	SRA-B2-9	5.0	5.1	D2	NA	
		8.0	83	D2	NA	
	SRA-B2-10	5.0	2.9	D2	NA	
		8.0	1.2		NA	
	SRA-B2-11	5.0	37	D2, M3	NA	
		9.0	39	D2	NA	
	SRA-B2-12	5.0	1.9	D2	NA	
		9.0	9.4	D2	NA	
	SRA-B2-13	5.0	0.61	D2	NA	
		9.0	2.0	D2	NA	
	SRA-B2-14	5.0	0.024		NA	
		10.0	28	D2	NA	
	SRA-B2-15	5.0	1.9	D2	NA	
		7.0	26	D2, M4	NA	

Notes:

Exceeds Site-Specific Groundwater Protection Level (GPL)

D2= Sample required dilution due to high concentration of analyte.

E4 = Concnetration is estimated. Analyte was detected below the RL but above the MDL

E8 = Target analyte was not detected at a concentration equal to or exceeding the MDL

M3 = The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The associated blank spike was acceptable.

M4 = The analysis of the spiked sample required a dilution such that the spike recovery calculation does not provide useful information. The associated blank spike recovery was acceptable.

bgs = below ground surface

mg/kg = milligrams per kilogram

mg/L = milligrams per liter

NA = Not analyzed

TABLE 4-10
Well Construction Summary Table
Thermal Treatment Unit RFI
Nammo Talley, Inc.

Well ID	Type of Well	X Coordinate/ Easting (NAD83)	Y Coordinate/ Northing (NAD83)	Z Coordinate/ TOC Elevation (NAVD88)	Well Owner	Well Completion Date	Casing Diameter (inches)	Top of Seal (feet bls)	Bottom of Seal (feet bls)	Top of Filter Pack (feet bls)	Bottom of Filter Pack (feet bls)	Top of Screen (feet bls)	Bottom of Screen (feet bls)	Bottom of Boring (feet bls)	Bottom of Casing (feet bls)	Well Construction Materials	
																Casing	Screen
TTU-1	Monitoring Well	909420.73	761281.20	1312.73	Nammo Talley	6/6/2012	4	0	25	25	77	30	70	200	75	Sch 40 PVC	Sch 40 PVC
TTU-2	Monitoring Well	909087.85	761148.27	1314.44	Nammo Talley	10/17/2013	4	0	44.8	44.8	187.5	49.4	179.6	187.5	185	Sch 40 PVC	Sch 40 PVC
TTU-3	Monitoring Well	909303.36	760888.20	1308.03	Nammo Talley	10/18/2013	4	0	73.3	73.3	147	78.1	138.1	180	143.6	Sch 40 PVC	Sch 40 PVC
TTU-4	Monitoring Well	909673.68	761041.98	1305.12	Nammo Talley	10/25/2013	4	0	35.5	35.5	111	39.5	99.5	180	104.9	Sch 40 PVC	Sch 40 PVC
TTU-5	Monitoring Well	908747.64	761102.23	1314.93	Nammo Talley	9/20/2014	4	0	54	54	174	59.5	164.5	174	169.5	Sch 40 PVC	Sch 40 PVC
TTU-6	Monitoring Well	909260.82	760560.10	1300.84	Nammo Talley	10/7/2014	4	0	85	85	185	110	175	185	180	Sch 40 PVC	Sch 40 PVC
TTU-7	Monitoring Well	909287.61	760527.27	1301.84	Nammo Talley	10/8/2014	4	0	282	---	---	282	410	410	410	---	Open Hole Completion
TTU-8	Monitoring Well	909699.27	760514.91	1310.23	Nammo Talley	7/1/2016	4	0	129	129	192	135	185	204	190	Sch 40 PVC	Sch 40 PVC
TTU-9A	Monitoring Well	909974.49	761710.15	1318.04	Nammo Talley	8/1/2016	4	0	20	20	105	24	99	105	104	Sch 40 PVC	Sch 40 PVC
TTU-10	Monitoring Well	908960.11	760297.01	1302.42	Nammo Talley	8/1/2016	4	0	110	110	187	115	180	204	185	Sch 40 PVC	Sch 40 PVC
TTU-11	Monitoring Well	909029.76	761706.47	1339.20	Nammo Talley	9/11/2015	4	0	21	21	95	24.1	89.1	136	94.1	Sch 40 PVC	Sch 40 PVC
PF-1	Supply Well	909161.58	760140.43	1295.99	University of Washington	3/27/2013	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown
PF-2	Supply Well	909166.89	760122.25	1296.35	University of Washington	3/27/2013	8 5/8	0	20	unknown	unknown	unknown	unknown	unknown	unknown	Steel	unknown

NOTES:

bls = below land surface

NAD83 = North American Datum of 1983, Arizona State Plane Grid Coordinates (International Feet)

NAVD88 = North American Vertical Datum of 1988

PVC = polyvinyl chloride

TOC = top of casing

--- = Not applicable.

TABLE 4-11
Perchlorate Concentrations in TTU-2 to TTU-4 Depth-Specific Samples - 2013
Thermal Treatment Unit RFI
Nammo Talley, Inc.

TTU-2		TTU-3		TTU-4	
Screened Interval	50-180	Screened Interval	78-138	Screened Interval	40-100
Depth to Water (12/30/13)	60.3	Depth to Water (12/30/13)	94.2	Depth to Water (12/30/13)	50.9
Water Level Elevation (12/30/13)	1251.5	Water Level Elevation (12/30/13)	1211.3	Water Level Elevation (12/30/13)	1251.6
Observed Flow Zones	100 incr. moist. Below ~150'	Observed Flow Zones	127	Observed Flow Zones	86
Sample Depth (feet bgs)	**Perchlorate Concetration[1] (µg/L)**	**Sample Depth (feet bgs)**	**Perchlorate Concetration[2] (µg/L)**	**Sample Depth (feet bgs)**	**Perchlorate Concetration (µg/L)**
70 (WT)	180,000	103 (WT)	340	59 (WT)	<2.0
100	210,000	127	330	87	<2.0
178 (BOT)	230,000	138 (BOT)	320	100 (BOT)	<2.0

NOTES:

[1] dilution factor of 10,000

[2] dilution factor of 25

µg/L = micrograms per liter

bgs = below ground surface

BOT = sample at bottom of screened interval

WT = sample at water table

TABLE 4-12
Detected Sorbed Volatile Organic Compounds from Soil Vapor - 2015
Thermal Treatment Unit RFI
Nammo Talley, Inc.

Module ID	Sample Depth (Inches bgs)	Lithology	Installation Date	Retrieval Date	Sorbed Mass of Volatile Organic Compounds (micrograms)														
					Benzene	Ethylbenzene	m-p-Xylene	o-Xylene	Toluene	BTEX[1]	TPH[2]	Undecane	1-1-1-Trichloroethane	1-1-2-Trichloroethane	1-1-Dichloroethene	Chlorobenzene	Chloroform	Tetrachloroethene	Trichloroethene
760483	36	Soil	6/24/2015	7/8/2015	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	**1.85**	<0.05	<0.02	<0.02	**0.18**	<0.02	<0.02	<0.02	**0.92**
760484	40	Soil	6/24/2015	7/8/2015	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	**3.67**	<0.05	<0.02	<0.02	**0.04**	<0.02	<0.02	<0.02	**0.12**
760485	43	Soil	6/24/2015	7/8/2015	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	**3.75**	<0.05	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	**0.02**
760486	36	Soil	6/24/2015	7/8/2015	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	**2.77**	<0.05	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
760487	35	Soil	6/24/2015	7/8/2015	<0.02	<0.02	**0.03**	**0.02**	<0.02	**0.05**	**1.84**	<0.05	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
760487D[3]					<0.02	<0.02	**0.03**	**0.02**	<0.02	**0.05**	**3.41**	**0.09**	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
760488	36	Bedrock	6/24/2015	7/8/2015	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	**3.95**	<0.05	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
760489	48	Soil	6/24/2015	7/8/2015	<0.02	<0.02	**0.02**	**0.03**	<0.02	**0.05**	**2.58**	<0.05	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	**0.15**
760490	36	Bedrock	6/24/2015	Missing	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
760491	33	Soil	6/24/2015	7/8/2015	<0.02	<0.02	**0.07**	**0.04**	<0.02	**0.11**	**7.65**	**0.78**	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
760492	36	Soil	6/24/2015	7/8/2015	<0.02	**0.02**	**0.09**	**0.06**	<0.02	**0.17**	**1.67**	<0.05	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
760493	37	Soil	6/24/2015	7/8/2015	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	**4.13**	<0.05	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
760494	37	Soil	6/24/2015	7/8/2015	<0.02	**0.03**	**0.15**	**0.14**	**0.05**	**0.36**	**9.23**	<0.05	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
760495	25	Bedrock	6/24/2015	7/8/2015	<0.02	<0.02	<0.02	<0.02	**0.03**	**0.03**	**2.9**	<0.05	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	**0.02**
760496	42	Bedrock	6/24/2015	7/8/2015	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	**7.59**	<0.05	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	**0.06**
760497	42	Bedrock	6/24/2015	7/8/2015	<0.02	<0.02	**0.02**	**0.02**	<0.02	**0.04**	**6.3**	<0.05	<0.02	<0.02	**0.04**	<0.02	<0.02	**0.02**	**1.32**
760498	38	Soil	6/24/2015	7/8/2015	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	**4.38**	**0.15**	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
760499	36	Soil	6/24/2015	7/8/2015	**0.03**	<0.02	<0.02	<0.02	<0.02	**0.03**	**5.5**	**0.37**	**0.28**	<0.02	**0.04**	<0.02	<0.02	**0.08**	**0.03**
760500	36	Bedrock	6/24/2015	7/8/2015	**3.57**	<0.02	**0.05**	**0.05**	**0.52**	**4.19**	**70.42**	**0.43**	**0.44**	**0.44**	**0.19**	**0.87**	**0.56**	**6.55**	**73.01**
760501	35	Bedrock	6/24/2015	7/8/2015	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	**1.58**	<0.05	**0.07**	<0.02	<0.02	<0.02	<0.02	**1.05**	**4.23**
760501D[4]					<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	**1.47**	<0.05	**0.08**	<0.02	<0.02	<0.02	<0.02	**0.96**	**2.09**
760502	42	Soil	6/24/2015	7/8/2015	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	**1.71**	<0.05	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
760503[5]	--	--	--	--	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.50	<0.05	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
760504[5]	--	--	--	--	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.50	<0.05	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02

NOTES

1. BTEX represents the combined sorbed mass of the benzene, toluene, ethylbenzene, m-p-xylenes, and o-xylenes.

2. TPH includes aliphatic compounds in the range of C4 to C20. TPH sorbed mass excludes BTEX (aromatic hydrocarbons).

3. Module 760487D is the laboratory duplicate of Module 760487.

4. Module 760501D is the laboratory duplicate of Module 760501D.

bgs = below ground surface

BTEX = benzene, toluene, ethylbenzene, and xylenes

NA = not analyzed

TPH = total petroleum hydrocarbons

TABLE 4-13
Slug Test Results in TTU Monitoring Wells
Thermal Treatment Unit RFI
Nammo Talley, Inc.

FALLING TEST K VALUES (ft/day)									
	TTU-1	TTU-2	TTU-3	TTU-4	TTU-6	TTU-8	TTU-9A	TTU-10	TTU-11
ESTIMATED HYDRAULIC CONDUCTIVITY DAGAN SOLUTION (FT/DAY)	4.07E-02	4.15E-03	1.91E-02	1.92E-02	1.27E-02	1.57E-01	1.27E-03	4.75E-01	1.59E-02

Dagan, G., 1978. A note on packer, slug, and recovery tests in unconfined aquifers, Water Resources Research, vol. 14, no. 5. pp. 929-934.

TABLE 5-1
Groundwater Level Elevation Data - 2012-2016
Thermal Treatment Unit RFI
Nammo Talley, Inc

	WELL TTU-1		WELL TTU-2		WELL TTU-3		WELL TTU-4		WELL TTU-5*		WELL TTU-6		WELL TTU-7*		WELL TTU-8		WELL TTU-9a		WELL TTU-10		WELL TTU-11		WELL PF-1		WELL PF-2	
NORTHING	909420.734		909087.852		909303.363		909673.68		908747.636		909260.820		909287.611		909699.266		909974.49		908960.114		909029.758		909161.578		909166.89	
EASTING	761281.203		761148.265		760888.204		761041.975		761102.227		760560.096		760527.269		760514.908		761710.151		760297.013		761706.47		760140.434		760122.25	
TOC ELEVATION (feet amsl)	1312.734		1314.442		1308.033		1305.124		1314.93		1300.84		1301.84		1310.23		1318.042		1302.42		1339.198		1295.985		1296.348	
Date	Depth to Water (ft BMP)	Water Level Elevation (ft AMSL)	Depth to Water (ft BMP)	Water Level Elevation (ft AMSL)	Depth to Water (ft BMP)	Water Level Elevation (ft AMSL)	Depth to Water (ft BMP)	Water Level Elevation (ft AMSL)	Depth to Water (ft BMP)	Water Level Elevation (ft AMSL)	Depth to Water (ft BMP)	Water Level Elevation (ft AMSL)	Depth to Water (ft BMP)	Water Level Elevation (ft AMSL)	Depth to Water (ft BMP)	Water Level Elevation (ft AMSL)	Depth to Water (ft BMP)	Water Level Elevation (ft AMSL)	Depth to Water (ft BMP)	Water Level Elevation (ft AMSL)	Depth to Water (ft BMP)	Water Level Elevation (ft AMSL)	Depth to Water (ft BMP)	Water Level Elevation (ft AMSL)	Depth to Water (ft BMP)	Water Level Elevation (ft AMSL)
1/22/2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	101.14	1194.07	-	-
6/28/2012	39.45	1273.28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7/12/2012	37.17	1275.56	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10/22/2012	33.73	1279.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	107.92	1187.29	-	-
11/13/2012	35.13	1277.60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8/26/2013	37.05	1275.68	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11/12/2013	37.23	1275.50	60.70	1253.74	92.33	1215.70	50.67	1254.45	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11/19/2013	-	-	-	-	92.51	1215.52	50.61	1254.51	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11/20/2013	-	-	-	-	92.73	1215.30	50.59	1254.53	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11/21/2013	37.23	1275.50	60.60	1253.84	92.33	1215.70	50.67	1254.45	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12/2/2013	34.26	1278.47	60.45	1253.99	93.32	1214.71	50.56	1254.56	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12/4/2013	-	-	-	-	-	-	50.54	1254.58	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12/30/2013	35.83	1276.90	60.61	1253.83	94.22	1213.81	50.90	1254.22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2/24/2014	36.88	1275.85	59.38	1255.06	90.08	1217.95	50.59	1254.53	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8/25/2014	37.29	1275.44	59.20	1255.24	88.25	1219.78	50.94	1254.18	132.22	1182.71	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10/30/2014	29.77	1282.96	58.11	1256.33	91.60	1216.43	50.84	1254.28	61.24	1253.69	123.42	1177.42	136.30	1165.54	-	-	-	-	-	-	-	-	-	-	-	-
11/17/2014	32.12	1280.61	58.73	1255.71	93.36	1214.67	51.19	1253.93	90.00	1224.93	123.73	1177.11	124.60	1177.24	-	-	-	-	-	-	-	-	-	-	-	-
12/8/2014	33.73	1279.00	58.85	1255.59	93.25	1214.78	51.23	1253.89	73.93	1241.00	125.83	1175.01	117.93	1183.91	-	-	-	-	-	-	-	-	-	-	-	-
12/22/2014	-	-	-	-	-	-	-	-	-	-	126.74	1174.10	116.16	1185.68	-	-	-	-	-	-	-	-	-	-	-	-
12/23/2014	34.88	1277.85	59.34	1255.10	94.11	1213.92	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1/22/2015	35.56	1277.17	59.26	1255.18	93.22	1214.81	51.34	1253.78	67.06	1247.87	128.17	1172.67	115.94	1185.90	-	-	-	-	-	-	-	-	-	-	-	-
1/27/2015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	118.92	1177.43
1/29/2015	34.81	1277.93	58.25	1256.19	91.21	1216.83	49.97	1255.15	67.04	1247.89	128.32	1172.52	116.01	1185.83	-	-	-	-	-	-	-	-	119.08	1176.91	118.84	1177.51
2/4/2015	34.70	1278.03	57.65	1256.79	89.53	1218.50	49.92	1255.20	66.85	1248.08	128.13	1172.71	115.75	1186.09	-	-	-	-	-	-	-	-	118.88	1177.11	118.64	1177.71
3/5/2015	35.28	1277.46	57.25	1257.19	86.64	1221.40	49.49	1255.63	67.53	1247.40	126.25	1174.59	114.98	1186.86	-	-	-	-	-	-	-	-	115.00	1180.99	114.71	1181.64
4/6/2015	36.16	1276.58	58.54	1255.90	89.94	1218.10	49.29	1255.83	69.09	1245.84	125.19	1175.65	113.10	1188.74	-	-	-	-	-	-	-	-	113.90	1182.09	113.77	1182.58
5/18/2015	30.22	1282.51	57.88	1256.56	87.81	1220.22	49.43	1255.69	70.62	1244.31	126.08	1174.76	112.65	1189.19	-	-	-	-	-	-	-	-	114.88	1181.11	114.56	1181.79
6/19/2015	31.02	1281.71	56.05	1258.39	86.26	1221.77	49.12	1256.00	64.01	1250.92	122.34	1178.50	112.60	1189.24	-	-	-	-	-	-	-	-	117.92	1178.07	116.87	1179.48
7/31/2015	33.22	1279.51	55.48	1258.96	83.88	1224.15	49.22	1255.90	65.51	1249.42	118.95	1181.89	111.68	1190.16	-	-	-	-	-	-	-	-	117.83	1178.16	117.66	1178.69
8/31/2015	33.17	1279.57	53.42	1261.02	75.11	1232.93	48.60	1256.52	67.31	1247.62	111.82	1189.02	111.46	1190.38	-	-	-	-	-	-	-	-	117.92	1178.07	117.83	1178.52
9/16/2015	33.56	1279.18	53.47	1260.97	75.61	1232.43	48.36	1256.76	68.52	1246.41	111.11	1189.73	111.25	1190.59	-	-	-	-	-	-	-	-	117.55	1178.44	117.48	1178.87
10/27/2015	34.84	1277.90	56.46	1257.98	84.92	1223.12	48.31	1256.81	70.87	1244.06	117.22	1183.62	110.20	1191.64	-	-	-	-	-	-	29.98	1309.22	145.59	1150.40	117.83	1178.52
11/23/2015	35.36	1277.38	57.77	1256.67	88.60	1219.44	68.36	1236.76	72.28	1242.65	120.45	1180.39	110.77	1191.07	-	-	-	-	-	-	30.49	1308.71	118.85	1177.14	118.47	1177.88
12/21/2015	39.65	1273.08	61.75	1252.69	94.10	1213.93	51.44	1253.68	76.61	1238.32	125.60	1175.24	114.65	1187.19	-	-	-	-	-	-	33.82	1305.38	120.75	1175.24	120.99	1175.36
1/28/2016	34.90	1277.84	55.67	1258.77	80.60	1227.44	48.40	1256.72	74.21	1240.72	125.16	1175.68	113.44	1188.40	142.00	1168.23	110.00	1208.04	120.00	1182.42	31.81	1307.39	119.80	1176.19	119.22	1177.13
2/25/2016	34.72	1278.02	54.64	1259.80	77.78	1230.26	47.63	1257.49	73.64	1241.29	119.63	1181.21	112.35	1189.49	-	-	-	-	-	-	31.94	1307.26	116.00	1179.99	115.33	1181.02
3/31/2016	35.06	1277.68	56.21	1258.23	83.40	1224.64	47.23	1257.89	-	-	118.27	1182.57	110.71	1191.13	-	-	-	-	-	-	32.47	1306.73	115.40	1180.59	114.79	1181.56
4/1/2016	-	-	-	-	-	-	-	-	74.73	1240.20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4/27/2016	34.94	1277.80	57.05	1257.39	84.49	1223.55	47.20	1257.92	75.33	1239.60	119.04	1181.80	110.55	1191.29	141.40	1168.83	30.00	1288.04	121.28	1181.14	32.96	1306.24	116.65	1179.34	116.13	1180.22
6/15/2016	35.34	1277.40	58.13	1256.31	86.40	1221.64	47.71	1257.41	76.34	1238.59	120.96	1179.88	111.34	1190.50	142.36	1167.87	-	-	124.31	1178.11	33.99	1305.21	119.88	1176.11	119.39	1176.96
7/20/2016	35.13	1277.61	55.56	1258.88	79.35	1228.69	47.66	1257.46	75.10	1239.83	116.89	1183.95	112.22	1189.62	142.70	1167.53	27.23	1290.81	123.93	1178.49	34.84	1304.36	121.82	1174.17	121.58	1174.77
7/21/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	142.63	1167.60	27.11	1290.93	123.70	1178.72	-	-	-	-	-	-
8/18/2016	17.31	1295.43	49.30	1265.14	72.51	1235.53	47.01	1258.11	74.36	1240.57	110.83	1190.01	111.72	1190.12	140.30	1169.93	24.44	1293.60	120.34	1182.08	35.29	1303.91	120.21	1175.78	120.10	1176.25

Notes:
amsl = above mean sea level

TABLE 5-2
Perchlorate Concentrations in Groundwater Samples - 2012-2016
Thermal Treatment Unit RFI
Nammo Talley, Inc.

Location	Sample Date	Sample Type	Perchlorate (ug/L)
OFC-1	6/1/2016	N	0.500 UJ
PF-1	6/4/2003	N	2.00 U
PF-1	1/22/2009	N	2.00 U
PF-1	10/22/2012	N	2.00 U
PF-1	5/18/2015	N	1.00 U
PF-1	9/9/2015	N	2.0 U
PF-1	9/9/2015	FD	2.0 U
PF-1	11/23/2015	N	2.0 U
PF-1	2/25/2016	N	2.0 U
PF-1	6/1/2016	N	0.500 UJ
PF-1	8/18/2016	N	0.10 U
PF-2	1/28/2014	N	2.00 U
PF-2	9/15/2014	N	2.00 U
PF-2	9/15/2014	FD	2.00 U
PF-2	10/7/2014	N	2.00 U
PF-2	11/19/2014	N	2.00 U
PF-2	2/5/2015	N	2.00 U
PF-2	5/18/2015	N	1.00 U
PF-2	9/9/2015	N	2.0 U
PF-2	11/23/2015	N	2.0 U
PF-2	2/25/2016	N	2.0 U
PF-2	6/1/2016	N	**0.523 J**
PF-2	6/1/2016	FD	0.500 UJ
PF-2	8/18/2016	N	**0.46**
PF-2-TANK	8/26/2014	N	**2.7**
TTU-1	9/25/2012	N	**30,000 [A]**
TTU-1	10/22/2012	N	2000 U
TTU-1	11/13/2013	N	**15,000 [A]**
TTU-1	8/26/2014	N	**12,000 [A]**
TTU-1	11/18/2014	N	**16,000 [A]**
TTU-1	2/5/2015	N	**18,000 [A]**
TTU-1	5/18/2015	N	**17,000 [A]**
TTU-1	9/9/2015	N	**15,000 [A]**
TTU-1	11/23/2015	N	**12,000 [A]**
TTU-1	2/25/2016	N	**9,600 [A]**
TTU-1	6/1/2016	N	**7,080 J [A]**
TTU-1	8/18/2016	N	**17,000 [A]**
TTU-2	11/13/2013	N	**210,000 [A]**
TTU-2	11/13/2013	N	**230,000 [A]**
TTU-2	11/13/2013	N	**180,000 [A]**
TTU-2	8/26/2014	N	**210,000 [A]**
TTU-2	11/18/2014	N	**200,000 [A]**
TTU-2	2/5/2015	N	**170,000 [A]**
TTU-2	5/18/2015	N	**170,000 [A]**

TABLE 5-2
Perchlorate Concentrations in Groundwater Samples - 2012-2016
Thermal Treatment Unit RFI
Nammo Talley, Inc.

Location	Sample Date	Sample Type	Perchlorate (ug/L)
TTU-2	9/9/2015	N	**170,000** [A]
TTU-2	11/23/2015	N	**170,000** [A]
TTU-2	2/25/2016	N	**170,000** [A]
TTU-2	6/1/2016	N	**116,000 J** [A]
TTU-2	8/18/2016	N	**190,000** [A]
TTU-3	11/13/2013	N	**340** [A]
TTU-3	11/13/2013	N	**330** [A]
TTU-3	11/13/2013	N	**320** [A]
TTU-3	8/26/2014	N	**78** [A]
TTU-3	11/18/2014	N	**300** [A]
TTU-3	2/5/2015	N	**500** [A]
TTU-3	5/18/2015	N	**150** [A]
TTU-3	9/9/2015	N	**60** [A]
TTU-3	11/23/2015	N	**35** [A]
TTU-3	2/25/2016	N	**50 S** [A]
TTU-3	6/1/2016	N	**43.9 J** [A]
TTU-3	8/18/2016	N	**50** [A]
TTU-4	11/13/2013	N	2.00 U
TTU-4	11/13/2013	N	2.00 U
TTU-4	11/13/2013	N	2.00 U
TTU-4	11/13/2013	FD	2.00 U
TTU-4	8/26/2014	N	2.00 U
TTU-4	11/18/2014	N	**6.5**
TTU-4	2/5/2015	N	2.00 U
TTU-4	5/18/2015	N	**24** [A]
TTU-4	9/9/2015	N	2.0 U
TTU-4	11/23/2015	N	2.0 U
TTU-4	11/23/2015	FD	2.0 U
TTU-4	2/25/2016	N	2.0 U
TTU-4	2/25/2016	FD	2.0 U
TTU-4	6/1/2016	N	**0.873 J**
TTU-4	6/1/2016	FD	**0.907 J**
TTU-4	8/18/2016	N	1.0 U
TTU-4	8/18/2016	FD	1.0 U
TTU-5	11/18/2014	N	**7**
TTU-5	2/5/2015	N	**26** [A]
TTU-5	5/18/2015	N	**39** [A]
TTU-5	9/9/2015	N	**37** [A]
TTU-5	11/23/2015	N	**34** [A]
TTU-5	2/25/2016	N	**33** [A]
TTU-5	6/1/2016	N	**35.6 J** [A]
TTU-5	8/18/2016	N	**34** [A]
TTU-6	11/18/2014	N	**180** [A]

TABLE 5-2
Perchlorate Concentrations in Groundwater Samples - 2012-2016
Thermal Treatment Unit RFI
Nammo Talley, Inc.

Location	Sample Date	Sample Type	Perchlorate (ug/L)
TTU-6	2/5/2015	N	**11**
TTU-6	5/18/2015	N	**32** [A]
TTU-6	9/9/2015	N	**190** [A]
TTU-6	11/23/2015	N	**20** [A]
TTU-6	2/25/2016	N	**5.8**
TTU-6	6/1/2016	N	**198 J** [A]
TTU-6	8/18/2016	N	**40** [A]
TTU-7	11/18/2014	N	**6.8**
TTU-7	11/18/2014	FD	4.00 U
TTU-7	2/5/2015	N	**5.5 J**
TTU-7	2/5/2015	FD	**14 J**
TTU-7	5/18/2015	N	**18 J** [A]
TTU-7	5/18/2015	FD	**33 J** [A]
TTU-7	9/9/2015	N	**5.7**
TTU-7	11/23/2015	N	**5.1**
TTU-7	2/25/2016	N	**4.6**
TTU-7	6/1/2016	N	**7.31 J**
TTU-7	8/18/2016	N	**4.2**
TTU-8	7/21/2016	N	1.0 U
TTU-8	8/18/2016	N	1.0 U
TTU-9a	7/21/2016	N	**2.3**
TTU-9a	8/18/2016	N	**6.6**
TTU-10	7/21/2016	N	1.0 U
TTU-10	8/18/2016	N	1.0 U
TTU-11	9/23/2015	N	**160,000** [A]
TTU-11	9/23/2015	FD	**100,000** [A]
TTU-11	11/23/2015	N	**120,000** [A]
TTU-11	2/25/2016	N	**87,000** [A]
TTU-11	6/1/2016	N	**76,800 J** [A]
TTU-11	8/18/2016	N	**75,000** [A]
Arizona Health Based Guidance Level			**14**

Notes:

A - result detected above the AZ Health Based Guidance Level of 14 µg/L

***BOLD** = detected result*

J = Estimated value. The numerical value is between the Method Detection Limit and the Reporting Limit.

U = Not detected. The numerical value is the Reporting Limit.

UJ = The compound was not detected above the reported sample reporting limit; however, the reporting limit is approximate.

N = Primary sample.

FD = Field duplicate sample.

TABLE 5-3
VOC Concentrations in Groundwater Samples - 2012-2016
Thermal Treatment Unit RFI
Nammo Talley, Inc.

			1,1,1,2-Tetra chloroethane	1,1,1-Trichloro ethane	1,1,2,2-Tetra chloroethane	1,1,2-Trichloro ethane	1,1-Dichloro ethane	1,1-Dichloro ethene	1,1-Dichloro propene	1,2,3-Trichloro benzene	1,2,3-Trichloro propane	1,2,3-Trimethyl benzene	1,2,4-Trichloro benzene	1,2,4-Trimethyl benzene	1,2-Dibromo-3-chloropropane (DBCP)
		Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Location	Sample Date	Sample Type													
OFC-1	6/1/2016	N	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	2.5 U	1 U	1 U	1 U	5 U
PF-1	5/18/2015	N	5.00 U	2.00 U	2.00 U	2.00 U	2.00 U	5.00 U	2.00 U	5.00 U	10.00 U	-	5.00 U	2.00 U	5.00 U
PF-1	9/9/2015	N	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	2.0 U	5.0 U	10 U	-	5.0 U	2.0 U	5.0 U
PF-1	9/9/2015	FD	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	2.0 U	5.0 U	10 U	-	5.0 U	2.0 U	5.0 U
PF-1	11/23/2015	N	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	2.0 U	5.0 U	10 U	-	5.0 U	2.0 U	5.0 U
PF-1	2/25/2016	N	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	2.0 U	5.0 U	10 U	-	5.0 U	2.0 U	5.0 U
PF-1	6/1/2016	N	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	2.5 U	1 U	1 U	1 U	5 U
PF-1	8/18/2016	N	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	2.0 U	5.0 U	10 U	-	5.0 U	2.0 U	5.0 U
PF-2	1/13/2015	N	5.00 U	2.00 U	2.00 U	2.00 U	2.00 U	5.00 U	2.00 U	5.00 U	10.00 U	-	5.00 U	2.00 U	5.00 U
PF-2	2/5/2015	N	5.00 U	2.00 U	2.00 U	2.00 U	2.00 U	5.00 U	2.00 U	5.00 U	10.00 U	-	5.00 U	2.00 U	5.00 U
PF-2	5/18/2015	N	5.00 U	2.00 U	2.00 U	2.00 U	2.00 U	5.00 U	2.00 U	5.00 U	10.00 U	-	5.00 U	2.00 U	5.00 U
PF-2	9/9/2015	N	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	2.0 U	5.0 U	10 U	-	5.0 U	2.0 U	5.0 U
PF-2	11/23/2015	N	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	2.0 U	5.0 U	10 U	-	5.0 U	2.0 U	5.0 U
PF-2	2/25/2016	N	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	2.0 U	5.0 U	10 U	-	5.0 U	2.0 U	5.0 U
PF-2	6/1/2016	N	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	2.5 U	1 U	1 U	1 U	5 U
PF-2	6/1/2016	FD	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	2.5 U	1 U	1 U	1 U	5 U
PF-2	8/18/2016	N	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	2.0 U	5.0 U	10 U	-	5.0 U	2.0 U	5.0 U
TTU-1	12/23/2014	N	5.00 U	2.00 U	2.00 U	2.00 U	2.00 U	5.00 U	2.00 U	5.00 U	10.00 U	-	5.00 U	2.00 U	5.00 U
TTU-1	2/5/2015	N	5.00 U	2.00 U	2.00 U	2.00 U	2.00 U	5.00 U	2.00 U	5.00 U	10.00 U	-	5.00 U	2.00 U	5.00 U
TTU-1	5/18/2015	N	5.00 U	2.00 U	2.00 U	2.00 U	2.00 U	5.00 U	2.00 U	5.00 U	10.00 U	-	5.00 U	2.00 U	5.00 U
TTU-1	9/9/2015	N	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	2.0 U	5.0 U	10 U	-	5.0 U	2.0 U	5.0 U
TTU-1	11/23/2015	N	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	2.0 U	5.0 U	10 U	-	5.0 U	2.0 U	5.0 U
TTU-1	2/25/2016	N	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	2.0 U	5.0 U	10 U	-	5.0 U	2.0 U	5.0 U
TTU-1	6/1/2016	N	1 U	1 U	1 U	1 U	1 U	**1.14**	1 U	1 U	2.5 U	1 U	1 U	1 U	5 U
TTU-1	8/18/2016	N	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	2.0 U	5.0 U	10 U	-	5.0 U	2.0 U	5.0 U
TTU-2	12/23/2014	N	5.00 U	2.00 U	2.00 U	2.00 U	2.00 U	**45** [(a)]	2.00 U	5.00 U	10.00 U	-	5.00 U	2.00 U	5.00 U
TTU-2	2/5/2015	N	5.00 U	2.00 U	2.00 U	2.00 U	2.00 U	**26** [(a)]	2.00 U	5.00 U	10.00 U	-	5.00 U	2.00 U	5.00 U
TTU-2	5/18/2015	N	5.00 U	2.00 U	2.00 U	2.00 U	2.00 U	**30** [(a)]	2.00 U	5.00 U	10.00 U	-	5.00 U	2.00 U	5.00 U
TTU-2	9/9/2015	N	20 U	8.0 U	8.0 U	8.0 U	8.0 U	**29** [(a)]	8.0 U	20 U	40 U	-	20 U	8.0 U	20 U
TTU-2	11/23/2015	N	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	**22** [(a)]	2.0 U	5.0 U	10 U	-	5.0 U	2.0 U	5.0 U
TTU-2	2/25/2016	N	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	**28** [(a)]	2.0 U	5.0 U	10 U	-	5.0 U	2.0 U	5.0 U
TTU-2	6/1/2016	N	1 U	1 U	1 U	**0.498 J**	1 U	**3.41**	1 U	1 U	2.5 U	1 U	1 U	1 U	5 U
TTU-2	8/18/2016	N	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	**46** [(a)]	2.0 U	5.0 U	10 U	-	5.0 U	2.0 U	5.0 U
TTU-3	12/23/2014	N	5.00 U	2.00 U	2.00 U	2.00 U	2.00 U	**41** [(a)]	2.00 U	5.00 U	10.00 U	-	5.00 U	2.00 U	5.00 U
TTU-3	2/5/2015	N	5.00 U	2.00 U	2.00 U	2.00 U	2.00 U	5.00 U	2.00 U	5.00 U	10.00 U	-	5.00 U	2.00 U	5.00 U
TTU-3	5/18/2015	N	5.00 U	2.00 U	2.00 U	2.00 U	2.00 U	5.00 U	2.00 U	5.00 U	10.00 U	-	5.00 U	2.00 U	5.00 U
TTU-3	9/9/2015	N	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	2.0 U	5.0 U	10 U	-	5.0 U	2.0 U	5.0 U
TTU-3	11/23/2015	N	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	2.0 U	5.0 U	10 U	-	5.0 U	2.0 U	5.0 U
TTU-3	2/25/2016	N	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	2.0 U	5.0 U	10 U	-	5.0 U	2.0 U	5.0 U
TTU-3	6/1/2016	N	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	2.5 U	1 U	1 U	1 U	5 U
TTU-3	8/18/2016	N	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	2.0 U	5.0 U	10 U	-	5.0 U	2.0 U	5.0 U
TTU-4	12/23/2014	N	5.00 U	2.00 U	2.00 U	2.00 U	2.00 U	5.00 U	2.00 U	5.00 U	10.00 U	-	5.00 U	2.00 U	5.00 U
TTU-4	2/5/2015	N	5.00 U	2.00 U	2.00 U	2.00 U	2.00 U	5.00 U	2.00 U	5.00 U	10.00 U	-	5.00 U	2.00 U	5.00 U
TTU-4	5/18/2015	N	5.00 U	2.00 U	2.00 U	2.00 U	2.00 U	5.00 U	2.00 U	5.00 U	10.00 U	-	5.00 U	2.00 U	5.00 U
TTU-4	9/9/2015	N	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	2.0 U	5.0 U	10 U	-	5.0 U	2.0 U	5.0 U
TTU-4	11/23/2015	N	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	2.0 U	5.0 U	10 U	-	5.0 U	2.0 U	5.0 U
TTU-4	11/23/2015	FD	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	2.0 U	5.0 U	10 U	-	5.0 U	2.0 U	5.0 U
TTU-4	2/25/2016	N	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	2.0 U	5.0 U	10 U	-	5.0 U	2.0 U	5.0 U
TTU-4	2/25/2016	FD	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	2.0 U	5.0 U	10 U	-	5.0 U	2.0 U	5.0 U
TTU-4	6/1/2016	N	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	2.5 U	1 U	1 U	1 U	5 U
TTU-4	6/1/2016	FD	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	2.5 U	1 U	1 U	1 U	5 U
TTU-4	8/18/2016	N	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	2.0 U	5.0 U	10 U	-	5.0 U	2.0 U	5.0 U
TTU-4	8/18/2016	FD	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	2.0 U	5.0 U	10 U	-	5.0 U	2.0 U	5.0 U
TTU-5	12/23/2014	N	5.00 U	2.00 U	2.00 U	2.00 U	2.00 U	5.00 U	2.00 U	5.00 U	10.00 U	-	5.00 U	2.00 U	5.00 U
TTU-5	2/5/2015	N	5.00 U	2.00 U	2.00 U	2.00 U	2.00 U	5.00 U	2.00 U	5.00 U	10.00 U	-	5.00 U	2.00 U	5.00 U
TTU-5	5/18/2015	N	5.00 U	2.00 U	2.00 U	2.00 U	2.00 U	5.00 U	2.00 U	5.00 U	10.00 U	-	5.00 U	2.00 U	5.00 U

TABLE 5-3
VOC Concentrations in Groundwater Samples - 2012-2016
Thermal Treatment Unit RFI
Nammo Talley, Inc.

			1,2-Dibromoethane (Ethylene Dibromide)	1,2-Dichloro benzene	1,2-Dichloro ethane	1,2-Dichloro propane	1,3,5-Trimethyl benzene	1,3-Butadiene	1,3-Dichloro benzene	1,3-Dichloro propane	1,4-Dichloro benzene	2,2-Dichloro propane	2-Butanone (Methyl Ethyl Ketone)	2-Chloro toluene	2-Hexanone
		Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Location	Sample Date	Sample Type													
OFC-1	6/1/2016	N	1 U	1 U	1 U	1 U	1 U	2 U	1 U	1 U	1 U	1 U	10 U	1 U	-
PF-1	5/18/2015	N	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	-	2.00 U	2.00 U	2.00 U	2.00 U	10.00 U	5.00 U	10.00 U
PF-1	9/9/2015	N	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	2.0 U	10 U	5.0 U	10 U
PF-1	9/9/2015	FD	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	2.0 U	10 U	5.0 U	10 U
PF-1	11/23/2015	N	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	2.0 U	10 U	5.0 U	10 U
PF-1	2/25/2016	N	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	2.0 U	10 U	5.0 U	10 U
PF-1	6/1/2016	N	1 U	1 U	1 U	1 U	1 U	2 U	1 U	1 U	1 U	1 U	10 U	1 U	-
PF-1	8/18/2016	N	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	2.0 U	10 U	5.0 U	10 U
PF-2	1/13/2015	N	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	-	2.00 U	2.00 U	2.00 U	2.00 U	10.00 U	5.00 U	10.00 U
PF-2	2/5/2015	N	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	-	2.00 U	2.00 U	2.00 U	2.00 U	10.00 U	5.00 U	10.00 U
PF-2	5/18/2015	N	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	-	2.00 U	2.00 U	2.00 U	2.00 U	10.00 U	5.00 U	10.00 U
PF-2	9/9/2015	N	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	2.0 U	10 U	5.0 U	10 U
PF-2	11/23/2015	N	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	2.0 U	10 U	5.0 U	10 U
PF-2	2/25/2016	N	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	2.0 U	10 U	5.0 U	10 U
PF-2	6/1/2016	N	1 U	1 U	1 U	1 U	1 U	2 U	1 U	1 U	1 U	1 U	10 U	1 U	-
PF-2	6/1/2016	FD	1 U	1 U	1 U	1 U	1 U	2 U	1 U	1 U	1 U	1 U	10 U	1 U	-
PF-2	8/18/2016	N	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	2.0 U	10 U	5.0 U	10 U
TTU-1	12/23/2014	N	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	-	2.00 U	2.00 U	2.00 U	2.00 U	10.00 U	5.00 U	10.00 U
TTU-1	2/5/2015	N	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	-	2.00 U	2.00 U	2.00 U	2.00 U	10.00 U	5.00 U	10.00 U
TTU-1	5/18/2015	N	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	-	2.00 U	2.00 U	2.00 U	2.00 U	10.00 U	5.00 U	10.00 U
TTU-1	9/9/2015	N	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	2.0 U	10 U	5.0 U	10 U
TTU-1	11/23/2015	N	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	2.0 U	10 U	5.0 U	10 U
TTU-1	2/25/2016	N	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	2.0 U	10 U	5.0 U	10 U
TTU-1	6/1/2016	N	1 U	1 U	1 U	1 U	1 U	2 U	1 U	1 U	1 U	1 U	10 U	1 U	-
TTU-1	8/18/2016	N	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	2.0 U	10 U	5.0 U	10 U
TTU-2	12/23/2014	N	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	-	2.00 U	2.00 U	2.00 U	2.00 U	10.00 U	5.00 U	10.00 U
TTU-2	2/5/2015	N	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	-	2.00 U	2.00 U	2.00 U	2.00 U	10.00 U	5.00 U	10.00 U
TTU-2	5/18/2015	N	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	-	2.00 U	2.00 U	2.00 U	2.00 U	10.00 U	5.00 U	10.00 U
TTU-2	9/9/2015	N	8.0 U	8.0 U	8.0 U	8.0 U	8.0 U	-	8.0 U	8.0 U	8.0 U	8.0 U	40 U	20 U	40 U
TTU-2	11/23/2015	N	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	2.0 U	10 U	5.0 U	10 U
TTU-2	2/25/2016	N	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	2.0 U	10 U	5.0 U	10 U
TTU-2	6/1/2016	N	1 U	1 U	1 U	1 U	1 U	2 U	1 U	1 U	1 U	1 U	10 U	1 U	-
TTU-2	8/18/2016	N	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	2.0 U	10 U	5.0 U	10 U
TTU-3	12/23/2014	N	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	-	2.00 U	2.00 U	2.00 U	2.00 U	10.00 U	5.00 U	10.00 U
TTU-3	2/5/2015	N	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	-	2.00 U	2.00 U	2.00 U	2.00 U	10.00 U	5.00 U	10.00 U
TTU-3	5/18/2015	N	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	-	2.00 U	2.00 U	2.00 U	2.00 U	10.00 U	5.00 U	10.00 U
TTU-3	9/9/2015	N	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	2.0 U	10 U	5.0 U	10 U
TTU-3	11/23/2015	N	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	2.0 U	10 U	5.0 U	10 U
TTU-3	2/25/2016	N	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	2.0 U	10 U	5.0 U	10 U
TTU-3	6/1/2016	N	1 U	1 U	1 U	1 U	1 U	2 U	1 U	1 U	1 U	1 U	10 U	1 U	-
TTU-3	8/18/2016	N	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	2.0 U	10 U	5.0 U	10 U
TTU-4	12/23/2014	N	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	-	2.00 U	2.00 U	2.00 U	2.00 U	10.00 U	5.00 U	10.00 U
TTU-4	2/5/2015	N	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	-	2.00 U	2.00 U	2.00 U	2.00 U	10.00 U	5.00 U	10.00 U
TTU-4	5/18/2015	N	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	-	2.00 U	2.00 U	2.00 U	2.00 U	10.00 U	5.00 U	10.00 U
TTU-4	9/9/2015	N	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	2.0 U	10 U	5.0 U	10 U
TTU-4	11/23/2015	N	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	2.0 U	10 U	5.0 U	10 U
TTU-4	11/23/2015	FD	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	2.0 U	10 U	5.0 U	10 U
TTU-4	2/25/2016	N	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	2.0 U	10 U	5.0 U	10 U
TTU-4	2/25/2016	FD	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	2.0 U	10 U	5.0 U	10 U
TTU-4	6/1/2016	N	1 U	1 U	1 U	1 U	1 U	2 U	1 U	1 U	1 U	1 U	10 U	1 U	-
TTU-4	6/1/2016	FD	1 U	1 U	1 U	1 U	1 U	2 U	1 U	1 U	1 U	1 U	10 U	1 U	-
TTU-4	8/18/2016	N	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	2.0 U	10 U	5.0 U	10 U
TTU-4	8/18/2016	FD	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	2.0 U	10 U	5.0 U	10 U
TTU-5	12/23/2014	N	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	-	2.00 U	2.00 U	2.00 U	2.00 U	10.00 U	5.00 U	10.00 U
TTU-5	2/5/2015	N	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	-	2.00 U	2.00 U	2.00 U	2.00 U	10.00 U	5.00 U	10.00 U
TTU-5	5/18/2015	N	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	-	2.00 U	2.00 U	2.00 U	2.00 U	10.00 U	5.00 U	10.00 U

TABLE 5-3
VOC Concentrations in Groundwater Samples - 2012-2016
Thermal Treatment Unit RFI
Nammo Talley, Inc.

			2-Phenylbutane (sec-Butylbenzene)	4-Chloro toluene	4-Ethyl toluene	4-Methyl-2-Pentanone (Methyl Isobutyl Ketone)	Acetone	Acrolein	Acrylonitrile	Benzene	Bromo-benzene	Bromodichloro-methane	Bromoform	Bromomethane (Methyl Bromide)	Carbon disulfide	Carbon tetrachloride	Chlorobenzene
		Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Location	Sample Date	Sample Type															
OFC-1	6/1/2016	N	1 U	1 U	1 U	10 U	50 U	50 U	10 U	1 U	1 U	1 U	1 U	5 U	1 U	1 U	1 U
PF-1	5/18/2015	N	5.00 U	5.00 U	-	10.00 U	20.00 U	-	-	2.00 U	5.00 U	2.00 U	5.00 U	5.00 U	5.00 U	5.00 U	2.00 U
PF-1	9/9/2015	N	5.0 U	5.0 U	-	10 U	10 U	-	-	2.0 U	5.0 U	2.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U
PF-1	9/9/2015	FD	5.0 U	5.0 U	-	10 U	10 U	-	-	2.0 U	5.0 U	2.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U
PF-1	11/23/2015	N	5.0 U	5.0 U	-	10 U	20 U	-	-	2.0 U	5.0 U	2.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U
PF-1	2/25/2016	N	5.0 U	5.0 U	-	10 U	20 U	-	-	2.0 U	5.0 U	2.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U
PF-1	6/1/2016	N	1 U	1 U	1 U	10 U	50 U	50 U	10 U	1 U	1 U	1 U	1 U	5 U	1 U	1 U	1 U
PF-1	8/18/2016	N	5.0 U	5.0 U	-	10 U	20 U	-	-	2.0 U	5.0 U	2.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U
PF-2	1/13/2015	N	5.00 U	5.00 U	-	10.00 U	20.00 U	-	-	2.00 U	5.00 U	2.00 U	5.00 U	5.00 U	5.00 U	5.00 U	2.00 U
PF-2	2/5/2015	N	5.00 U	5.00 U	-	10.00 U	20.00 U	-	-	2.00 U	5.00 U	2.00 U	5.00 U	5.00 U	5.00 U	5.00 U	2.00 U
PF-2	5/18/2015	N	5.00 U	5.00 U	-	10.00 U	20.00 U	-	-	2.00 U	5.00 U	2.00 U	5.00 U	5.00 U	5.00 U	5.00 U	2.00 U
PF-2	9/9/2015	N	5.0 U	5.0 U	-	10 U	10 U	-	-	2.0 U	5.0 U	2.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U
PF-2	11/23/2015	N	5.0 U	5.0 U	-	10 U	20 U	-	-	2.0 U	5.0 U	2.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U
PF-2	2/25/2016	N	5.0 U	5.0 U	-	10 U	20 U	-	-	2.0 U	5.0 U	2.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U
PF-2	6/1/2016	N	1 U	1 U	1 U	10 U	50 U	50 U	10 U	1 U	1 U	1 U	1 U	5 U	1 U	1 U	1 U
PF-2	6/1/2016	FD	1 U	1 U	1 U	10 U	50 U	50 U	10 U	1 U	1 U	1 U	1 U	5 U	1 U	1 U	1 U
PF-2	8/18/2016	N	5.0 U	5.0 U	-	10 U	20 U	-	-	2.0 U	5.0 U	2.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U
TTU-1	12/23/2014	N	5.00 U	5.00 U	-	10.00 U	20.00 U	-	-	2.00 U	5.00 U	2.00 U	5.00 U	5.00 U	5.00 U	5.00 U	2.00 U
TTU-1	2/5/2015	N	5.00 U	5.00 U	-	10.00 U	20.00 U	-	-	2.00 U	5.00 U	2.00 U	5.00 U	5.00 U	5.00 U	5.00 U	2.00 U
TTU-1	5/18/2015	N	5.00 U	5.00 U	-	10.00 U	20.00 U	-	-	2.00 U	5.00 U	2.00 U	5.00 U	5.00 U	5.00 U	5.00 U	2.00 U
TTU-1	9/9/2015	N	5.0 U	5.0 U	-	10 U	10 U	-	-	2.0 U	5.0 U	2.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U
TTU-1	11/23/2015	N	5.0 U	5.0 U	-	10 U	20 U	-	-	2.0 U	5.0 U	2.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U
TTU-1	2/25/2016	N	5.0 U	5.0 U	-	10 U	20 U	-	-	2.0 U	5.0 U	2.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U
TTU-1	6/1/2016	N	1 U	1 U	1 U	10 U	50 U	50 U	10 U	1 U	1 U	1 U	1 U	5 U	1 U	1 U	1 U
TTU-1	8/18/2016	N	5.0 U	5.0 U	-	10 U	20 U	-	-	2.0 U	5.0 U	2.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U
TTU-2	12/23/2014	N	5.00 U	5.00 U	-	10.00 U	20.00 U	-	-	2.00 U	5.00 U	2.00 U	5.00 U	5.00 U	5.00 U	5.00 U	2.00 U
TTU-2	2/5/2015	N	5.00 U	5.00 U	-	10.00 U	20.00 U	-	-	2.00 U	5.00 U	2.00 U	5.00 U	5.00 U	5.00 U	5.00 U	2.00 U
TTU-2	5/18/2015	N	5.00 U	5.00 U	-	10.00 U	20.00 U	-	-	2.00 U	5.00 U	2.00 U	5.00 U	5.00 U	5.00 U	5.00 U	2.00 U
TTU-2	9/9/2015	N	20 U	20 U	-	40 U	40 U	-	-	8.0 U	20 U	8.0 U	20 U	20 U	20 U	20 U	8.0 U
TTU-2	11/23/2015	N	5.0 U	5.0 U	-	10 U	20 U	-	-	2.0 U	5.0 U	2.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U
TTU-2	2/25/2016	N	5.0 U	5.0 U	-	10 U	20 U	-	-	2.0 U	5.0 U	2.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U
TTU-2	6/1/2016	N	1 U	1 U	1 U	10 U	50 U	50 U	10 U	1 U	1 U	1 U	1 U	5 U	1 U	1 U	1 U
TTU-2	8/18/2016	N	5.0 U	5.0 U	-	10 U	20 U	-	-	2.0 U	5.0 U	2.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U
TTU-3	12/23/2014	N	5.00 U	5.00 U	-	10.00 U	20.00 U	-	-	2.00 U	5.00 U	2.00 U	5.00 U	5.00 U	5.00 U	5.00 U	2.00 U
TTU-3	2/5/2015	N	5.00 U	5.00 U	-	10.00 U	20.00 U	-	-	2.00 U	5.00 U	2.00 U	5.00 U	5.00 U	5.00 U	5.00 U	2.00 U
TTU-3	5/18/2015	N	5.00 U	5.00 U	-	10.00 U	20.00 U	-	-	2.00 U	5.00 U	2.00 U	5.00 U	5.00 U	5.00 U	5.00 U	2.00 U
TTU-3	9/9/2015	N	5.0 U	5.0 U	-	10 U	10 U	-	-	2.0 U	5.0 U	2.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U
TTU-3	11/23/2015	N	5.0 U	5.0 U	-	10 U	20 U	-	-	2.0 U	5.0 U	2.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U
TTU-3	2/25/2016	N	5.0 U	5.0 U	-	10 U	20 U	-	-	2.0 U	5.0 U	2.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U
TTU-3	6/1/2016	N	1 U	1 U	1 U	10 U	50 U	50 U	10 U	1 U	1 U	1 U	1 U	5 U	1 U	1 U	1 U
TTU-3	8/18/2016	N	5.0 U	5.0 U	-	10 U	20 U	-	-	2.0 U	5.0 U	2.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U
TTU-4	12/23/2014	N	5.00 U	5.00 U	-	10.00 U	20.00 U	-	-	2.00 U	5.00 U	2.00 U	5.00 U	5.00 U	5.00 U	5.00 U	2.00 U
TTU-4	2/5/2015	N	5.00 U	5.00 U	-	10.00 U	20.00 U	-	-	2.00 U	5.00 U	2.00 U	5.00 U	5.00 U	5.00 U	5.00 U	2.00 U
TTU-4	5/18/2015	N	5.00 U	5.00 U	-	10.00 U	20.00 U	-	-	2.00 U	5.00 U	2.00 U	5.00 U	5.00 U	5.00 U	5.00 U	2.00 U
TTU-4	9/9/2015	N	5.0 U	5.0 U	-	10 U	10 U	-	-	2.0 U	5.0 U	2.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U
TTU-4	11/23/2015	N	5.0 U	5.0 U	-	10 U	20 U	-	-	2.0 U	5.0 U	2.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U
TTU-4	11/23/2015	FD	5.0 U	5.0 U	-	10 U	20 U	-	-	2.0 U	5.0 U	2.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U
TTU-4	2/25/2016	N	5.0 U	5.0 U	-	10 U	20 U	-	-	2.0 U	5.0 U	2.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U
TTU-4	2/25/2016	FD	5.0 U	5.0 U	-	10 U	20 U	-	-	2.0 U	5.0 U	2.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U
TTU-4	6/1/2016	N	1 U	1 U	1 U	10 U	50 U	50 U	10 U	1 U	1 U	1 U	1 U	5 U	1 U	1 U	1 U
TTU-4	6/1/2016	FD	1 U	1 U	1 U	10 U	50 U	50 U	10 U	1 U	1 U	1 U	1 U	5 U	1 U	1 U	1 U
TTU-4	8/18/2016	N	5.0 U	5.0 U	-	10 U	20 U	-	-	2.0 U	5.0 U	2.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U
TTU-4	8/18/2016	FD	5.0 U	5.0 U	-	10 U	20 U	-	-	2.0 U	5.0 U	2.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U
TTU-5	12/23/2014	N	5.00 U	5.00 U	-	10.00 U	20.00 U	-	-	2.00 U	5.00 U	2.00 U	5.00 U	5.00 U	5.00 U	5.00 U	2.00 U
TTU-5	2/5/2015	N	5.00 U	5.00 U	-	10.00 U	20.00 U	-	-	2.00 U	5.00 U	2.00 U	5.00 U	5.00 U	5.00 U	5.00 U	2.00 U
TTU-5	5/18/2015	N	5.00 U	5.00 U	-	10.00 U	20.00 U	-	-	2.00 U	5.00 U	2.00 U	5.00 U	5.00 U	5.00 U	5.00 U	2.00 U

TABLE 5-3
VOC Concentrations in Groundwater Samples - 2012-2016
Thermal Treatment Unit RFI
Nammo Talley, Inc.

			Chlorobromo-methane	Chloroethane	Chloroform (Trichloromethane)	Chloromethane (Methyl Chloride)	cis-1,2-Dichloro ethene	cis-1,3-Dichloro propene	Cyclohexane	Cymene (p-isopropyl toluene)	Dibromo-chloromethane	Dibromo-methane	Dichlorodifluoro methane (CFC-12)	Dicyclo-pentadiene	Diisopropyl ether (DIPE)
		Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Location	Sample Date	Sample Type													
OFC-1	6/1/2016	N	-	5 U	5 U	2.50 UJ	1 U	1 U	1 U	1 U	1 U	1 U	5 U	1 U	1 U
PF-1	5/18/2015	N	5.00 U	5.00 U	2.00 U	5.00 U	2.00 U	2.00 U	-	2.00 U	2.00 U	2.00 U	5.00 U	-	-
PF-1	9/9/2015	N	5.0 U	5.0 U	2.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	5.0 U	-	-
PF-1	9/9/2015	FD	5.0 U	5.0 U	2.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	5.0 U	-	-
PF-1	11/23/2015	N	5.0 U	5.0 U	2.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	5.0 U	-	-
PF-1	2/25/2016	N	5.0 U	5.0 U	2.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	5.0 U	-	-
PF-1	6/1/2016	N	-	5 U	5 U	2.50 UJ	1 U	1 U	1 U	1 U	1 U	1 U	5 U	1 U	1 U
PF-1	8/18/2016	N	5.0 U	5.0 U	2.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	5.0 U	-	-
PF-2	1/13/2015	N	5.00 U	5.00 U	2.00 U	5.00 U	2.00 U	2.00 U	-	2.00 U	2.00 U	2.00 U	5.00 U	-	-
PF-2	2/5/2015	N	5.00 U	5.00 U	2.00 U	5.00 U	2.00 U	2.00 U	-	2.00 U	2.00 U	2.00 U	5.00 U	-	-
PF-2	5/18/2015	N	5.00 U	5.00 U	2.00 U	5.00 U	2.00 U	2.00 U	-	2.00 U	2.00 U	2.00 U	5.00 U	-	-
PF-2	9/9/2015	N	5.0 U	5.0 U	2.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	5.0 U	-	-
PF-2	11/23/2015	N	5.0 U	5.0 U	2.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	5.0 U	-	-
PF-2	2/25/2016	N	5.0 U	5.0 U	2.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	5.0 U	-	-
PF-2	6/1/2016	N	-	5 U	5 U	2.50 UJ	1 U	1 U	1 U	1 U	1 U	1 U	5 U	1 U	1 U
PF-2	6/1/2016	FD	-	5 U	5 U	2.50 UJ	1 U	1 U	1 U	1 U	1 U	1 U	5 U	1 U	1 U
PF-2	8/18/2016	N	5.0 U	5.0 U	2.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	5.0 U	-	-
TTU-1	12/23/2014	N	5.00 U	5.00 U	2.00 U	5.00 U	2.00 U	2.00 U	-	2.00 U	2.00 U	2.00 U	5.00 U	-	-
TTU-1	2/5/2015	N	5.00 U	5.00 U	2.00 U	5.00 U	2.00 U	2.00 U	-	2.00 U	2.00 U	2.00 U	5.00 U	-	-
TTU-1	5/18/2015	N	5.00 U	5.00 U	2.00 U	5.00 U	2.00 U	2.00 U	-	2.00 U	2.00 U	2.00 U	5.00 U	-	-
TTU-1	9/9/2015	N	5.0 U	5.0 U	2.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	5.0 U	-	-
TTU-1	11/23/2015	N	5.0 U	5.0 U	2.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	5.0 U	-	-
TTU-1	2/25/2016	N	5.0 U	5.0 U	2.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	5.0 U	-	-
TTU-1	6/1/2016	N	-	5 U	5 U	2.50 UJ	1 U	1 U	1 U	1 U	1 U	1 U	5 U	1 U	1 U
TTU-1	8/18/2016	N	5.0 U	5.0 U	2.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	5.0 U	-	-
TTU-2	12/23/2014	N	5.00 U	5.00 U	**2.1**	5.00 U	2.00 U	2.00 U	-	2.00 U	2.00 U	2.00 U	5.00 U	-	-
TTU-2	2/5/2015	N	5.00 U	5.00 U	2.00 U	5.00 U	2.00 U	2.00 U	-	2.00 U	2.00 U	2.00 U	5.00 U	-	-
TTU-2	5/18/2015	N	5.00 U	5.00 U	2.00 U	5.00 U	2.00 U	2.00 U	-	2.00 U	2.00 U	2.00 U	5.00 U	-	-
TTU-2	9/9/2015	N	20 U	20 U	8.0 U	20 U	8.0 U	8.0 U	-	8.0 U	8.0 U	8.0 U	20 U	-	-
TTU-2	11/23/2015	N	5.0 U	5.0 U	2.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	5.0 U	-	-
TTU-2	2/25/2016	N	5.0 U	5.0 U	2.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	5.0 U	-	-
TTU-2	6/1/2016	N	-	5 U	**0.466 J**	2.5 U	1 U	1 U	1 U	1 U	1 U	1 U	5 U	1 U	1 U
TTU-2	8/18/2016	N	5.0 U	5.0 U	2.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	5.0 U	-	-
TTU-3	12/23/2014	N	5.00 U	5.00 U	**2**	5.00 U	2.00 U	2.00 U	-	2.00 U	2.00 U	2.00 U	5.00 U	-	-
TTU-3	2/5/2015	N	5.00 U	5.00 U	2.00 U	5.00 U	2.00 U	2.00 U	-	2.00 U	2.00 U	2.00 U	5.00 U	-	-
TTU-3	5/18/2015	N	5.00 U	5.00 U	2.00 U	5.00 U	2.00 U	2.00 U	-	2.00 U	2.00 U	2.00 U	5.00 U	-	-
TTU-3	9/9/2015	N	5.0 U	5.0 U	2.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	5.0 U	-	-
TTU-3	11/23/2015	N	5.0 U	5.0 U	2.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	5.0 U	-	-
TTU-3	2/25/2016	N	5.0 U	5.0 U	2.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	5.0 U	-	-
TTU-3	6/1/2016	N	-	5 U	5 U	2.5 U	1 U	1 U	1 U	1 U	1 U	1 U	5 U	1 U	1 U
TTU-3	8/18/2016	N	5.0 U	5.0 U	2.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	5.0 U	-	-
TTU-4	12/23/2014	N	5.00 U	5.00 U	2.00 U	5.00 U	2.00 U	2.00 U	-	2.00 U	2.00 U	2.00 U	5.00 U	-	-
TTU-4	2/5/2015	N	5.00 U	5.00 U	2.00 U	5.00 U	2.00 U	2.00 U	-	2.00 U	2.00 U	2.00 U	5.00 U	-	-
TTU-4	5/18/2015	N	5.00 U	5.00 U	2.00 U	5.00 U	2.00 U	2.00 U	-	2.00 U	2.00 U	2.00 U	5.00 U	-	-
TTU-4	9/9/2015	N	5.0 U	5.0 U	2.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	5.0 U	-	-
TTU-4	11/23/2015	N	5.0 U	5.0 U	2.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	5.0 U	-	-
TTU-4	11/23/2015	FD	5.0 U	5.0 U	2.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	5.0 U	-	-
TTU-4	2/25/2016	N	5.0 U	5.0 U	2.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	5.0 U	-	-
TTU-4	2/25/2016	FD	5.0 U	5.0 U	2.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	5.0 U	-	-
TTU-4	6/1/2016	N	-	5 U	5 U	2.5 U	1 U	1 U	1 U	1 U	1 U	1 U	5 U	1 U	1 U
TTU-4	6/1/2016	FD	-	5 U	5 U	2.5 U	1 U	1 U	1 U	1 U	1 U	1 U	5 U	1 U	1 U
TTU-4	8/18/2016	N	5.0 U	5.0 U	2.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	5.0 U	-	-
TTU-4	8/18/2016	FD	5.0 U	5.0 U	2.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	5.0 U	-	-
TTU-5	12/23/2014	N	5.00 U	5.00 U	2.00 U	5.00 U	2.00 U	2.00 U	-	2.00 U	2.00 U	2.00 U	5.00 U	-	-
TTU-5	2/5/2015	N	5.00 U	5.00 U	2.00 U	5.00 U	2.00 U	2.00 U	-	2.00 U	2.00 U	2.00 U	5.00 U	-	-
TTU-5	5/18/2015	N	5.00 U	5.00 U	2.00 U	5.00 U	2.00 U	2.00 U	-	2.00 U	2.00 U	2.00 U	5.00 U	-	-

TABLE 5-3
VOC Concentrations in Groundwater Samples - 2012-2016
Thermal Treatment Unit RFI
Nammo Talley, Inc.

			Ethylbenzene	Hexachloro-butadiene	Hexane	Iodomethane	Isopropyl benzene (Cumene)	m,p-Xylenes	Methyl cyclohexane	Methyl Tert Butyl Ether	Methylene chloride	Naphthalene	n-Butyl benzene	n-Propyl benzene	o-Xylene	Propylene (Propene)	Styrene	tert-Butyl benzene	Tetrachloro ethene
		Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Location	Sample Date	Sample Type																	
OFC-1	6/1/2016	N	1 U	1 U	10 U	-	1 U	-	1 U	1 U	5 U	5 U	1 U	1 U	-	2.5 U	1 U	1 U	1 U
PF-1	5/18/2015	N	2.00 U	5.00 U	-	2.00 U	2.00 U	5.00 U	-	1.00 U	5.00 U	5.00 U	5.00 U	2.00 U	5.00 U	-	2.00 U	5.00 U	2.00 U
PF-1	9/9/2015	N	2.0 U	5.0 U	-	2.0 U	2.0 U	2.0 U	-	1.0 U	5.0 U	5.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	5.0 U	2.0 U
PF-1	9/9/2015	FD	2.0 U	5.0 U	-	2.0 U	2.0 U	2.0 U	-	1.0 U	5.0 U	5.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	5.0 U	2.0 U
PF-1	11/23/2015	N	2.0 U	5.0 U	-	2.0 U	2.0 U	5.0 U	-	1.0 U	5.0 U	5.0 U	5.0 U	2.0 U	5.0 U	-	2.0 U	5.0 U	2.0 U
PF-1	2/25/2016	N	2.0 U	5.0 U	-	2.0 U	2.0 U	5.0 U	-	1.0 U	5.0 U	5.0 U	5.0 U	2.0 U	5.0 U	-	2.0 U	5.0 U	2.0 U
PF-1	6/1/2016	N	1 U	1 U	10 U	-	1 U	-	1 U	1 U	5 U	5 U	1 U	1 U	-	2.5 U	1 U	1 U	1 U
PF-1	8/18/2016	N	2.0 U	5.0 U	-	2.0 U	2.0 U	5.0 U	-	1.0 U	5.0 U	5.0 U	5.0 U	2.0 U	5.0 U	-	2.0 U	5.0 U	2.0 U
PF-2	1/13/2015	N	2.00 U	5.00 U	-	2.00 U	2.00 U	5.00 U	-	1.00 U	5.00 U	5.00 U	5.00 U	2.00 U	5.00 U	-	2.00 U	5.00 U	2.00 U
PF-2	2/5/2015	N	2.00 U	5.00 U	-	2.00 U	2.00 U	5.00 U	-	1.00 U	5.00 U	5.00 U	5.00 U	2.00 U	5.00 U	-	2.00 U	5.00 U	2.00 U
PF-2	5/18/2015	N	2.00 U	5.00 U	-	2.00 U	2.00 U	5.00 U	-	1.00 U	5.00 U	5.00 U	5.00 U	2.00 U	5.00 U	-	2.00 U	5.00 U	2.00 U
PF-2	9/9/2015	N	2.0 U	5.0 U	-	2.0 U	2.0 U	2.0 U	-	1.0 U	5.0 U	5.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	5.0 U	2.0 U
PF-2	11/23/2015	N	2.0 U	5.0 U	-	2.0 U	2.0 U	5.0 U	-	1.0 U	5.0 U	5.0 U	5.0 U	2.0 U	5.0 U	-	2.0 U	5.0 U	2.0 U
PF-2	2/25/2016	N	2.0 U	5.0 U	-	2.0 U	2.0 U	5.0 U	-	1.0 U	5.0 U	5.0 U	5.0 U	2.0 U	5.0 U	-	2.0 U	5.0 U	2.0 U
PF-2	6/1/2016	N	1 U	1 U	10 U	-	1 U	-	1 U	1 U	5 U	5 U	1 U	1 U	-	2.5 U	1 U	1 U	1 U
PF-2	6/1/2016	FD	1 U	1 U	10 U	-	1 U	-	1 U	1 U	5 U	5 U	1 U	1 U	-	2.5 U	1 U	1 U	1 U
PF-2	8/18/2016	N	2.0 U	5.0 U	-	2.0 U	2.0 U	5.0 U	-	1.0 U	5.0 U	5.0 U	5.0 U	2.0 U	5.0 U	-	2.0 U	5.0 U	2.0 U
TTU-1	12/23/2014	N	2.00 U	5.00 U	-	2.00 U	2.00 U	5.00 U	-	1.00 U	5.00 U	5.00 U	5.00 U	2.00 U	5.00 U	-	2.00 U	5.00 U	2.00 U
TTU-1	2/5/2015	N	2.00 U	5.00 U	-	2.00 U	2.00 U	5.00 U	-	1.00 U	5.00 U	5.00 U	5.00 U	2.00 U	5.00 U	-	2.00 U	5.00 U	2.00 U
TTU-1	5/18/2015	N	2.00 U	5.00 U	-	2.00 U	2.00 U	5.00 U	-	1.00 U	5.00 U	5.00 U	5.00 U	2.00 U	5.00 U	-	2.00 U	5.00 U	2.00 U
TTU-1	9/9/2015	N	2.0 U	5.0 U	-	2.0 U	2.0 U	2.0 U	-	1.0 U	5.0 U	5.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	5.0 U	2.0 U
TTU-1	11/23/2015	N	2.0 U	5.0 U	-	2.0 U	2.0 U	5.0 U	-	1.0 U	5.0 U	5.0 U	5.0 U	2.0 U	5.0 U	-	2.0 U	5.0 U	2.0 U
TTU-1	2/25/2016	N	2.0 U	5.0 U	-	2.0 U	2.0 U	5.0 U	-	1.0 U	5.0 U	5.0 U	5.0 U	2.0 U	5.0 U	-	2.0 U	5.0 U	2.0 U
TTU-1	6/1/2016	N	1 U	1 U	10 U	-	1 U	-	1 U	1 U	5 U	5 U	1 U	1 U	-	2.5 U	1 U	1 U	1 U
TTU-1	8/18/2016	N	2.0 U	5.0 U	-	2.0 U	2.0 U	5.0 U	-	1.0 U	5.0 U	5.0 U	5.0 U	2.0 U	5.0 U	-	2.0 U	5.0 U	2.0 U
TTU-2	12/23/2014	N	2.00 U	5.00 U	-	2.00 U	2.00 U	5.00 U	-	1.00 U	5.00 U	5.00 U	5.00 U	2.00 U	5.00 U	-	2.00 U	5.00 U	2.00 U
TTU-2	2/5/2015	N	2.00 U	5.00 U	-	2.00 U	2.00 U	5.00 U	-	1.00 U	5.00 U	5.00 U	5.00 U	2.00 U	5.00 U	-	2.00 U	5.00 U	2.00 U
TTU-2	5/18/2015	N	2.00 U	5.00 U	-	2.00 U	2.00 U	5.00 U	-	1.00 U	5.00 U	5.00 U	5.00 U	2.00 U	5.00 U	-	2.00 U	5.00 U	2.00 U
TTU-2	9/9/2015	N	8.0 U	20 U	-	8.0 U	8.0 U	8.0 U	-	4.0 U	20 U	20 U	20 U	8.0 U	8.0 U	-	8.0 U	20 U	8.0 U
TTU-2	11/23/2015	N	2.0 U	5.0 U	-	2.0 U	2.0 U	5.0 U	-	1.0 U	5.0 U	5.0 U	5.0 U	2.0 U	5.0 U	-	2.0 U	5.0 U	2.0 U
TTU-2	2/25/2016	N	2.0 U	5.0 U	-	2.0 U	2.0 U	5.0 U	-	1.0 U	5.0 U	5.0 U	5.0 U	2.0 U	5.0 U	-	2.0 U	5.0 U	2.0 U
TTU-2	6/1/2016	N	1 U	1 U	10 U	-	1 U	-	1 U	1 U	5 U	5 U	1 U	1 U	-	2.5 U	1 U	1 U	1 U
TTU-2	8/18/2016	N	2.0 U	5.0 U	-	2.0 U	2.0 U	5.0 U	-	1.0 U	5.0 U	5.0 U	5.0 U	2.0 U	5.0 U	-	2.0 U	5.0 U	2.0 U
TTU-3	12/23/2014	N	2.00 U	5.00 U	-	2.00 U	2.00 U	5.00 U	-	1.00 U	5.00 U	5.00 U	5.00 U	2.00 U	5.00 U	-	2.00 U	5.00 U	2.00 U
TTU-3	2/5/2015	N	2.00 U	5.00 U	-	2.00 U	2.00 U	5.00 U	-	1.00 U	5.00 U	5.00 U	5.00 U	2.00 U	5.00 U	-	2.00 U	5.00 U	2.00 U
TTU-3	5/18/2015	N	2.00 U	5.00 U	-	2.00 U	2.00 U	5.00 U	-	1.00 U	5.00 U	5.00 U	5.00 U	2.00 U	5.00 U	-	2.00 U	5.00 U	2.00 U
TTU-3	9/9/2015	N	2.0 U	5.0 U	-	2.0 U	2.0 U	2.0 U	-	1.0 U	5.0 U	5.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	5.0 U	2.0 U
TTU-3	11/23/2015	N	2.0 U	5.0 U	-	2.0 U	2.0 U	5.0 U	-	1.0 U	5.0 U	5.0 U	5.0 U	2.0 U	5.0 U	-	2.0 U	5.0 U	2.0 U
TTU-3	2/25/2016	N	2.0 U	5.0 U	-	2.0 U	2.0 U	5.0 U	-	1.0 U	5.0 U	5.0 U	5.0 U	2.0 U	5.0 U	-	2.0 U	5.0 U	2.0 U
TTU-3	6/1/2016	N	1 U	1 U	10 U	-	1 U	-	1 U	1 U	5 U	5 U	1 U	1 U	-	2.5 U	1 U	1 U	1 U
TTU-3	8/18/2016	N	2.0 U	5.0 U	-	2.0 U	2.0 U	5.0 U	-	1.0 U	5.0 U	5.0 U	5.0 U	2.0 U	5.0 U	-	2.0 U	5.0 U	2.0 U
TTU-4	12/23/2014	N	2.00 U	5.00 U	-	2.00 U	2.00 U	5.00 U	-	1.00 U	5.00 U	5.00 U	5.00 U	2.00 U	5.00 U	-	2.00 U	5.00 U	2.00 U
TTU-4	2/5/2015	N	2.00 U	5.00 U	-	2.00 U	2.00 U	5.00 U	-	1.00 U	5.00 U	5.00 U	5.00 U	2.00 U	5.00 U	-	2.00 U	5.00 U	2.00 U
TTU-4	5/18/2015	N	2.00 U	5.00 U	-	2.00 U	2.00 U	5.00 U	-	1.00 U	5.00 U	5.00 U	5.00 U	2.00 U	5.00 U	-	2.00 U	5.00 U	2.00 U
TTU-4	9/9/2015	N	2.0 U	5.0 U	-	2.0 U	2.0 U	2.0 U	-	1.0 U	5.0 U	5.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	5.0 U	2.0 U
TTU-4	11/23/2015	N	2.0 U	5.0 U	-	2.0 U	2.0 U	5.0 U	-	1.0 U	5.0 U	5.0 U	5.0 U	2.0 U	5.0 U	-	2.0 U	5.0 U	2.0 U
TTU-4	11/23/2015	FD	2.0 U	5.0 U	-	2.0 U	2.0 U	5.0 U	-	1.0 U	5.0 U	5.0 U	5.0 U	2.0 U	5.0 U	-	2.0 U	5.0 U	2.0 U
TTU-4	2/25/2016	N	2.0 U	5.0 U	-	2.0 U	2.0 U	5.0 U	-	1.0 U	5.0 U	5.0 U	5.0 U	2.0 U	5.0 U	-	2.0 U	5.0 U	2.0 U
TTU-4	2/25/2016	FD	2.0 U	5.0 U	-	2.0 U	2.0 U	5.0 U	-	1.0 U	5.0 U	5.0 U	5.0 U	2.0 U	5.0 U	-	2.0 U	5.0 U	2.0 U
TTU-4	6/1/2016	N	1 U	1 U	10 U	-	1 U	-	1 U	1 U	5 U	5 U	1 U	1 U	-	2.5 U	1 U	1 U	1 U
TTU-4	6/1/2016	FD	1 U	1 U	10 U	-	1 U	-	1 U	1 U	5 U	5 U	1 U	1 U	-	2.5 U	1 U	1 U	1 U
TTU-4	8/18/2016	N	2.0 U	5.0 U	-	2.0 U	2.0 U	5.0 U	-	1.0 U	5.0 U	5.0 U	5.0 U	2.0 U	5.0 U	-	2.0 U	5.0 U	2.0 U
TTU-4	8/18/2016	FD	2.0 U	5.0 U	-	2.0 U	2.0 U	5.0 U	-	1.0 U	5.0 U	5.0 U	5.0 U	2.0 U	5.0 U	-	2.0 U	5.0 U	2.0 U
TTU-5	12/23/2014	N	2.00 U	5.00 U	-	2.00 U	2.00 U	5.00 U	-	1.00 U	5.00 U	5.00 U	5.00 U	2.00 U	5.00 U	-	2.00 U	5.00 U	2.00 U
TTU-5	2/5/2015	N	2.00 U	5.00 U	-	2.00 U	2.00 U	5.00 U	-	1.00 U	5.00 U	5.00 U	5.00 U	2.00 U	5.00 U	-	2.00 U	5.00 U	2.00 U
TTU-5	5/18/2015	N	2.00 U	5.00 U	-	2.00 U	2.00 U	5.00 U	-	1.00 U	5.00 U	5.00 U	5.00 U	2.00 U	5.00 U	-	2.00 U	5.00 U	2.00 U

TABLE 5-3
VOC Concentrations in Groundwater Samples - 2012-2016
Thermal Treatment Unit RFI
Nammo Talley, Inc.

			Toluene	trans-1,2-Dichloroethene	trans-1,3-Dichloropropene	Trichloro-ethene	Trichlorofluoro-methane (CFC-11)	Trifluorotrichloro-ethane (Freon 113)	Trihalo-methanes	Vinyl acetate	Vinyl chloride	Xylene (total)	1,4-Dioxane
		Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Location	Sample Date	Sample Type											
OFC-1	6/1/2016	N	5 U	1 U	1 U	1 U	5 U	1 U	-	-	1 U	3 U	3 U
PF-1	5/18/2015	N	180	2.00 U	2.00 U	2.00 U	5.00 U	-	-	25.00 U	5.00 U	10.00 U	2.00 U
PF-1	9/9/2015	N	27	2.0 U	2.0 U	2.0 U	5.0 U	-	-	5.0 U	5.0 U	2.0 U	2.0 U
PF-1	9/9/2015	FD	29	2.0 U	2.0 U	2.0 U	5.0 U	-	-	5.0 U	5.0 U	2.0 U	2.0 U
PF-1	11/23/2015	N	42	2.0 U	2.0 U	2.0 U	5.0 U	-	-	25 U	5.0 U	10 U	2.0 U
PF-1	2/25/2016	N	4.5	2.0 U	2.0 U	2.0 U	5.0 U	-	-	25 U	5.0 U	10 U	2.8 [A]
PF-1	6/1/2016	N	5 U	1 U	1 U	1 U	5 U	1 U	-	-	1 U	3 U	3 U
PF-1	8/18/2016	N	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	-	-	25 U	5.0 U	10 U	2.0 U
PF-2	1/13/2015	N	2.00 U	2.00 U	2.00 U	2.00 U	5.00 U	-	-	25.00 U	5.00 U	10.00 U	-
PF-2	2/5/2015	N	2.00 U	2.00 U	2.00 U	2.00 U	5.00 U	-	4.00 U	25.00 U	5.00 U	10.00 U	2.00 U
PF-2	5/18/2015	N	2.00 U	2.00 U	2.00 U	2.00 U	5.00 U	-	-	25.00 U	5.00 U	10.00 U	2.00 U
PF-2	9/9/2015	N	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	-	-	5.0 U	5.0 U	2.0 U	2.0 U
PF-2	11/23/2015	N	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	-	-	25 U	5.0 U	10 U	2.0 U
PF-2	2/25/2016	N	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	-	-	25 U	5.0 U	10 U	2.0 U
PF-2	6/1/2016	N	5 U	1 U	1 U	1 U	5 U	1 U	-	-	1 U	3 U	3 U
PF-2	6/1/2016	FD	5 U	1 U	1 U	1 U	5 U	1 U	-	-	1 U	3 U	3 U
PF-2	8/18/2016	N	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	-	-	25 U	5.0 U	10 U	2.0 U
TTU-1	12/23/2014	N	2.00 U	2.00 U	2.00 U	8.8 [A]	5.00 U	-	-	25.00 U	5.00 U	10.00 U	-
TTU-1	2/5/2015	N	2.00 U	2.00 U	2.00 U	10 [A]	5.00 U	-	4.00 U	25.00 U	5.00 U	10.00 U	26 [A]
TTU-1	5/18/2015	N	2.00 U	2.00 U	2.00 U	6.1 [A]	5.00 U	-	-	25.00 U	5.00 U	10.00 U	20 [A]
TTU-1	9/9/2015	N	2.0 U	2.0 U	2.0 U	5.2 [A]	5.0 U	-	-	5.0 U	5.0 U	2.0 U	17 [A]
TTU-1	11/23/2015	N	2.0 U	2.0 U	2.0 U	5.1 [A]	5.0 U	-	-	25 U	5.0 U	10 U	14 [A]
TTU-1	2/25/2016	N	2.0 U	2.0 U	2.0 U	4.6	5.0 U	-	-	25 U	5.0 U	10 U	11 [A]
TTU-1	6/1/2016	N	5 U	1 U	1 U	3.03	5 U	1 U	-	-	1 U	3 U	12.7 [A]
TTU-1	8/18/2016	N	2.0 U	2.0 U	2.0 U	3.7	5.0 U	-	-	25 U	5.0 U	10 U	11 [A]
TTU-2	12/23/2014	N	2.00 U	2.00 U	2.00 U	280 [A]	5.00 U	-	-	25.00 U	5.00 U	10.00 U	-
TTU-2	2/5/2015	N	2.00 U	2.00 U	2.00 U	280 [A]	5.00 U	-	4.00 U	25.00 U	5.00 U	10.00 U	170 [A]
TTU-2	5/18/2015	N	2.00 U	2.00 U	2.00 U	190 [A]	5.00 U	-	-	25.00 U	5.00 U	10.00 U	160 [A]
TTU-2	9/9/2015	N	8.0 U	8.0 U	8.0 U	200 [A]	20 U	-	-	20 U	20 U	8.0 U	170 [A]
TTU-2	11/23/2015	N	2.0 U	2.0 U	2.0 U	150 [A]	5.0 U	-	-	25 U	5.0 U	10 U	140 [A]
TTU-2	2/25/2016	N	2.0 U	2.0 U	2.0 U	150 [A]	5.0 U	-	-	25 U	5.0 U	10 U	110 [A]
TTU-2	6/1/2016	N	5 U	1 U	1 U	50.3 [A]	5 U	1 U	-	-	1 U	3 U	88.2 [A]
TTU-2	8/18/2016	N	2.0 U	2.0 U	2.0 U	360 [A]	5.0 U	-	-	25 U	5.0 U	10 U	150 [A]
TTU-3	12/23/2014	N	2.00 U	2.00 U	2.00 U	2.00 U	5.00 U	-	-	25.00 U	5.00 U	10.00 U	-
TTU-3	2/5/2015	N	2.00 U	2.00 U	2.00 U	2.00 U	5.00 U	-	4.00 U	25.00 U	5.00 U	10.00 U	2.00 U
TTU-3	5/18/2015	N	2.00 U	2.00 U	2.00 U	2.00 U	5.00 U	-	-	25.00 U	5.00 U	10.00 U	2.00 U
TTU-3	9/9/2015	N	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	-	-	5.0 U	5.0 U	2.0 U	2.0 U
TTU-3	11/23/2015	N	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	-	-	25 U	5.0 U	10 U	2.0 U
TTU-3	2/25/2016	N	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	-	-	25 U	5.0 U	10 U	2.0 U
TTU-3	6/1/2016	N	5 U	1 U	1 U	1 U	5 U	1 U	-	-	1 U	3 U	1.24 J [A]
TTU-3	8/18/2016	N	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	-	-	25 U	5.0 U	10 U	2.0 U
TTU-4	12/23/2014	N	2.00 U	2.00 U	2.00 U	2.00 U	5.00 U	-	-	25.00 U	5.00 U	10.00 U	-
TTU-4	2/5/2015	N	2.00 U	2.00 U	2.00 U	2.00 U	5.00 U	-	4.00 U	25.00 U	5.00 U	10.00 U	2.00 U
TTU-4	5/18/2015	N	2.00 U	2.00 U	2.00 U	2.00 U	5.00 U	-	-	25.00 U	5.00 U	10.00 U	2.00 U
TTU-4	9/9/2015	N	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	-	-	5.0 U	5.0 U	2.0 U	2.0 U
TTU-4	11/23/2015	N	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	-	-	25 U	5.0 U	10 U	2.0 U
TTU-4	11/23/2015	FD	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	-	-	25 U	5.0 U	10 U	2.0 U
TTU-4	2/25/2016	N	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	-	-	25 U	5.0 U	10 U	2.0 U
TTU-4	2/25/2016	FD	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	-	-	25 U	5.0 U	10 U	2.0 U
TTU-4	6/1/2016	N	5 U	1 U	1 U	1 U	5 U	1 U	-	-	1 U	3 U	3 U
TTU-4	6/1/2016	FD	5 U	1 U	1 U	1 U	5 U	1 U	-	-	1 U	3 U	3 U
TTU-4	8/18/2016	N	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	-	-	25 U	5.0 U	10 U	2.0 U
TTU-4	8/18/2016	FD	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	-	-	25 U	5.0 U	10 U	2.0 U
TTU-5	12/23/2014	N	2.00 U	2.00 U	2.00 U	2.00 U	5.00 U	-	-	25.00 U	5.00 U	10.00 U	-
TTU-5	2/5/2015	N	2.00 U	2.00 U	2.00 U	2.00 U	5.00 U	-	4.00 U	25.00 U	5.00 U	10.00 U	2.00 U
TTU-5	5/18/2015	N	2.00 U	2.00 U	2.00 U	2.00 U	5.00 U	-	-	25.00 U	5.00 U	10.00 U	2.00 U

TABLE 5-3
VOC Concentrations in Groundwater Samples - 2012-2016
Thermal Treatment Unit RFI
Nammo Talley, Inc.

			1,1,1,2-Tetra chloroethane	1,1,1-Trichloro ethane	1,1,2,2-Tetra chloroethane	1,1,2-Trichloro ethane	1,1-Dichloro ethane	1,1-Dichloro ethene	1,1-Dichloro propene	1,2,3-Trichloro benzene	1,2,3-Trichloro propane	1,2,3-Trimethyl benzene	1,2,4-Trichloro benzene	1,2,4-Trimethyl benzene	1,2-Dibromo-3-chloropropane (DBCP)
		Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Location	Sample Date	Sample Type													
TTU-5	9/9/2015	N	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	2.0 U	5.0 U	10 U	-	5.0 U	2.0 U	5.0 U
TTU-5	11/23/2015	N	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	2.0 U	5.0 U	10 U	-	5.0 U	2.0 U	5.0 U
TTU-5	2/25/2016	N	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	2.0 U	5.0 U	10 U	-	5.0 U	2.0 U	5.0 U
TTU-5	6/1/2016	N	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	2.5 U	1 U	1 U	1 U	5 U
TTU-5	8/18/2016	N	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	2.0 U	5.0 U	10 U	-	5.0 U	2.0 U	5.0 U
TTU-6	12/23/2014	N	5.00 U	2.00 U	2.00 U	2.00 U	2.00 U	5.00 U	2.00 U	5.00 U	10.00 U	-	5.00 U	2.00 U	5.00 U
TTU-6	2/5/2015	N	5.00 U	2.00 U	2.00 U	2.00 U	2.00 U	5.00 U	2.00 U	5.00 U	10.00 U	-	5.00 U	2.00 U	5.00 U
TTU-6	5/18/2015	N	5.00 U	2.00 U	2.00 U	2.00 U	2.00 U	5.00 U	2.00 U	5.00 U	10.00 U	-	5.00 U	2.00 U	5.00 U
TTU-6	9/9/2015	N	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	2.0 U	5.0 U	10 U	-	5.0 U	2.0 U	5.0 U
TTU-6	11/23/2015	N	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	2.0 U	5.0 U	10 U	-	5.0 U	2.0 U	5.0 U
TTU-6	2/25/2016	N	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	2.0 U	5.0 U	10 U	-	5.0 U	2.0 U	5.0 U
TTU-6	6/1/2016	N	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	2.5 U	1 U	1 U	1 U	5 U
TTU-6	8/18/2016	N	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	2.0 U	5.0 U	10 U	-	5.0 U	2.0 U	5.0 U
TTU-7	12/23/2014	N	5.00 U	2.00 U	2.00 U	2.00 U	2.00 U	5.00 U	2.00 U	5.00 U	10.00 U	-	5.00 U	2.00 U	5.00 U
TTU-7	2/5/2015	N	5.00 U	2.00 U	2.00 U	2.00 U	2.00 U	5.00 U	2.00 U	5.00 U	10.00 U	-	5.00 U	2.00 U	5.00 U
TTU-7	2/5/2015	FD	5.00 U	2.00 U	2.00 U	2.00 U	2.00 U	5.00 U	2.00 U	5.00 U	10.00 U	-	5.00 U	2.00 U	5.00 U
TTU-7	5/18/2015	N	5.00 U	2.00 U	2.00 U	2.00 U	2.00 U	5.00 U	2.00 U	5.00 U	10.00 U	-	5.00 U	2.00 U	5.00 U
TTU-7	5/18/2015	FD	5.00 U	2.00 U	2.00 U	2.00 U	2.00 U	5.00 U	2.00 U	5.00 U	10.00 U	-	5.00 U	2.00 U	5.00 U
TTU-7	9/9/2015	N	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	2.0 U	5.0 U	10 U	-	5.0 U	2.0 U	5.0 U
TTU-7	11/23/2015	N	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	2.0 U	5.0 U	10 U	-	5.0 U	2.0 U	5.0 U
TTU-7	2/25/2016	N	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	2.0 U	5.0 U	10 U	-	5.0 U	2.0 U	5.0 U
TTU-7	6/1/2016	N	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	2.5 U	1 U	1 U	1 U	5 U
TTU-7	8/18/2016	N	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	2.0 U	5.0 U	10 U	-	5.0 U	2.0 U	5.0 U
TTU-7	8/18/2016	N	-	-	-	-	-	-	-	-	-	-	-	-	-
TTU-7	9/29/2016	N	-	-	-	-	-	-	-	-	-	-	-	-	-
TTU-8	7/21/2016	N	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	2.0 U	5.0 U	10 U	-	5.0 U	2.0 U	5.0 U
TTU-8	8/18/2016	N	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	2.0 U	5.0 U	10 U	-	5.0 U	2.0 U	5.0 U
TTU-9a	7/21/2016	N	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	2.0 U	5.0 U	10 U	-	5.0 U	2.0 U	5.0 U
TTU-9a	8/18/2016	N	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	2.0 U	5.0 U	10 U	-	5.0 U	2.0 U	5.0 U
TTU-10	7/21/2016	N	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	2.0 U	5.0 U	10 U	-	5.0 U	2.0 U	5.0 U
TTU-10	8/18/2016	N	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	2.0 U	5.0 U	10 U	-	5.0 U	2.0 U	5.0 U
TTU-11	9/23/2015	N	250 U	100 U	100 U	100 U	100 U	**450** [A]	100 U	250 U	500 U	-	250 U	100 U	250 U
TTU-11	9/23/2015	FD	250 U	100 U	100 U	100 U	100 U	**460** [A]	100 U	250 U	500 U	-	250 U	100 U	250 U
TTU-11	11/23/2015	N	5.0 U	2.0 U	2.0 U	**2.5**	**3.4**	**410** [A]	2.0 U	5.0 U	10 U	-	5.0 R	2.0 U	5.0 U
TTU-11	2/25/2016	N	5.0 U	2.0 U	2.0 U	**2.2**	**2.3**	**290** [A]	2.0 U	5.0 U	10 U	-	5.0 U	2.0 U	5.0 U
TTU-11	6/1/2016	N	1 U	1 U	1 U	**1.77**	**1.68**	**188** [A]	1 U	1 U	2.5 U	1 U	1 U	1 U	5 U
TTU-11	8/18/2016	N	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	**220** [A]	2.0 U	5.0 U	10 U	-	5.0 U	2.0 U	5.0 U
		Screening Level	-	200	0.2	5	-	7	-	-	-	-	70	-	0.2

Notes:

A - result detected above the AWQS (or Region 9 EPA Tapwater Screening Level of 0.78 ug/L for 1,4-Dioxane)

BOLD *= detected result*

J = Estimated value. The numerical value is between the Method Detection Limit and the Reporting Limit.

U = Not detected. The numerical value is the Reporting Limit.

UJ = The compound was not detected above the Reporting Limit; however, the RL is approximate.

N = Primary sample.

FD = Field duplicate sample.

TABLE 5-3
VOC Concentrations in Groundwater Samples - 2012-2016
Thermal Treatment Unit RFI
Nammo Talley, Inc.

			1,2-Dibromoethane (Ethylene Dibromide)	1,2-Dichloro benzene	1,2-Dichloro ethane	1,2-Dichloro propane	1,3,5-Trimethyl benzene	1,3-Butadiene	1,3-Dichloro benzene	1,3-Dichloro propane	1,4-Dichloro benzene	2,2-Dichloro propane	2-Butanone (Methyl Ethyl Ketone)	2-Chloro toluene	2-Hexanone
		Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Location	Sample Date	Sample Type													
TTU-5	9/9/2015	N	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	2.0 U	10 U	5.0 U	10 U
TTU-5	11/23/2015	N	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	2.0 U	10 U	5.0 U	10 U
TTU-5	2/25/2016	N	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	2.0 U	10 U	5.0 U	10 U
TTU-5	6/1/2016	N	1 U	1 U	1 U	1 U	1 U	2 U	1 U	1 U	1 U	1 U	10 U	1 U	-
TTU-5	8/18/2016	N	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	2.0 U	10 U	5.0 U	10 U
TTU-6	12/23/2014	N	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	-	2.00 U	2.00 U	2.00 U	2.00 U	10.00 U	5.00 U	10.00 U
TTU-6	2/5/2015	N	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	-	2.00 U	2.00 U	2.00 U	2.00 U	10.00 U	5.00 U	10.00 U
TTU-6	5/18/2015	N	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	-	2.00 U	2.00 U	2.00 U	2.00 U	10.00 U	5.00 U	10.00 U
TTU-6	9/9/2015	N	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	2.0 U	10 U	5.0 U	10 U
TTU-6	11/23/2015	N	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	2.0 U	10 U	5.0 U	10 U
TTU-6	2/25/2016	N	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	2.0 U	10 U	5.0 U	10 U
TTU-6	6/1/2016	N	1 U	1 U	1 U	1 U	1 U	2 U	1 U	1 U	1 U	1 U	10 U	1 U	-
TTU-6	8/18/2016	N	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	2.0 U	10 U	5.0 U	10 U
TTU-7	12/23/2014	N	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	-	2.00 U	2.00 U	2.00 U	2.00 U	10.00 U	5.00 U	10.00 U
TTU-7	2/5/2015	N	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	-	2.00 U	2.00 U	2.00 U	2.00 U	10.00 U	5.00 U	10.00 U
TTU-7	2/5/2015	FD	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	-	2.00 U	2.00 U	2.00 U	2.00 U	10.00 U	5.00 U	10.00 U
TTU-7	5/18/2015	N	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	-	2.00 U	2.00 U	2.00 U	2.00 U	10.00 U	5.00 U	10.00 U
TTU-7	5/18/2015	FD	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	-	2.00 U	2.00 U	2.00 U	2.00 U	10.00 U	5.00 U	10.00 U
TTU-7	9/9/2015	N	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	2.0 U	10 U	5.0 U	10 U
TTU-7	11/23/2015	N	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	2.0 U	10 U	5.0 U	10 U
TTU-7	2/25/2016	N	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	2.0 U	10 U	5.0 U	10 U
TTU-7	6/1/2016	N	1 U	1 U	1 U	1 U	1 U	2 U	1 U	1 U	1 U	1 U	10 U	1 U	-
TTU-7	8/18/2016	N	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	2.0 U	10 U	5.0 U	10 U
TTU-7	8/18/2016	N	-	-	-	-	-	-	-	-	-	-	-	-	-
TTU-7	9/29/2016	N	-	-	-	-	-	-	-	-	-	-	-	-	-
TTU-8	7/21/2016	N	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	2.0 U	10 U	5.0 U	10 U
TTU-8	8/18/2016	N	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	2.0 U	10 U	5.0 U	10 U
TTU-9a	7/21/2016	N	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	2.0 U	10 U	5.0 U	10 U
TTU-9a	8/18/2016	N	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	2.0 U	10 U	5.0 U	10 U
TTU-10	7/21/2016	N	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	2.0 U	10 U	5.0 U	10 U
TTU-10	8/18/2016	N	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	2.0 U	10 U	5.0 U	10 U
TTU-11	9/23/2015	N	100 U	100 U	100 U	100 U	100 U	-	100 U	100 U	100 U	100 U	500 U	250 U	500 U
TTU-11	9/23/2015	FD	100 U	100 U	100 U	100 U	100 U	-	100 U	100 U	100 U	100 U	500 U	250 U	500 U
TTU-11	11/23/2015	N	2.0 U	2.0 U	2.0 U	2.0 U	2.0 R	-	2.0 U	2.0 U	2.0 U	2.0 U	10 U	5.0 U	10 U
TTU-11	2/25/2016	N	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	2.0 U	10 U	5.0 U	10 U
TTU-11	6/1/2016	N	1 U	**0.441 J**	1 U	1 U	1 U	2 U	1 U	1 U	1 U	1 U	10 U	1 U	-
TTU-11	8/18/2016	N	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	2.0 U	10 U	5.0 U	10 U
		Screening Level	0.05	600	5	5	-	-	-	-	75	-	-	-	-

Notes:

A - result detected above the AWQS (or Region 9 EPA Tapwater Screening Level of 0.78 ug/L for 1,4-Dioxane)
BOLD *= detected result*
J = Estimated value. The numerical value is between the Method Detection Limit and the Reporting Limit.
U = Not detected. The numerical value is the Reporting Limit.
UJ = The compound was not detected above the Reporting Limit; however, the RL is approximate.
N = Primary sample.
FD = Field duplicate sample.

TABLE 5-3
VOC Concentrations in Groundwater Samples - 2012-2016
Thermal Treatment Unit RFI
Nammo Talley, Inc.

Location	Sample Date	Sample Type	2-Phenylbutane (sec-Butylbenzene)	4-Chloro toluene	4-Ethyl toluene	4-Methyl-2-Pentanone (Methyl Isobutyl Ketone)	Acetone	Acrolein	Acrylonitrile	Benzene	Bromo-benzene	Bromodichloro-methane	Bromoform	Bromomethane (Methyl Bromide)	Carbon disulfide	Carbon tetrachloride	Chlorobenzene
		Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
TTU-5	9/9/2015	N	5.0 U	5.0 U	-	10 U	10 U	-	-	2.0 U	5.0 U	2.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U
TTU-5	11/23/2015	N	5.0 U	5.0 U	-	10 U	20 U	-	-	2.0 U	5.0 U	2.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U
TTU-5	2/25/2016	N	5.0 U	5.0 U	-	10 U	20 U	-	-	2.0 U	5.0 U	2.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U
TTU-5	6/1/2016	N	1 U	1 U	1 U	10 U	50 U	50 U	10 U	1 U	1 U	1 U	1 U	5 U	1 U	1 U	1 U
TTU-5	8/18/2016	N	5.0 U	5.0 U	-	10 U	20 U	-	-	2.0 U	5.0 U	2.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U
TTU-6	12/23/2014	N	5.00 U	5.00 U	-	10.00 U	20.00 U	-	-	2.00 U	5.00 U	2.00 U	5.00 U	5.00 U	5.00 U	5.00 U	2.00 U
TTU-6	2/5/2015	N	5.00 U	5.00 U	-	10.00 U	20.00 U	-	-	2.00 U	5.00 U	2.00 U	5.00 U	5.00 U	5.00 U	5.00 U	2.00 U
TTU-6	5/18/2015	N	5.00 U	5.00 U	-	10.00 U	20.00 U	-	-	2.00 U	5.00 U	2.00 U	5.00 U	5.00 U	5.00 U	5.00 U	2.00 U
TTU-6	9/9/2015	N	5.0 U	5.0 U	-	10 U	10 U	-	-	2.0 U	5.0 U	2.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U
TTU-6	11/23/2015	N	5.0 U	5.0 U	-	10 U	20 U	-	-	2.0 U	5.0 U	2.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U
TTU-6	2/25/2016	N	5.0 U	5.0 U	-	10 U	20 U	-	-	2.0 U	5.0 U	2.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U
TTU-6	6/1/2016	N	1 U	1 U	1 U	10 U	50 U	50 U	10 U	1 U	1 U	1 U	1 U	5 U	1 U	1 U	1 U
TTU-6	8/18/2016	N	5.0 U	5.0 U	-	10 U	20 U	-	-	2.0 U	5.0 U	2.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U
TTU-7	12/23/2014	N	5.00 U	5.00 U	-	10.00 U	20.00 U	-	-	2.00 U	5.00 U	2.00 U	5.00 U	5.00 U	5.00 U	5.00 U	2.00 U
TTU-7	2/5/2015	N	5.00 U	5.00 U	-	10.00 U	20.00 U	-	-	2.00 U	5.00 U	2.00 U	5.00 U	5.00 U	5.00 U	5.00 U	2.00 U
TTU-7	2/5/2015	FD	5.00 U	5.00 U	-	10.00 U	20.00 U	-	-	2.00 U	5.00 U	2.00 U	5.00 U	5.00 U	5.00 U	5.00 U	2.00 U
TTU-7	5/18/2015	N	5.00 U	5.00 U	-	10.00 U	20.00 U	-	-	2.00 U	5.00 U	2.00 U	5.00 U	5.00 U	5.00 U	5.00 U	2.00 U
TTU-7	5/18/2015	FD	5.00 U	5.00 U	-	10.00 U	20.00 U	-	-	2.00 U	5.00 U	2.00 U	5.00 U	5.00 U	5.00 U	5.00 U	2.00 U
TTU-7	9/9/2015	N	5.0 U	5.0 U	-	10 U	20	-	-	2.0 U	5.0 U	2.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U
TTU-7	11/23/2015	N	5.0 U	5.0 U	-	10 U	20 U	-	-	2.0 U	5.0 U	2.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U
TTU-7	2/25/2016	N	5.0 U	5.0 U	-	10 U	20 U	-	-	2.0 U	5.0 U	2.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U
TTU-7	6/1/2016	N	1 U	1 U	1 U	10 U	50 U	50 U	10 U	1 U	1 U	1 U	1 U	5 U	1 U	1 U	1 U
TTU-7	8/18/2016	N	5.0 U	5.0 U	-	10 U	20 U	-	-	2.0 U	5.0 U	2.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U
TTU-7	8/18/2016	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TTU-7	9/29/2016	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TTU-8	7/21/2016	N	5.0 U	5.0 U	-	10 U	20 U	-	-	2.0 U	5.0 U	2.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U
TTU-8	8/18/2016	N	5.0 U	5.0 U	-	10 U	20 U	-	-	2.0 U	5.0 U	2.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U
TTU-9a	7/21/2016	N	5.0 U	5.0 U	-	10 U	20 U	-	-	2.0 U	5.0 U	2.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U
TTU-9a	8/18/2016	N	5.0 U	5.0 U	-	10 U	20 U	-	-	2.0 U	5.0 U	2.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U
TTU-10	7/21/2016	N	5.0 U	5.0 U	-	10 U	20 U	-	-	2.0 U	5.0 U	2.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U
TTU-10	8/18/2016	N	5.0 U	5.0 U	-	10 U	20 U	-	-	2.0 U	5.0 U	2.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U
TTU-11	9/23/2015	N	250 U	250 U	-	500 U	500 U	-	-	100 U	250 U	100 U	250 U	250 U	250 U	250 U	100 U
TTU-11	9/23/2015	FD	250 U	250 U	-	500 U	500 U	-	-	100 U	250 U	100 U	250 U	250 U	250 U	250 U	100 U
TTU-11	11/23/2015	N	5.0 U	5.0 U	-	10 U	20 U	-	-	**7.1** [A]	5.0 U	2.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U
TTU-11	2/25/2016	N	5.0 U	5.0 U	-	10 U	20 U	-	-	**13** [A]	5.0 U	2.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U
TTU-11	6/1/2016	N	1 U	1 U	1 U	10 U	50 U	50 U	10 U	**3.73**	1 U	1 U	1 U	5 U	1 U	1 U	**0.355 J**
TTU-11	8/18/2016	N	5.0 U	5.0 U	-	10 U	20 U	-	-	**4.2**	5.0 U	2.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U
		Screening Level	-	-	-	-	-	3.5	0.06	5	-	-	-	9.8	-	5	100

Notes:

A - result detected above the AWQS (or Region 9 EPA Tapwater Screening Level of 0.78 ug/L for 1,4-Dioxane)

***BOLD** = detected result*

J = Estimated value. The numerical value is between the Method Detection Limit and the Reporting Limit.

U = Not detected. The numerical value is the Reporting Limit.

UJ = The compound was not detected above the Reporting Limit; however, the RL is approximate.

N = Primary sample.

FD = Field duplicate sample.

TABLE 5-3
VOC Concentrations in Groundwater Samples - 2012-2016
Thermal Treatment Unit RFI
Nammo Talley, Inc.

			Chlorobromo-methane	Chloroethane	Chloroform (Trichloromethane)	Chloromethane (Methyl Chloride)	cis-1,2-Dichloro ethene	cis-1,3-Dichloro propene	Cyclohexane	Cymene (p-isopropyl toluene)	Dibromo-chloromethane	Dibromo-methane	Dichlorodifluoro methane (CFC-12)	Dicyclo-pentadiene	Diisopropyl ether (DIPE)
		Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Location	Sample Date	Sample Type													
TTU-5	9/9/2015	N	5.0 U	5.0 U	2.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	5.0 U	-	-
TTU-5	11/23/2015	N	5.0 U	5.0 U	2.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	5.0 U	-	-
TTU-5	2/25/2016	N	5.0 U	5.0 U	2.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	5.0 U	-	-
TTU-5	6/1/2016	N	-	5 U	5 U	2.50 UJ	1 U	1 U	1 U	1 U	1 U	1 U	5 U	1 U	1 U
TTU-5	8/18/2016	N	5.0 U	5.0 U	2.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	5.0 U	-	-
TTU-6	12/23/2014	N	5.00 U	5.00 U	2.00 U	5.00 U	2.00 U	2.00 U	-	2.00 U	2.00 U	2.00 U	5.00 U	-	-
TTU-6	2/5/2015	N	5.00 U	5.00 U	2.00 U	5.00 U	2.00 U	2.00 U	-	2.00 U	2.00 U	2.00 U	5.00 U	-	-
TTU-6	5/18/2015	N	5.00 U	5.00 U	2.00 U	5.00 U	2.00 U	2.00 U	-	2.00 U	2.00 U	2.00 U	5.00 U	-	-
TTU-6	9/9/2015	N	5.0 U	5.0 U	2.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	5.0 U	-	-
TTU-6	11/23/2015	N	5.0 U	5.0 U	2.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	5.0 U	-	-
TTU-6	2/25/2016	N	5.0 U	5.0 U	2.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	5.0 U	-	-
TTU-6	6/1/2016	N	-	5 U	5 U	2.5 U	1 U	1 U	1 U	1 U	1 U	1 U	5 U	1 U	1 U
TTU-6	8/18/2016	N	5.0 U	5.0 U	2.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	5.0 U	-	-
TTU-7	12/23/2014	N	5.00 U	5.00 U	2.00 U	5.00 U	2.00 U	2.00 U	-	2.00 U	2.00 U	2.00 U	5.00 U	-	-
TTU-7	2/5/2015	N	5.00 U	5.00 U	2.00 U	5.00 U	2.00 U	2.00 U	-	2.00 U	2.00 U	2.00 U	5.00 U	-	-
TTU-7	2/5/2015	FD	5.00 U	5.00 U	2.00 U	5.00 U	2.00 U	2.00 U	-	2.00 U	2.00 U	2.00 U	5.00 U	-	-
TTU-7	5/18/2015	N	5.00 U	5.00 U	2.00 U	5.00 U	2.00 U	2.00 U	-	2.00 U	2.00 U	2.00 U	5.00 U	-	-
TTU-7	5/18/2015	FD	5.00 U	5.00 U	2.00 U	5.00 U	2.00 U	2.00 U	-	2.00 U	2.00 U	2.00 U	5.00 U	-	-
TTU-7	9/9/2015	N	5.0 U	5.0 U	2.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	5.0 U	-	-
TTU-7	11/23/2015	N	5.0 U	5.0 U	2.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	5.0 U	-	-
TTU-7	2/25/2016	N	5.0 U	5.0 U	2.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	5.0 U	-	-
TTU-7	6/1/2016	N	-	5 U	5 U	2.5 U	1 U	1 U	1 U	1 U	1 U	1 U	5 U	1 U	1 U
TTU-7	8/18/2016	N	5.0 U	5.0 U	2.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	5.0 U	-	-
TTU-7	8/18/2016	N	-	-	-	-	-	-	-	-	-	-	-	-	-
TTU-7	9/29/2016	N	-	-	-	-	-	-	-	-	-	-	-	-	-
TTU-8	7/21/2016	N	5.0 U	5.0 U	2.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	5.0 U	-	-
TTU-8	8/18/2016	N	5.0 U	5.0 U	2.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	5.0 U	-	-
TTU-9a	7/21/2016	N	5.0 U	5.0 U	2.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	5.0 U	-	-
TTU-9a	8/18/2016	N	5.0 U	5.0 U	2.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	5.0 U	-	-
TTU-10	7/21/2016	N	5.0 U	5.0 U	2.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	5.0 U	-	-
TTU-10	8/18/2016	N	5.0 U	5.0 U	2.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	5.0 U	-	-
TTU-11	9/23/2015	N	250 U	250 U	100 U	250 U	100 U	100 U	-	100 U	100 U	100 U	250 U	-	-
TTU-11	9/23/2015	FD	250 U	250 U	100 U	250 U	100 U	100 U	-	100 U	100 U	100 U	250 U	-	-
TTU-11	11/23/2015	N	5.0 U	5.0 U	**5.5**	5.0 U	2.0 U	2.0 U	-	2.0 R	2.0 U	2.0 U	5.0 U	-	-
TTU-11	2/25/2016	N	5.0 U	5.0 U	2.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	5.0 U	-	-
TTU-11	6/1/2016	N	-	5 U	**2.74 J**	2.50 UJ	**0.361 J**	1 U	1 U	1 U	1 U	1 U	5 U	1 U	1 U
TTU-11	8/18/2016	N	5.0 U	5.0 U	**3.5**	5.0 U	2.0 U	2.0 U	-	2.0 U	2.0 U	2.0 U	5.0 U	-	-
		Screening Level	-	-	-	-	70	-	-	-	-	-	-	-	-

Notes:

A - result detected above the AWQS (or Region 9 EPA Tapwater Screening Level of 0.78 ug/L for 1,4-Dioxane)

BOLD *= detected result*

J = Estimated value. The numerical value is between the Method Detection Limit and the Reporting Limit.

U = Not detected. The numerical value is the Reporting Limit.

UJ = The compound was not detected above the Reporting Limit; however, the RL is approximate.

N = Primary sample.

FD = Field duplicate sample.

TABLE 5-3
VOC Concentrations in Groundwater Samples - 2012-2016
Thermal Treatment Unit RFI
Nammo Talley, Inc.

			Ethylbenzene	Hexachloro-butadiene	Hexane	Iodomethane	Isopropyl benzene (Cumene)	m,p-Xylenes	Methyl cyclohexane	Methyl Tert Butyl Ether	Methylene chloride	Naphthalene	n-Butyl benzene	n-Propyl benzene	o-Xylene	Propylene (Propene)	Styrene	tert-Butyl benzene	Tetrachloro ethene
		Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Location	Sample Date	Sample Type																	
TTU-5	9/9/2015	N	2.0 U	5.0 U	-	2.0 U	2.0 U	2.0 U	-	1.0 U	5.0 U	5.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	5.0 U	2.0 U
TTU-5	11/23/2015	N	2.0 U	5.0 U	-	2.0 U	2.0 U	5.0 U	-	1.0 U	5.0 U	5.0 U	5.0 U	2.0 U	5.0 U	-	2.0 U	5.0 U	2.0 U
TTU-5	2/25/2016	N	2.0 U	5.0 U	-	2.0 U	2.0 U	5.0 U	-	1.0 U	5.0 U	5.0 U	5.0 U	2.0 U	5.0 U	-	2.0 U	5.0 U	2.0 U
TTU-5	6/1/2016	N	1 U	1 U	10 U	-	1 U	-	1 U	1 U	5 U	5 U	1 U	1 U	-	2.5 U	1 U	1 U	1 U
TTU-5	8/18/2016	N	2.0 U	5.0 U	-	2.0 U	2.0 U	5.0 U	-	1.0 U	5.0 U	5.0 U	5.0 U	2.0 U	5.0 U	-	2.0 U	5.0 U	2.0 U
TTU-6	12/23/2014	N	2.00 U	5.00 U	-	2.00 U	2.00 U	5.00 U	-	1.00 U	5.00 U	5.00 U	5.00 U	2.00 U	5.00 U	-	2.00 U	5.00 U	2.00 U
TTU-6	2/5/2015	N	2.00 U	5.00 U	-	2.00 U	2.00 U	5.00 U	-	1.00 U	5.00 U	5.00 U	5.00 U	2.00 U	5.00 U	-	2.00 U	5.00 U	2.00 U
TTU-6	5/18/2015	N	2.00 U	5.00 U	-	2.00 U	2.00 U	5.00 U	-	1.00 U	5.00 U	5.00 U	5.00 U	2.00 U	5.00 U	-	2.00 U	5.00 U	2.00 U
TTU-6	9/9/2015	N	2.0 U	5.0 U	-	2.0 U	2.0 U	2.0 U	-	1.0 U	5.0 U	5.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	5.0 U	2.0 U
TTU-6	11/23/2015	N	2.0 U	5.0 U	-	2.0 U	2.0 U	5.0 U	-	1.0 U	5.0 U	5.0 U	5.0 U	2.0 U	5.0 U	-	2.0 U	5.0 U	2.0 U
TTU-6	2/25/2016	N	2.0 U	5.0 U	-	2.0 U	2.0 U	5.0 U	-	1.0 U	5.0 U	5.0 U	5.0 U	2.0 U	5.0 U	-	2.0 U	5.0 U	2.0 U
TTU-6	6/1/2016	N	1 U	1 U	10 U	-	1 U	-	1 U	1 U	5 U	5 U	1 U	1 U	-	2.5 U	1 U	1 U	1 U
TTU-6	8/18/2016	N	2.0 U	5.0 U	-	2.0 U	2.0 U	5.0 U	-	1.0 U	5.0 U	5.0 U	5.0 U	2.0 U	5.0 U	-	2.0 U	5.0 U	2.0 U
TTU-7	12/23/2014	N	2.00 U	5.00 U	-	2.00 U	2.00 U	5.00 U	-	1.00 U	5.00 U	5.00 U	5.00 U	2.00 U	5.00 U	-	2.00 U	5.00 U	2.00 U
TTU-7	2/5/2015	N	2.00 U	5.00 U	-	2.00 U	2.00 U	5.00 U	-	1.00 U	5.00 U	5.00 U	5.00 U	2.00 U	5.00 U	-	2.00 U	5.00 U	2.00 U
TTU-7	2/5/2015	FD	2.00 U	5.00 U	-	2.00 U	2.00 U	5.00 U	-	1.00 U	5.00 U	5.00 U	5.00 U	2.00 U	5.00 U	-	2.00 U	5.00 U	2.00 U
TTU-7	5/18/2015	N	2.00 U	5.00 U	-	2.00 U	2.00 U	5.00 U	-	1.00 U	5.00 U	5.00 U	5.00 U	2.00 U	5.00 U	-	2.00 U	5.00 U	2.00 U
TTU-7	5/18/2015	FD	2.00 U	5.00 U	-	2.00 U	2.00 U	5.00 U	-	1.00 U	5.00 U	5.00 U	5.00 U	2.00 U	5.00 U	-	2.00 U	5.00 U	2.00 U
TTU-7	9/9/2015	N	2.0 U	5.0 U	-	2.0 U	2.0 U	2.0 U	-	1.0 U	5.0 U	5.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	5.0 U	2.0 U
TTU-7	11/23/2015	N	2.0 U	5.0 U	-	2.0 U	2.0 U	5.0 U	-	1.0 U	5.0 U	5.0 U	5.0 U	2.0 U	5.0 U	-	2.0 U	5.0 U	2.0 U
TTU-7	2/25/2016	N	2.0 U	5.0 U	-	2.0 U	2.0 U	5.0 U	-	1.0 U	5.0 U	5.0 U	5.0 U	2.0 U	5.0 U	-	2.0 U	5.0 U	2.0 U
TTU-7	6/1/2016	N	1 U	1 U	10 U	-	**0.541 J**	-	1 U	1 U	5 U	5 U	1 U	1 U	-	**7.76**	1 U	1 U	1 U
TTU-7	8/18/2016	N	2.0 U	5.0 U	-	2.0 U	2.0 U	5.0 U	-	1.0 U	5.0 U	5.0 U	5.0 U	2.0 U	5.0 U	-	2.0 U	5.0 U	2.0 U
TTU-7	8/18/2016	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TTU-7	9/29/2016	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TTU-8	7/21/2016	N	2.0 U	5.0 U	-	2.0 U	2.0 U	2.0 U	-	1.0 U	5.0 U	5.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	5.0 U	2.0 U
TTU-8	8/18/2016	N	2.0 U	5.0 U	-	2.0 U	2.0 U	5.0 U	-	1.0 U	5.0 U	5.0 U	5.0 U	2.0 U	5.0 U	-	2.0 U	5.0 U	2.0 U
TTU-9a	7/21/2016	N	2.0 U	5.0 U	-	2.0 U	2.0 U	2.0 U	-	1.0 U	5.0 U	5.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	5.0 U	2.0 U
TTU-9a	8/18/2016	N	2.0 U	5.0 U	-	2.0 U	2.0 U	5.0 U	-	1.0 U	5.0 U	5.0 U	5.0 U	2.0 U	5.0 U	-	2.0 U	5.0 U	2.0 U
TTU-10	7/21/2016	N	2.0 U	5.0 U	-	2.0 U	2.0 U	2.0 U	-	1.0 U	5.0 U	5.0 U	5.0 U	2.0 U	2.0 U	-	2.0 U	5.0 U	2.0 U
TTU-10	8/18/2016	N	2.0 U	5.0 U	-	2.0 U	2.0 U	5.0 U	-	1.0 U	5.0 U	5.0 U	5.0 U	2.0 U	5.0 U	-	2.0 U	5.0 U	2.0 U
TTU-11	9/23/2015	N	100 U	250 U	-	100 U	100 U	100 U	-	50 U	250 U	250 U	250 U	100 U	100 U	-	100 U	250 U	100 U
TTU-11	9/23/2015	FD	100 U	250 U	-	100 U	100 U	100 U	-	50 U	250 U	250 U	250 U	100 U	100 U	-	100 U	250 U	100 U
TTU-11	11/23/2015	N	2.0 U	5.0 U	-	2.0 R	2.0 U	5.0 R	-	1.0 U	5.0 U	5.0 R	5.0 U	2.0 R	5.0 R	-	2.0 R	5.0 U	**5 [A]**
TTU-11	2/25/2016	N	2.0 U	5.0 U	-	2.0 U	2.0 U	5.0 U	-	1.0 U	5.0 U	5.0 U	5.0 U	2.0 U	5.0 U	-	2.0 U	5.0 U	**4.8**
TTU-11	6/1/2016	N	1 U	1 U	10 U	-	1 U	-	1 U	1 U	5 U	5 U	1 U	1 U	-	2.5 U	1 U	1 U	**3.55**
TTU-11	8/18/2016	N	2.0 U	5.0 U	-	2.0 U	2.0 U	5.0 U	-	1.0 U	5.0 U	5.0 U	5.0 U	2.0 U	5.0 U	-	2.0 U	5.0 U	**3.1**
		Screening Level	700	0.4	-	-	-	10000	-	-	5	140	-	-	10000	-	100	-	5

Notes:

A - result detected above the AWQS (or Region 9 EPA Tapwater Screening Level of 0.78 ug/L for 1,4-Dioxane)

***BOLD** = detected result*

J = Estimated value. The numerical value is between the Method Detection Limit and the Reporting Limit.

U = Not detected. The numerical value is the Reporting Limit.

UJ = The compound was not detected above the Reporting Limit; however, the RL is approximate.

N = Primary sample.

FD = Field duplicate sample.

TABLE 5-3
VOC Concentrations in Groundwater Samples - 2012-2016
Thermal Treatment Unit RFI
Nammo Talley, Inc.

			Toluene	trans-1,2-Dichloroethene	trans-1,3-Dichloropropene	Trichloro-ethene	Trichlorofluoro-methane (CFC-11)	Trifluorotrichloro-ethane (Freon 113)	Trihalo-methanes	Vinyl acetate	Vinyl chloride	Xylene (total)	1,4-Dioxane
		Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Location	Sample Date	Sample Type											
TTU-5	9/9/2015	N	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	-	-	5.0 U	5.0 U	2.0 U	2.0 U
TTU-5	11/23/2015	N	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	-	-	25 U	5.0 U	10 U	2.0 U
TTU-5	2/25/2016	N	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	-	-	25 U	5.0 U	10 U	2.0 U
TTU-5	6/1/2016	N	5 U	1 U	1 U	1 U	5 U	1 U	-	-	1 U	3 U	3 U
TTU-5	8/18/2016	N	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	-	-	25 U	5.0 U	10 U	2.0 U
TTU-6	12/23/2014	N	2.00 U	2.00 U	2.00 U	2.00 U	5.00 U	-	-	25.00 U	5.00 U	10.00 U	-
TTU-6	2/5/2015	N	2.00 U	2.00 U	2.00 U	2.00 U	5.00 U	-	4.00 U	25.00 U	5.00 U	10.00 U	2.00 U
TTU-6	5/18/2015	N	2.00 U	2.00 U	2.00 U	2.00 U	5.00 U	-	-	25.00 U	5.00 U	10.00 U	2.00 U
TTU-6	9/9/2015	N	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	-	-	5.0 U	5.0 U	2.0 U	2.0 U
TTU-6	11/23/2015	N	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	-	-	25 U	5.0 U	10 U	2.0 U
TTU-6	2/25/2016	N	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	-	-	25 U	5.0 U	10 U	2.0 U
TTU-6	6/1/2016	N	5 U	1 U	1 U	1 U	5 U	1 U	-	-	1 U	3 U	3 U
TTU-6	8/18/2016	N	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	-	-	25 U	5.0 U	10 U	2.0 U
TTU-7	12/23/2014	N	**36**	2.00 U	2.00 U	2.00 U	5.00 U	-	-	25.00 U	5.00 U	10.00 U	-
TTU-7	2/5/2015	N	**36**	2.00 U	2.00 U	2.00 U	5.00 U	-	4.00 U	25.00 U	5.00 U	10.00 U	2.00 U
TTU-7	2/5/2015	FD	2.00 U	2.00 U	2.00 U	2.00 U	5.00 U	-	4.00 U	25.00 U	5.00 U	10.00 U	2.00 U
TTU-7	5/18/2015	N	**40 J**	2.00 U	2.00 U	2.00 U	5.00 U	-	-	25.00 U	5.00 U	10.00 U	2.00 U
TTU-7	5/18/2015	FD	2.00 UJ	2.00 U	2.00 U	2.00 U	5.00 U	-	-	25.00 U	5.00 U	10.00 U	-
TTU-7	9/9/2015	N	**42**	2.0 U	2.0 U	2.0 U	5.0 U	-	-	5.0 U	5.0 U	2.0 U	2.0 U
TTU-7	11/23/2015	N	**40**	2.0 U	2.0 U	2.0 U	5.0 U	-	-	25 U	5.0 U	10 U	2.0 U
TTU-7	2/25/2016	N	**41**	2.0 U	2.0 U	2.0 U	5.0 U	-	-	25 U	5.0 U	10 U	2.0 U
TTU-7	6/1/2016	N	**31.5**	1 U	1 U	1 U	5 U	1 U	-	-	1 U	**1.28 J**	3 U
TTU-7	8/18/2016	N	**34**	2.0 U	2.0 U	2.0 U	5.0 U	-	-	25 U	5.0 U	10 U	**2.5 [A]**
TTU-7	8/18/2016	N	-	-	-	-	-	-	-	-	-	-	2.0 U
TTU-7	9/29/2016	N	-	-	-	-	-	-	-	-	-	-	2.0 U
TTU-8	7/21/2016	N	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	-	-	5.0 U	5.0 U	2.0 U	2.0 U
TTU-8	8/18/2016	N	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	-	-	25 U	5.0 U	10 U	2.0 U
TTU-9a	7/21/2016	N	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	-	-	5.0 U	5.0 U	2.0 U	2.0 U
TTU-9a	8/18/2016	N	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	-	-	25 U	5.0 U	10 U	2.0 U
TTU-10	7/21/2016	N	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	-	-	5.0 U	5.0 U	2.0 U	2.0 U
TTU-10	8/18/2016	N	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	-	-	25 U	5.0 U	10 U	2.0 U
TTU-11	9/23/2015	N	100 U	100 U	100 U	**3100 [A]**	250 U	-	-	250 U	250 U	100 U	**380 [A]**
TTU-11	9/23/2015	FD	100 U	100 U	100 U	**3100 [A]**	250 U	-	-	250 U	250 U	100 U	**400 [A]**
TTU-11	11/23/2015	N	2.0 U	2.0 U	2.0 U	**2900 J [A]**	5.0 U	-	-	25 R	5.0 U	10 R	**270 [A]**
TTU-11	2/25/2016	N	2.0 U	2.0 U	2.0 U	**2400 [A]**	5.0 U	-	-	25 U	5.0 U	10 U	**250 [A]**
TTU-11	6/1/2016	N	5 U	1 U	1 U	**1600 [A]**	5 U	**0.659 J**	-	-	1 U	3 U	**282 [A]**
TTU-11	8/18/2016	N	2.0 U	2.0 U	2.0 U	**1800 [A]**	5.0 U	-	-	25 U	5.0 U	10 U	**240 [A]**
		Screening Level	1000	100	-	5	-	-	80	-	2	10000	0.78

Notes:

A - result detected above the AWQS (or Region 9 EPA Tapwater Screening Level of 0.78 ug/L for 1,4-Dioxane)
BOLD *= detected result*
J = Estimated value. The numerical value is between the Method Detection Limit and the Reporting Limit.
U = Not detected. The numerical value is the Reporting Limit.
UJ = The compound was not detected above the Reporting Limit; however, the RL is approximate.
N = Primary sample.
FD = Field duplicate sample.

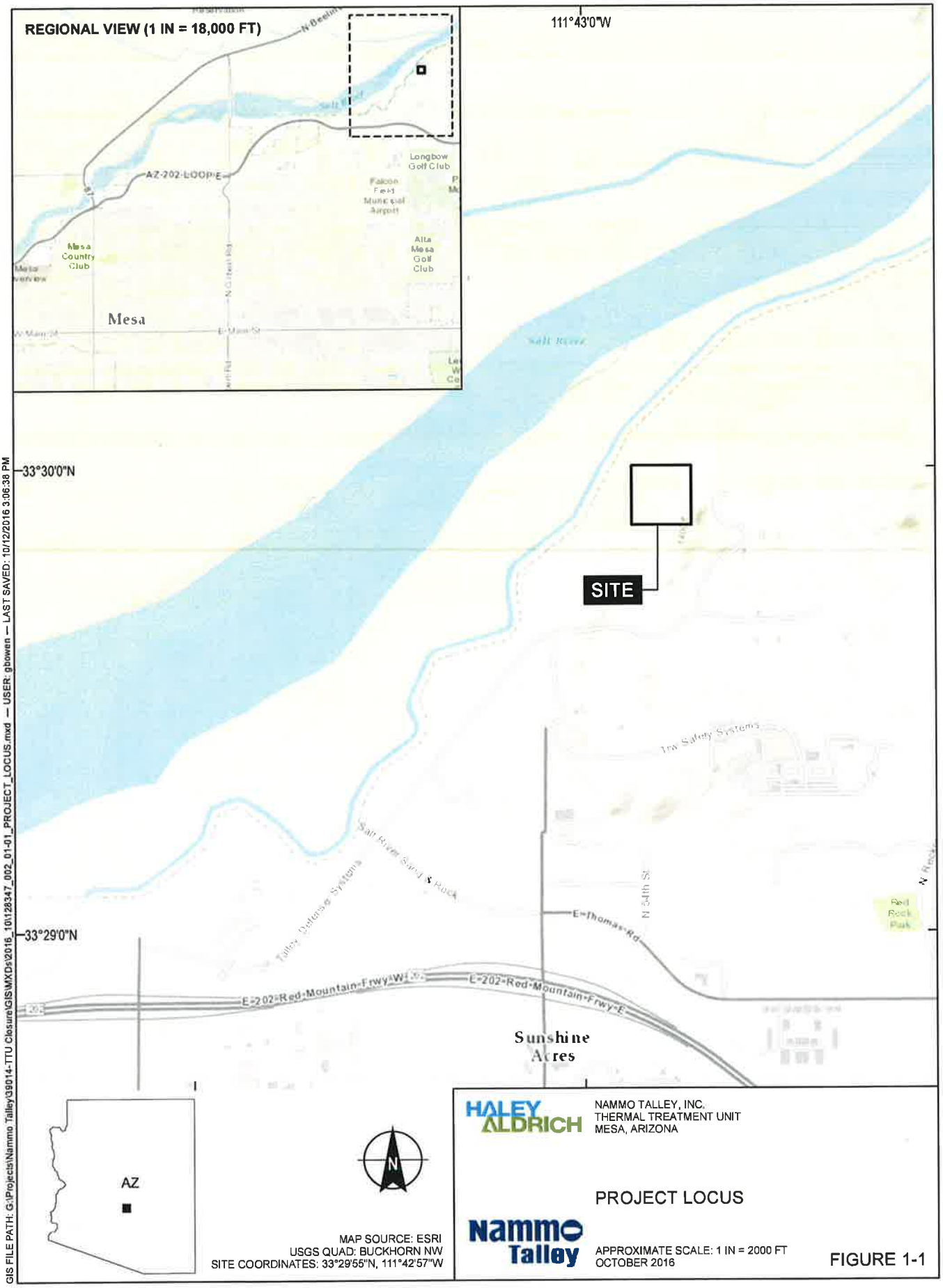
TABLE 7-1
Mann-Kendall Summary Table
Thermal Treatment Unit RFI
Nammo Talley, Inc.

Well ID	Constituent	Data Time Period	n	S	CF [%]	COV	Trend
TTU-1	Perchlorate	2012 - 2016	11	-20	92.9%	0.39	Probably Decreasing
TTU-2	Perchlorate	2013 - 2016	10	-22	97.1%	0.16	Decreasing
TTU-3	Perchlorate	2013 - 2016	10	-26	98.9%	1.01	Decreasing
TTU-5	Perchlorate	2015 - 2016	7	-1	50.0%	0.17	Stable
TTU-6	Perchlorate	2014 - 2016	8	2	54.8%	1.03	No Trend
TTU-7	Perchlorate	2014 - 2016	8	-12	91.1%	0.63	Probably Decreasing
TTU-11	Perchlorate	2015 - 2016	5	-10	99.2%	0.35	Decreasing
TTU-1	TCE	2014 - 2016	8	-24	99.9%	0.42	Decreasing
TTU-2	TCE	2014 - 2016	8	-10	86.2%	0.47	Stable
TTU-11	TCE	2015 - 2016	5	-8	95.8%	0.28	Decreasing
TTU-1	1,4-Dioxane	2015 - 2016	5	-7	92.1%	0.19	Probably Decreasing
TTU-2	1,4-Dioxane	2015 - 2016	5	-4	75.8%	0.25	Stable
TTU-11	1,4-Dioxane	2015 - 2016	5	-6	88.3%	0.2	Stable

NOTES:

1. *n = number of sampling points*
2. *S = Mann-Kendall Statistic*
3. *CF = confidence factor*
4. *COV = coefficient of variation*

FIGURES



HALEY ALDRICH

NAMMO TALLEY, INC.
THERMAL TREATMENT UNIT
MESA, ARIZONA

PROJECT LOCUS

Nammo Talley

APPROXIMATE SCALE: 1 IN = 2000 FT
OCTOBER 2016

MAP SOURCE: ESRI
USGS QUAD: BUCKHORN NW
SITE COORDINATES: 33°29'55"N, 111°42'57"W

FIGURE 1-1

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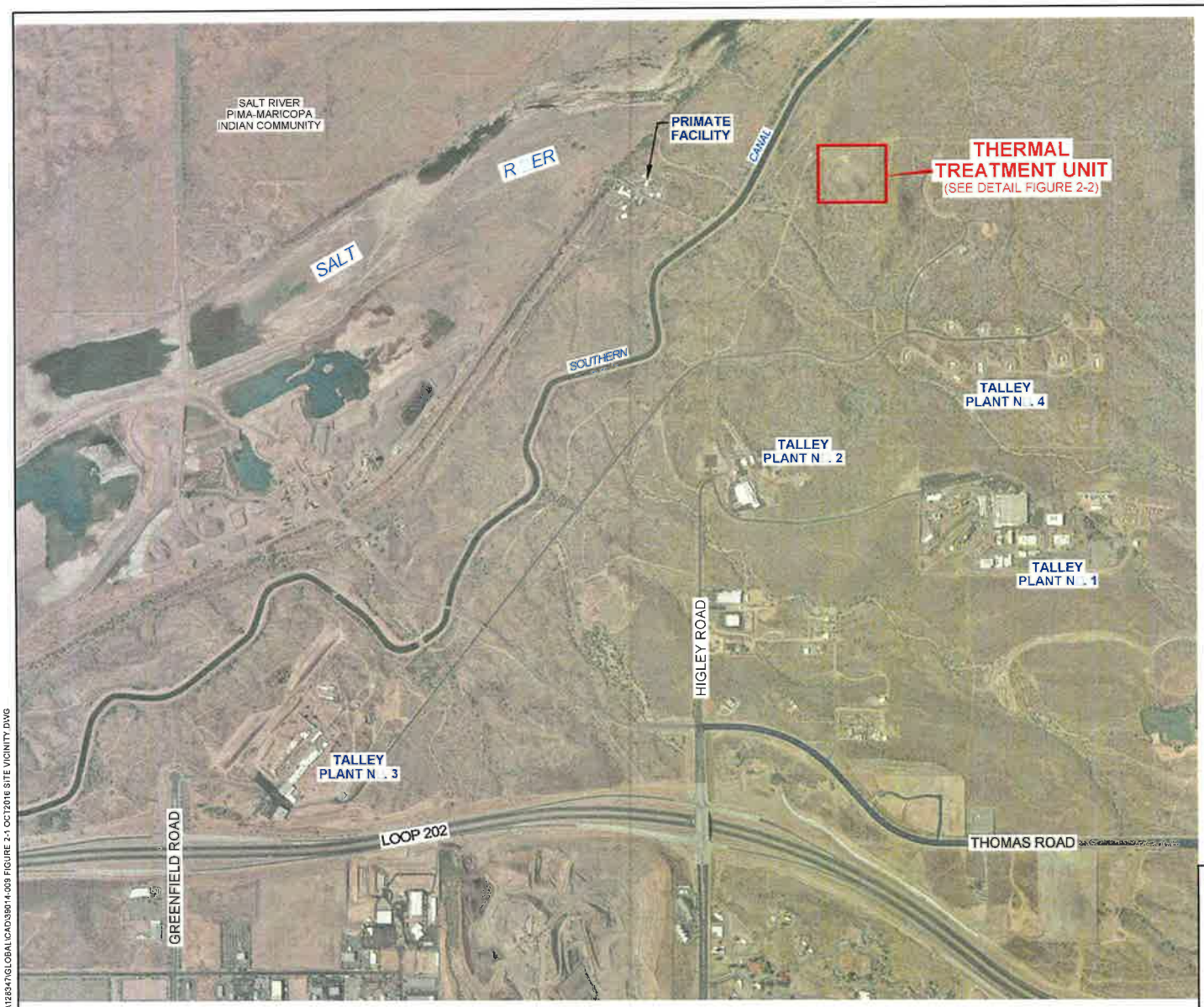


0 1,000 2,000
SCALE IN FEET

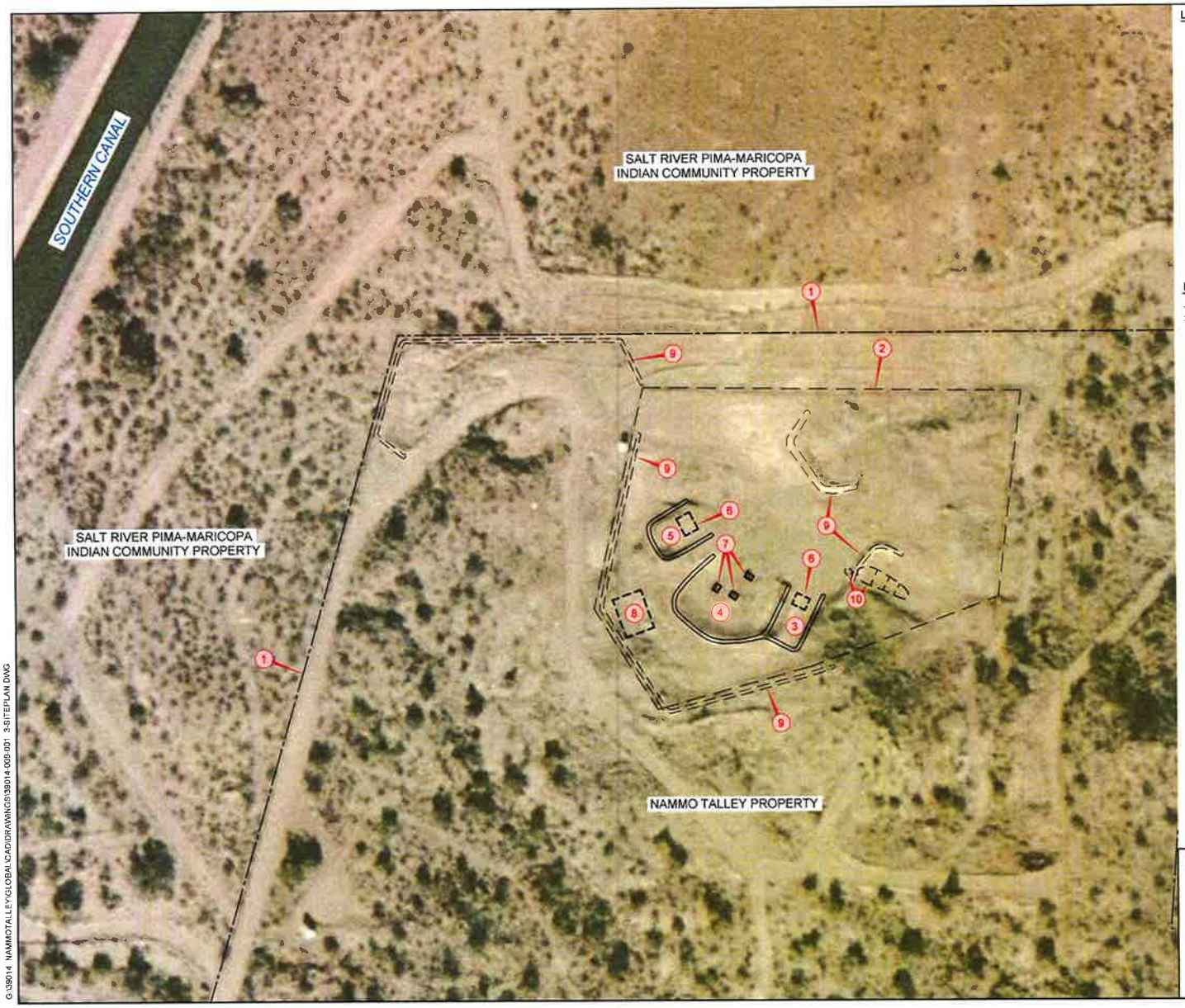
NAMMO TALLEY, INC.
THERMAL TREATMENT UNIT
MESA, ARIZONA

SITE VICINITY

SCALE: AS SHOWN
OCTOBER 2016

FIGURE 2-1

G:\128347\GLOBAL\CAD\39014-009 FIGURE 2-1 OCT2016 SITE VICINITY.DWG



LEGEND

1. BOUNDARY BETWEEN TALLEY AND SRPMIC PROPERTIES
2. APPROXIMATE TTU BOUNDARY
3. PIT 1
4. PIT 2 THROUGH 5
5. PIT 6
6. FORMER BURN PAD
7. FORMER BURN BOXES AND CAGES
8. OLD BURN BOX AREA
9. EARTHEN BERMS (STORMWATER RETENTION)
10. PIT 6 THROUGH 10

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE
2. SRPMIC SALT RIVER PIMA-MARICOPA INDIAN COMMUNITY

0 100 200
SCALE IN FEET

HALEY & ALDRICH

NAMMO TALLEY, INC.
THERMAL TREATMENT UNIT
MESA, ARIZONA

SITE PLAN

Nammo Talley

SCALE: AS SHOWN
OCTOBER 2016

FIGURE 2-2

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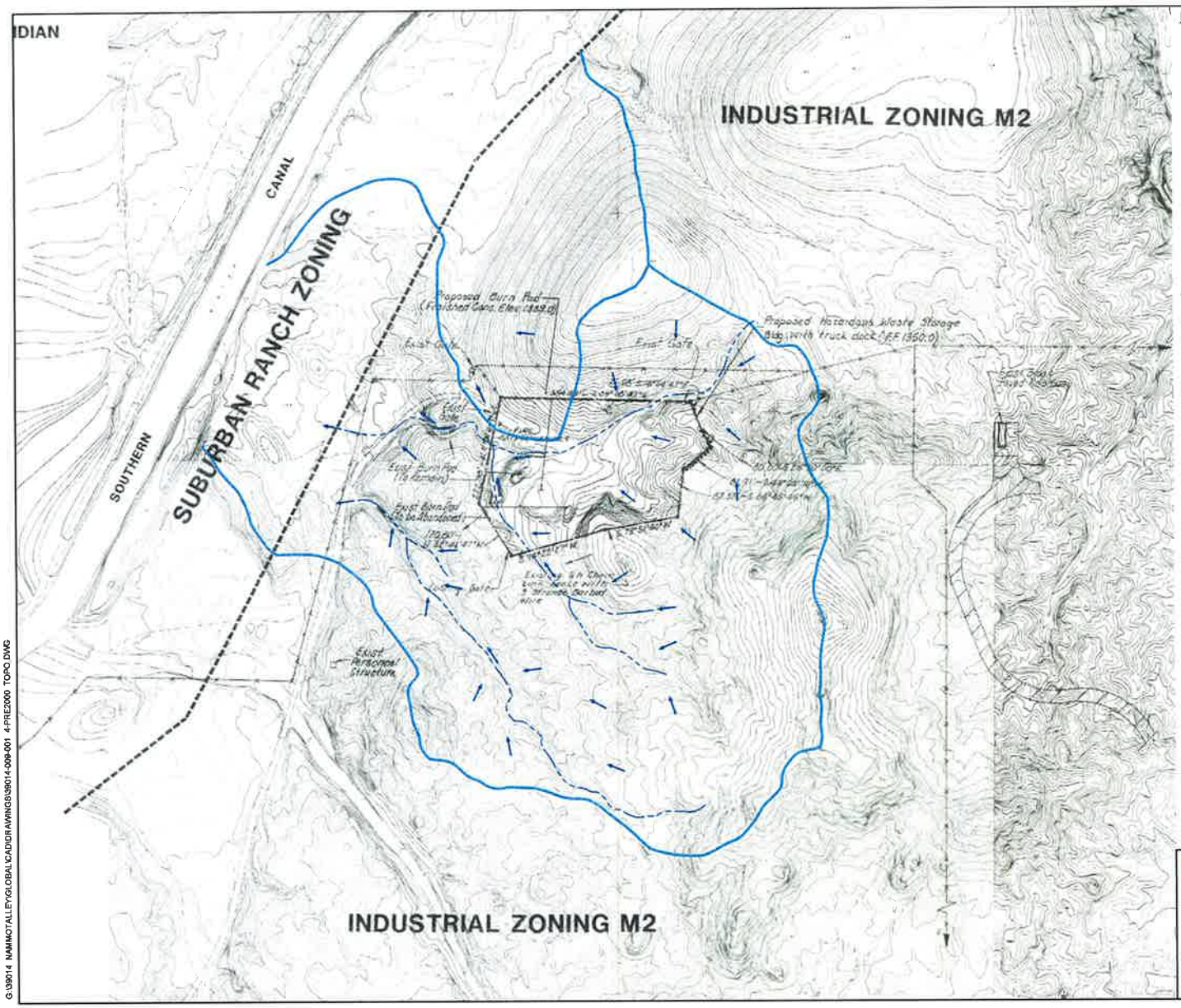


LEGEND

- RUN-OFF FLOW DIRECTION
- DRAINAGE AREA BOUNDARY
- APPROXIMATE DRAINAGE CHANNEL

NOTE

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE

0 200 400
SCALE IN FEET

HALEY ALDRICH

NAMMO TALLEY, INC.
THERMAL TREATMENT UNIT
MESA, ARIZONA

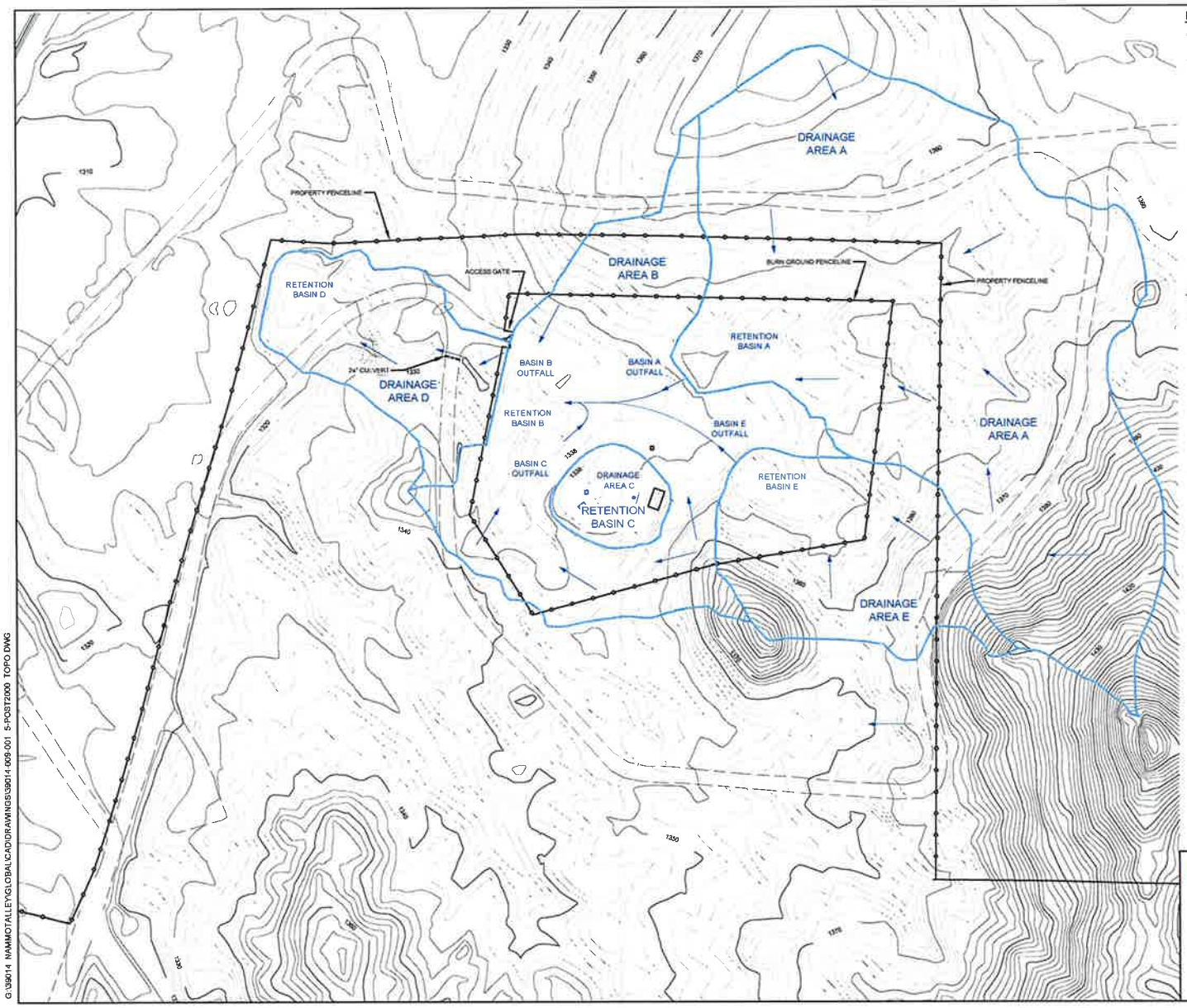
PRE-2000 TTU TOPOGRAPHY
AND SURFACE DRAINAGE

Nammo Talley

SCALE: AS SHOWN
OCTOBER 2016

FIGURE 3-1

G:\39014 NAMMO TALLEY\GLOBAL\CAD\DRAWING\S39014-009-001 4-PRE2000 TOPO.DWG



LEGEND

DRAINAGE AREA DELINEATION

DRAINAGE FLOW PATH

NOTE

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE
2. SITE TOPOGRAPHY FLOWN ON AUGUST 17, 2005 BY AERIAL MAPPING COMPANY. STRUCTURES LOCATED DURING AN ON THE GROUND SURVEY BY ROSENDAHL AND ASSOCIATES, INC., AS SHOWN ON A PLAN TITLED "STORM RETENTION PLAN FOR TALLEY DEFENSE SYSTEMS BURN AREA" DATED JUNE 14, 2005.

0 100 200
SCALE IN FEET

HALEY ALDRICH

NAMMO TALLEY, INC.
THERMAL TREATMENT UNIT
MESA, ARIZONA

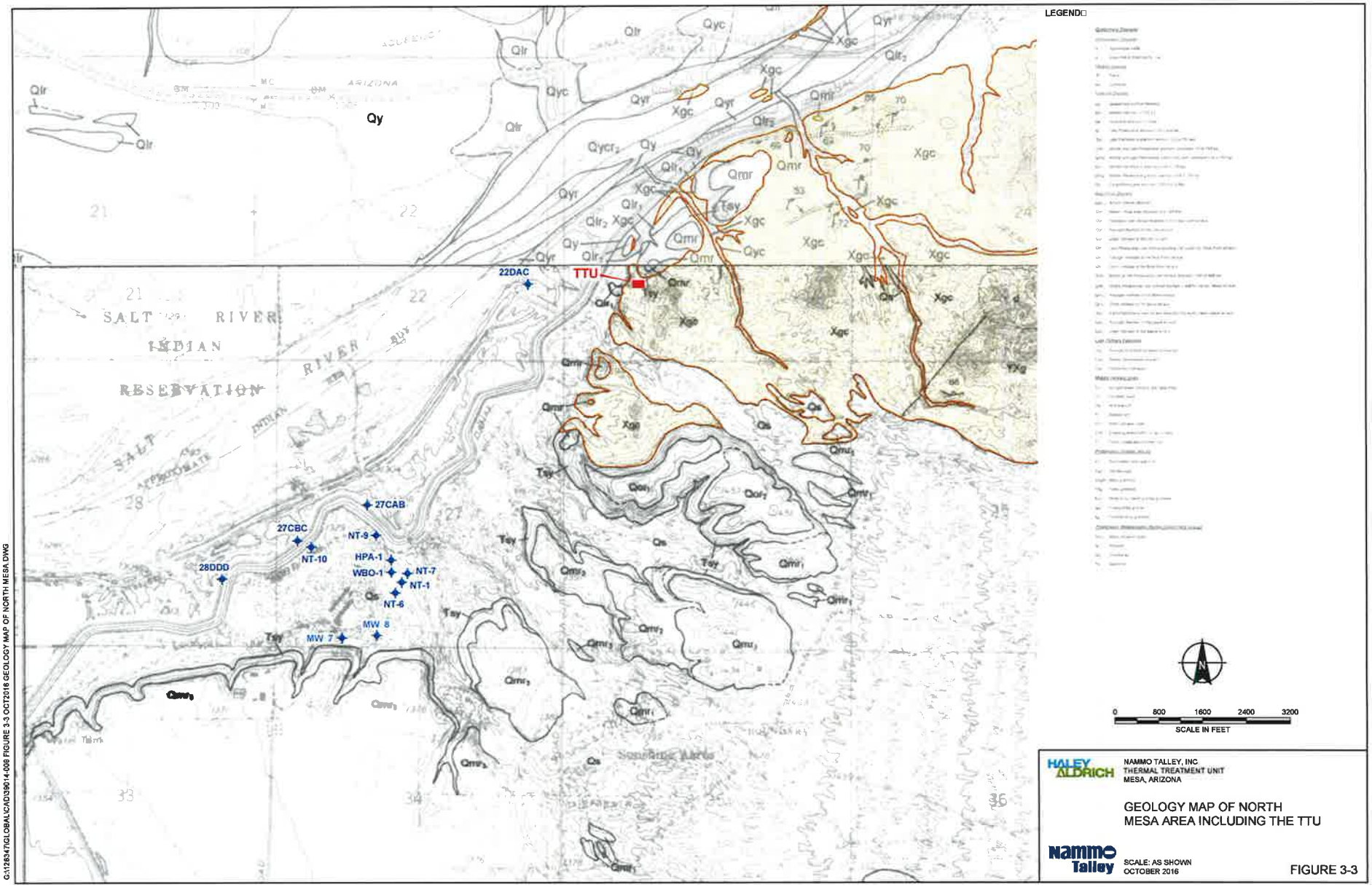
POST-2000 TTU TOPOGRAPHY AND SURFACE DRAINAGE

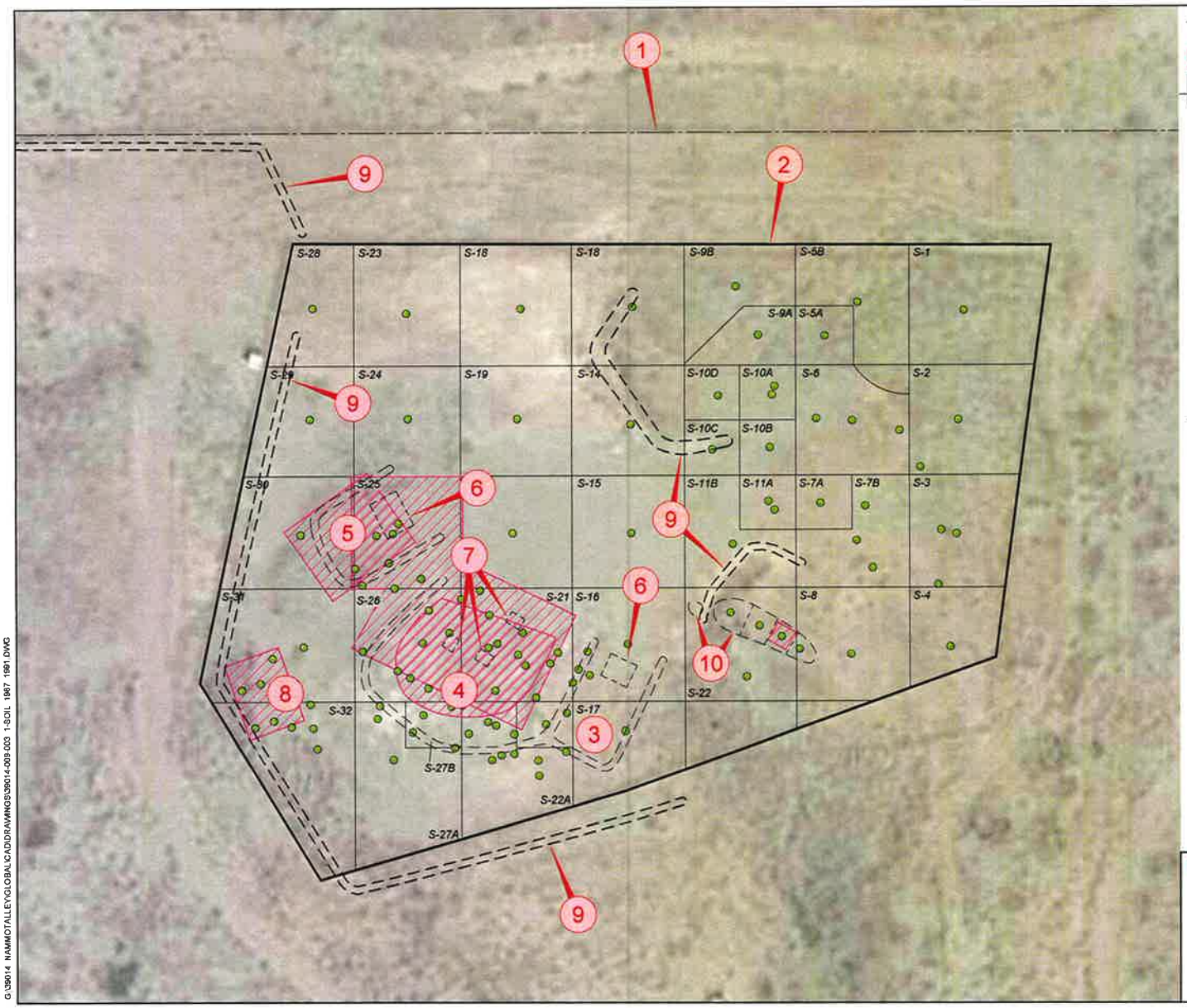
Nammo Talley

SCALE: AS SHOWN
OCTOBER 2016

FIGURE 3-2

G:\39014 NAMMOTALLEY\GLOBAL\CAD\DRAWINGS\39014-009-001 5-POST2000 TOPO.DWG


LEGEND
22DAC
TTU
27CAB
27CBC
NT-9
NT-10
HPA-1
WBO-1
NT-7
NT-1
NT-6
28DDD
MW 8
MW 7
SALT RIVER INDIAN RESERVATION
ARIZONA
0 800 1600 2400 3200
SCALE IN FEET
HALEY ALDRICH
NAMMO TALLEY, INC.
THERMAL TREATMENT UNIT
MESA, ARIZONA
GEOLOGY MAP OF NORTH MESA AREA INCLUDING THE TTU
Nammo Talley
SCALE: AS SHOWN
OCTOBER 2016
FIGURE 3-3
G:\128347\GLOBAL\CAD\39014-008 FIGURE 3-3 OCT2016 GEOLOGY MAP OF NORTH MESA DWG



LEGEND:

- SAMPLE LOCATION
- APPROXIMATE REMOVAL AREA
- S-20 SAMPLE GRID AND GRID ID NUMBER (TRC, 1987)
- (1) BOUNDARY BETWEEN TALLEY AND SRPMIC PROPERTIES
- (2) APPROXIMATE TTU BOUNDARY
- (3) PIT 1
- (4) PIT 2 THROUGH 5
- (5) PIT 6
- (6) FORMER BURN PAD
- (7) FORMER BURN BOXES AND CAGES
- (8) OLD BURN BOX AREA
- (9) EARTHEN BERMS (STORMWATER RETENTION)
- (10) PIT 6 THROUGH 10

NOTES:

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE
2. AERIAL SOURCE: LANDISCOR AERIAL INFORMATION - ULY 2009
3. ADDITIONAL BURN ACTIVITIES WERE CONDUCTED AT THE TTU FOLLOWING THE WORK DEPICTED ON THIS FIGURE. REFER TO SECTION 2, "OPERATING HISTORY."

N

0 50 100
SCALE IN FEET

HALEY ALDRICH

NAMMO TALLEY, INC.
THERMAL TREATMENT UNIT
MESA, ARIZONA

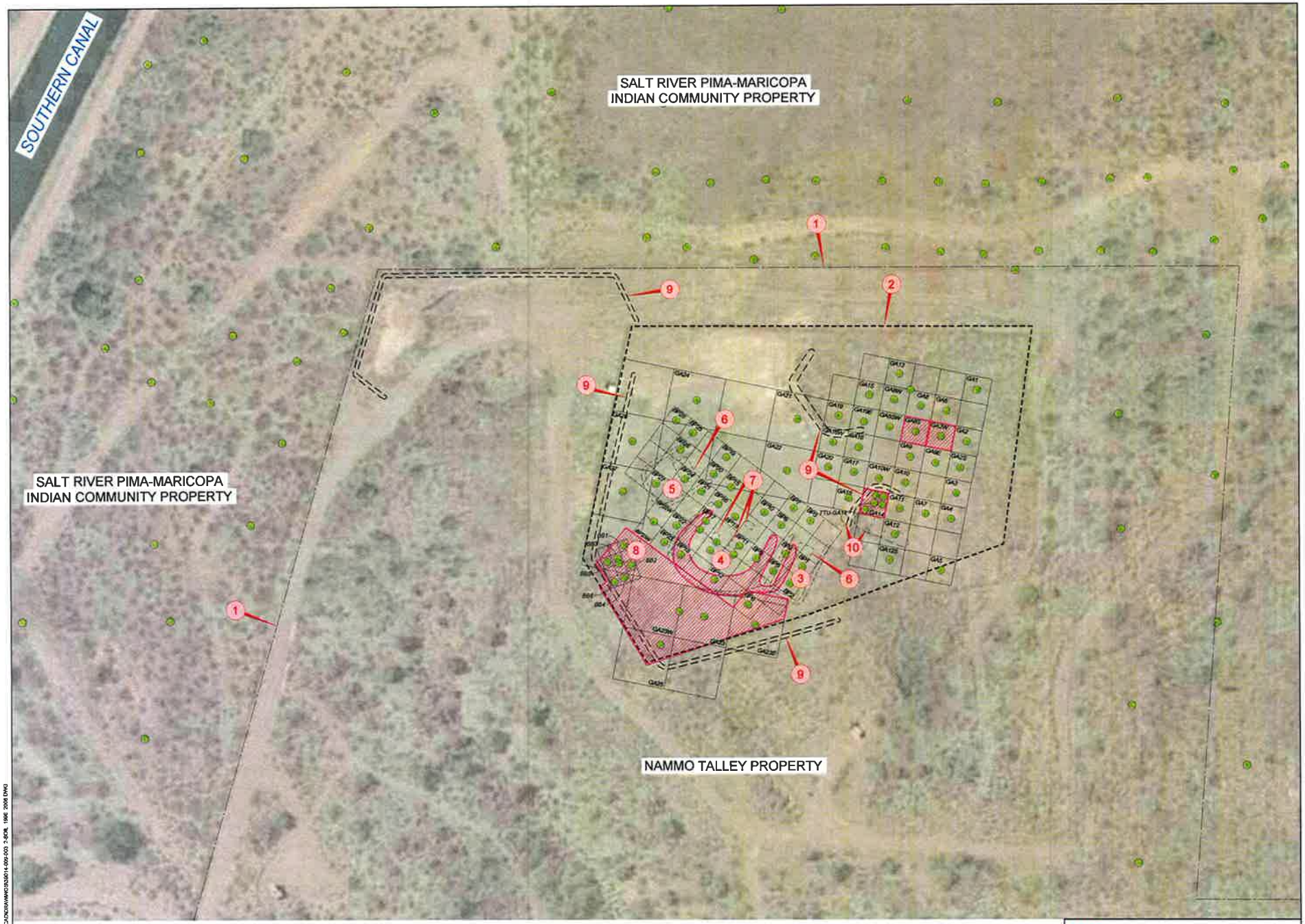
1987 THROUGH 1991 SOIL SAMPLE LOCATIONS AND SOIL REMOVAL AREAS

Nammo Talley

SCALE: AS SHOWN
OCTOBER 2016

FIGURE 4-1

G:\39014 NAMMOTALLEY\GLOBAL\CAD\DRAWINGS\39014-009-003 1-SOIL 1987 1991.DWG



LEGEND:

- SAMPLE LOCATION
- APPROXIMATE REMOVAL AREA
- FORMER BURN PITS
- S-20 SAMPLE GRID AND GRID ID NUMBER (TRC, 1997)
- BOUNDARY BETWEEN TALLEY AND SRPMIC PROPERTIES
- APPROXIMATE TTU BOUNDARY
- PIT 1
- PIT 2 THROUGH 5
- PIT 6
- FORMER BURN PAD
- FORMER BURN BOXES AND CAGES
- OLD BURN BOX AREA
- EARTHEN BERMS (STORMWATER RETENTION)
- PIT 8 THROUGH 10

NOTES:

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. MANY BB, BP AND GA GRID POINTS REPRESENT MULTIPLE SAMPLES COLLECTED BETWEEN 1996 AND 2005 AS INDICATED IN TABLE 4-3.
3. AERIAL SOURCE: LANDVISOR AERIAL INFORMATION - JULY 2009
4. ADDITIONAL BURN ACTIVITIES WERE CONDUCTED AT THE TTU FOLLOWING THE WORK DEPICTED ON THIS FIGURE. REFER TO SECTION 2, "OPERATING HISTORY."

0 60 120
SCALE IN FEET

HALEY ALDRICH

NAMMO TALLEY, INC.
THERMAL TREATMENT UNIT
MESA, ARIZONA

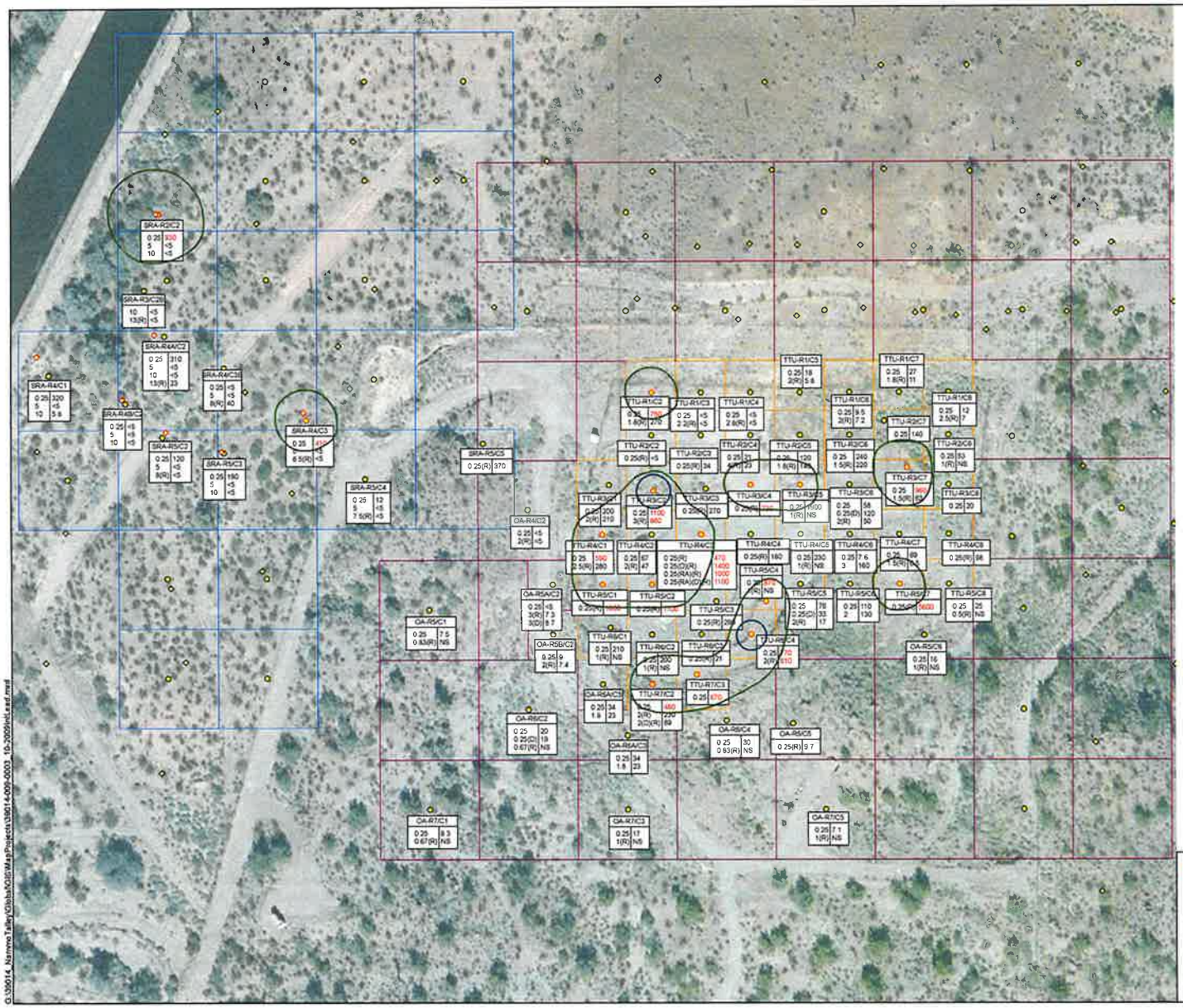
1996 THROUGH 2005 SOIL SAMPLE LOCATIONS AND 2003 THROUGH 2008 SOIL REMOVAL AREAS

Nammo Talley

SCALE: AS SHOWN
OCTOBER 2016

FIGURE 4-2

G:\38914 NAMMOTALLEY\EL DEAL\CADD\RAWINGS\38914-009-003 2-SPR, 1996 2006.DWG



LEGEND

- TTU AREA
- AREA SURROUNDING TTU
- STORM WATER ACCUMULATION AREA
- 400 mg/kg LEAD CONTOUR 0 25 FT BGS
- 400 mg/kg LEAD CONTOUR 2 AND 3 FT BGS

SMITH CONSULTANTS (2000)

- GREATER THAN SCREENING LEVEL
- LESS THAN SCREENING LEVEL

BROWN AND CALDWELL (2009)

- LESS THAN SCREENING LEVEL
- ONE OR MORE RESULTS GREATER THAN SCREENING LEVEL

TTU-R4C1
0 25 | 590
3 | 280

- RED EXCEEDS LEAD SCREENING LEVEL
- RESULT IN mg/kg (NS = NOT SAMPLED)
- DEPTH IN FEET (RA) = REANALYSIS (R) = REFUSAL ENCOUNTERED AT THE INDICATED DEPTH

SCREENING LEVEL FOR LEAD = 400 mg/kg

NOTES:

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.

N

0 10 20 40

SCALE IN FEET

HALEY ALDRICH

NAMMO TALLEY, INC.
THERMAL TREATMENT UNIT
MESA, ARIZONA

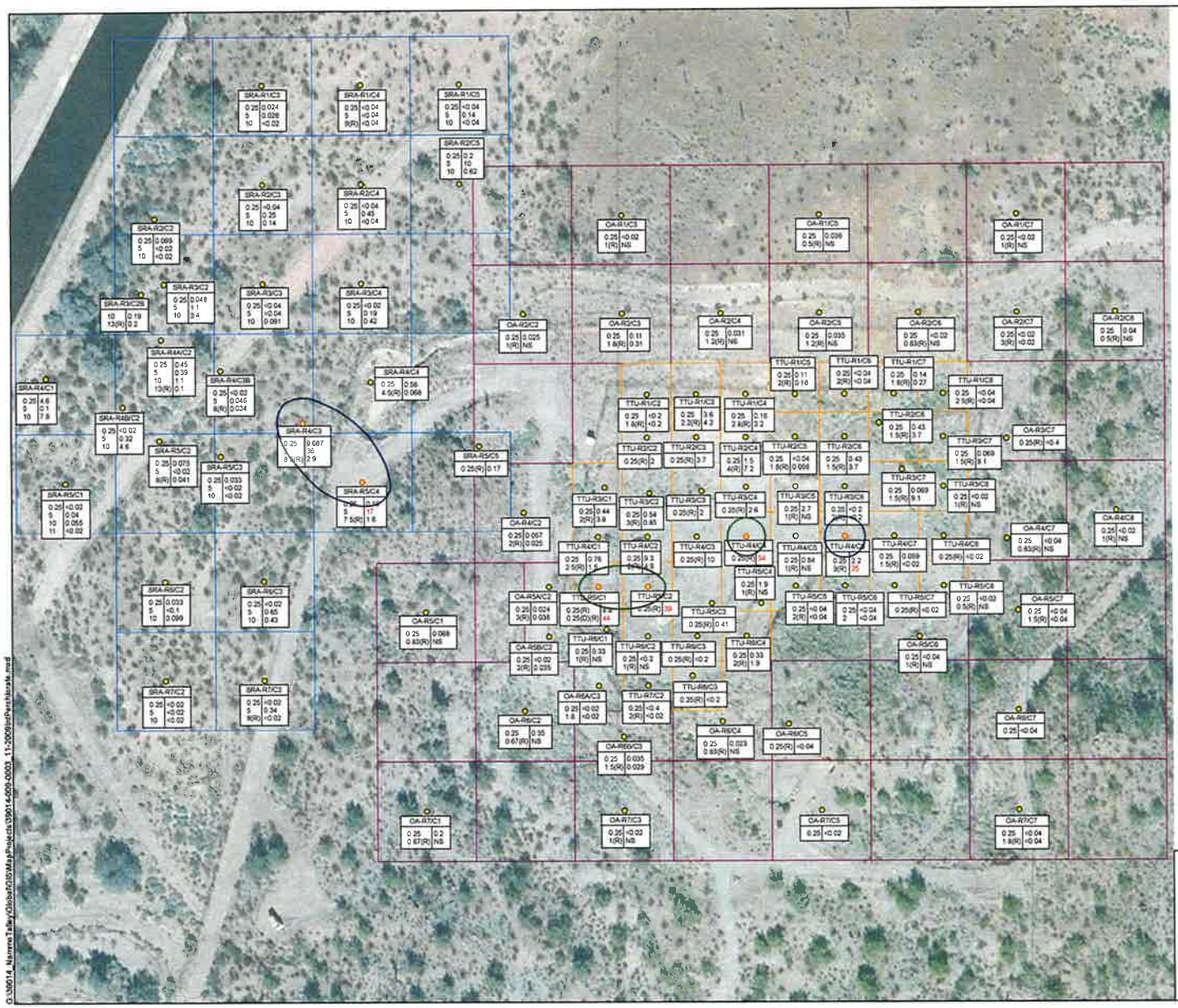
2009 INITIAL SOIL CHARACTERIZATION RESULTS FOR LEAD

Nammo Talley

SCALE: AS SHOWN
OCTOBER 2016

FIGURE 4-3

G:\135014_Nammo Talley\Global\GIS\Map Projects\135014-009-0003_10-2009Init Lead.mxd



LEGEND

- TTU AREA
- AREA SURROUNDING TTU
- STORM WATER ACCUMULATION AREA
- 16 mg/kg PERCHLORATE CONTOUR 0.25 FT BGS
- 16 mg/kg PERCHLORATE CONTOUR 3 AND 5 FT BGS

BROWN AND CALDWELL (2009)

- LESS THAN SCREENING LEVEL
- ONE OR MORE RESULTS GREATER THAN SCREENING LEVEL

TTU-R6C5 | 0.25 | 2.2 | 25

- RED: EXCEEDS PERCHLORATE SCREENING LEVEL
- RESULT IN mg/kg (NS = NOT SAMPLED)
- DEPTH IN FEET
  - (D) = FIELD DUPLICATE
  - (R) = REFUSAL ENCOUNTERED AT THE INDICATED DEPTH

SCREENING LEVEL FOR PERCHLORATE = 16 mg/kg

NOTES:

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.

0 10 20 40

SCALE IN FEET

HALEY & ALDRICH

NAMMO TALLEY, INC.
THERMAL TREATMENT UNIT
MESA, ARIZONA

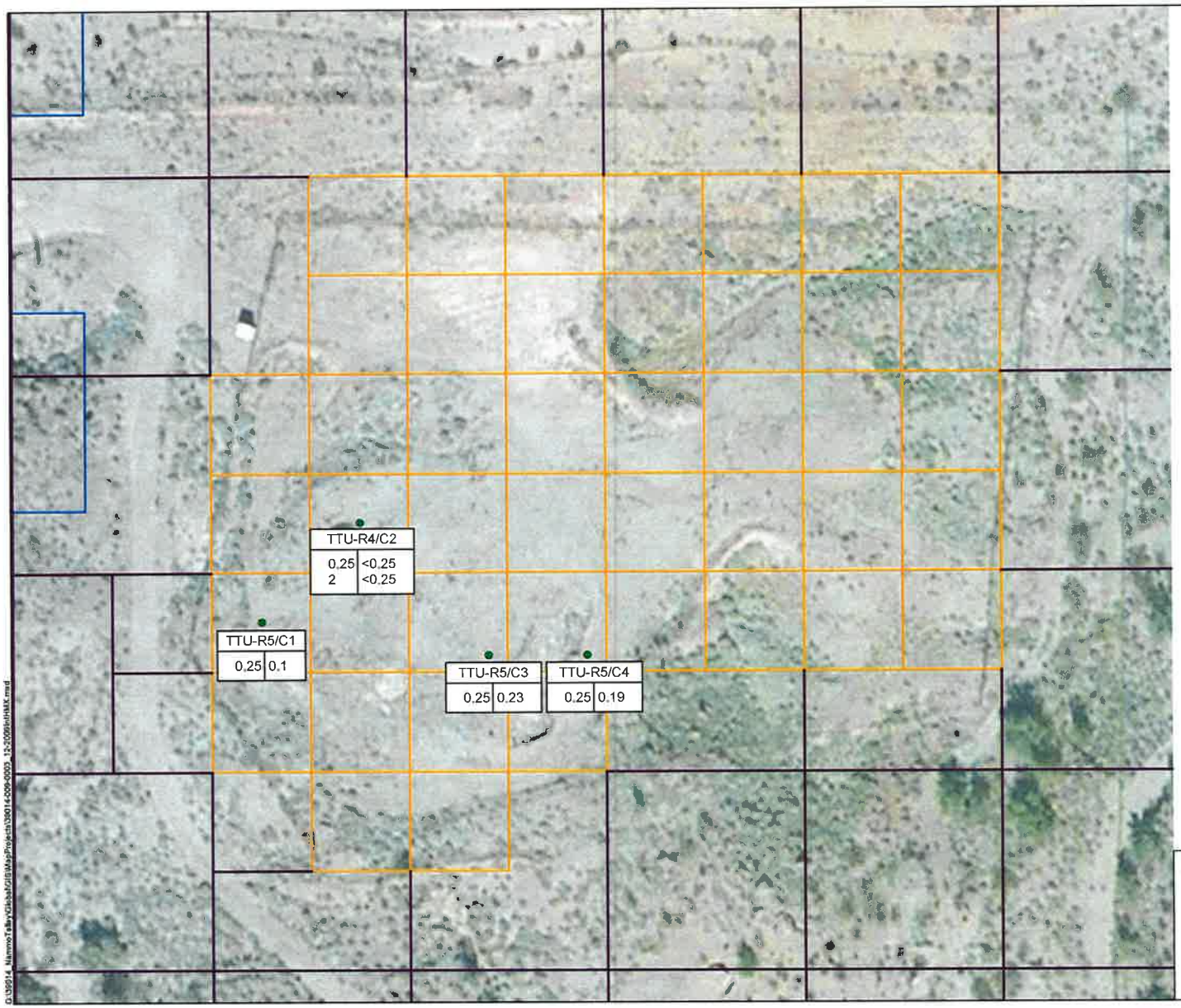
2009 INITIAL SOIL CHARACTERIZATION RESULTS FOR PERCHLORATE

Nammo Talley

SCALE: AS SHOWN
OCTOBER 2010

FIGURE 4-4

Q:\36014_Nammo Talley\Global\GIS\Maps\Projects\39014-009-0003_11-2009\InPerchlorate.mxd



LEGEND

- TTU AREA
- AREA SURROUNDING TTU
- STORM WATER ACCUMULATION AREA
- SAMPLE LOCATION

TTU-R4/C4	
0.25	7.6
3	160

RESULT IN mg/kg

DEPTH IN FEET

NOTES:

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.

0 50 100

SCALE IN FEET

HALEY ALDRICH

NAMMO TALLEY, INC.
THERMAL TREATMENT UNIT
MESA, ARIZONA

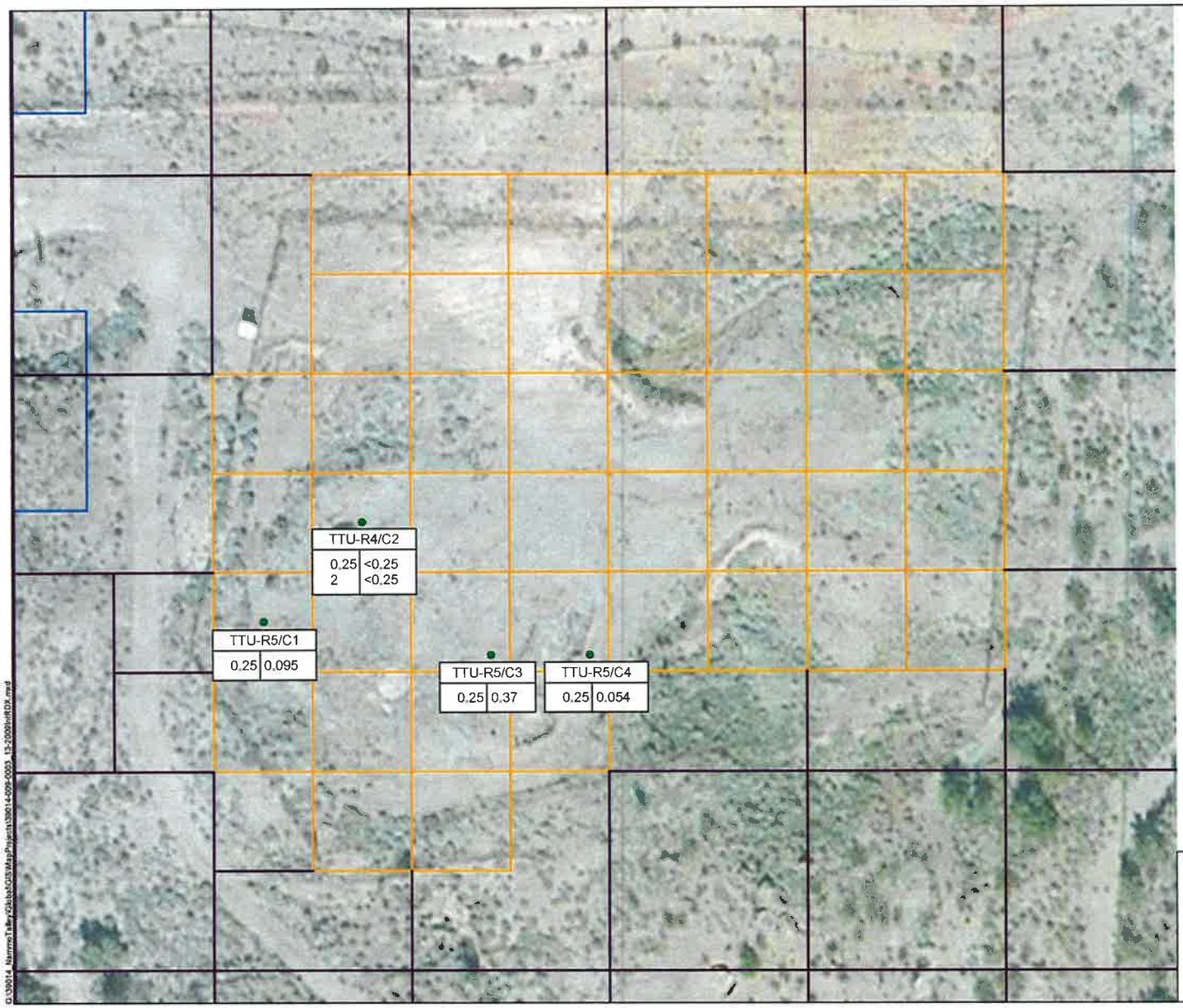
INITIAL SOIL CHARACTERIZATION RESULTS FOR HMX

Nammo Talley

SCALE: AS SHOWN
OCTOBER 2016

FIGURE 4-5

G:\36914_Nammo Talley\Data\GIS\Map Projects\36014-006-0003_13-2009\InitHMX.mxd



LEGEND

- TTU AREA
- AREA SURROUNDING TTU
- STORM WATER ACCUMULATION AREA
- SAMPLE LOCATION

TTU-R4/C4	
0.25	7.6
3	160

RESULT IN mg/kg

DEPTH IN FEET

NOTES:

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE

N

0 50 100

SCALE IN FEET

HALEY ALDRICH

NAMMO TALLEY, INC
THERMAL TREATMENT UNIT
MESA, ARIZONA

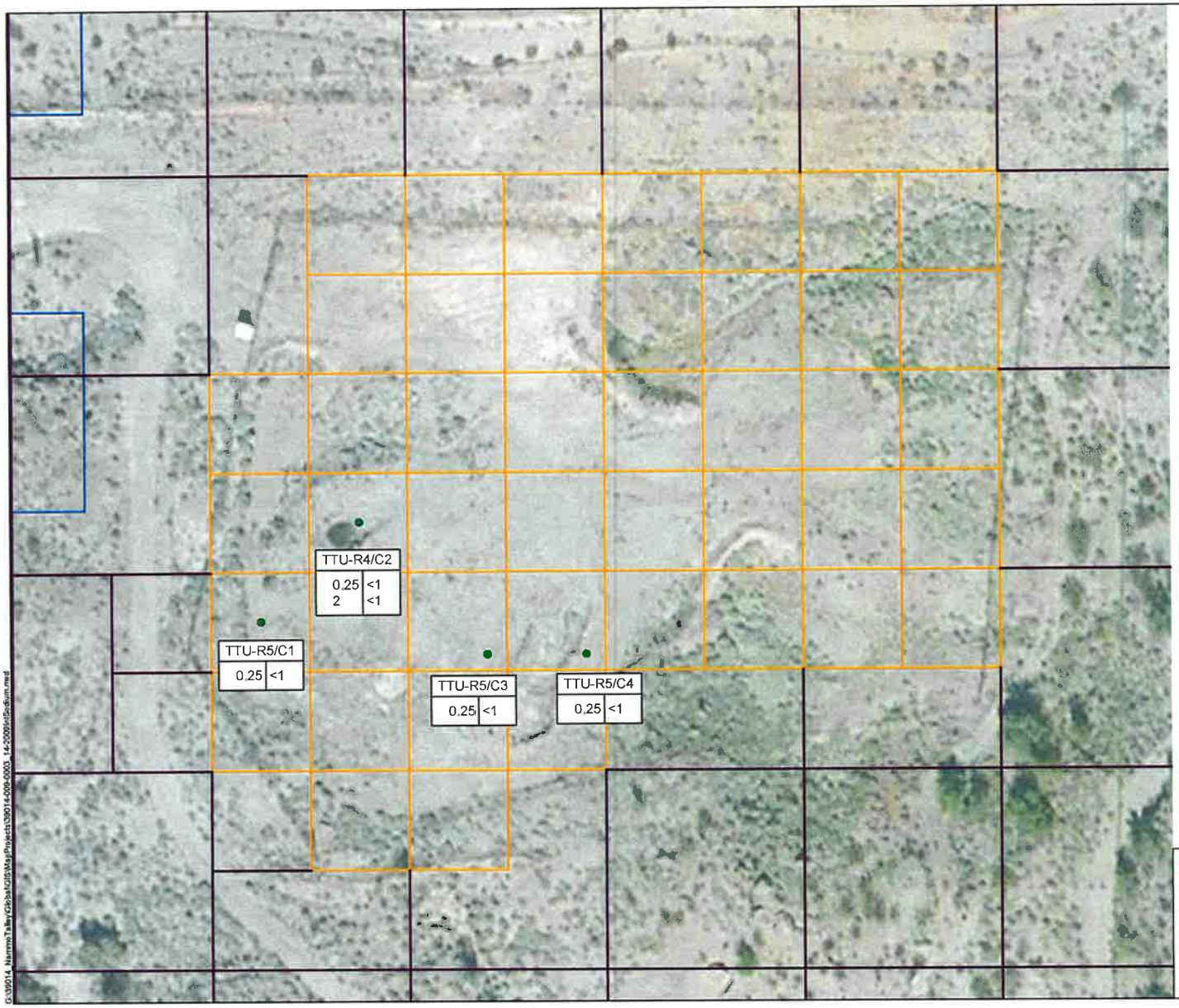
INITIAL SOIL CHARACTERIZATION RESULTS FOR RDX

Nammo Talley

SCALE: AS SHOWN
OCTOBER 2016

FIGURE 4-6

G:\30014_NammoTalley\Global\GIS\MapProjects\30014-009-0003_13-2009InitRDX.mxd



LEGEND

- TTU AREA
- AREA SURROUNDING TTU
- STORM WATER ACCUMULATION AREA
- SAMPLE LOCATION

TTU-R4/C4	
0.25	7.6
3	160

RESULT IN mg/kg

DEPTH IN FEET

NOTES:

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.

0 50 100

SCALE IN FEET

HALEY & ALDRICH

NAMMO TALLEY, INC.
THERMAL TREATMENT UNIT
MESA, ARIZONA

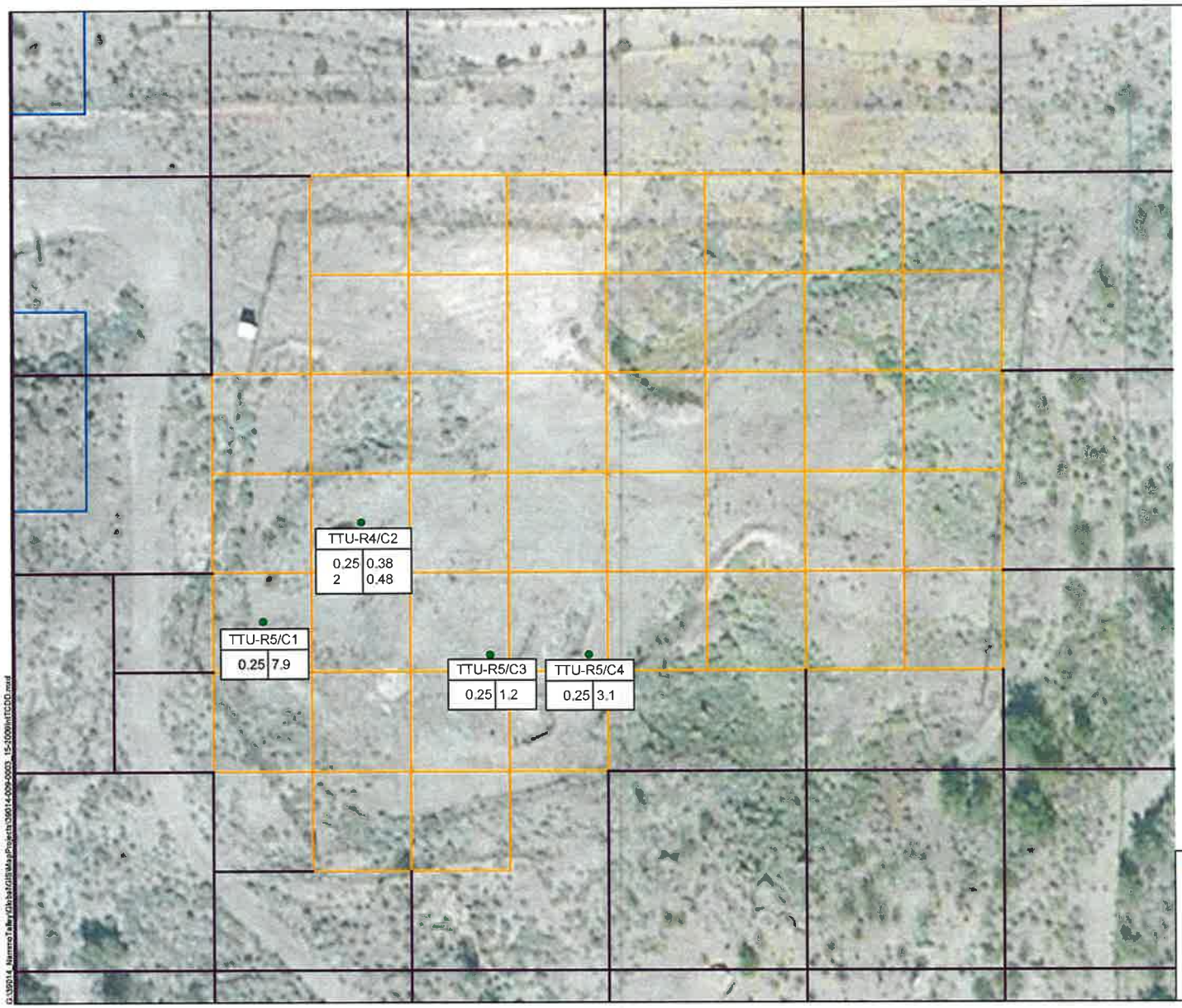
INITIAL SOIL CHARACTERIZATION RESULTS FOR SODIUM AZIDE

Nammo Talley

SCALE: AS SHOWN
OCTOBER 2015

FIGURE 4-7

G:\39014_Nammo Talley\Global\GIS\Map Projects\39014-006-0003_14-2009\ISodium.mxd



LEGEND

- TTU AREA
- AREA SURROUNDING TTU
- STORM WATER ACCUMULATION AREA
- SAMPLE LOCATION

TTU-R4/C4	
0.25	7.6
3	160

RESULT IN pg/g

DEPTH IN FEET

NOTES:

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. PG/G : PICO GRAMS PER GRAM

N

0 50 100

SCALE IN FEET

HALEY ALDRICH

NAMMO TALLEY, INC.
THERMAL TREATMENT UNIT
MESA, ARIZONA

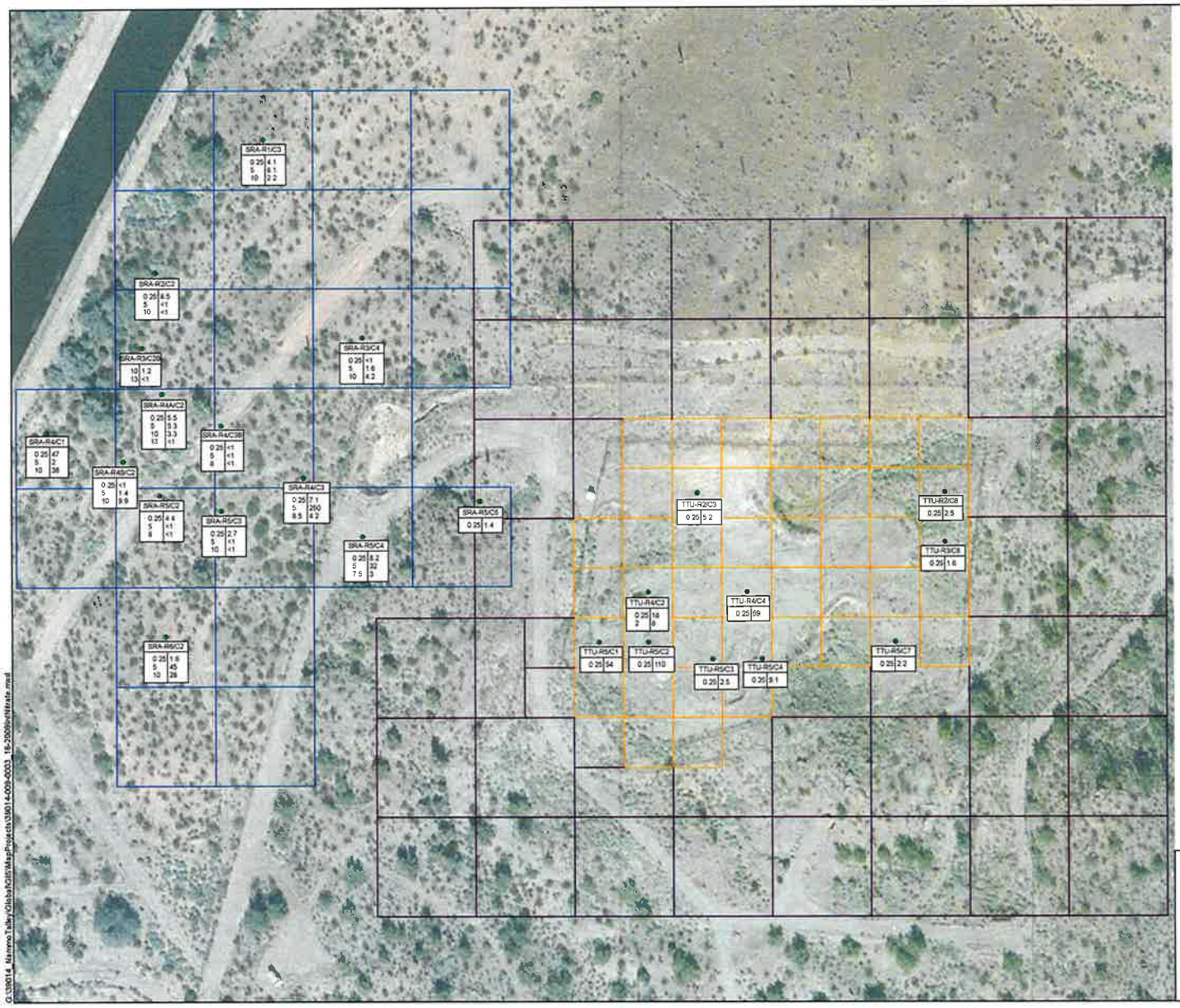
INITIAL SOIL CHARACTERIZATION RESULTS FOR 2,3,7,8-TCDD

Nammo Talley

SCALE: AS SHOWN
OCTOBER 2016

FIGURE 4-8

G:\35014_NammoTalley\Gis\ba\GIS\MapProjects\35014-009-0003_15-1000IntTCDD.mxd



LEGEND

- TTU AREA
- AREA SURROUNDING TTU
- STORM WATER ACCUMULATION AREA
- SAMPLE LOCATION

TTU-R4/C4
0.25 7.6
3 160

RESULT IN mg/Kg
DEPTH IN FEET

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. SAMPLE LOCATIONS SRA-R3/C2B AND SRA-R4/C3B WERE NOT PART OF THE ORIGINAL SCOPE, BUT WERE ADDED TO INVESTIGATE THE DEPTH TO BEDROCK IN THE AREA WHERE PONDING OF STORM WATER HISTORICALLY OCCURRED DURING RUNOFF EVENTS.

N

0 50 20 40
SCALE IN FEET

HALEY ALDRICH

NAMMO TALLEY, INC.
THERMAL TREATMENT UNIT
MESA, ARIZONA

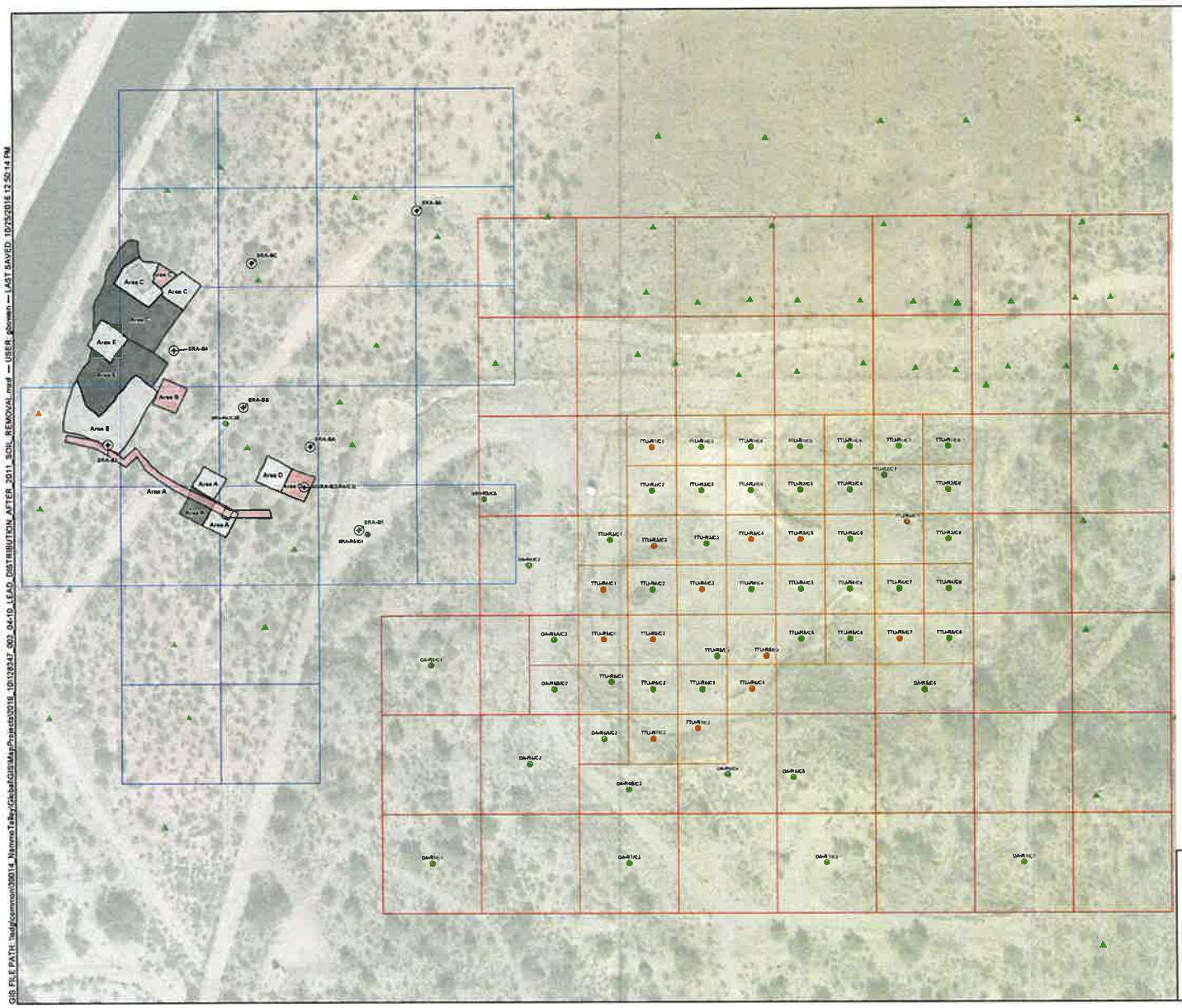
INITIAL SOIL CHARACTERIZATION RESULTS FOR NITRATE

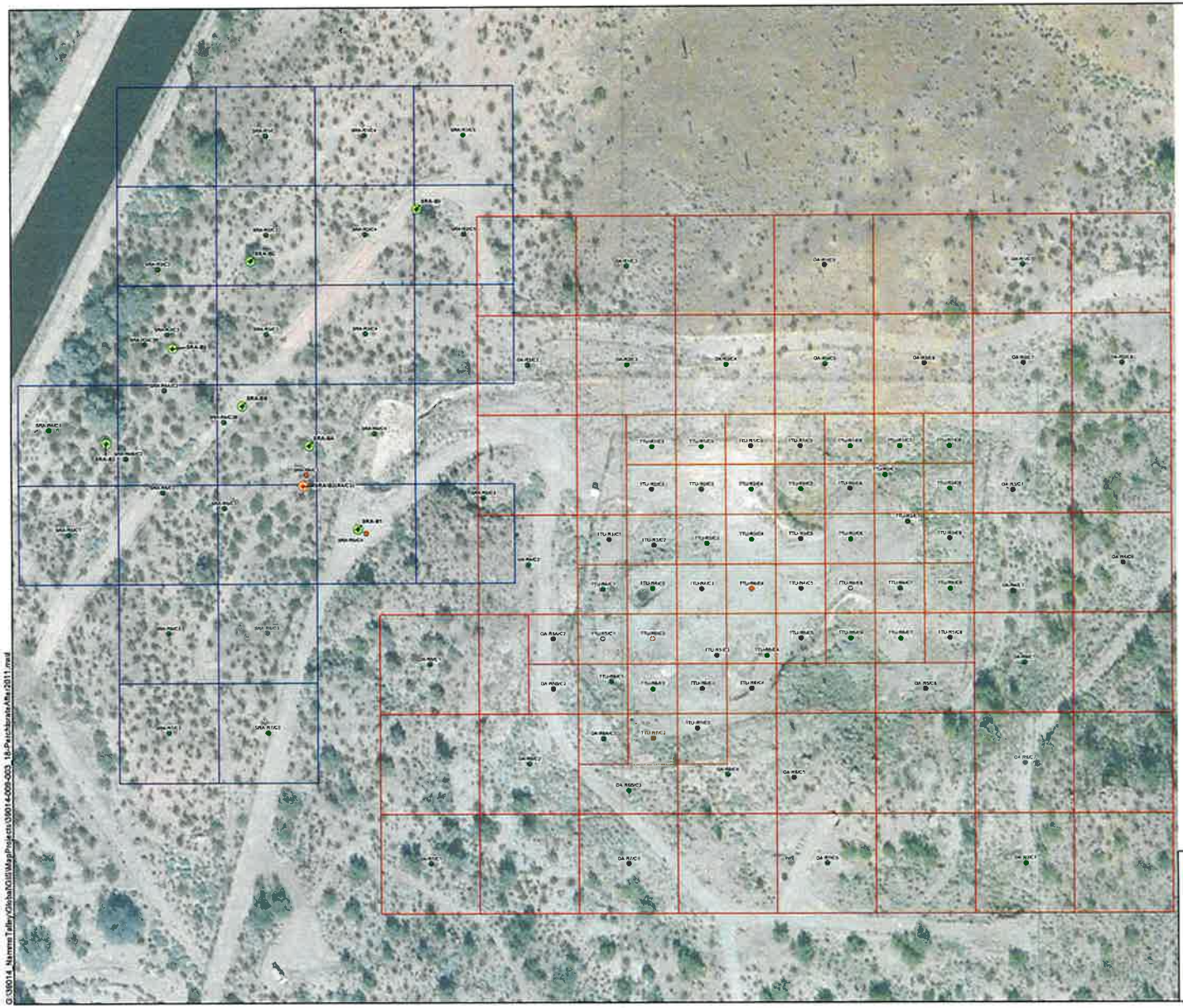
Nammo Talley

SCALE: AS SHOWN
OCTOBER 2016

FIGURE 4-9

G:\336014_Nammo Talley\GIS\MapProjects\336014-009-0003_18-2009\Nitrate.mxd


Area C
Area C
Area E
Area B
Area B
Area A
Area A
Area D
Area A
SRA-B4
SRA-B5
SRA-B6
SRA-B7
SRA-B8
SRA-B9
SRA-B10
SRA-B11
SRA-B12
SRA-B13
SRA-B14
SRA-B15
SRA-B16
SRA-B17
SRA-B18
SRA-B19
SRA-B20
SRA-B21
SRA-B22
SRA-B23
SRA-B24
SRA-B25
SRA-B26
SRA-B27
SRA-B28
SRA-B29
SRA-B30
SRA-B31
SRA-B32
SRA-B33
SRA-B34
SRA-B35
SRA-B36
SRA-B37
SRA-B38
SRA-B39
SRA-B40
SRA-B41
SRA-B42
SRA-B43



LEGEND

- SOIL AND BEDROCK BORING
- CHARACTERIZATION SAMPLING LOCATION (2009)
- LESS THAN SCREENING LEVEL (16 mg/Kg)
- GREATER THAN SCREENING LEVEL (16 mg/Kg)
- TTU AREA
- AREA SURROUNDING TTU
- STORM WATER ACCUMULATION AREA

NOTES:

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.

N

0 50 100 200

SCALE IN FEET

HALEY ALDRICH

NAMMO TALLEY, INC.
THERMAL TREATMENT UNIT
MESA, ARIZONA

PERCHLORATE DISTRIBUTION
AFTER 2011 SOIL REMOVAL

Nammo Talley

SCALE: AS SHOWN
OCTOBER 2016

FIGURE 4-11

G:\36014_NammoTalley\Gis\ba\GIS\MapProjects\36014-009-003_18-PerchlorateAfter2011.mxd

LEGEND

- BORING LOCATION (result less than 16 mg/KL)
- BORING LOCATION (result more than 16 mg/Kg)
- CROSS-SECTION TRACE
- 25 FT. SAMPLE GRID
- EXISTING WELL

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.

0 25 50 75 100

SCALE IN FEET

HALEY ALDRICH

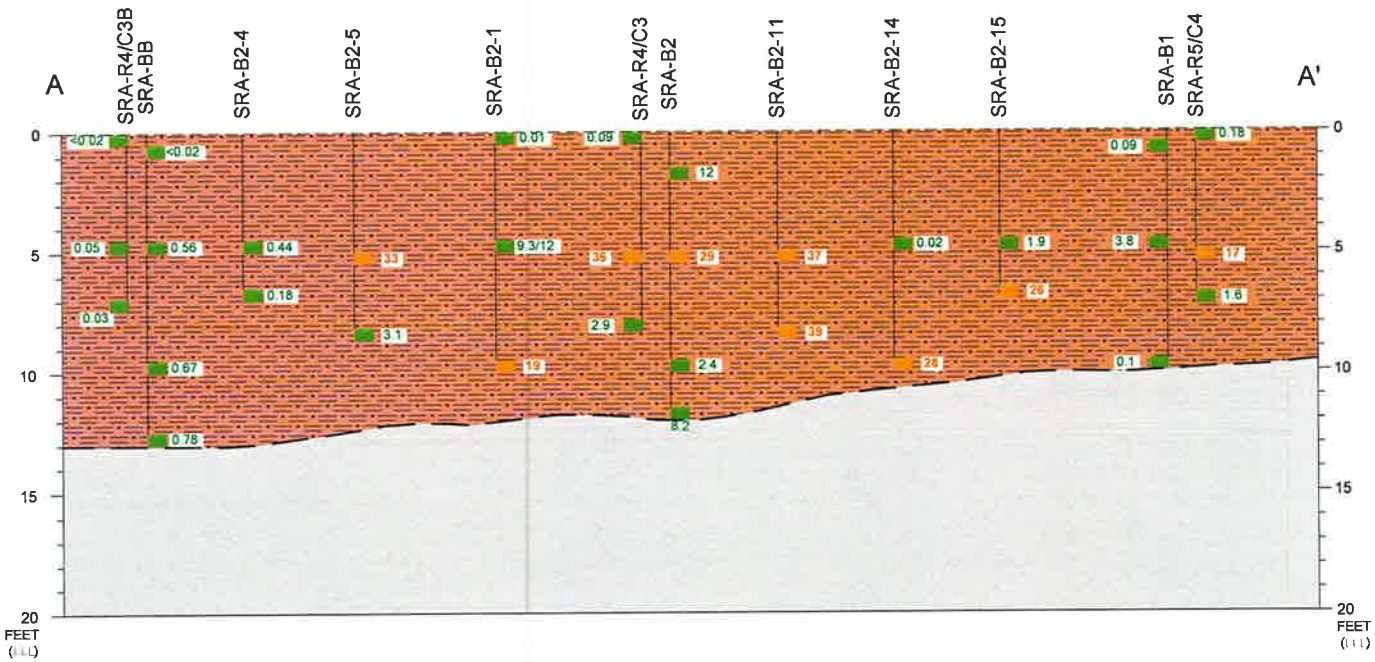
NAMMO TALLEY, INC.
THERMAL TREATMENT UNIT
MESA, ARIZONA

PERCHLORATE SOIL INVESTIGATI

Nammo Talley

OCTOBER 2016

FIGURE 4-12



LEGEND

- RECENT ALLUVIUM
- GRANITE BEDROCK
- LESS THEN SCREENING LEVEL (16 /K)
- GREATER THEN SCREENING LEVEL (16 /K)

NOTE

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE
2. ALL CONCENTRATIONS ARE IN MILLIGRAMS PER KILOGRAM
3. BELOW GROUND SURFACE

HORIZ. 0 20 40
VERT. 0 5 10
SCALE IN FEET

HALEY ALDRICH

NAMMO TALLEY, INC.
THERMAL TREATMENT UNIT
MESA, ARIZONA

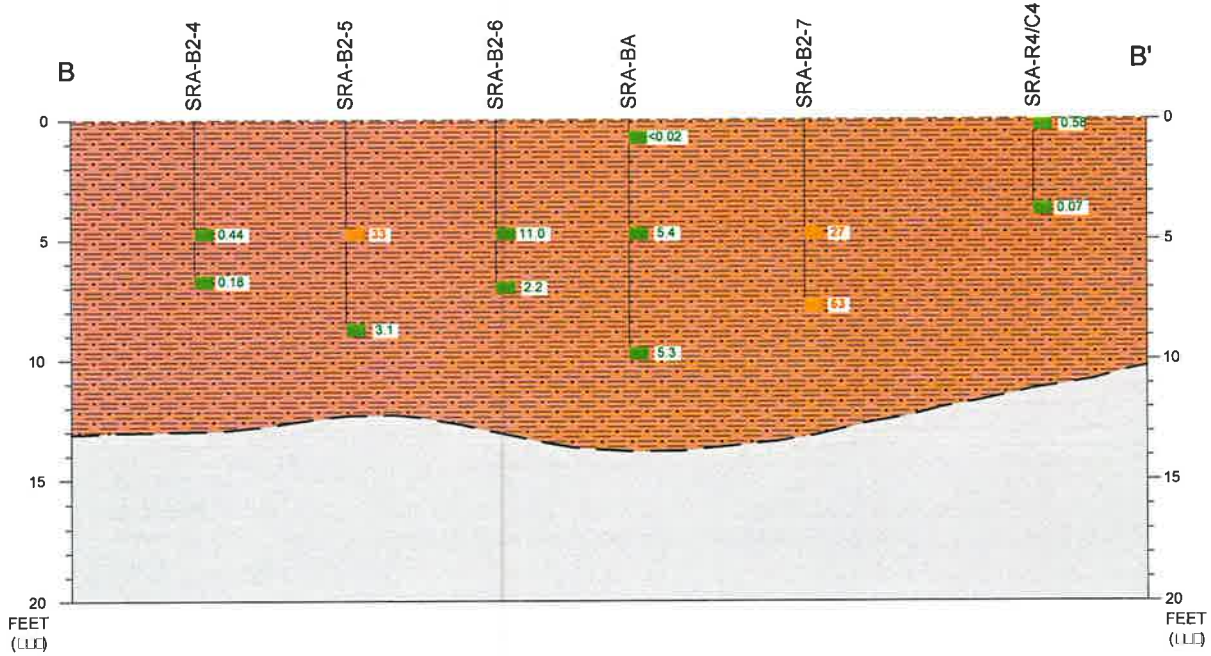
PERCHLORATE SOIL CONCENTRATION IN CROSS SECTION A-A'

Nammo Talley

SCALE: AS SHOWN
OCTOBER 2016

FIGURE 4-13

MOBINI, GITA Printed: 3/26/2015 4:05 PM Layout: CROSSSECTIONAA'
C:\39014_NAMMOTALLEY\CGI\BALF-AD\DRAWINGS\2015-01\39014-006-0001-XSECTIONS.DWG



LEGEND

- RECENT ALLUVIUM
- GRANITE BEDROCK
- LESS THEN SCREENING LEVEL (16 /K)
- GREATER THEN SCREENING LEVEL (16 /K)

NOTE

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE
2. ALL CONCENTRATIONS ARE IN MILLIGRAMS PER KILOGRAM
3. BELOW GROUND SURFACE

HORIZ. 0 20 40
VERT. 0 5 10
SCALE IN FEET

HALEY ALDRICH

NAMMO TALLEY, INC.
THERMAL TREATMENT UNIT
MESA, ARIZONA

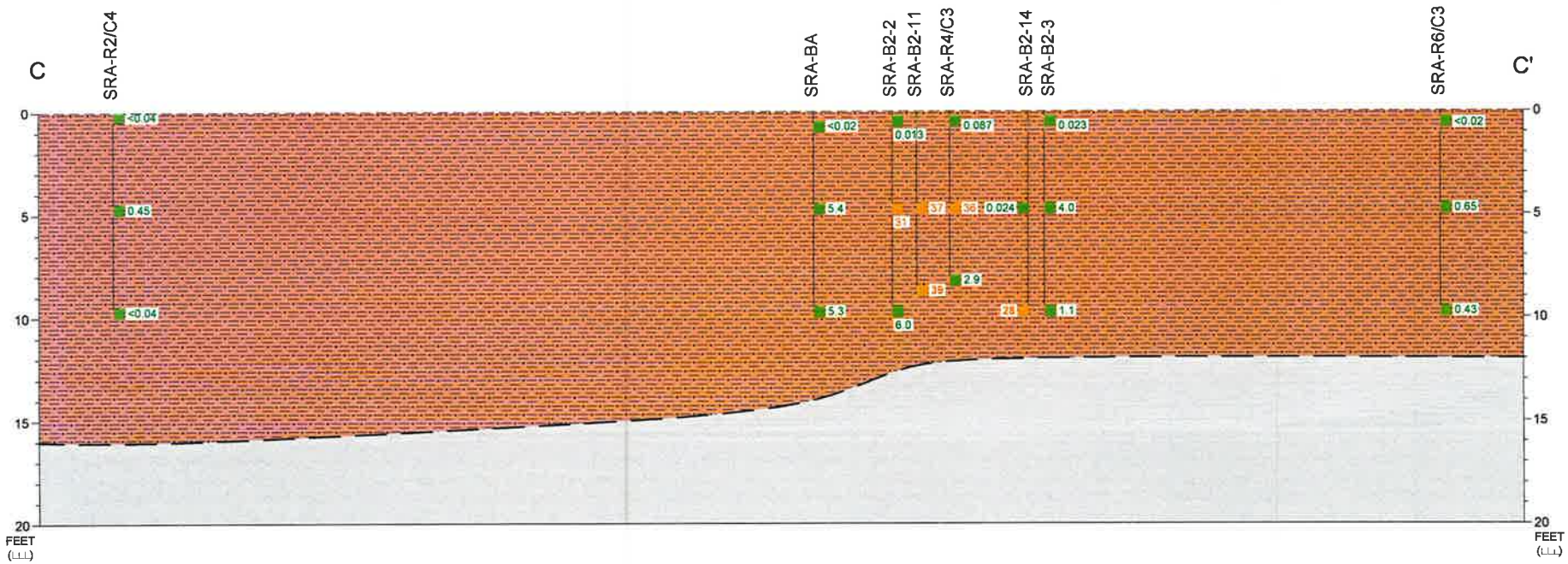
PERCHLORATE SOIL CONCENTRATION IN CROSS SECTION B-B'

Nammo Talley

SCALE: AS SHOWN
OCTOBER 2016

FIGURE 4-14

MOBINI, GITA
Plotted 2/26/2015 4:06 PM Layout: CROSSSECTIONBB'
G:\90914 NAMMOTALLEY\GLOBAL\CAD\DRAWINGS\2015\130914-506-001-SSECTIONS.DWG



LEGEND

- RECENT ALLUVIUM
- GRANITE BEDROCK
- LESS THEN SCREENING LEVEL (16 /K)
- GREATER THEN SCREENING LEVEL (16 /K)

NOTE

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE
2. ALL CONCENTRATIONS ARE IN MILLIGRAMS PER KILOGRAM (
3. BELOW GROUND SURFACE

HORIZ. 0 30 60
VERT. 0 5 10
SCALE IN FEET

HALEY ALDRICH

NAMMO TALLEY, INC
THERMAL TREATMENT UNIT
MESA, ARIZONA

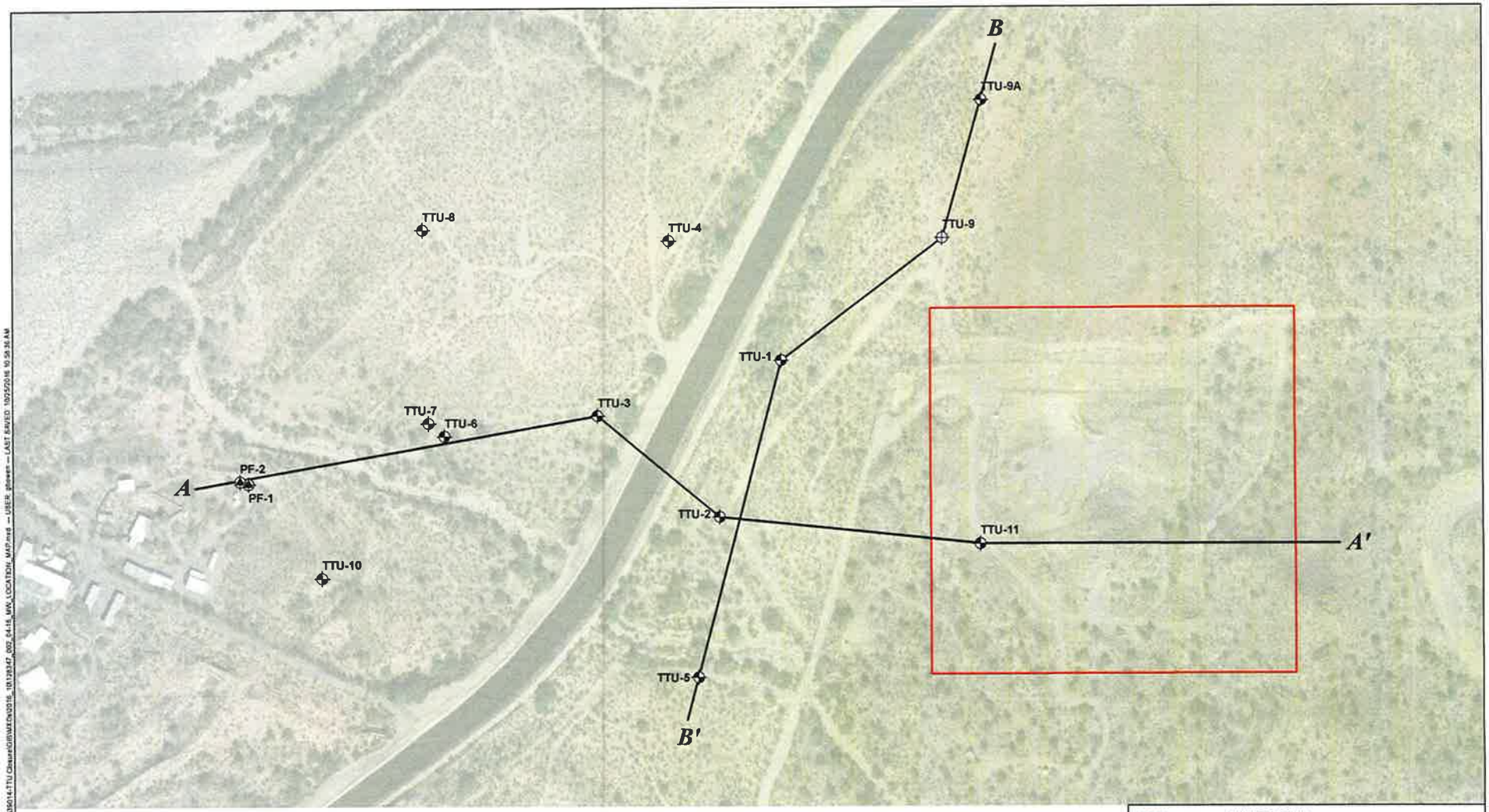
PERCHLORATE SOIL CONCENTRATION IN CROSS SECTION C-C'

Nammo Talley

SCALE: AS SHOWN
OCTOBER 2016

FIGURE 4-15

MOBINI, GITA
G:\36014_NAMMOTALLEY\GLOBAL\CAD\DRAWING\2015-01\36014-004-0001-XSECTIONS.DWG
Printed 2/26/2015 4:06 PM Layout: CROSSSECTIONCC'



LEGEND

- MONITORING WELL
- NON-POTABLE SUPPLY WELL
- ABANDONED BOREHOLE
- CROSS SECTION LINE
- THERMAL TREATMENT UNIT BOUNDARY

NOTE

ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.

N

0 200 400
SCALE IN FEET

HALEY ALDRICH

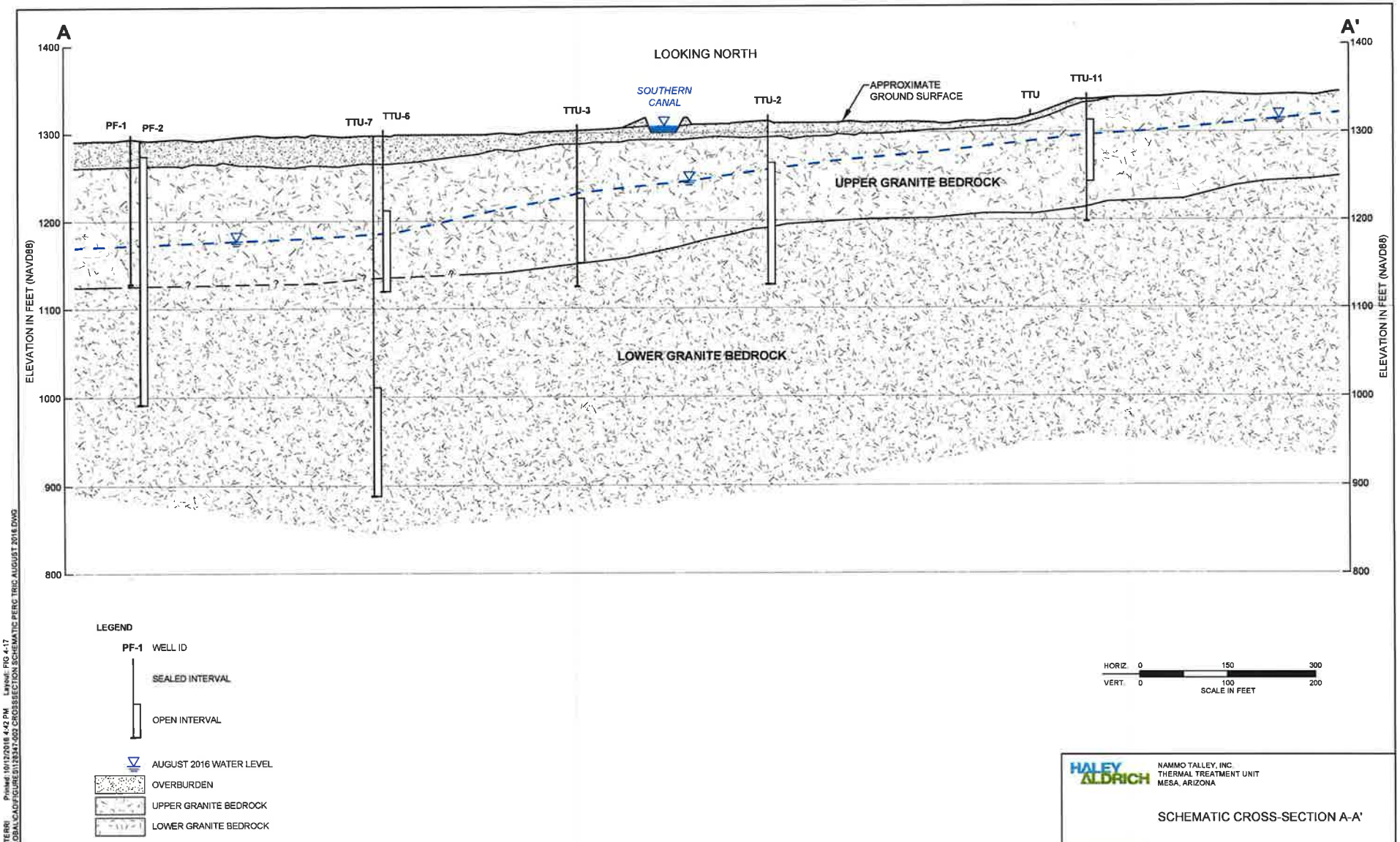
NAMMO TALLEY, INC.
THERMAL TREATMENT UNIT
MESA, ARIZONA

MONITORING WELL LOCATIONS

Nammo Talley

OCTOBER 2016

FIGURE 4-16



HALEY ALDRICH

NAMMO TALLEY, INC.
THERMAL TREATMENT UNIT
MESA, ARIZONA

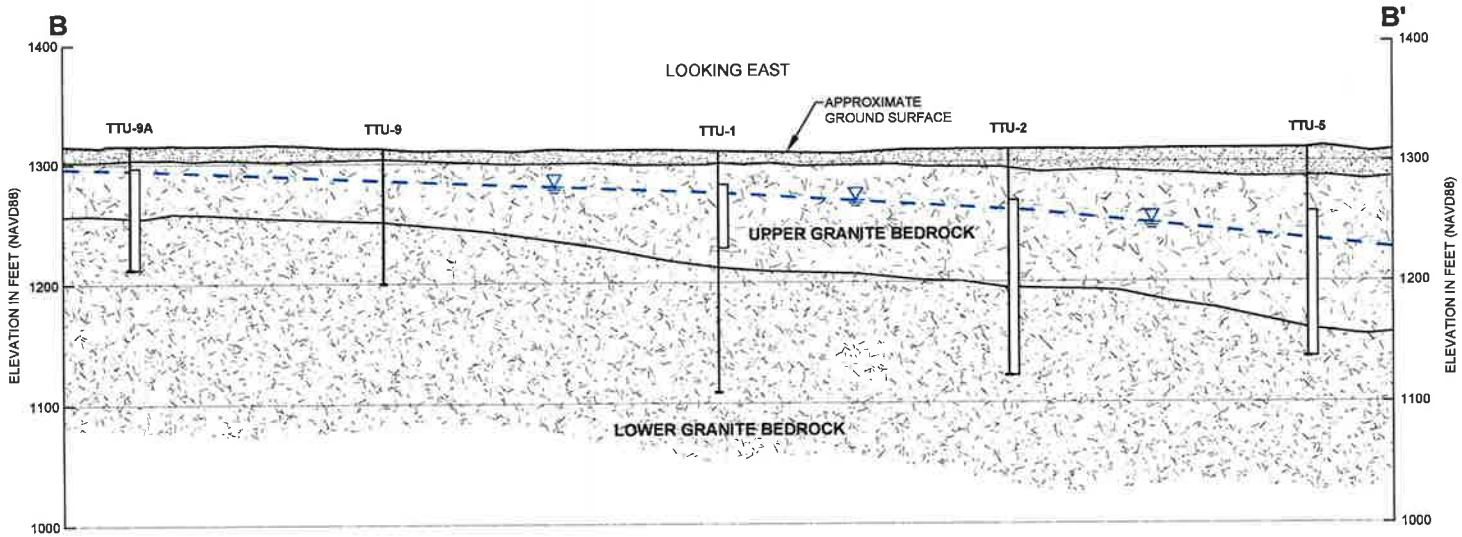
SCHEMATIC CROSS-SECTION A-A'

Nammo Talley

SCALE: AS SHOWN
OCTOBER 2016

FIGURE 4-17

MCELENEY, TERRI Printed: 10/12/2016 4:42 PM Layout: FIG 4-17
G:\119341\01\GBA\CAD\FIGURES\119341-002-CR03\SECTION SCHEMATIC PERC TRIC AUGUST 2016.DWG



LEGEND

PF-1 WELL ID

SEALED INTERVAL

OPEN INTERVAL

AUGUST 2016 WATER LEVEL

OVERBURDEN

UPPER GRANITE BEDROCK

LOWER GRANITE BEDROCK

HORIZ 0 150 300
VERT 0 100 200
SCALE IN FEET

HALEY ALDRICH

NAMMO TALLEY, INC.
THERMAL TREATMENT UNIT
MESA, ARIZONA

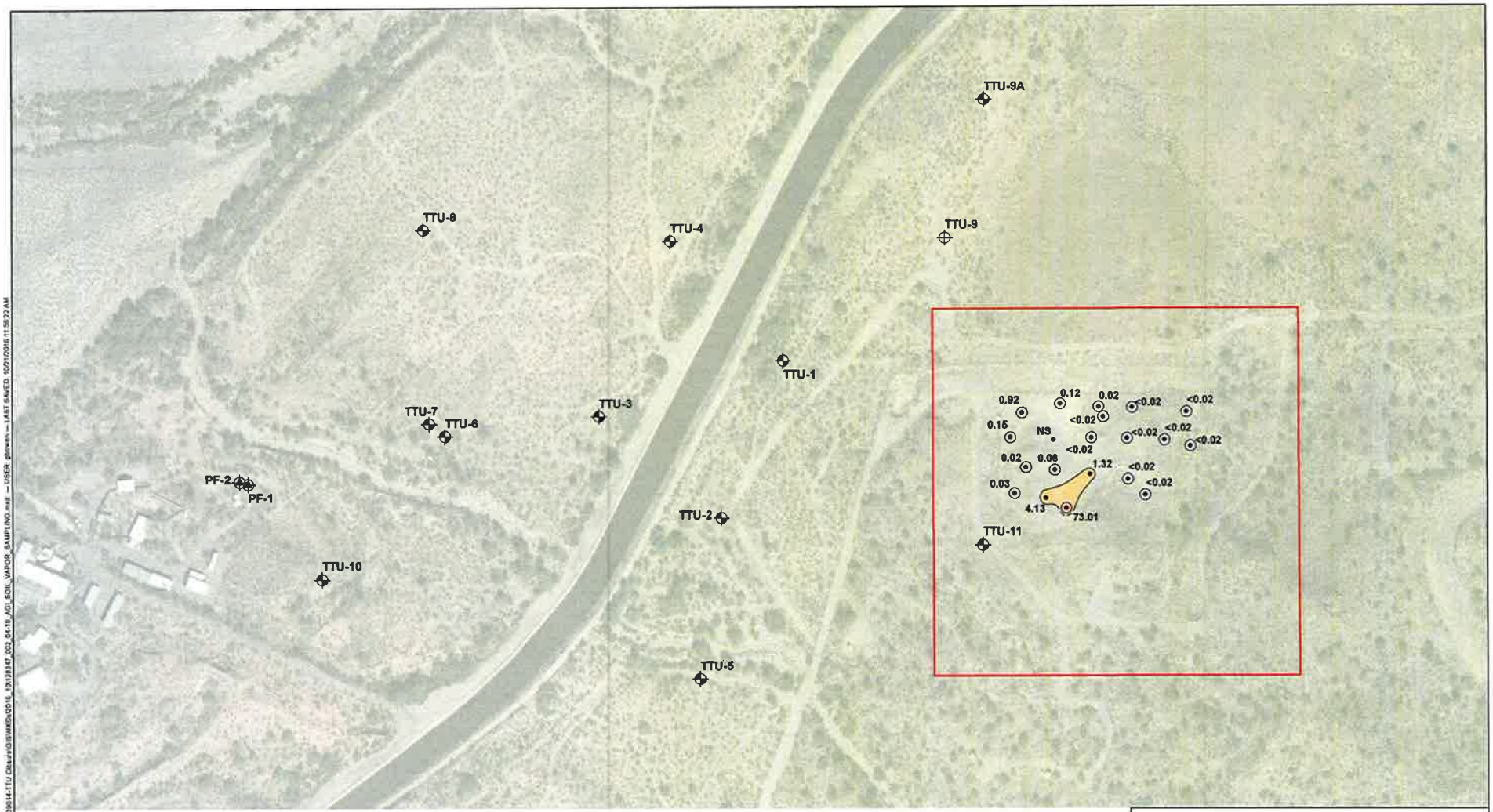
SCHEMATIC CROSS-SECTION B-B'

Nammo Talley

SCALE: AS SHOWN
OCTOBER 2016

FIGURE 4-18

MCELENEY, TERRI Printed: 10/12/2016 4:42 PM Layout: FIG 4-18
Q:\128347\GLOBAL\CAD\FIGURES\128347-002 CROSSSECTION SCHEMATIC PERC TRIC AUGUST 2016.DWG



LEGEND

- AGI SOIL VAPOR SAMPLE LOCATION
- MONITORING WELL
- NON-POTABLE SUPPLY WELL
- ABANDONED BOREHOLE
- THERMAL TREATMENT UNIT BOUNDARY

TCE SORBED MASS (µg)

- <0.02 (ND)
- 0.02 - 1
- 1 - 10
- 10 - 100

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. CONTOURS DASHED WHERE INFERRED.
3. NS = NO SAMPLE
4. ND = NON DETECT

0 200 400
SCALE IN FEET

HALEY ALDRICH

NAMMO TALLEY, INC.
THERMAL TREATMENT UNIT
MESA, ARIZONA

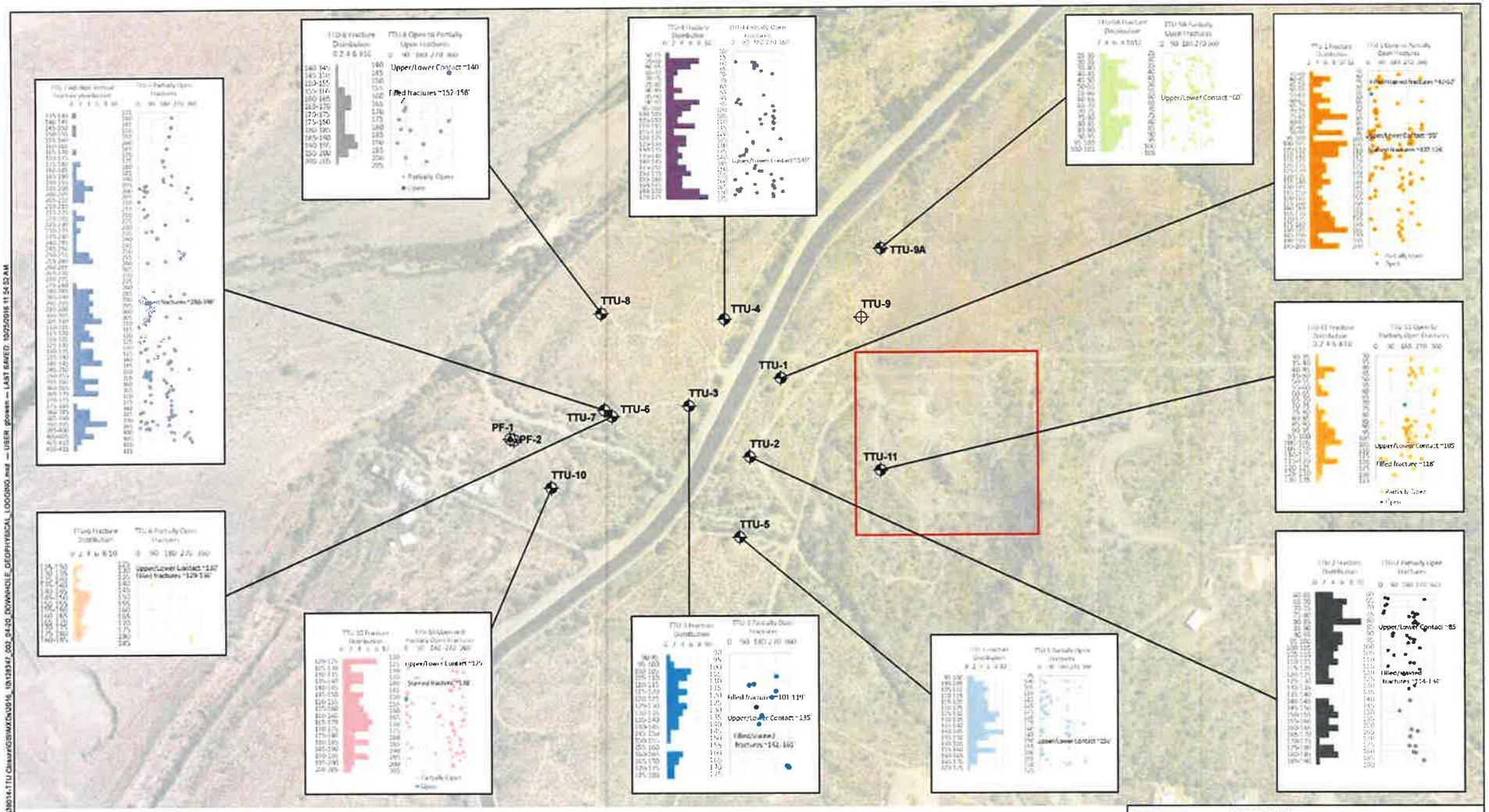
Nammo Talley

AGI SOIL VAPOR SAMPLING - 6/14/15 THROUGH 7/8/15

OCTOBER 2016

FIGURE 4-19

GIS FILE PATH: G:\Projects\Nammo Talley\36514-TTU Closure\GIS\MXD\2016_10\38347_003_04-18_AGI_SOIL_VAPOR_SAMPLING.mxd — USER: gbreeh — LAST SAVED: 10/21/2016 11:59:22 AM



LEGEND

- MONITORING WELL
- NON-POTABLE SUPPLY WELL
- ABANDONED BOREHOLE
- THERMAL TREATMENT UNIT BOUNDARY

NOTE

ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.

0 400 800
SCALE IN FEET

HALEY ALDRICH

NAMMO TALLEY, INC.
THERMAL TREATMENT UNIT
MESA, ARIZONA

DOWNHOLE GEOPHYSICAL LOGGING INFORMATION

Nammo Talley

OCTOBER 2016

FIGURE 4-20

GIS FILE PATH: G:\Projects\Nammo Talley\36014.TTU Closure\GIS\MXDs\2016_10\139347_003_04-20_DOWNHOLE_GEOPHYSICAL_LOGGING.mxd — USER: jgowen — LAST SAVED: 10/25/2016 11:54:52 AM

FIGURE 4-21: WATER ELEVATION VS. TIME DURING PULSE TESTING ACTIVITIES

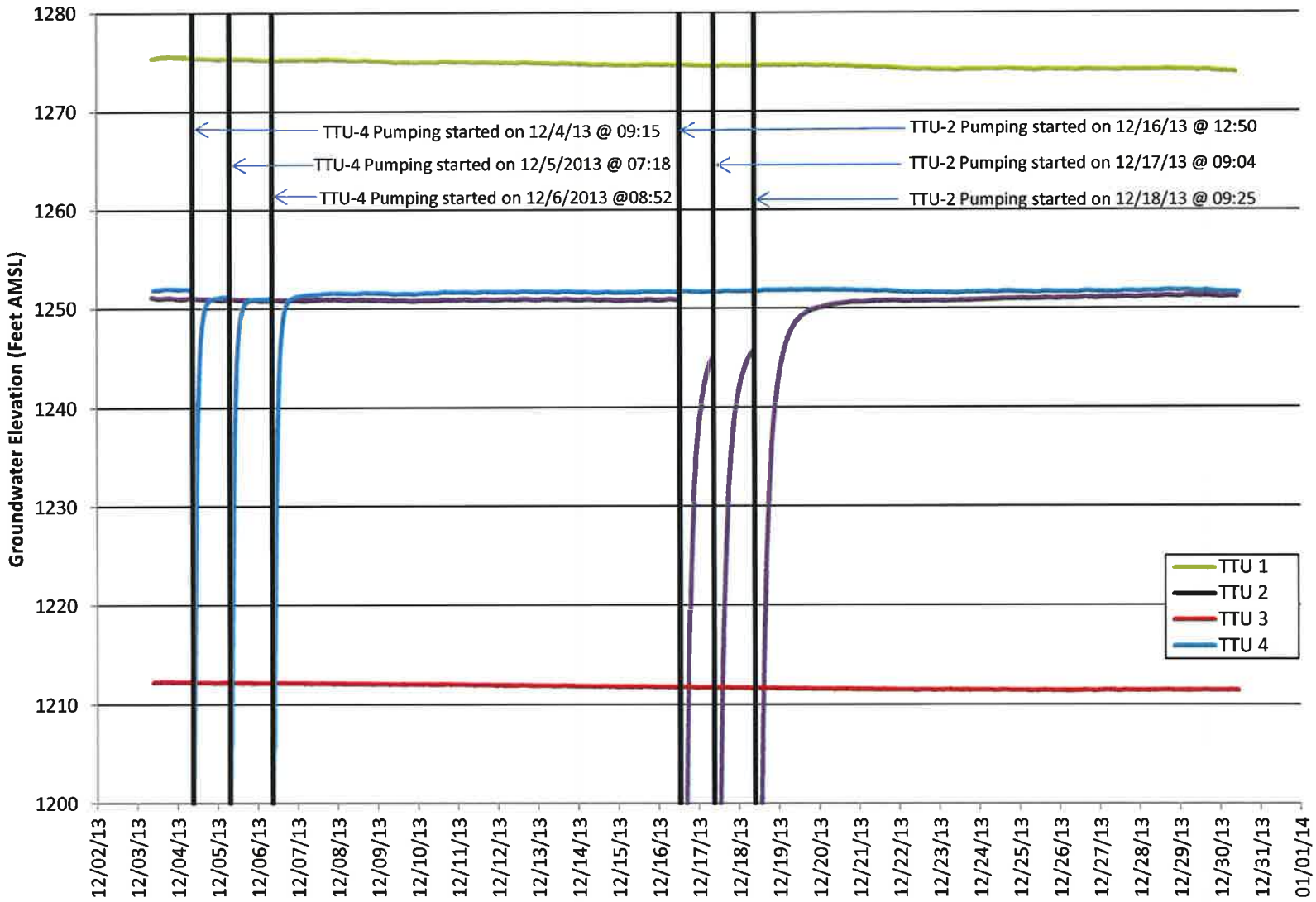
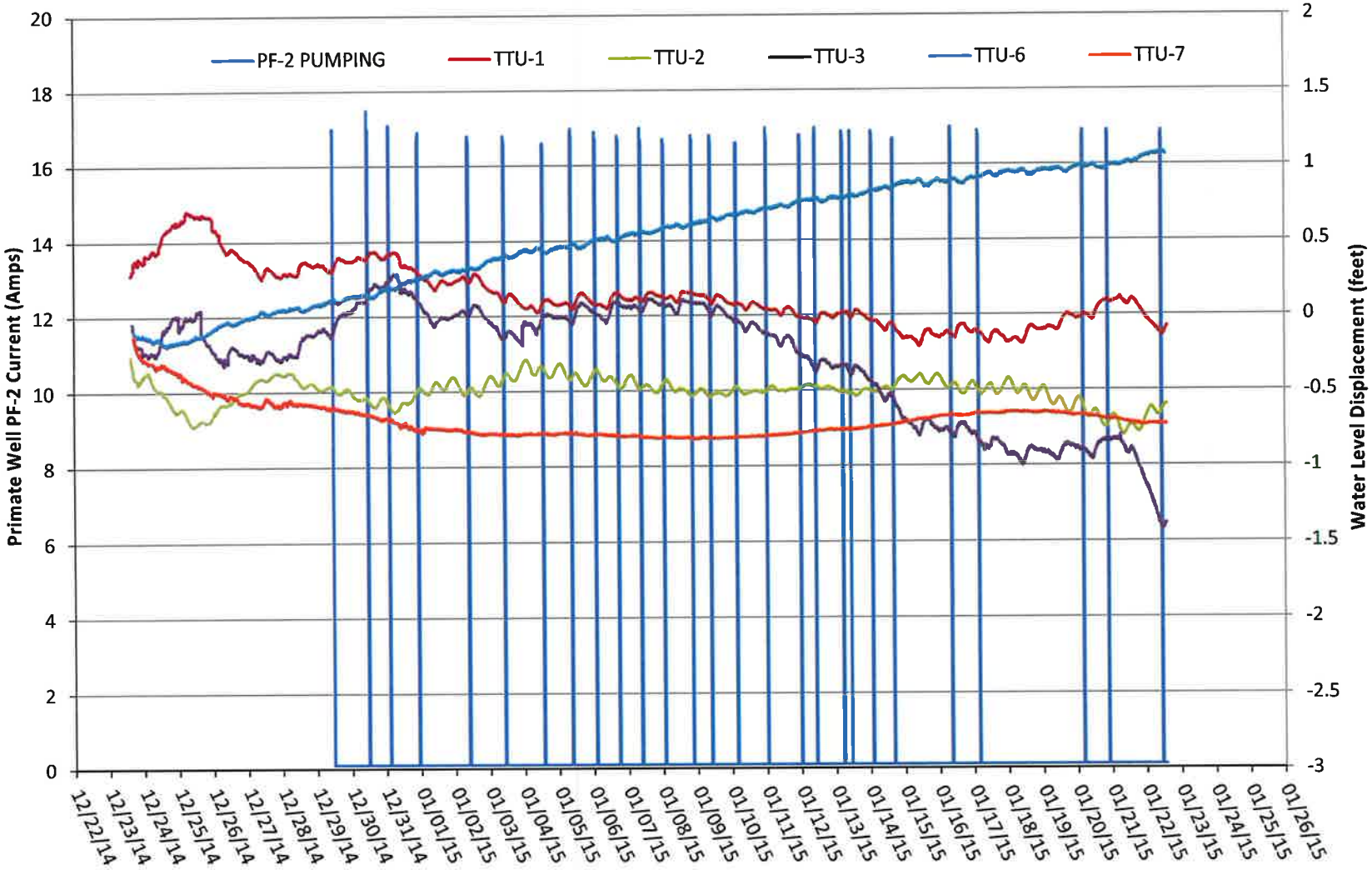


Figure 4-22: PF-2 Pumping Versus TTU Monitoring Well Water Levels



LEGEND:

- PRE SOIL REMOVAL SAMPLE
- POST SOIL REMOVAL SAMPLE
- LESS THAN R-SRL
- GREATER THAN R-SRL
- APPROXIMATE REMOVAL AREA
- SAMPLE GRID AND GRID ID NUMBER (BASIN AND RANGE, 1996)

NOTES:

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. AERIAL SOURCE: LANDISCOR AERIAL INFORMATION - JULY 2009.
3. ADDITIONAL BURN ACTIVITIES WERE CONDUCTED AT THE TTU FOLLOWING THE WORK DEPICTED ON THIS FIGURE. REFER TO SECTION 1.1.2.2, "OPERATING HISTORY."

0 100 200
SCALE IN FEET

HALEY ALDRICH

NAMMO TALLEY, INC.
THERMAL TREATMENT UNIT
MESA, ARIZONA

LEAD SAMPLE LOCATIONS
AND SOIL REMOVAL AREAS

Nammo Talley

SCALE: AS SHOWN
OCTOBER 2016

FIGURE 5-1

G:\12834/TGL/OBA1\CAD\98014-009 FIGURE 5-1 OCT2016 LEADSAMPLES.DWG

LEGEND:

- PRE SOIL REMOVAL SAMPLE
- APPROXIMATE REMOVAL AREA
- SAMPLE GRID AND GRID ID NUMBER (BASIN AND RANGE, 1996)

NOTES:

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE
2. ALL RESULTS ARE LESS THAN R-SRL
3. AERIAL SOURCE: LANDISCOR AERIAL INFORMATION - ULY 2009
4. ADDITIONAL BURN ACTIVITIES WERE CONDUCTED AT THE TTU FOLLOWING THE WORK DEPICTED ON THIS FIGURE. REFER TO SECTION 2, "OPERATING HISTORY."

0 50 100
SCALE IN FEET

HALEY ALDRICH

NAMMO TALLEY, INC
THERMAL TREATMENT UNIT
MESA, ARIZONA

BARIUM SAMPLE LOCATIONS
AND SOIL REMOVAL AREAS

Nammo Talley

SCALE AS SHOWN
OCTOBER 2016

FIGURE 5-2

G:\39014 NAMMOTALLEY\GLOBAL\CAD\DRAWING\39014-009-003 4-BARIUMSAMPLES.DWG

LEGEND:

- PRE SOIL REMOVAL SAMPLE
- APPROXIMATE REMOVAL AREA
- SAMPLE GRID AND GRID ID NUMBER (BASIN AND RANGE, 1996)

NOTES:

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. ALL RESULTS ARE LESS THAN R-SRL.
3. AERIAL SOURCE: LANDISCOR AERIAL INFORMATION - JULY 2009.
4. ADDITIONAL BURN ACTIVITIES WERE CONDUCTED AT THE TTU FOLLOWING THE WORK DEPICTED ON THIS FIGURE. REFER TO SECTION 1.1.2.2, "OPERATING HISTORY."

0 100 200
SCALE IN FEET

HALEY ALDRICH

NAMMO TALLEY, INC.
THERMAL TREATMENT UNIT
MESA, ARIZONA

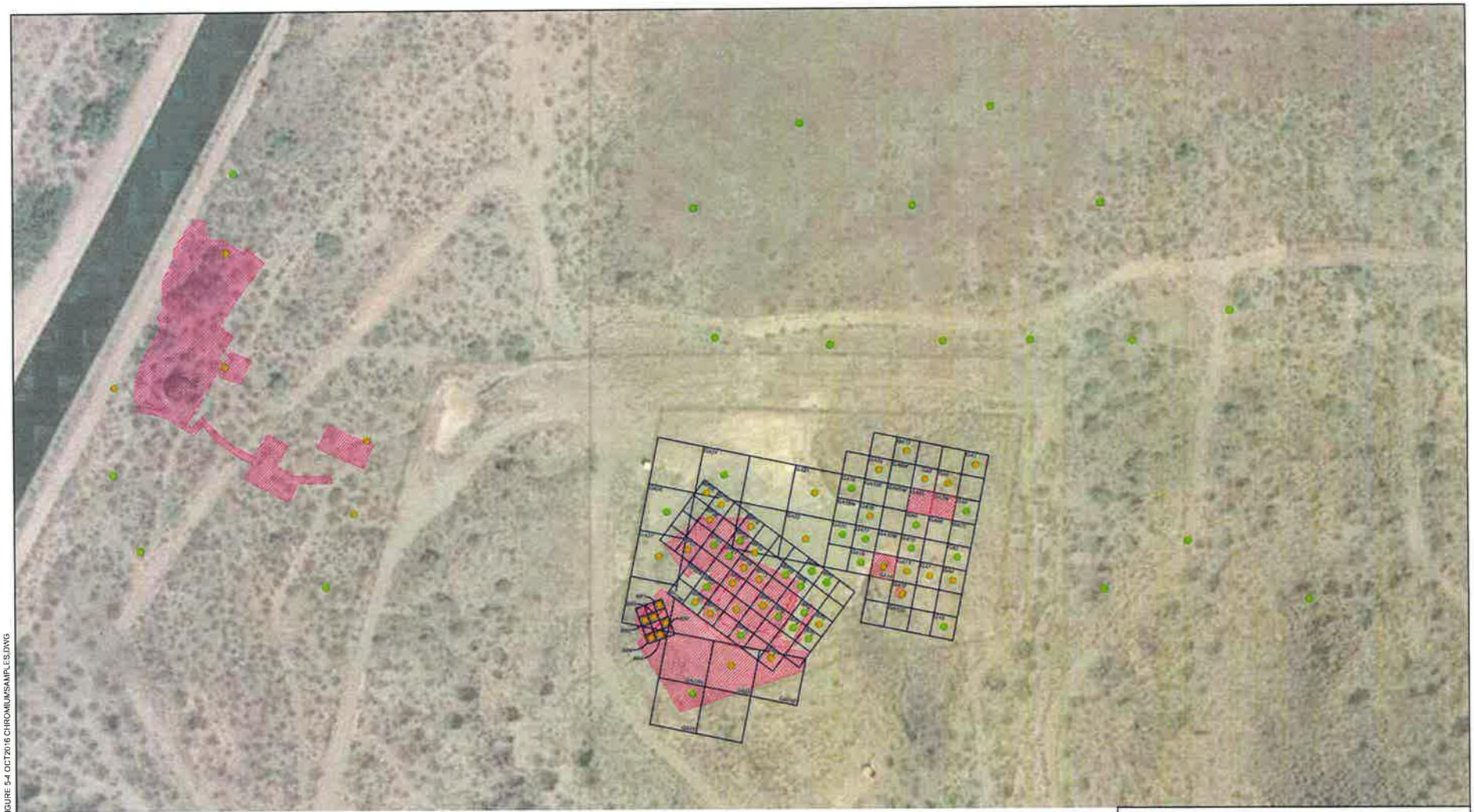
CADMIUM SAMPLE LOCATIONS
AND SOIL REMOVAL AREAS

Nammo Talley

SCALE: AS SHOWN
OCTOBER 2016

FIGURE 5-3

G:\12834\7\GLOBAL\CAD\390\14-009 FIGURE 5-3 OCT 2016 CADMIUMSAMPLES.DWG



LEGEND:

- PRE SOIL REMOVAL SAMPLE
- LESS THAN R-SRL
- GREATER THAN R-SRL
- APPROXIMATE REMOVAL AREA
- SAMPLE GRID AND GRID ID NUMBER (BASIN AND RANGE, 1996)

NOTES:

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. AERIAL SOURCE: LANDISCOR AERIAL INFORMATION - JULY 2009
3. THIS FIGURE COMPARES RESULTS FOR TOTAL CHROMIUM VERSUS THE HEXAVALENT CHROMIUM RESIDENTIAL SRL. HOWEVER, THE RATIO OF HEXAVALENT CHROMIUM TO TOTAL CHROMIUM WAS FOUND TO BE ONLY 7 PERCENT (SECTION 3.4.2). BASED ON THIS, NONE OF THE DEPICTED SAMPLES WOULD ACTUALLY EXCEED THE HEXAVALENT CHROMIUM RESIDENTIAL SRL, WITH THE EXCEPTION OF GRID GA14, WHICH WAS SUBSEQUENTLY REMEDIATED (SECTION 3.3.6).
4. ADDITIONAL BURN ACTIVITIES WERE CONDUCTED AT THE TTU FOLLOWING THE WORK DEPICTED ON THIS FIGURE. REFER TO SECTION 1.1.2.2, "OPERATING HISTORY."

N

0 100 200
SCALE IN FEET

HALEY ALDRICH

NAMMO TALLEY, INC.
THERMAL TREATMENT UNIT
MESA, ARIZONA

CHROMIUM SAMPLE LOCATIONS AND SOIL REMOVAL AREAS

Nammo Talley

SCALE: AS SHOWN
OCTOBER 2016

FIGURE 5-4

G:\129347\GLOBAL\CAD\39014-009 FIGURE 5-4 OCT2016 CHROMIUM SAMPLES.DWG

LEGEND:

- PRE SOIL REMOVAL SAMPLE
- POST SOIL REMOVAL SAMPLE
- LESS THAN R-SRL
- GREATER THAN R-SRL
- APPROXIMATE REMOVAL AREA
- GA6 — SAMPLE GRID AND GRID ID NUMBER (BASIN AND RANGE, 1996)

NOTES:

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE
2. AERIAL SOURCE: LANDISCOR AERIAL INFORMATION - ULY 2009
3. ADDITIONAL BURN ACTIVITIES WERE CONDUCTED AT THE TTU FOLLOWING THE WORK DEPICTED ON THIS FIGURE. REFER TO SECTION 2, "OPERATING HISTORY."

0 50 100
SCALE IN FEET

HALEY ALDRICH

NAMMO TALLEY, INC.
THERMAL TREATMENT UNIT
MESA, ARIZONA

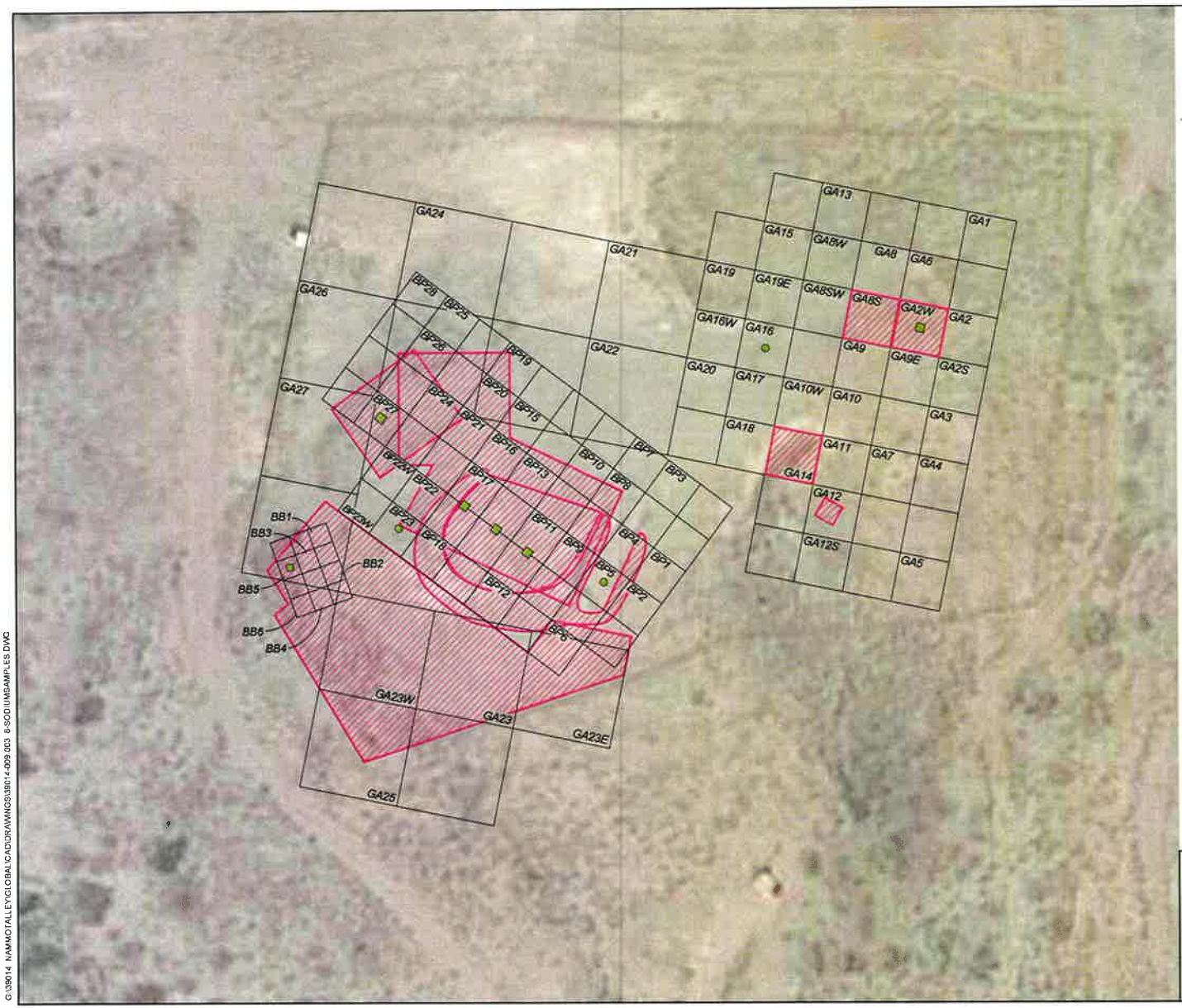
PERCHLORATE SAMPLE LOCATIONS AND SOIL REMOVAL AREAS

Nammo Talley

SCALE: AS SHOWN
OCTOBER 2016

FIGURE 5-5

G:\39014 NAMMOTALLEY\GLOBAL\CAD\DRAWINGS\39014-009.003 7-PERCHLORATESAMPLES.DWG



LEGEND:

- PRE SOIL REMOVAL SAMPLE
- POST SOIL REMOVAL SAMPLE
- APPROXIMATE REMOVAL AREA
- SAMPLE GRID AND GRID ID NUMBER (BASIN AND RANGE, 1996)

NOTES:

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE
2. ALL RESULTS WERE NON-DETECT
3. AERIAL SOURCE: LANDISCOR AERIAL INFORMATION - ULY 2009
4. ADDITIONAL BURN ACTIVITIES WERE CONDUCTED AT THE TTU FOLLOWING THE WORK DEPICTED ON THIS FIGURE. REFER TO SECTION 2, "OPERATING HISTORY."

N

0 50 100
SCALE IN FEET

HALEY ALDRICH

NAMMO TALLEY, INC.
THERMAL TREATMENT UNIT
MESA, ARIZONA

SODIUM AZIDE SAMPLE LOCATIONS AND SOIL REMOVAL AREAS

Nammo Talley

SCALE: AS SHOWN
OCTOBER 2016

FIGURE 5-6

G:\39014 NAMMOTALLEYGLOBAL\CAD\DRAWINGS\39014-009-003 8-SODIUMSAMPLES.DWG

LEGEND:

- PRE SOIL REMOVAL SAMPLE
- POST SOIL REMOVAL SAMPLE
- APPROXIMATE REMOVAL AREA
- SAMPLE GRID AND GRID ID NUMBER (BASIN AND RANGE, 1996)

NOTES:

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE
2. ALL RESULTS WERE NON-DETECT
3. AERIAL SOURCE: LANDISCOR AERIAL INFORMATION - JULY 2009
4. ADDITIONAL BURN ACTIVITIES WERE CONDUCTED AT THE TTU FOLLOWING THE WORK DEPICTED ON THIS FIGURE. REFER TO SECTION 2, "OPERATING HISTORY."

0 50 100
SCALE IN FEET

HALEY ALDRICH

NAMMO TALLEY, INC.
THERMAL TREATMENT UNIT
MESA, ARIZONA

NITRATE SAMPLE LOCATIONS AND SOIL REMOVAL AREAS

Nammo Talley

SCALE: AS SHOWN
OCTOBER 2016

FIGURE 5-7

G:\39014 NAMMO TALLEY\GLOBAL\CAD\DRAWINGS\39014-008-003 9-NITRATE SAMPLES.DWG

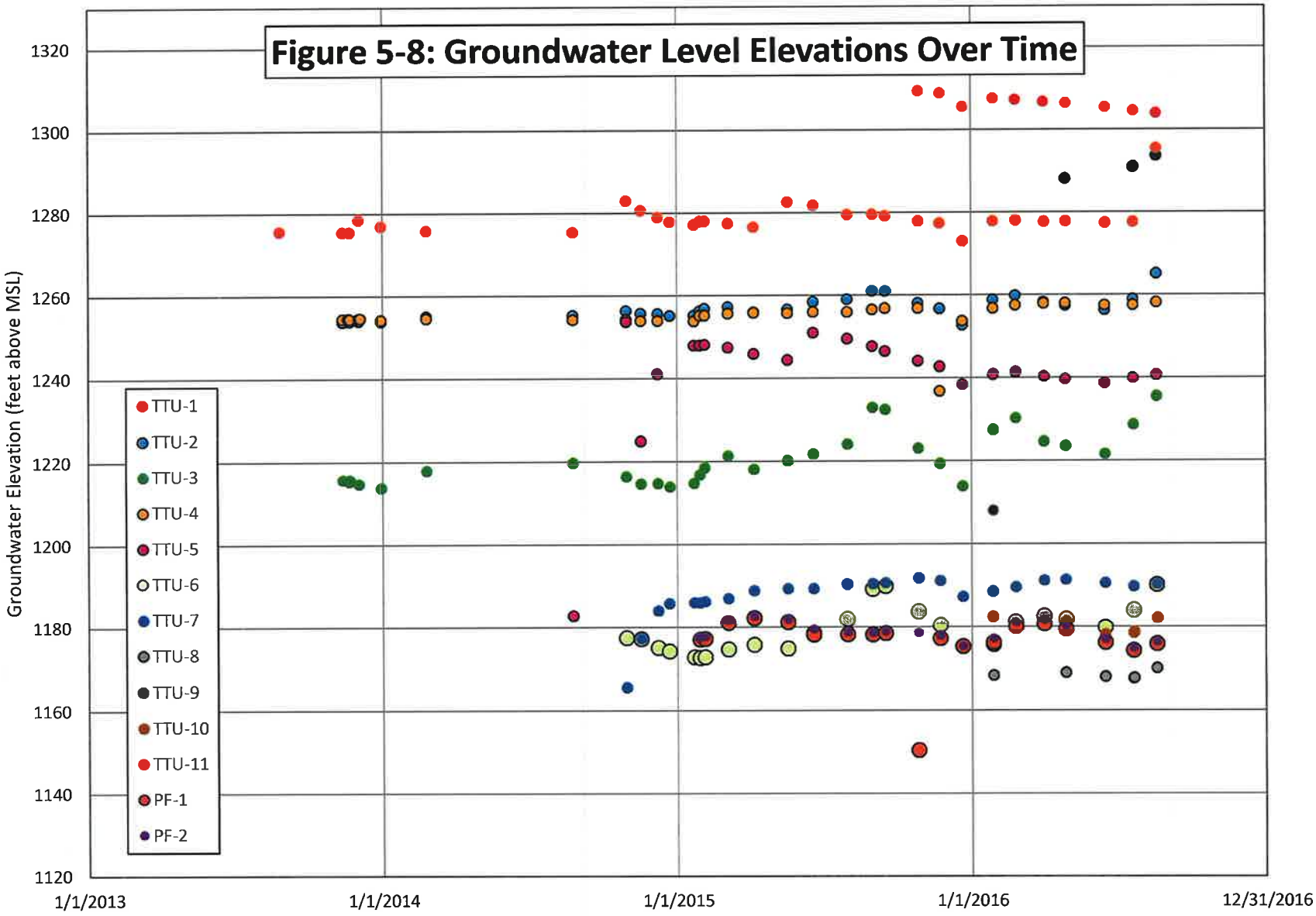
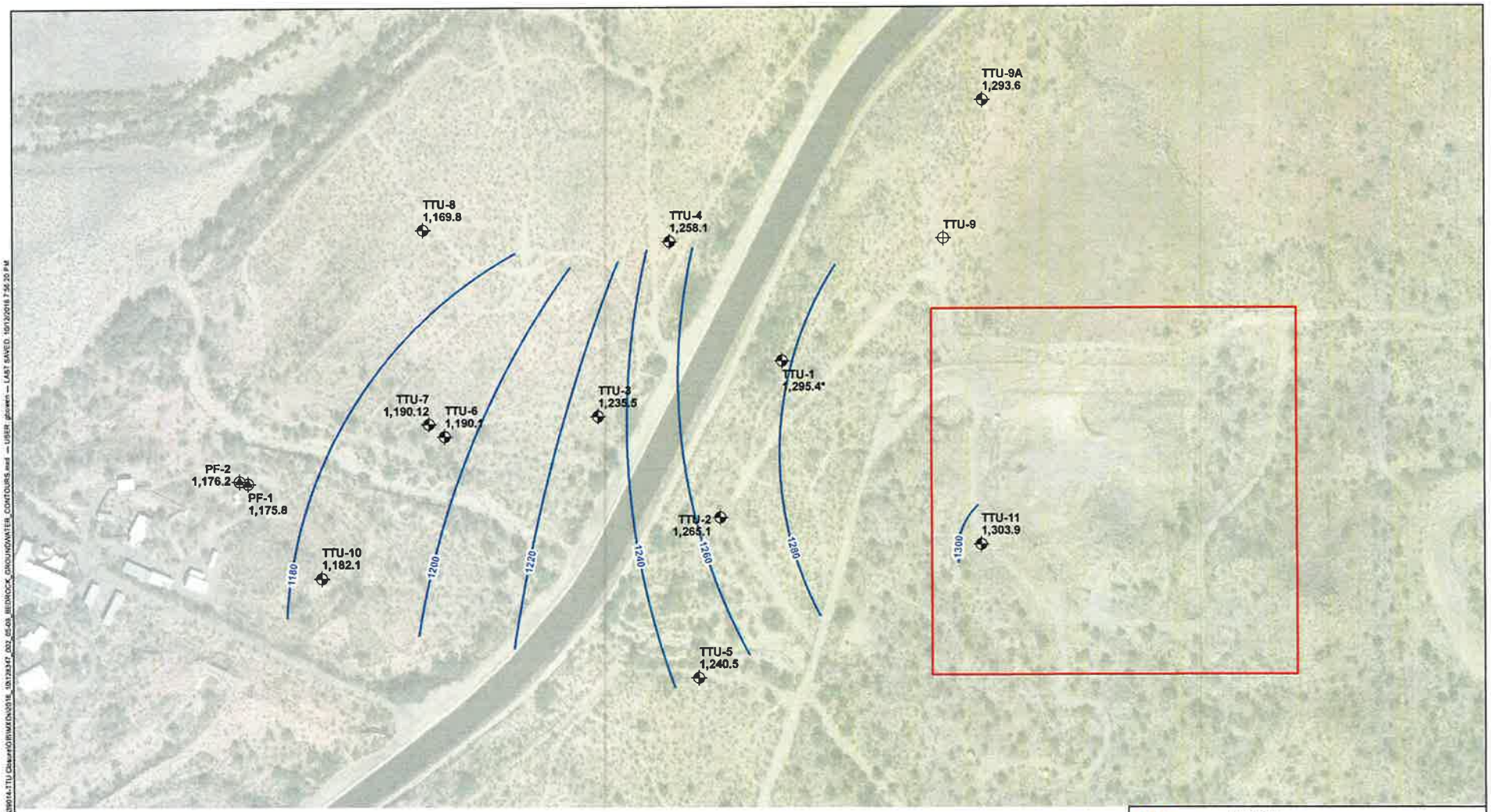


Figure 5-8: Groundwater Level Elevations Over Time
Groundwater Elevation (feet above MSL)
1320
1300
1280
1260
1240
1220
1200
1180
1160
1140
1120
1/1/2013
1/1/2014
1/1/2015
1/1/2016
12/31/2016
TTU-1
TTU-2
TTU-3
TTU-4
TTU-5
TTU-6
TTU-7
TTU-8
TTU-9
TTU-10
TTU-11
PF-1
PF-2



LEGEND

- MONITORING WELL
- NON-POTABLE SUPPLY WELL
- ABANDONED BOREHOLE
- BEDROCK GROUNDWATER ELEVATION CONTOUR, 20-FT INTERVAL
- THERMAL TREATMENT UNIT BOUNDARY

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. * = ANOMALOUS RESULT (HISTORICAL VALUE OF 1,278 USED IN CONTOURING)

N

0 200 400
SCALE IN FEET

HALEY ALDRICH

NAMMO TALLEY, INC.
THERMAL TREATMENT UNIT
MESA, ARIZONA

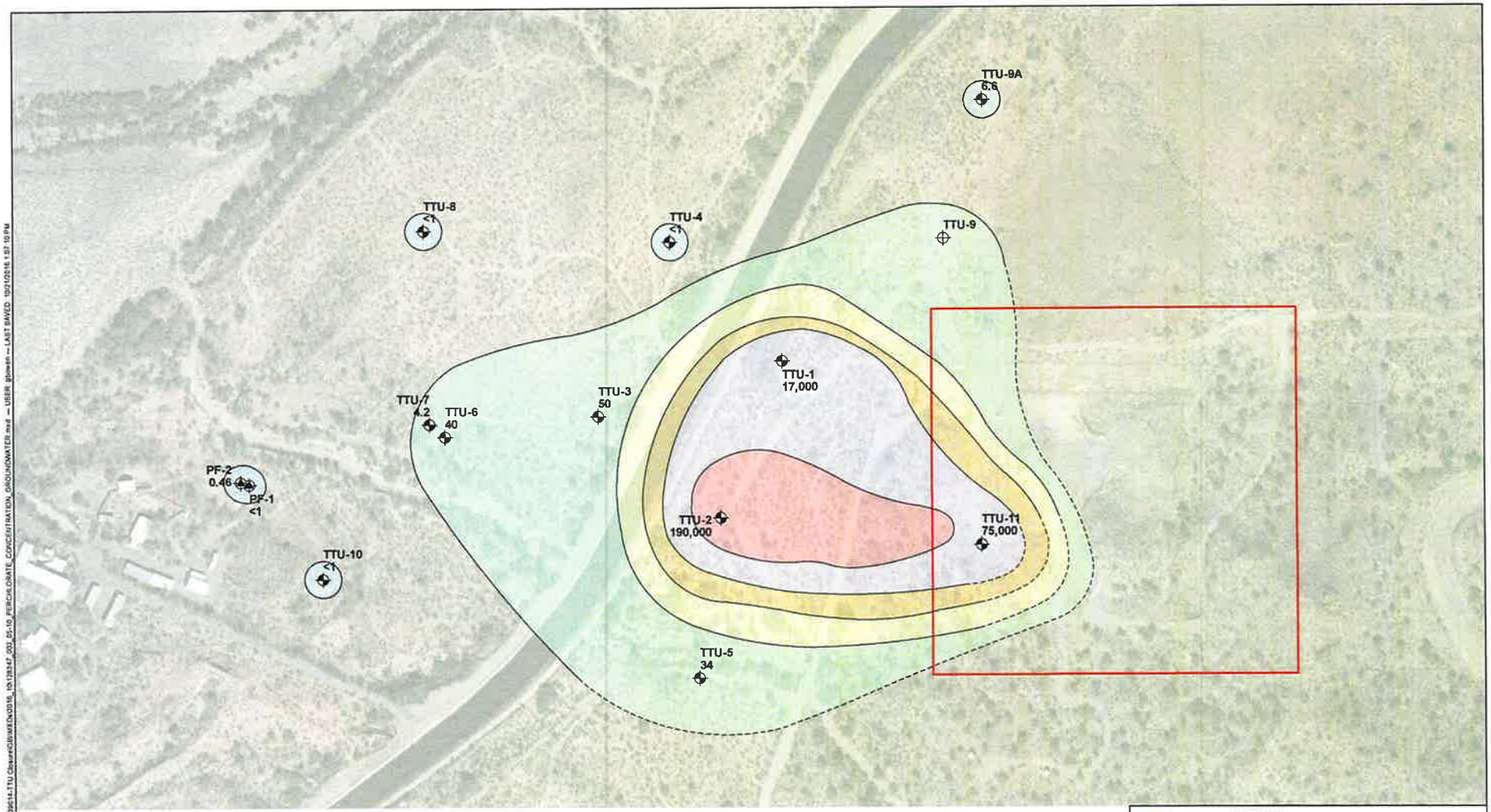
BEDROCK GROUNDWATER CONTOURS - AUGUST 2016

Nammo Talley

OCTOBER 2016

FIGURE 5-9

GIS FILE PATH: G:\Projects\Nammo Talley\09914-TTU Closure\GIS\MXD\2016_10\293147_002_05-08_BEDROCK_GROUNDWATER_CONTOURS.mxd -- USER: gbowen -- LAST SAVED: 10/13/2016 7:56:20 PM



LEGEND

- MONITORING WELL
- NON-POTABLE SUPPLY WELL
- ABANDONED BOREHOLE
- THERMAL TREATMENT UNIT BOUNDARY

PERCHLORATE (µg/L)

- >100,000
- 10,000 - 100,000
- 1,000 - 10,000
- 100 - 1,000
- 14 - 100
- <14 OR ND

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. CONTOURS DASHED WHERE INFERRED.
3. ND = NON DETECT
4. TTU-7 IS A LOWER BEDROCK WELL.

N

0 200 400
SCALE IN FEET

HALEY ALDRICH

NAMMO TALLEY, INC.
THERMAL TREATMENT UNIT
MESA, ARIZONA

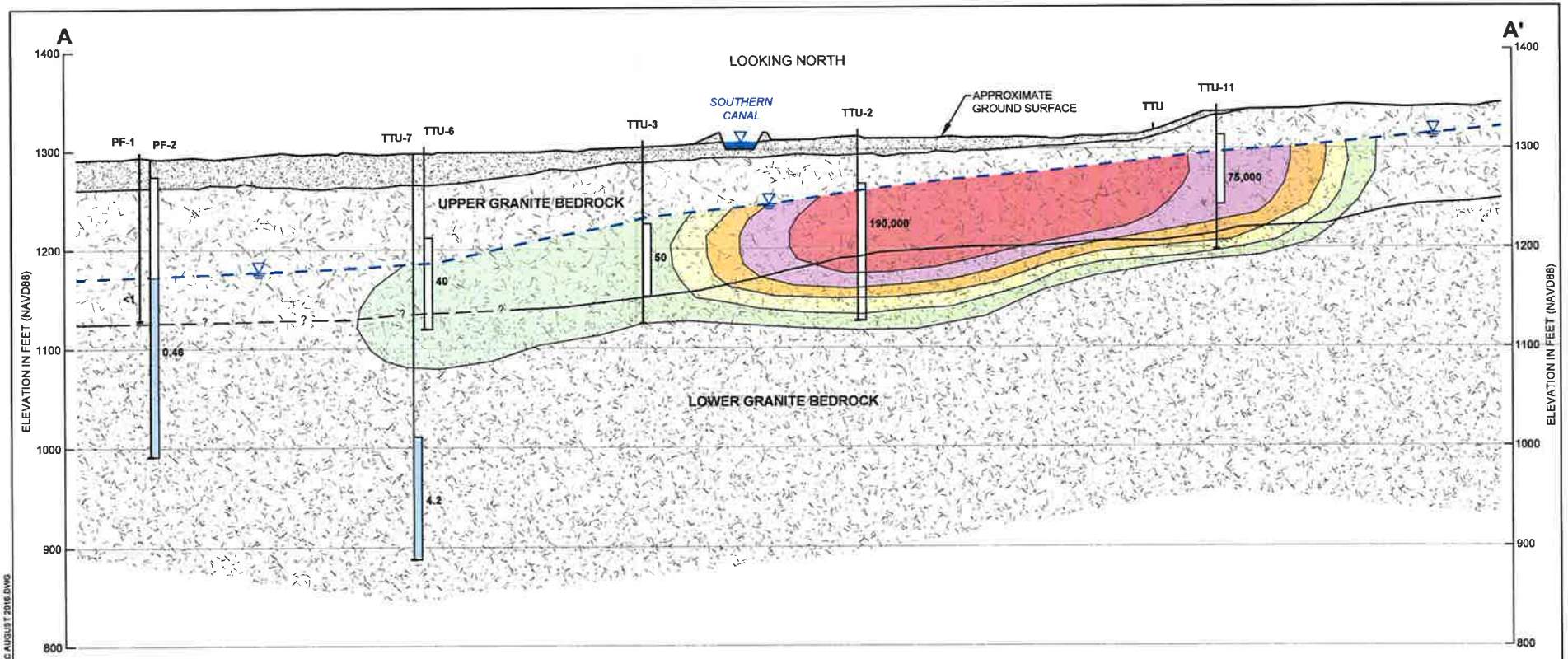
PERCHLORATE CONCENTRATIONS IN GROUNDWATER - AUGUST 2016

Nammo Talley

OCTOBER 2016

FIGURE 5-10

GIS FILE PATH: G:\Projects\Nammo Talley\06014-TTU Closure\GIS\MXD\GW_10\178347_002_05_10_PERCHLORATE_CONCENTRATION_GROUNDWATER.mxd -- USER: glowen -- LAST SAVED: 10/21/2016 1:57:10 PM



LEGEND

PF-1 WELL ID

SEALED INTERVAL

OPEN INTERVAL

AUGUST 2016 WATER LEVEL

OVERBURDEN

UPPER GRANITE BEDROCK

LOWER GRANITE BEDROCK

PERCHLORATE (UG/L)

- >100,000
- 10,000-100,000
- 1,000-10,000
- 100-1,000
- 14-100
- <14 OR NON-DETECT

HORIZ 0 150 300
VERT 0 100 200
SCALE IN FEET

HALEY ALDRICH

NAMMO TALLEY, INC.
THERMAL TREATMENT UNIT
MESA, ARIZONA

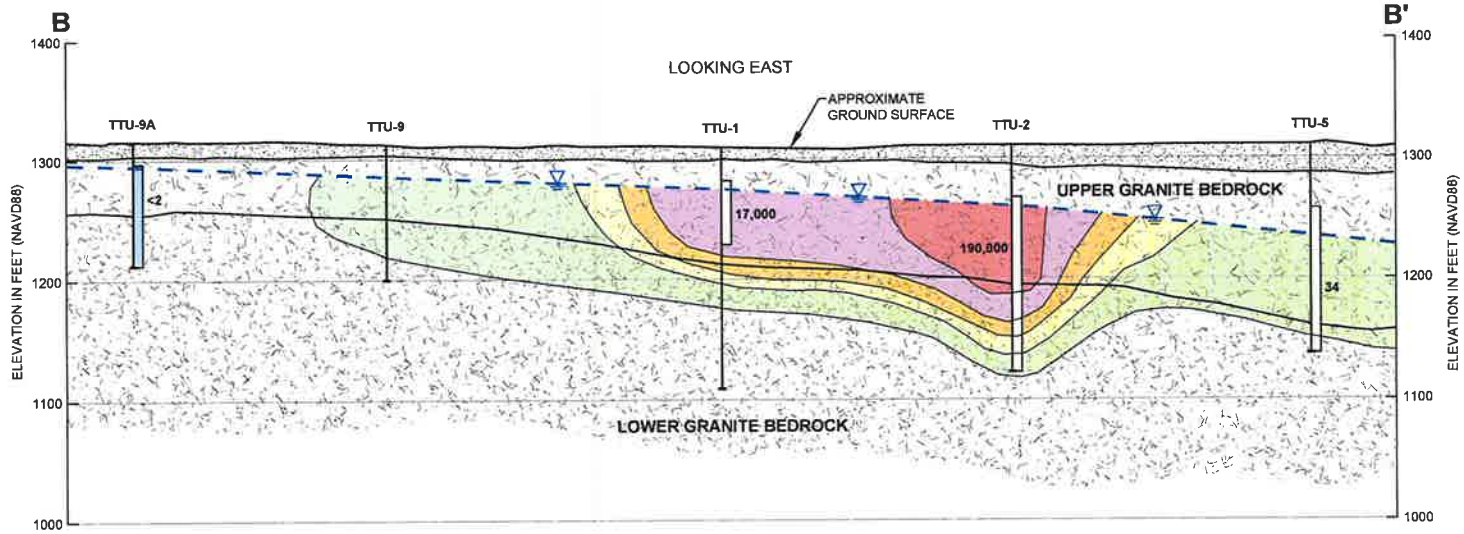
PERCHLORATE AUGUST 2016
SCHEMATIC CROSS-SECTION A-A'

Nammo Talley

SCALE: AS SHOWN
OCTOBER 2016

FIGURE 5-11

MCELENEY, TERRI Printed: 10/12/2016 4:42 PM Layout: FIG 5-11
G:\128347\GLOBAL\CAD\FIGURES\128347-003 CROSSSECTION SCHEMATIC PERC TRIC AUGUST 2016.DWG



LEGEND

PF-1 WELL ID

SEALED INTERVAL

OPEN INTERVAL

AUGUST 2016 WATER LEVEL

OVERBURDEN

UPPER GRANITE BEDROCK

LOWER GRANITE BEDROCK

PERCHLORATE (UG/L)

- >100,000
- 10,000-100,000
- 1,000-10,000
- 100-1,000
- 14-100
- <14 OR NON-DETECT

HORIZ 0 150 300
VERT. 0 100 200
SCALE IN FEET

HALEY ALDRICH

NAMMO TALLEY, INC.
THERMAL TREATMENT UNIT
MESA, ARIZONA

PERCHLORATE AUGUST 2016
SCHEMATIC CROSS-SECTION B-B'

Nammo Talley

SCALE: AS SHOWN
OCTOBER 2016

FIGURE 5-12

MCELENEY, TERRI Plotted: 10/12/2016 4:42 PM Layout: FIG 5-12
G:\12834\GLOBAL\CAD\FIGURE 5\129347-002 CROSSSECTION SCHEMATIC PERC TRIC AUGUST 2016.DWG

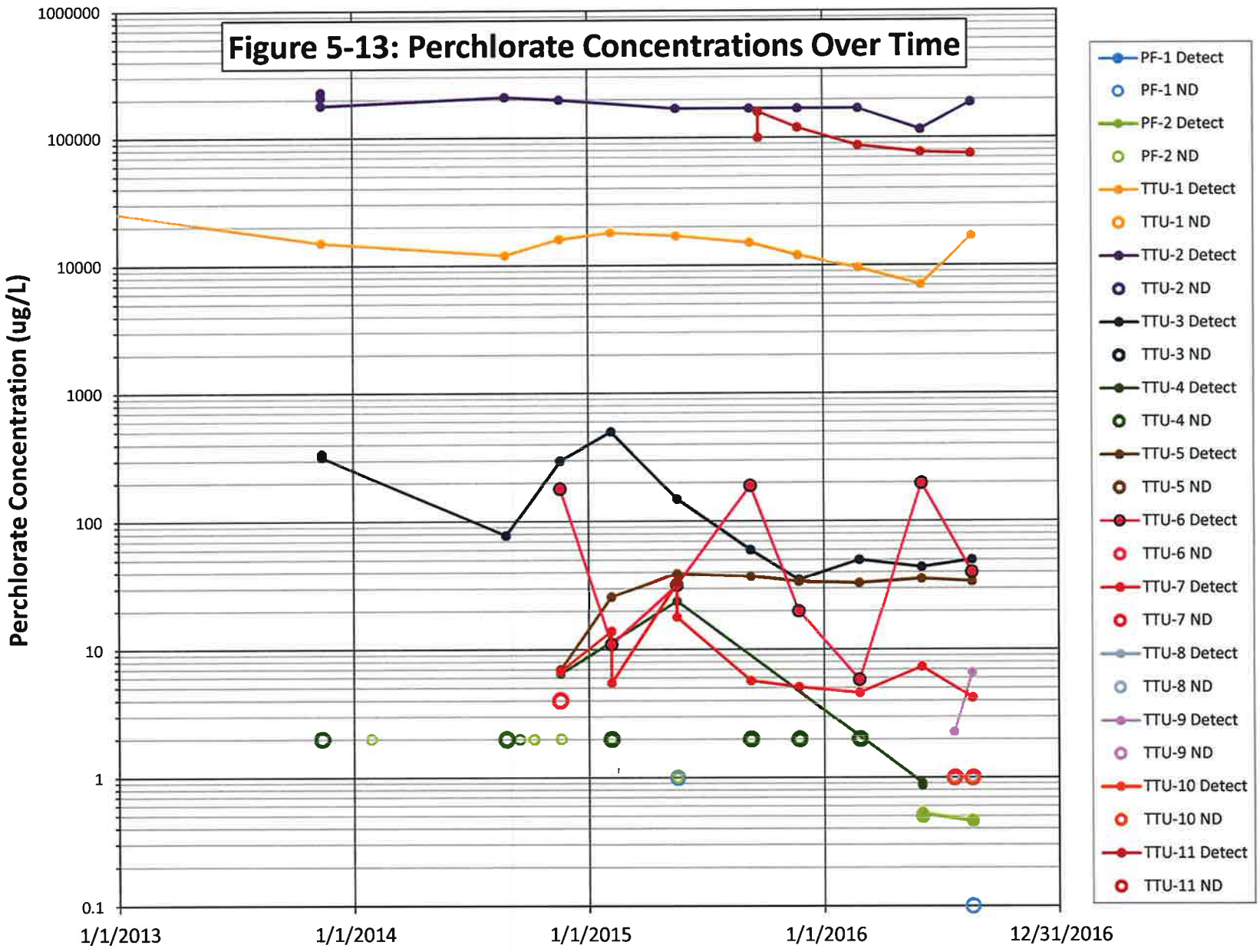
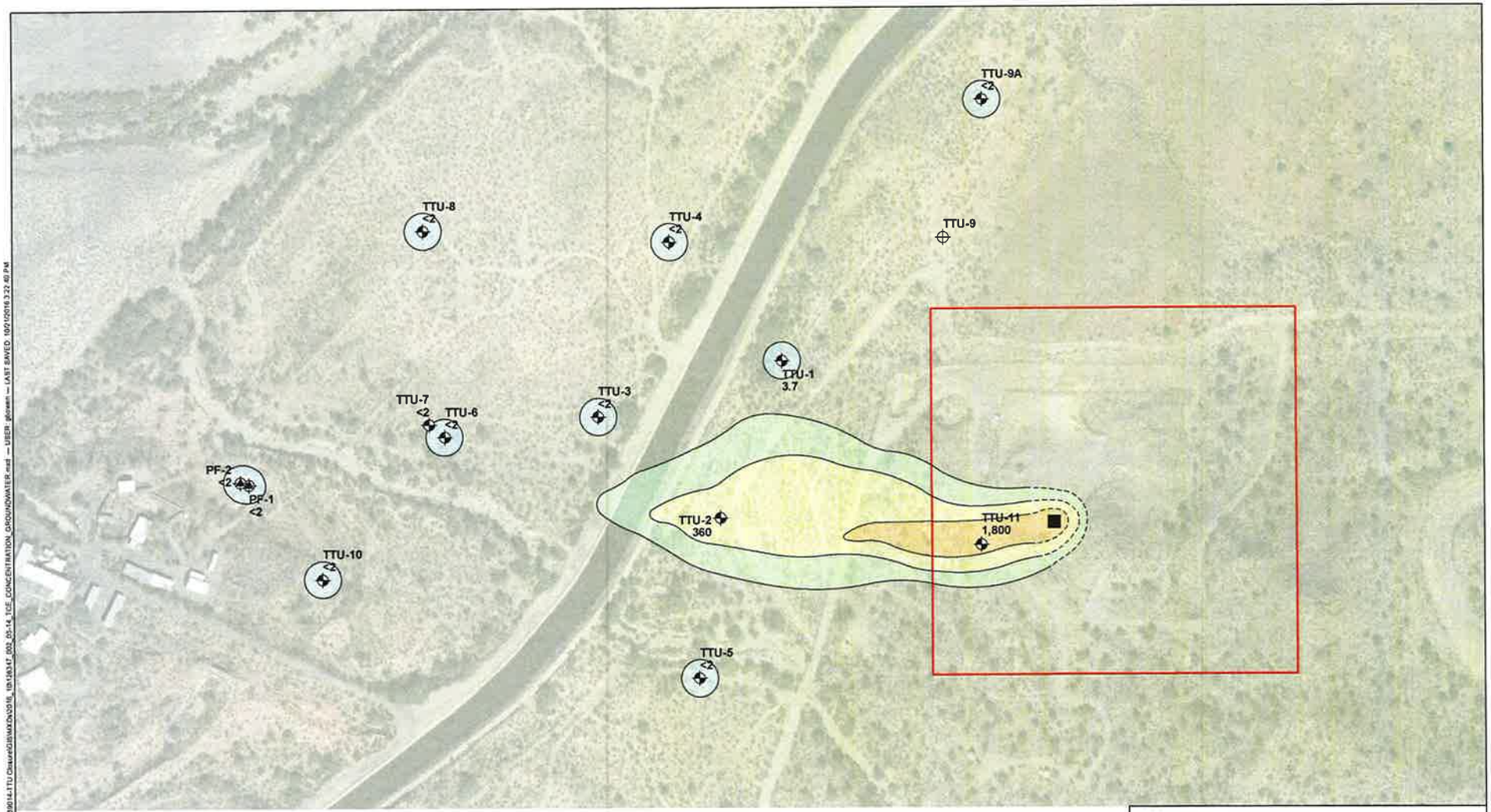


Figure 5-13: Perchlorate Concentrations Over Time
Perchlorate Concentration (ug/L)
1000000
100000
10000
1000
100
10
1
0.1
1/1/2013
1/1/2014
1/1/2015
1/1/2016
12/31/2016
PF-1 Detect
PF-1 ND
PF-2 Detect
PF-2 ND
TTU-1 Detect
TTU-1 ND
TTU-2 Detect
TTU-2 ND
TTU-3 Detect
TTU-3 ND
TTU-4 Detect
TTU-4 ND
TTU-5 Detect
TTU-5 ND
TTU-6 Detect
TTU-6 ND
TTU-7 Detect
TTU-7 ND
TTU-8 Detect
TTU-8 ND
TTU-9 Detect
TTU-9 ND
TTU-10 Detect
TTU-10 ND
TTU-11 Detect
TTU-11 ND



LEGEND

- MONITORING WELL
- NON-POTABLE SUPPLY WELL
- ABANDONED BOREHOLE
- POTENTIAL VOC SOURCE AREA BASED ON 2015 SOIL VAPOR SAMPLING
- THERMAL TREATMENT UNIT BOUNDARY

TCE (µg/L)

- >100,000
- 10,000 - 100,000
- 1,000 - 10,000
- 100 - 1,000
- 5 - 100
- <5 OR ND

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. CONTOURS DASHED WHERE INFERRED.
3. ND = NON DETECT
4. TTU-7 IS A LOWER BEDROCK WELL.

N

0 200 400
SCALE IN FEET

HALEY ALDRICH

NAMMO TALLEY, INC.
THERMAL TREATMENT UNIT
MESA, ARIZONA

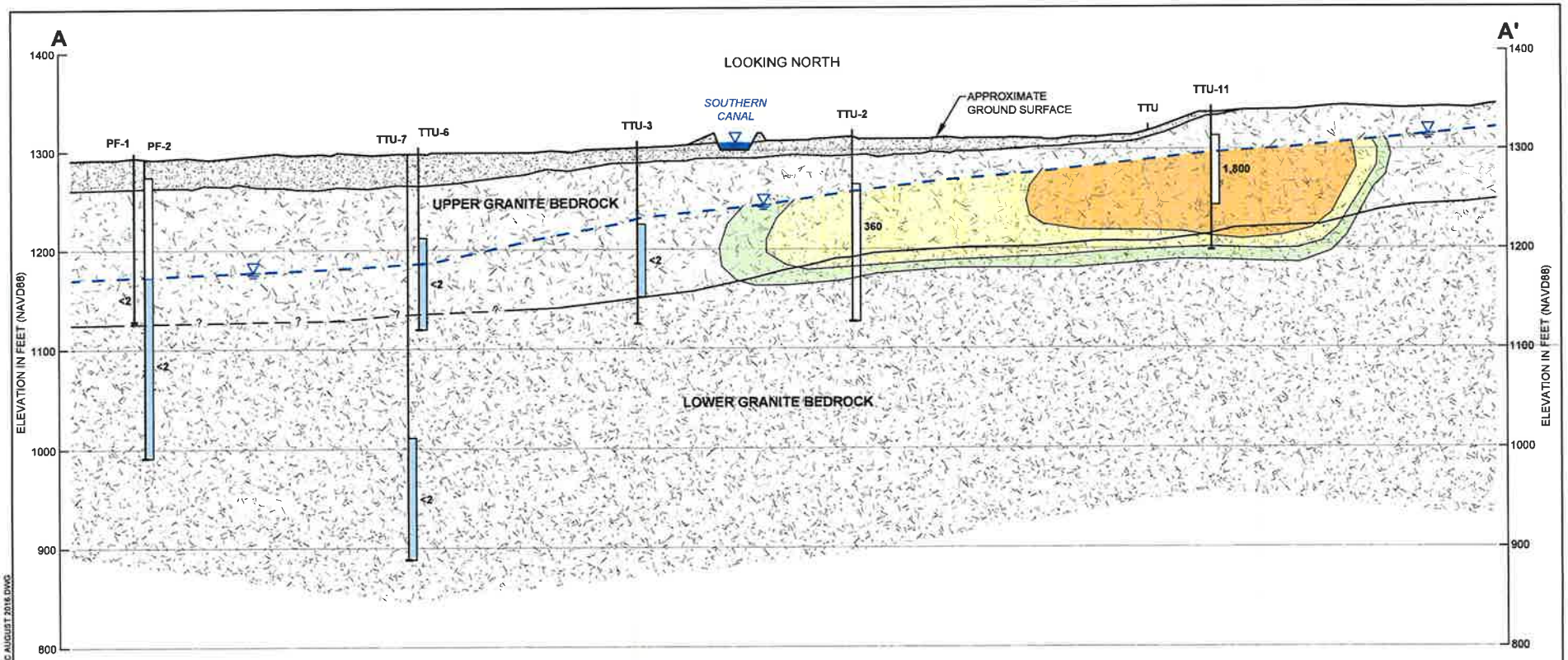
TCE CONCENTRATIONS IN GROUNDWATER - AUGUST 2016

Nammo Talley

OCTOBER 2016

FIGURE 5-14

GIS FILE PATH: G:\Projects\Nammo Talley\39014-TTU Closure\GIS\MXD\2016_10\193147_003_05-14_TCE_CONCENTRATION_GROUNDWATER.mxd — USER: gkowen — LAST SAVED: 10/12/2016 3:22:40 PM



LEGEND

PF-1 WELL ID

SEALED INTERVAL

OPEN INTERVAL

AUGUST 2016 WATER LEVEL

OVERBURDEN

UPPER GRANITE BEDROCK

LOWER GRANITE BEDROCK

TRICHLOROETHYLENE (UG/L)

- >100,000
- 10,000-100,000
- 1,000-10,000
- 100-1,000
- 5-100
- <5 OR NON-DETECT

HORIZ. 0 150 300
VERT. 0 100 200
SCALE IN FEET

HALEY ALDRICH

NAMMO TALLEY, INC
THERMAL TREATMENT UNIT
MESA, ARIZONA

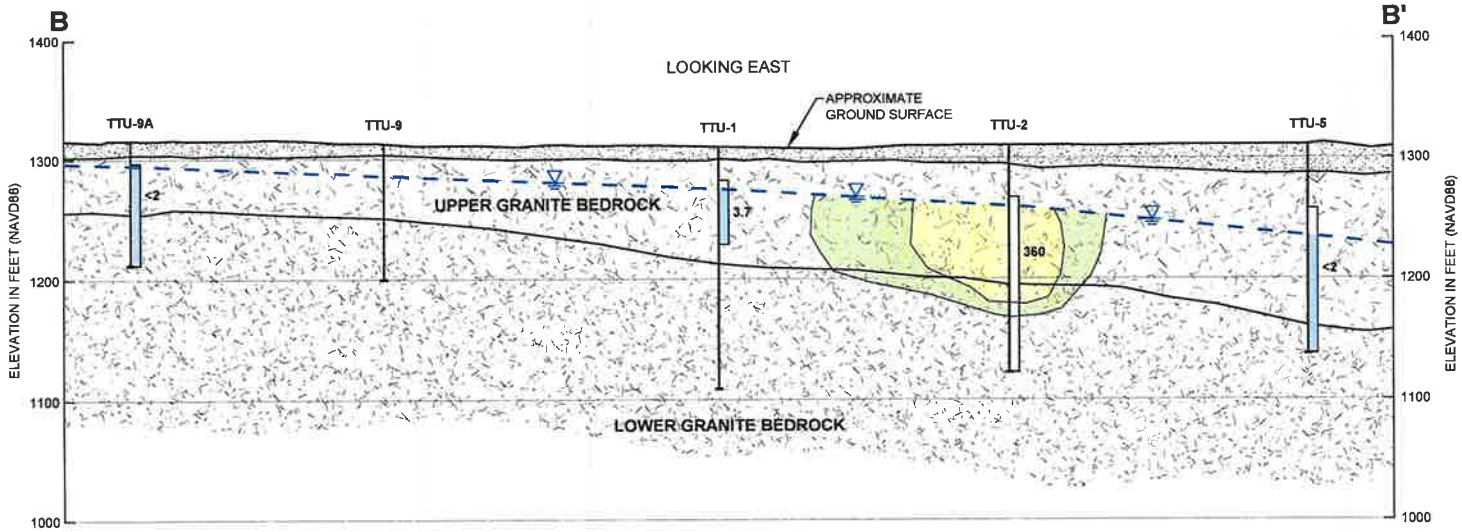
TRICHLOROETHYLENE AUGUST 2016
SCHEMATIC CROSS-SECTION A-A'

Nammo Talley

SCALE: AS SHOWN
OCTOBER 2016

FIGURE 5-15

MCELENEY, TERRI Printed: 10/12/2016 4:43 PM Layout: FIG 5-15
G:\12834\GLOBAL\CAD\FIGURES\12834T-002 CROSSSECTION SCHEMATIC PERC TRIC AUGUST 2016.DWG



LEGEND

PF-1 WELL ID

SEALED INTERVAL

OPEN INTERVAL

AUGUST 2016 WATER LEVEL

OVERBURDEN

UPPER GRANITE BEDROCK

LOWER GRANITE BEDROCK

TRICHLOROETHYLENE (UG/L)

- >100,000
- 10,000-100,000
- 1,000-10,000
- 100-1,000
- 5-100
- <5 OR NON-DETECT

HORIZ. 0 150 300
VERT. 0 100 200
SCALE IN FEET

HALEY ALDRICH

NAMMO TALLEY, INC.
THERMAL TREATMENT UNIT
MESA, ARIZONA

TRICHLOROETHYLENE AUGUST 2016
SCHEMATIC CROSS-SECTION B-B'

Nammo Talley

SCALE: AS SHOWN
OCTOBER 2016

FIGURE 5-16

MCELENEY, TERRI Printed: 10/12/2016 4:42 PM Layout: FIG 5-16
G:\128347\GLOBAL\CAD\FIGURES\128347-002 CROSSSECTION SCHEMATIC PERC TRIC AUGUST 2016.DWG

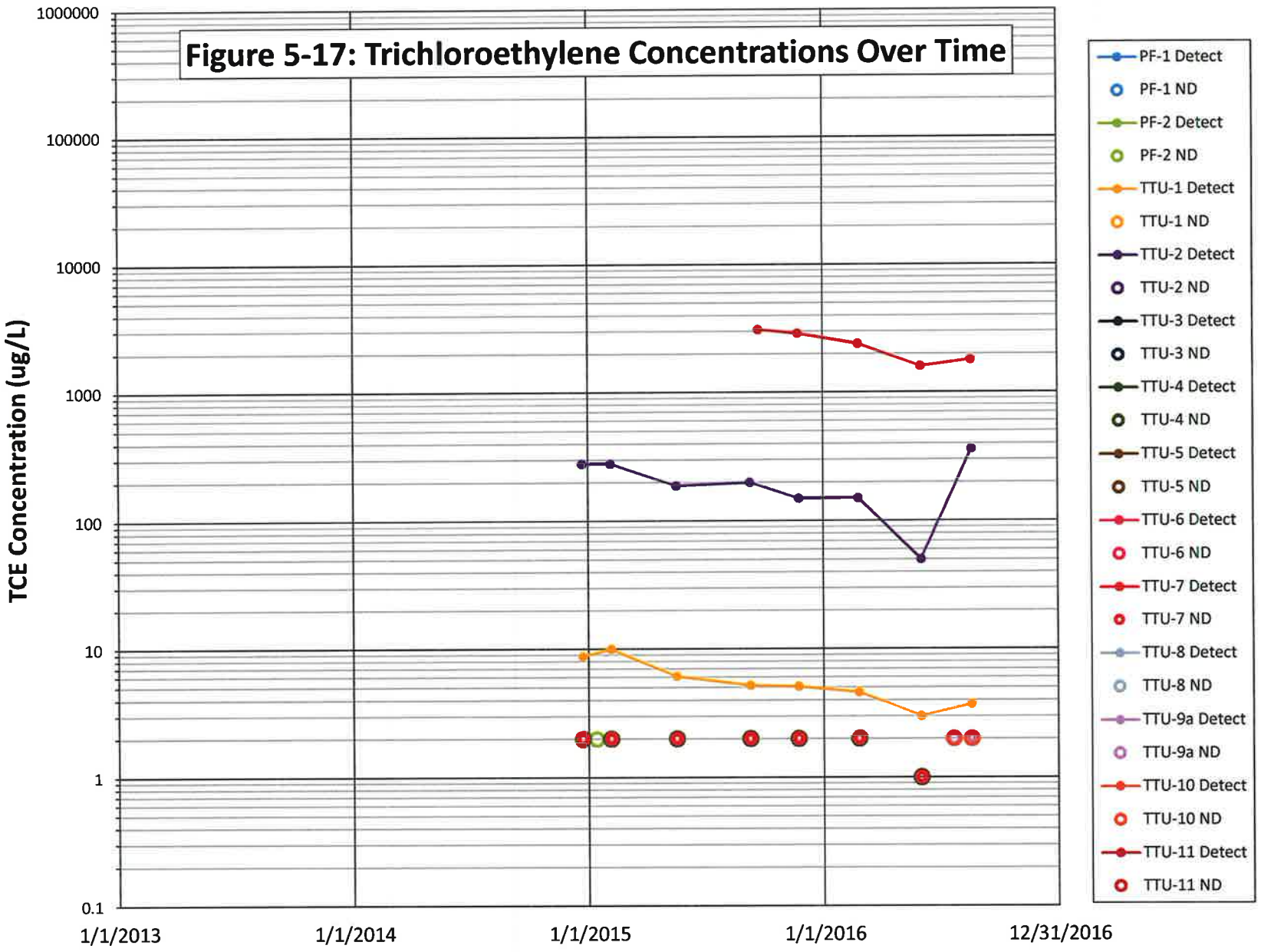
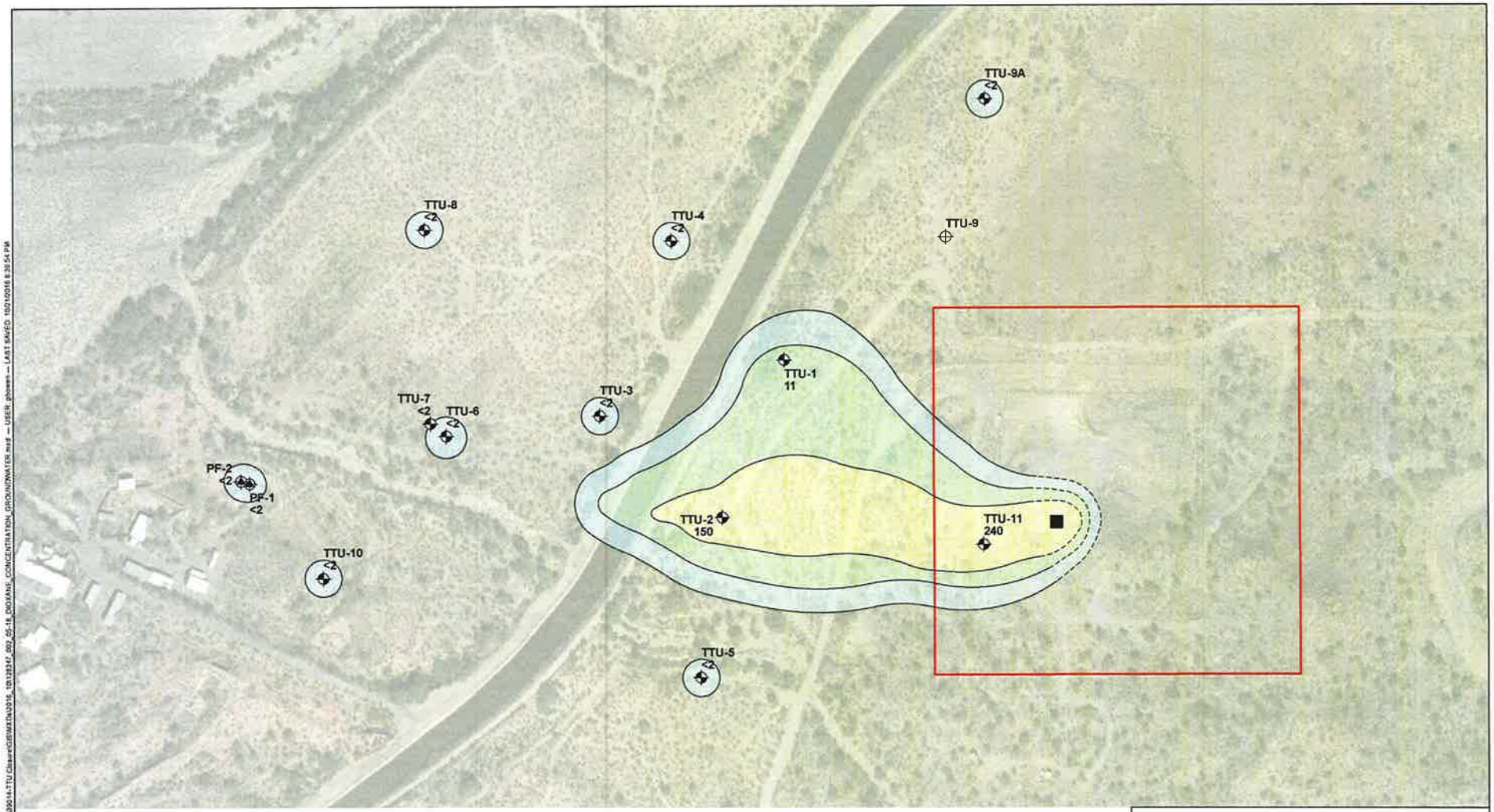


Figure 5-17: Trichloroethylene Concentrations Over Time
TCE Concentration (ug/L)
1000000
100000
10000
1000
100
10
1
0.1
1/1/2013
1/1/2014
1/1/2015
1/1/2016
12/31/2016
PF-1 Detect
PF-1 ND
PF-2 Detect
PF-2 ND
TTU-1 Detect
TTU-1 ND
TTU-2 Detect
TTU-2 ND
TTU-3 Detect
TTU-3 ND
TTU-4 Detect
TTU-4 ND
TTU-5 Detect
TTU-5 ND
TTU-6 Detect
TTU-6 ND
TTU-7 Detect
TTU-7 ND
TTU-8 Detect
TTU-8 ND
TTU-9a Detect
TTU-9a ND
TTU-10 Detect
TTU-10 ND
TTU-11 Detect
TTU-11 ND



LEGEND

- MONITORING WELL
- NON-POTABLE SUPPLY WELL
- ABANDONED BOREHOLE
- POTENTIAL VOC SOURCE AREA BASED ON 2015 SOIL VAPOR SAMPLING
- THERMAL TREATMENT UNIT BOUNDARY

1,4 DIOXANE (µg/L)

- >100,000
- 10,000 - 100,000
- 1,000 - 10,000
- 100 - 1,000
- 10 - 100
- <0.78 OR ND

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. CONTOURS DASHED WHERE INFERRED.
3. ND = NON DETECT
4. TTU-7 IS A LOWER BEDROCK WELL.

N

0 200 400
SCALE IN FEET

HALEY ALDRICH

NAMMO TALLEY, INC.
THERMAL TREATMENT UNIT
MESA, ARIZONA

1,4 DIOXANE CONCENTRATIONS IN GROUNDWATER - AUGUST 2016

Nammo Talley

OCTOBER 2016

FIGURE 5-18

GIS FILE PATH: G:\Projects\Nammo Talley\00014-TTU Closure\GIS\MXD\2016_10\128342_002_05-18_DIOXANE_CONCENTRATION_GROUNDWATER.mxd -- USER: gbowen -- LAST SAVED: 10/21/2016 8:38:54 PM

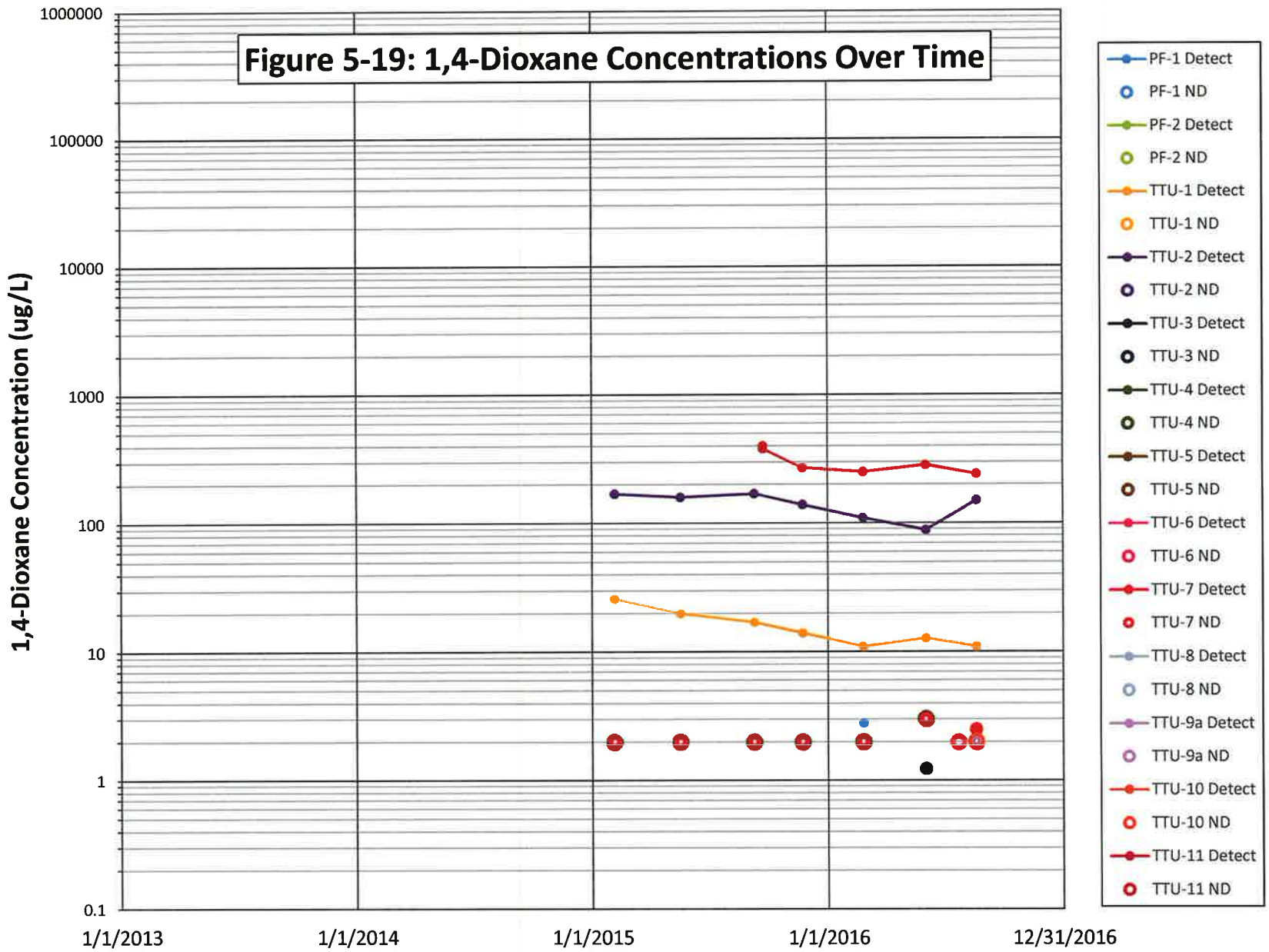


Figure 5-19: 1,4-Dioxane Concentrations Over Time
1,4-Dioxane Concentration (ug/L)
1000000
100000
10000
1000
100
10
1
0.1
1/1/2013
1/1/2014
1/1/2015
1/1/2016
12/31/2016
PF-1 Detect
PF-1 ND
PF-2 Detect
PF-2 ND
TTU-1 Detect
TTU-1 ND
TTU-2 Detect
TTU-2 ND
TTU-3 Detect
TTU-3 ND
TTU-4 Detect
TTU-4 ND
TTU-5 Detect
TTU-5 ND
TTU-6 Detect
TTU-6 ND
TTU-7 Detect
TTU-7 ND
TTU-8 Detect
TTU-8 ND
TTU-9a Detect
TTU-9a ND
TTU-10 Detect
TTU-10 ND
TTU-11 Detect
TTU-11 ND

Prepared for

Nammo Defense Systems, Inc.
4051 North Higley Road
Mesa, Arizona 85215

GROUNDWATER INVESTIGATION REPORT FORMER THERMAL TREATMENT UNIT NAMMO DEFENSE SYSTEMS, INC. 4051 NORTH HIGLEY ROAD MESA, ARIZONA

Prepared by

Geosyntec consultants

engineers | scientists | innovators
11811 N. Tatum Blvd., Suite P-186
Phoenix, Arizona 85028

Project No. SP0101M

April 2020

TABLE OF CONTENTS

1.0 INTRODUCTION 1
1.1 Site Setting 1
1.2.1 Surrounding Land and Topography 1
2.0 WELL INSTALLATIONS 3
2.1 Drilling, Well Construction, and Top-of-Casing Survey 3
2.2 Well Development 4
3.0 GEOPHYSICAL LOGS AND ANALYSIS OF FRACTURES 5
4.0 HYDRAULIC TESTING 7
4.1 Pre-Testing Activities 7
4.2 Step-Drawdown Tests 8
4.3 Constant Discharge Tests 8
5.0 GROUNDWATER SAMPLING AND RESULTS 10
6.0 REFERENCES 12

FIGURES

Figure 1– Site Location Map
Figure 2 – TTU Wells Location Map
Figure 3 – Groundwater Elevation Map March 2020
Figure 4 – Fracture Density vs. Depth Plots
Figure 5 – Stereonet Plots of Joints and Fractures
Figure 6 – Perchlorate Detections in Groundwater
Figure 7 – VOCs Detections in Groundwater

TABLES

Table 1 – Summary Groundwater Results – Perchlorate
Table 2 – Summary Groundwater Results – VOCs
Table 3 – Summary Groundwater Results – 1,4-Dioxane

APPENDICES

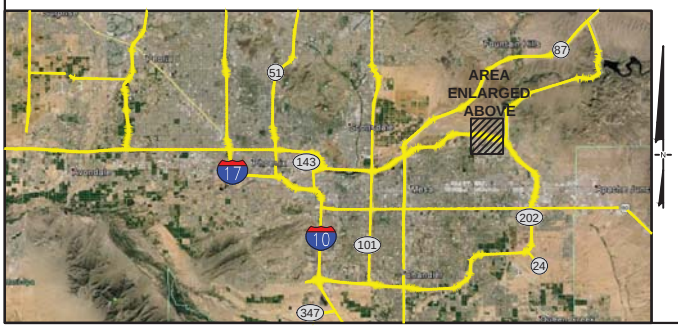
Appendix A — ADWR Well Registration Records
Appendix B — As-Built Well Construction Detail and Boring Logs
Appendix C — Investigation Derived Waste Laboratory Results
Appendix D — Top-of-Casing Survey Results
Appendix E — Well Development Logs
Appendix F — Geophysical Borehole Logging Data
Appendix G —Hydraulic Testing Analyses
Appendix H — Laboratory Reports
Appendix I — Data Validation

FIGURES

2010 AERIAL IMAGE FROM USDA: GEOSPATIAL GATEWAY

EXPLANATION:

APPROXIMATE PROPERTY BOUNDARY



2,000' 1,000' 0 2,000 Feet

SITE VICINITY MAP

Nammo Defense Systems Inc.
Former Thermal Treatment Unit
Mesa, Arizona

Geosyntec consultants

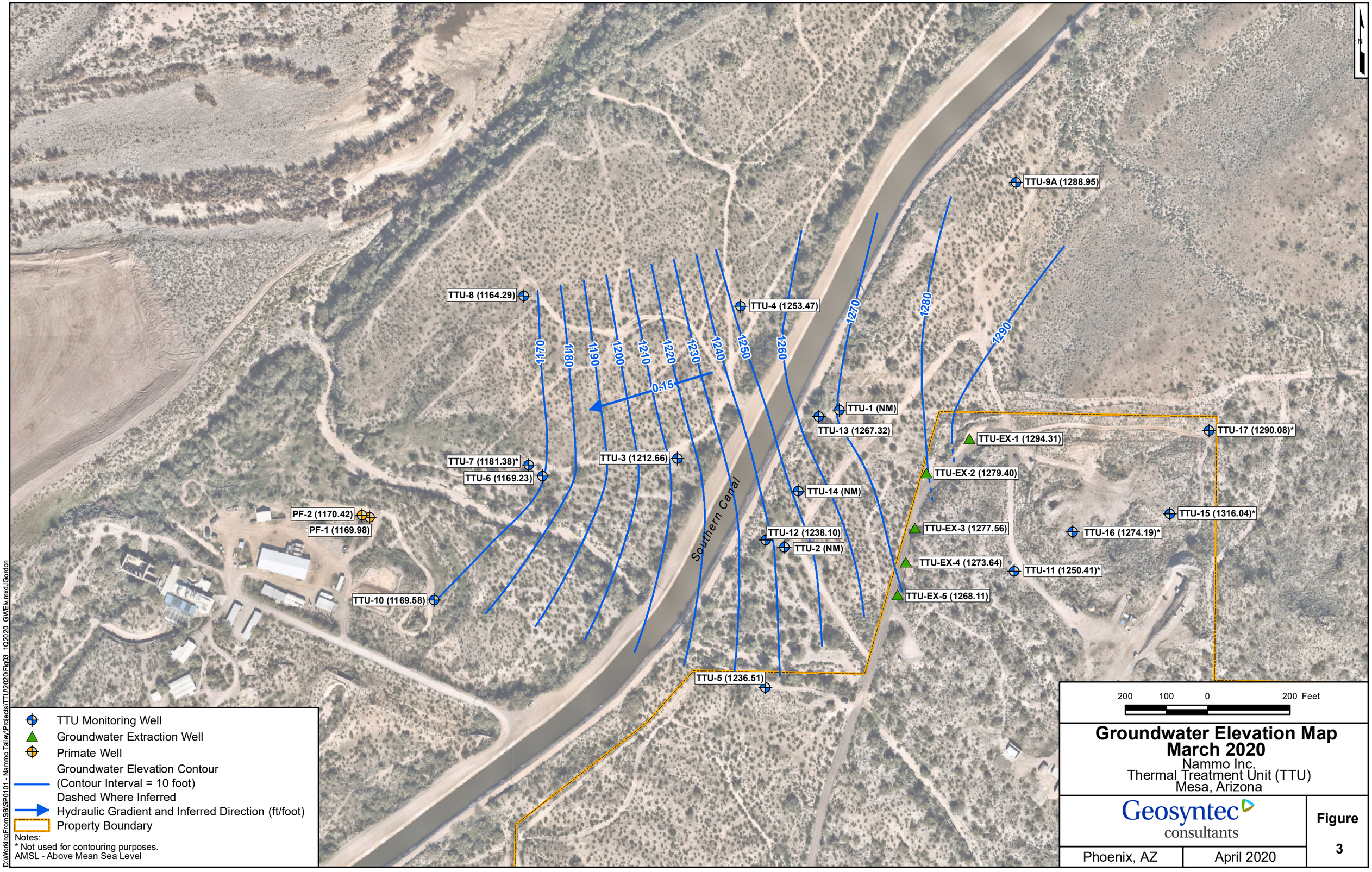
Phoenix, AZ | April 2020

Figure

1

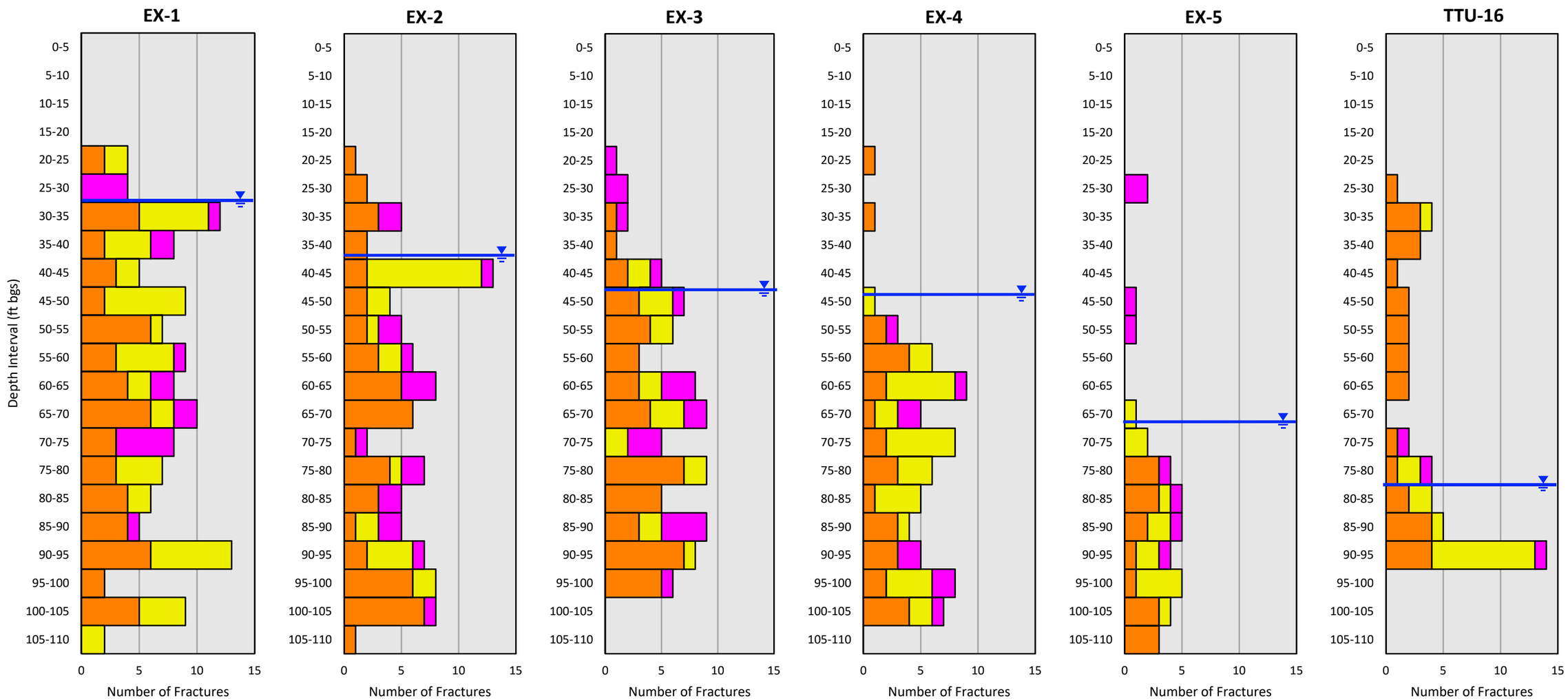
N:\GEOSYNTEC\NAMMO TALLEY\VICINITY MAP\NT VICINITY MAP EXHIBIT

TTU-9A
TTU-8
TTU-4
TTU-1
TTU-13
TTU-EX-1
TTU-17
TTU-7
TTU-6
TTU-3
TTU-EX-2
TTU-14
PF-2
PF-1
TTU-15
TTU-12
TTU-2
TTU-EX-3
TTU-16
TTU-EX-4
TTU-11
TTU-EX-5
TTU-10
Southern Canal
TTU-5
TTU-18
Primate Well
TTU Extraction Well
TTU Monitoring Well
Property Boundary
Notes:
Extraction wells and TTU-16.-17,-18 surveyed Febuaruy 2020.
Other locations are approximate.
200 100 0 200 Feet
Well Locations
Nammo Inc.
Thermal Treatment Unit (TTU)
Mesa, Arizona
Geosyntec consultants
Figure
2
Phoenix, AZ
March 2020
P:\GIS_SanDiego01\WorkingFromSBISP0101 - Nammo Talley\Projects\TTU\2020\TTUWellLocs.mxd\JGordon



Groundwater Elevation Map
March 2020

Nammo Inc.
Thermal Treatment Unit (TTU)
Mesa, Arizona



LEGEND

Partially Open Joints/ Fractures

Nearly-Vertical Joints/ Fractures

Minor Joints/ Fractures

Groundwater Level

Note: Fracture groupings are derived from interpretations of geophysical logs by Southwest Exploration Services based on measurements of fracture aperture and orientation.

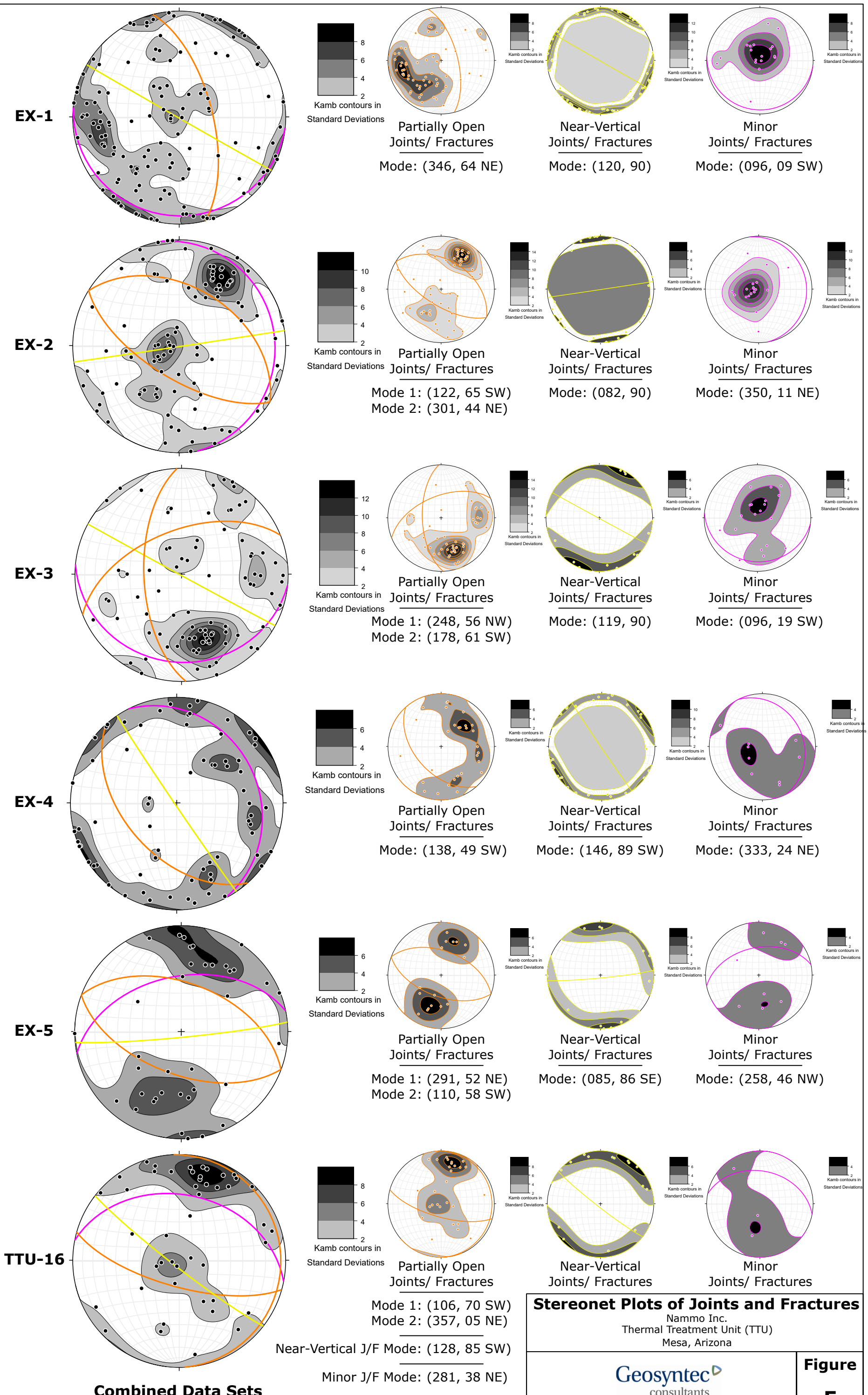
Fracture Density Histograms

Nammo Inc.
Thermal Treatment Unit (TTU)
Mesa, Arizona

Geosyntec consultants

Phoenix, AZ | April 2020

Figure 4



Note: Planes and poles to planes are plotted in lower hemisphere projection

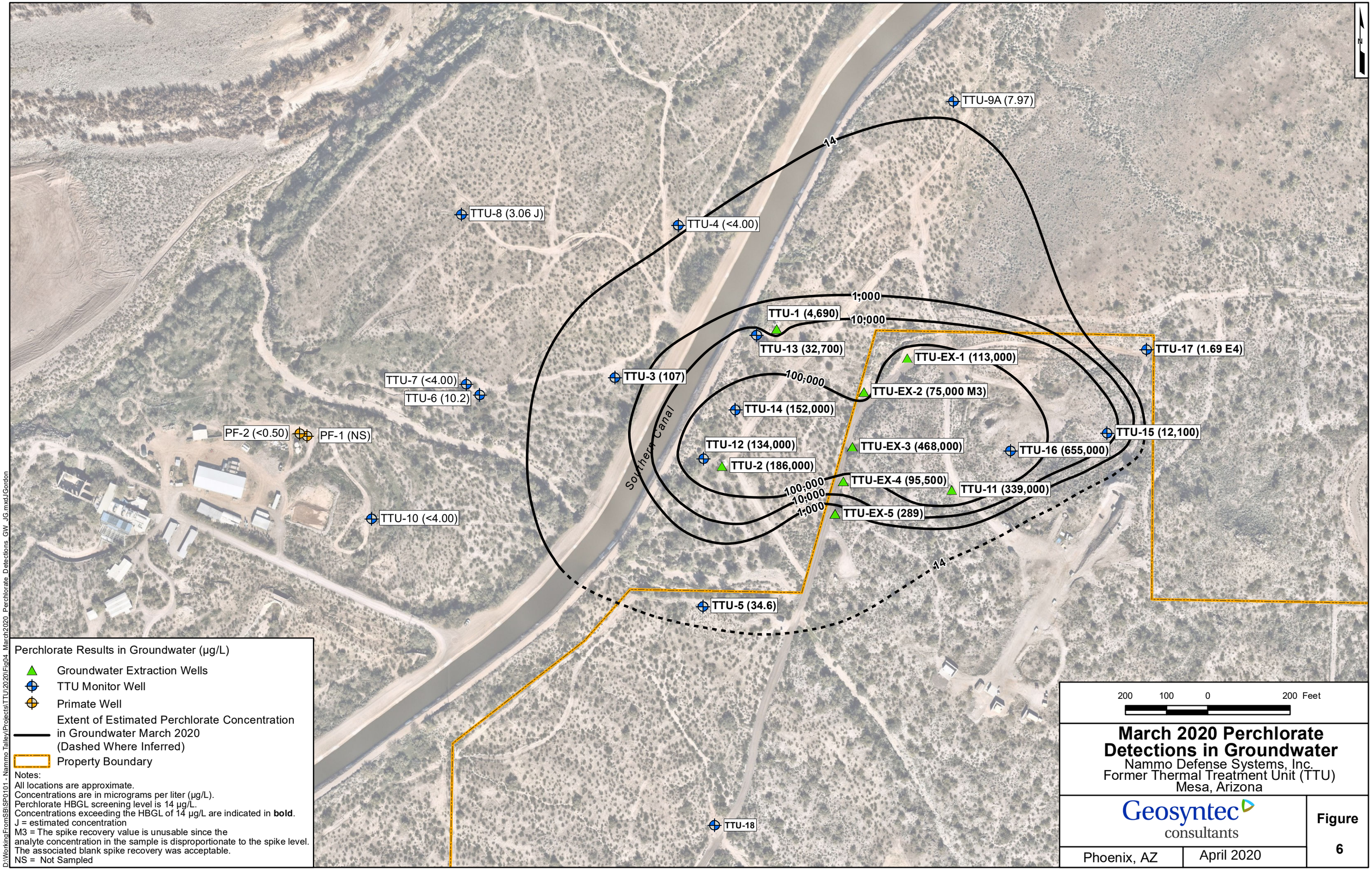
Stereonet Plots of Joints and Fractures

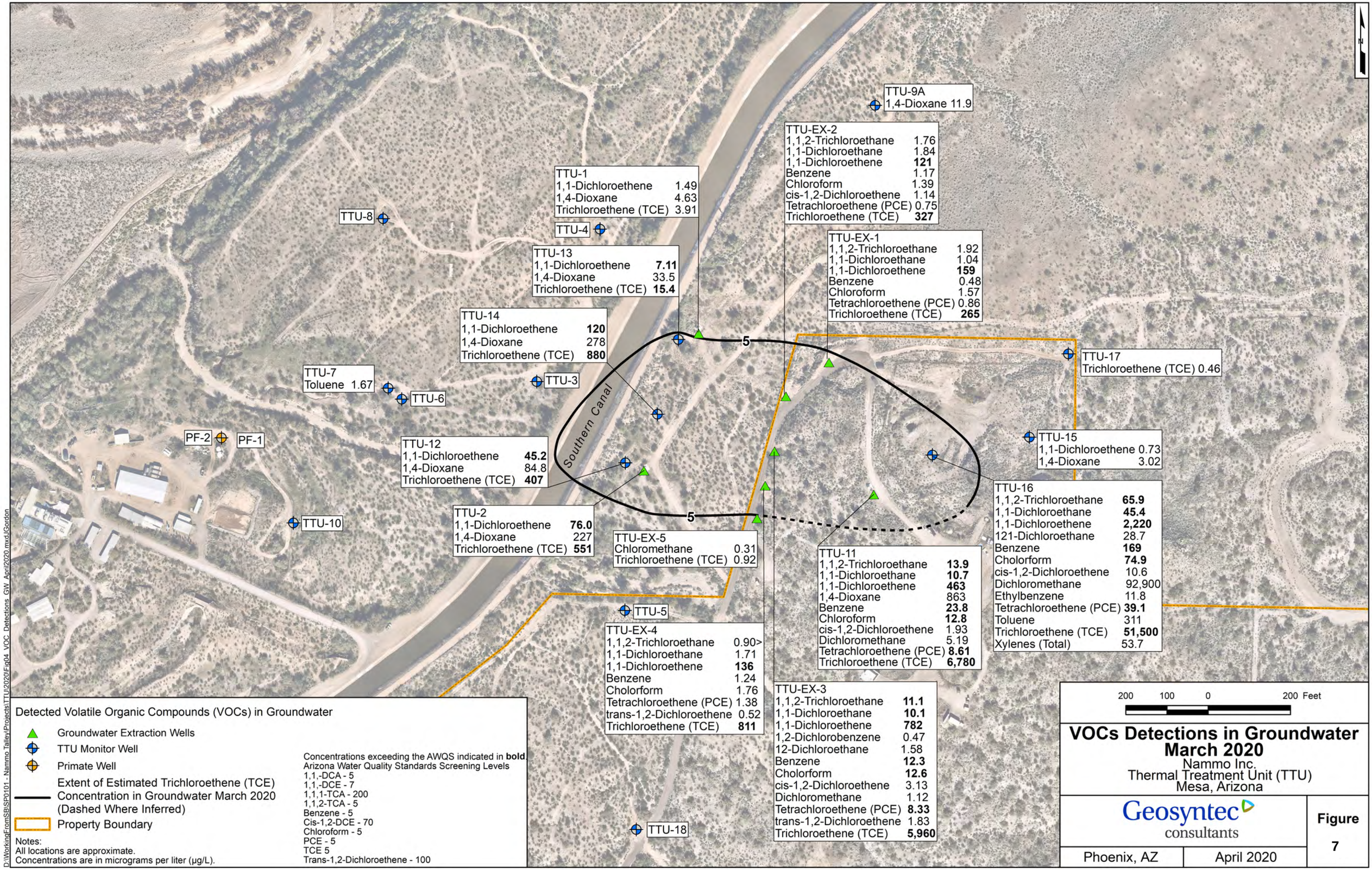
Nammo Inc.
Thermal Treatment Unit (TTU)
Mesa, Arizona

Geosyntec consultants

Phoenix, AZ | April 2020

Figure 5


TTU-9A (7.97)
14
TTU-8 (3.06 J)
TTU-4 (<4.00)
1,000
10,000
TTU-1 (4,690)
TTU-13 (32,700)
TTU-17 (1.69 E4)
TTU-EX-1 (113,000)
TTU-3 (107)
100,000
TTU-EX-2 (75,000 M3)
TTU-7 (<4.00)
TTU-6 (10.2)
TTU-14 (152,000)
Southern Canal
PF-2 (<0.50)
PF-1 (NS)
TTU-15 (12,100)
TTU-12 (134,000)
TTU-EX-3 (468,000)
TTU-16 (655,000)
TTU-2 (186,000)
TTU-EX-4 (95,500)
100,000
10,000
1,000
TTU-11 (339,000)
TTU-EX-5 (289)
TTU-10 (<4.00)
14
TTU-5 (34.6)
TTU-18
Perchlorate Results in Groundwater (µg/L)
Groundwater Extraction Wells
TTU Monitor Well
Primate Well
Extent of Estimated Perchlorate Concentration in Groundwater March 2020 (Dashed Where Inferred)
Property Boundary
Notes:
All locations are approximate.
Concentrations are in micrograms per liter (µg/L).
Perchlorate HBGL screening level is 14 µg/L.
Concentrations exceeding the HBGL of 14 µg/L are indicated in **bold**.
J = estimated concentration
M3 = The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The associated blank spike recovery was acceptable.
NS = Not Sampled
200 100 0 200 Feet
March 2020 Perchlorate Detections in Groundwater
Nammo Defense Systems, Inc.
Former Thermal Treatment Unit (TTU)
Mesa, Arizona
Geosyntec consultants
Figure
6
Phoenix, AZ
April 2020
D:\Working\From$\BISP0101 - Nammo Talley\Projects\TTU\2020\Fig04_March2020_Perchlorate_Detections_GW_JG.mxd\Gordon


TTU-9A
1,4-Dioxane 11.9
TTU-EX-2
1,1,2-Trichloroethane 1.76
1,1-Dichloroethane 1.84
1,1-Dichloroethene **121**
Benzene 1.17
Chloroform 1.39
cis-1,2-Dichloroethene 1.14
Tetrachloroethene (PCE) 0.75
Trichloroethene (TCE) **327**
TTU-1
1,1-Dichloroethene 1.49
1,4-Dioxane 4.63
Trichloroethene (TCE) 3.91
TTU-8
TTU-4
TTU-13
1,1-Dichloroethene **7.11**
1,4-Dioxane 33.5
Trichloroethene (TCE) **15.4**
TTU-EX-1
1,1,2-Trichloroethane 1.92
1,1-Dichloroethane 1.04
1,1-Dichloroethene **159**
Benzene 0.48
Chloroform 1.57
Tetrachloroethene (PCE) 0.86
Trichloroethene (TCE) **265**
TTU-14
1,1-Dichloroethene **120**
1,4-Dioxane 278
Trichloroethene (TCE) **880**
5
TTU-17
Trichloroethene (TCE) 0.46
TTU-7
Toluene 1.67
TTU-6
TTU-3
Southern Canal
PF-2
PF-1
TTU-12
1,1-Dichloroethene **45.2**
1,4-Dioxane 84.8
Trichloroethene (TCE) **407**
TTU-15
1,1-Dichloroethene 0.73
1,4-Dioxane 3.02
TTU-16
1,1,2-Trichloroethane **65.9**
1,1-Dichloroethane **45.4**
1,1-Dichloroethene **2,220**
121-Dichloroethane 28.7
Benzene **169**
Cholorform **74.9**
cis-1,2-Dichloroethene 10.6
Dichloromethane 92,900
Ethylbenzene 11.8
Tetrachloroethene (PCE) **39.1**
Toluene 311
Trichloroethene (TCE) **51,500**
Xylenes (Total) 53.7
TTU-10
TTU-2
1,1-Dichloroethene **76.0**
1,4-Dioxane 227
Trichloroethene (TCE) **551**
5
TTU-EX-5
Chloromethane 0.31
Trichloroethene (TCE) 0.92
TTU-11
1,1,2-Trichloroethane **13.9**
1,1-Dichloroethane **10.7**
1,1-Dichloroethene **463**
1,4-Dioxane 863
Benzene **23.8**
Chloroform **12.8**
cis-1,2-Dichloroethene 1.93
Dichloromethane 5.19
Tetrachloroethene (PCE) **8.61**
Trichloroethene (TCE) **6,780**
TTU-5
TTU-EX-4
1,1,2-Trichloroethane 0.90>
1,1-Dichloroethane 1.71
1,1-Dichloroethene **136**
Benzene 1.24
Cholorform 1.76
Tetrachloroethene (PCE) 1.38
trans-1,2-Dichloroethene 0.52
Trichloroethene (TCE) **811**
TTU-EX-3
1,1,2-Trichloroethane **11.1**
1,1-Dichloroethane **10.1**
1,1-Dichloroethene **782**
1,2-Dichlorobenzene 0.47
12-Dichloroethane 1.58
Benzene **12.3**
Cholorform **12.6**
cis-1,2-Dichloroethene 3.13
Dichloromethane 1.12
Tetrachloroethene (PCE) **8.33**
trans-1,2-Dichloroethene 1.83
Trichloroethene (TCE) **5,960**
TTU-18
N
200 100 0 200 Feet
Detected Volatile Organic Compounds (VOCs) in Groundwater
Groundwater Extraction Wells
TTU Monitor Well
Primate Well
Extent of Estimated Trichloroethene (TCE) Concentration in Groundwater March 2020 (Dashed Where Inferred)
Property Boundary
Concentrations exceeding the AWQS indicated in **bold**.
Arizona Water Quality Standards Screening Levels
1,1,-DCA - 5
1,1,-DCE - 7
1,1,1-TCA - 200
1,1,2-TCA - 5
Benzene - 5
Cis-1,2-DCE - 70
Chloroform - 5
PCE - 5
TCE 5
Trans-1,2-Dichloroethene - 100
Notes:
All locations are approximate.
Concentrations are in micrograms per liter (µg/L).
D:\WorkingFromSB\SP0101 - Nammo Talley\Projects\TTU\2020\Fig04_VOC_Detections_GW_April2020.mxd\Gordon
VOCs Detections in Groundwater
March 2020
Nammo Inc.
Thermal Treatment Unit (TTU)
Mesa, Arizona
Geosyntec consultants
Figure
7
Phoenix, AZ
April 2020

TABLES

Geosyntec consultants

TABLE 1:
SUMMARY OF DETECTED PERCHLORATE CONCENTRATIONS
FORMER THERMAL TREATMENT UNIT

NAMMO DEFENSE SYSTEMS, INC.

APRIL 2020

			Analyte	**Perchlorate**
			Method	**USEPA 314.0**
			Units	**µg/l**
			HBGL	**14**
Location	**Date Sampled**	**Sample Type**	**Sample Depth (ft btoc)**	**Concentrations**
TTU-EX-1	03/13/2020	Primary	69	**113,000**
TTU-EX-2	03/13/2020	Primary	74	**75,000 M3**
TTU-EX-3	03/13/2020	Primary	76	**468,000**
TTU-EX-4	03/13/2020	Primary	77	**95500**
TTU-EX-5	03/13/2020	Primary	80	**289**
		Duplicate		**158**
TTU-16	03/13/2020	Primary	80	**655,000**
TTU-17	03/13/2020	Primary	80	1.69 E4

Notes

µg/l = micrograms per liter

HBGL = Health Based Guidence Limit

USEPA = United States Environmental Protection Agency

Concentrations exceeding the HBGL are indicated in **boldface**.

E4: Concentration estimated. Analyte was detected below laboratory minimum reporting level (MRL) but above MDL.

M3: The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The associated blank spike recovery was acceptable

TABLE 2:
SUMMARY OF DETECTED VOC CONCENTRATIONS
FORMER THERMAL TREATMENT UNIT
NAMMO DEFENSE SYSTEMS, INC.
APRIL 2020

Geosyntec consultants

			Analyte	**Benzene**	**Chloroform**	**Chloromethane**	**1,2-Dichlorobenzene**	**1,1-Dichloroethane**	**1,2-Dichloroethane**	**1,1-Dichloroethene**	**Cis-1,2-Dichloroethene**	**Trans-1,2-Dichloroethene**	**Ethylbenzene**	**Methylene Chloride**	**Tetrachloroethene**	**Toluene**	**1,1,2-Trichloroethane**	**Trichloroethene**	**Total Xylenes**
			Method	**USEPA 8260B**															
			Units	**µg/l**															
			AWQS	**5**	**NE**	**NE**	**600**	**NE**	**5**	**7**	**70**	**100**	**700**	**5**	**5**	**1000**	**5**	**5**	**10000**
Location	**Date Sampled**	**Sample Type**	**Sample Depth (ft bgs)**	**Concentrations**															
TTU-EX-1	03/13/2020	Primary	69	0.483 E4	1.57 E4	<2.50 R7	<1.00	1.04	<1.00	**159**	<1.00	<1.00	<1.00	**<5.00**	0.864 E4	<1.00	1.92	**265**	<3.00
TTU-EX-2	03/13/2020	Primary	74	1.17	1.39 E4	<2.50 R7	<1.00	0.845 E4	<1.00	**121**	1.14	<1.00	<1.00	**<5.00**	0.753 E4	<1.00	1.76	**327**	<3.00
TTU-EX-3	03/13/2020	Primary	76	**12.3**	12.6	<2.50 R7	0.478 E4	10.1	1.58	**782**	3.13	1.83	<1.00	1.12 E4	**8.33**	<1.00	**11.1**	**5,960**	<3.00
TTU-EX-4	03/13/2020	Primary	77	1.24	1.76 E4	<2.50 R7	<1.00	1.71	<1.00	**136**	<1.00	0.525 E4	<1.00	**<5.00**	1.38	<1.00	0.905 E4	**811**	<3.00
TTU-EX-5	03/13/2020	Primary	80	<1.00	<5.00	0.284 E4 R7	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	**<5.00**	<1.00	<1.00	<1.00	0.929 E4	<3.00
		Duplicate		<1.00	<5.00	0.315 E4	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	**<5.00**	<1.00	<1.00	<1.00	0.775 E4 L1	<3.00
TTU-16	03/13/2020	Primary	80	**169**	74.9 E4	<50.0 R7	<20.0	45.4	**28.7**	**2,220**	10.6 E4	<20.0	11.8 E4	**92,900**	**39.1**	311	**65.9**	**51,500**	53.7 E4
TTU-17	03/13/2020	Primary	80	<1.00	<5.00	<2.50 R7	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	**<5.00**	<1.00	<1.00	<1.00	0.463 E4	<3.00

Notes

µg/l = micrograms per liter

AWQS = Arizona Aquifer Water Quality Standard

* = this is the Health Based Guidence limit

NE = Not established; no aquifer water quality standard is established.

USEPA = United States Environmental Protection Agency

Concentrations exceeding the AWQS are indicated in **boldface**.

E4: Concentration estimated. Analyte was detected below laboratory minimum reporting level (MRL) but above MDL.

L1: The associated blank spike recovery was above laboratory acceptance limits.

R7: LFB/LFBD RPD exceeded the laboratory acceptance limit. Recovery met acceptance criteria.

TABLE 3:
SUMMARY OF DETECTED 1,4 DIOXANE CONCENTRATIONS
FORMER THERMAL TREATMENT UNIT
NAMMO DEFENSE SYSTEMS, INC.
APRIL 2020

Geosyntec consultants

			Analyte	**1,4-Dioxane**
			Method	**USEPA 8270 C**
			Units	**µg/l**
			AWQS	**NE**
Location	**Date Sampled**	**Sample Type**	**Sample Depth (ft btoc)**	**Concentrations**
TTU-EX-1	03/13/2020	Primary	69	24.5
TTU-EX-2	03/13/2020	Primary	74	198 E1
TTU-EX-3	03/13/2020	Primary	76	175 E1
TTU-EX-4	03/13/2020	Primary	77	16.1
TTU-EX-5	03/13/2020	Primary	80	<0.476
		Duplicate		<0.492
TTU-16	03/13/2020	Primary	80	2470 E1
TTU-17	03/13/2020	Primary	80	<0.424

Notes

µg/l = micrograms per liter

AWQS = Arizona Aquifer Water Quality Standard

* = this is the Health Based Guidence limit

NE = Not established; no aquifer water quality standard is established.

USEPA = United States Environmental Protection Agency

Concentrations exceeding the AWQS are indicated in **boldface**.

E1: Concentration estimated. Analyte exceeded calibration range. Reanalysis not possible due to insufficient sample.

APPENDIX F

Geophysical Borehole Logging Data

Drill Hole: TTU EX-1 March 10, 2020, EJB

Geophysical Logs were collected by SwExp on February 16, 2020.
Features oriented to Magnetic North and corrected for borehole deviation to true orientation
Features picked/ranked by EJB Prior to March 10, 2020.

Ranking Scheme:

100 = Black = Bottom of Casing
104 = White = In-filled Joint/Fracture - mineralogy not determined
106 = Green = Bedding/banding/foliation
109 = Orange = Partially open Joint/Fracture
110 = Pink = Thin and/or discontinuous around circumference Joint/Fracture
111 = Yellow = Apparent Joint/Fracture terminates at fracture intersection
112 = Light Blue = Unclassified planar feature
305 = Red = Wide major Joint/Fracture
307 = Blue = Fluid Level

VFx = 2 Near vertical Joints/Fractures
VFx-W = 2 Wide Near vertical Joints/fractures
33 = >2 near vertical Joint/fractures
IFx = Possible drilling induced near vertical tensile fractures
Bx = Breccia/Collapse Breccia
Lg V = Large Vug/ Vugs/ or Vesicles (> 6" diameter)
MV = Medium Vug/ Vugs/ or Vesicles (2-6" diameter)
CNG = Small Vug/ Vugs/ or Vesicles (< 2" diameter)
Vein = infilled near vertical joint/fracture

Continuity
C1 Discontinuous - < 50%
C2 Slightly continuous - 50-75%
C3 Moderately continuous 75-100%
C4 High continuous – thin
C5 Very continuous – wide

Condition
0 – Smooth
1 – Rough
2 – Weathered
3 - Brec / Crushed
4 – Offset

Form
0 – Undulating/curved
1 – Planar
2 – Stepped
3 – Parting
4 – Styolitic

Remark
Open
Partially Open
Tight
Cemented/Filled
Partially Cemented

Filling (OBI)
No apparent filling
White soft
White
Dark soft
Dark
Sulfide/metallic
Stained Black
Stained Brown

Filling (ABI)
No apparent filling
Hard

Note: Some partially open features on the ABI image may be filled with soft material and may not be potential fluid pathways.

Image log was obtained in 2 pieces:
OBI from 19.8' to 106.4'
ABI from 29.7' to 106.4'

The OBI/ABI combined image from 19.8' to 106.4' is good throughout the logged interval.

*Depth for dipping fractures is midpoint depth; for near Vertical joints/fractures and Vugs it is Top Depth

Depth*	Btm Depth	Dip Dir	Tilt	Aperture	Classification	Continuity	Form	Condition	Filling	Remark
Ft	Ft	Deg	Deg	Inch/10						
19.82		307.0	0.80	0.00	100 - Bottom of Casing	C3 Moderately continuous 75-100%	1 - Planar	0 - Smooth		
20.22		349.4	40.69	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
21.43		171.0	45.15	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
25.95		221.8	24.74	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
26.47		257.4	23.55	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
28.78		94.0	63.24	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
28.96		140.9	31.13	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
29.75		307.0	1.00	0.00	307 - Fluid Level	C3 Moderately continuous 75-100%	1 - Planar	0 - Smooth		
30.32		202.4	19.17	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
30.98		117.3	13.44	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
31.91		192.4	60.89	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
32.56		30.6	68.73	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
33.45		93.2	22.59	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
34.35		85.6	37.04	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
35.83		140.5	21.16	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
36.79		41.7	40.68	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
39.10		202.3	7.43	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
39.78		83.1	6.53	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
41.75		44.4	54.37	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
42.44		32.6	45.35	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
43.47		43.7	73.13	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
45.34		24.7	74.64	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
49.37		44.4	70.15	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
50.25		137.3	59.95	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
51.63		167.1	67.89	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
52.73		181.1	51.58	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
52.82		7.2	61.56	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
53.29		161.0	57.40	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
54.00		28.9	37.54	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
56.96		236.2	26.48	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
58.37		12.8	67.52	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
58.57		76.1	64.10	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
59.31		60.9	59.95	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
61.26		30.4	63.01	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
61.91		65.3	56.67	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
62.07		146.8	27.09	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
63.37		102.4	6.33	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
63.39		163.7	55.23	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
64.36		11.4	59.13	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
65.18		159.3	26.20	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
65.73		8.8	35.47	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
66.18		10.4	39.54	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
66.67		36.1	24.07	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
67.42		87.1	63.21	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open

68.53		83.9	55.53	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
69.33		39.5	52.23	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
69.93		70.1	6.88	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
70.22		109.1	60.03	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
70.33		341.3	25.00	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
71.81		252.9	23.74	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
71.91		221.5	29.20	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
72.48		268.7	2.07	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
72.98		4.3	12.63	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
73.86		83.0	65.31	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
73.94		201.8	39.64	0.00	104 - Infilled Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	0 - Smooth	White	Cemented/Filled
74.55		86.2	69.70	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
75.10		356.9	72.95	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
76.10		86.1	55.79	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	White	Partially Open
78.26		70.7	64.24	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
80.97		98.7	76.72	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
82.58		43.3	34.67	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
83.42		55.2	53.85	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
84.69		70.8	65.60	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
85.65		100.1	69.31	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
85.75		235.6	79.49	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
87.54		76.3	60.55	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
88.06		209.6	58.91	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
89.25		14.1	29.36	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
90.18		356.4	47.95	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
90.78		314.3	42.47	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
91.56		69.0	64.39	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
93.72		37.8	56.11	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
93.96		235.7	77.89	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
94.04		78.2	74.41	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
95.89		91.6	75.54	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
99.33		218.1	62.98	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
100.16		156.5	49.92	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
101.38		290.8	68.64	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
102.57		294.1	48.48	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
103.09		256.7	75.20	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
103.87		107.7	67.66	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open

Vugs and Bx Features

VFx = 2 Near vertical Joints/Fractures
VFx-W = 2 Wide Near vertical Joints/fractures
33 = >2 near vertical Joint/fractures
IFx = Possible drilling induced near vertical tensile fractures
Bx = Breccia/Collapse Breccia
Lg V = Large Vug/ Vugs/ or Vesicles (> 6" diameter)
MV = Medium Vug/ Vugs/ or Vesicles (2-6" diameter)
CNG = Small Vug/ Vugs/ or Vesicles (< 2" diameter)
Vein = infilled near vertical joint/fracture
7 = Conglomerate - Sand matrix supported
8 = Conglomerate - Mud matrix supported
9 = Conglomerate - Clast supported

Breccia/Vugs/Vesicles Etc. on OBI/ABI combined image from 19.8' to 106.4'

Depth	Btm Depth				Ranking/Description
Ft	Ft				

Near Vertical (Near parallel to hole axis) Features

0 = Gray = Broken Zone/Undifferentiated
1 = Red = Major Breakout
2 = Orange = Minor Breakout
3 = Light Blue = Tensile Fracture
4 = Green = Filled Near Vertical Joint/Fx
5 = Yellow = Near Vertical Joint/Fx

OBI/ABI combined image from 19.8' to 106.4'

Depth* = mid-point of near vertical feature.
Tilt is referenced to hole axis - 0 Deg tilt is parallel to hole axis

Depth*	Azimuth	Tilt	Length	Opening	Classification
Ft	Deg	Deg	Ft	Deg	
20.89	267.7	-10.15	1.56	0.00	Near Vertical Joint/Fx
21.02	21.8	2.74	1.53	0.00	Near Vertical Joint/Fx
32.69	64.0	-3.04	2.54	0.00	Near Vertical Joint/Fx
33.84	308.6	1.80	0.98	0.00	Near Vertical Joint/Fx
33.88	225.5	-20.50	0.81	0.00	Near Vertical Joint/Fx
33.89	348.8	-3.16	1.02	0.00	Near Vertical Joint/Fx
33.98	181.3	10.58	1.02	0.00	Near Vertical Joint/Fx
34.07	33.6	-10.76	0.83	0.00	Near Vertical Joint/Fx
35.21	102.2	1.60	3.61	0.00	Near Vertical Joint/Fx
35.28	261.8	-7.16	0.86	0.00	Near Vertical Joint/Fx
37.90	254.5	-2.02	2.91	0.00	Near Vertical Joint/Fx
38.96	105.5	1.53	6.15	0.00	Near Vertical Joint/Fx
40.12	187.9	0.19	8.44	0.00	Near Vertical Joint/Fx
40.24	255.2	5.19	2.02	0.00	Near Vertical Joint/Fx
45.06	112.8	-0.52	6.90	0.00	Near Vertical Joint/Fx
45.32	185.3	-5.26	2.68	0.00	Near Vertical Joint/Fx
47.93	214.3	2.83	1.17	0.00	Near Vertical Joint/Fx
48.02	171.4	-1.25	1.45	0.00	Near Vertical Joint/Fx
48.39	16.5	-0.54	3.61	0.00	Near Vertical Joint/Fx
49.04	290.1	2.49	5.00	10.55	Near Vertical Joint/Fx
49.80	70.6	-9.44	2.64	0.00	Near Vertical Joint/Fx
50.08	180.3	9.57	1.47	13.85	Near Vertical Joint/Fx
55.79	204.4	1.18	2.12	0.00	Near Vertical Joint/Fx
55.89	125.3	1.86	3.80	0.00	Near Vertical Joint/Fx
56.17	23.1	0.00	2.96	0.00	Near Vertical Joint/Fx
56.66	282.9	1.21	5.88	0.00	Near Vertical Joint/Fx
57.93	211.0	-3.49	1.78	0.00	Near Vertical Joint/Fx
60.15	71.2	-6.37	4.41	0.00	Near Vertical Joint/Fx
61.05	264.4	1.22	2.92	0.00	Near Vertical Joint/Fx
65.62	122.6	0.63	3.95	0.00	Near Vertical Joint/Fx
66.62	292.8	-0.96	6.49	0.00	Near Vertical Joint/Fx
78.08	138.5	-0.83	0.82	0.00	Near Vertical Joint/Fx
78.15	85.7	10.11	0.87	0.00	Near Vertical Joint/Fx

78.46	304.6	0.89	2.01	0.00	Near Vertical Joint/Fx
78.75	219.6	-2.56	2.17	0.00	Near Vertical Joint/Fx
80.50	145.7	8.76	2.23	0.00	Near Vertical Joint/Fx
81.81	303.3	-0.82	1.35	0.00	Near Vertical Joint/Fx
90.38	294.1	-1.03	1.29	0.00	Near Vertical Joint/Fx
90.57	229.5	-7.12	1.70	0.00	Near Vertical Joint/Fx
91.16	114.1	1.02	3.27	0.00	Near Vertical Joint/Fx
91.54	213.0	-6.38	1.58	0.00	Near Vertical Joint/Fx
91.90	267.0	4.96	2.58	0.00	Near Vertical Joint/Fx
94.35	309.9	-3.97	3.35	0.00	Near Vertical Joint/Fx
94.67	256.5	-4.34	2.72	0.00	Near Vertical Joint/Fx
101.45	195.2	-9.69	3.39	0.00	Near Vertical Joint/Fx
102.32	124.0	-9.64	3.45	0.00	Near Vertical Joint/Fx
104.23	71.2	0.00	3.98	0.00	Near Vertical Joint/Fx
104.96	13.9	-1.09	2.91	0.00	Near Vertical Joint/Fx
105.24	316.5	-1.29	2.17	0.00	Near Vertical Joint/Fx
105.57	242.6	0.00	1.54	0.00	Near Vertical Joint/Fx

Southwest Exploration Services, LLC

borehole geophysics & video services

COMPANY	GEOSYNTEC
WELL ID	TTU EX-1
FIELD	TALLEY
COUNTY	MARICOPA STATE ARIZONA

TYPE OF LOGS: ACOUSTIC TELEVIEWER
MORE: CALIPER

LOCATION

SEC TWP RGE

OTHER SERVICES
OPTICAL TELEVIEWER
GAMMA
TEMPERATURE
FLUID RESISTIVITY

PERMANENT DATUM		ELEVATION	K.B.
LOG MEAS. FROM	GROUND LEVEL	ABOVE PERM. DATUM	D.F.
DRILLING MEAS. FROM	GROUND LEVEL		G.L.

DATE	02-16-20	TYPE FLUID IN HOLE	FORMATION WATER
RUN No	3	MUD WEIGHT	N/A
TYPE LOG	ACOUSTIC TELEVIEWER	VISCOSITY	N/A
DEPTH-DRILLER	110.0 FT	LEVEL	~30 FT
DEPTH-LOGGER	109.0 FT	MAX. REC. TEMP.	29.2 DEG C
BTM LOGGED INTERVAL	108.0 FT	IMAGE ORIENTED TO:	MAGNETIC NORTH
TOP LOGGED INTERVAL	28.0 FT	SAMPLE INTERVAL	0.010 FT
DRILLER / RIG#	N/A	LOGGING TRUCK	TRUCK #310
RECORDED BY / Logging Eng.	E. BEAM / T. GODSEY	TOOL STRING/SN	ALT QL ABI40 2G SN 192302
WITNESSED BY	FABRIZIO - GEOSYNTEC	LOG TIME:ON SITE/OFF SITE	7:00 AM

RUN	BOREHOLE RECORD			CASING RECORD			
NO.	BIT	FROM	TO	SIZE	WGT.	FROM	TO
1	?	SURFACE	20 FT	8.5 IN	STEEL	SURFACE	20 FT
2	8 IN	20 FT	TOTAL DEPTH				
3							

COMMENTS:

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Tool Summary:

Date	02-16-20	**Date**	02-16-20	**Date**	02-16-20		
Run No.	1	**Run No.**	2	**Run No.**	3		
Tool Model	ALT QL OBI40 2G	**Tool Model**	MSI COMBO TOOL	**Tool Model**	ALT QL ABI40 2G		
Tool SN	170106	**Tool SN**	5446	**Tool SN**	192302		
From	SURFACE	**From**	SURFACE	**From**	28.0 FT		
To	52.0 FT	**To**	109.0 FT	**To**	108.0 FT		
Recorded By	E. BEAM	**Recorded By**	E. BEAM	**Recorded By**	E. BEAM		
Truck No	310	**Truck No**	310	**Truck No**	310		
Operation Check	01-30-20	**Operation Check**	02-16-20	**Operation Check**	02-14-20		
Calibration Check	N/A	**Calibration Check**	02-16-20	**Calibration Check**	N/A		
Time Logged	7:30 AM	**Time Logged**	8:15 AM	**Time Logged**	8:30 AM		
Date		**Date**		**Date**			
Run No.	4	**Run No.**	5	**Run No.**	6		
Tool Model		**Tool Model**		**Tool Model**			
Tool SN		**Tool SN**		**Tool SN**			
From		**From**		**From**			
To		**To**		**To**			
Recorded By		**Recorded By**		**Recorded By**			
Truck No		**Truck No**		**Truck No**			
Operation Check		**Operation Check**		**Operation Check**			
Calibration Check		**Calibration Check**		**Calibration Check**			
Time Logged		**Time Logged**		**Time Logged**			

Additional Comments:

Caliper Arms Used: 9" **Calibration Points:** 4" & 10"

E-Log Calibration Range: N/A **Calibration Points:** N/A

Disclaimer:

All interpretations of log data are opinions based on inferences from electrical or other measurements. We do not guarantee the accuracy or correctness of any interpretations or recommendations and shall not be liable or responsible for any loss, costs, damages, or expenses incurred or sustained by anyone resulting from any interpretation made by any of our employees or agents. These interpretations are also subject to our general terms and conditions set out in our current Service Invoice.

Image Features Legend

- Btm of Casing
- Filled Fracture / Joint
- Bedding / Banding / Foliation / Veins
- Partially Open Joint / Fracture
- Minor Open Joint / Fracture
- OJ/Fx terminates at Fx intersection
- Unclassified
- Sulfide Vein
- Breakouts
- Major Open Joint / Fracture
- Fluid Level

Breakout Legend

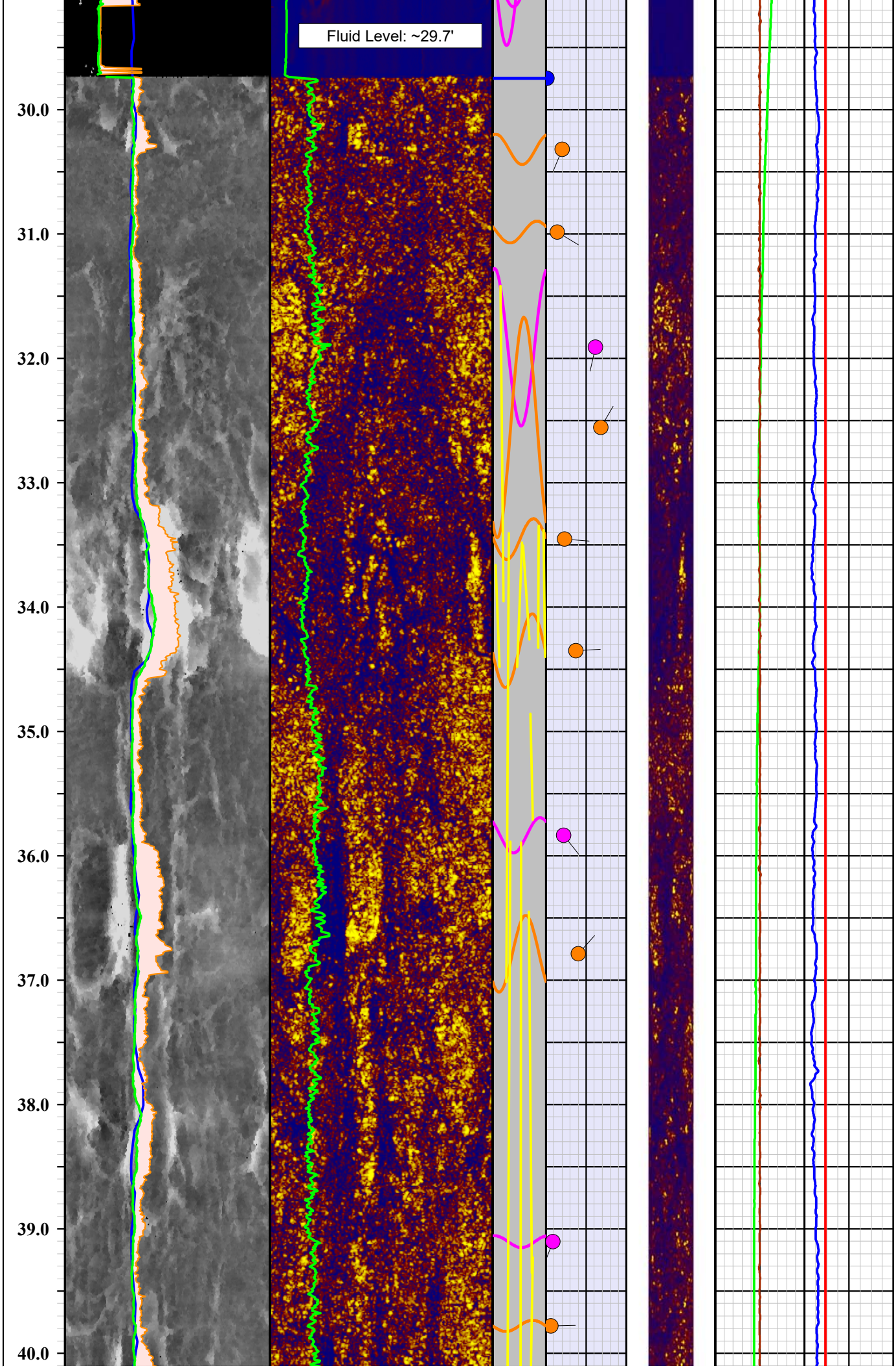
- Broken Zone / Undifferentiated
- Major Breakout
- Minor Breakout
- Tensile Fracture
- Filled Near Vertical Joint/Fx
- Near Vertical Joint/Fx

Bx Legend

- Breccia or Conglomerate
- Large Vugs/Vesicles (> 6")
- Medium Vugs/Vesicles (2-6")
- Small Vugs/Vesicles (< 2")
- Conglomerate - sand matrix supported
- Conglomerate - mud matrix supported
- Conglomerate - clast supported

Depth 1in:1ft	TTU EX-1 Well ABI40 2G Summary ~29.7' to ~106.4'						
	Centralized TT, Oriented Mag North, 0° 90° 180° 270° 0°	Amplitude-NM, Oriented Mag North, 0° 90° 180° 270° 0°	Picks, DIPA	Tadpole, DIPA, 0 100	3-D View, -0°	Mag Field, 40 uT 60	Tilt, 0 Deg 8
	3-Arm Caliper, 5 Inches 15	Amplitude-Static, Oriented Mag North, 0° 90° 180° 270° 0°	NVJts			Gravity, 0.8 g 1.2	Azi-Edited, 0 360
	Max-Acoustic Caliper, 5 Inches 15	ARI, 0 2000	Bx				
	Ave-Acoustic Caliper, 5 Inches 15						
	Enlargements						

29.0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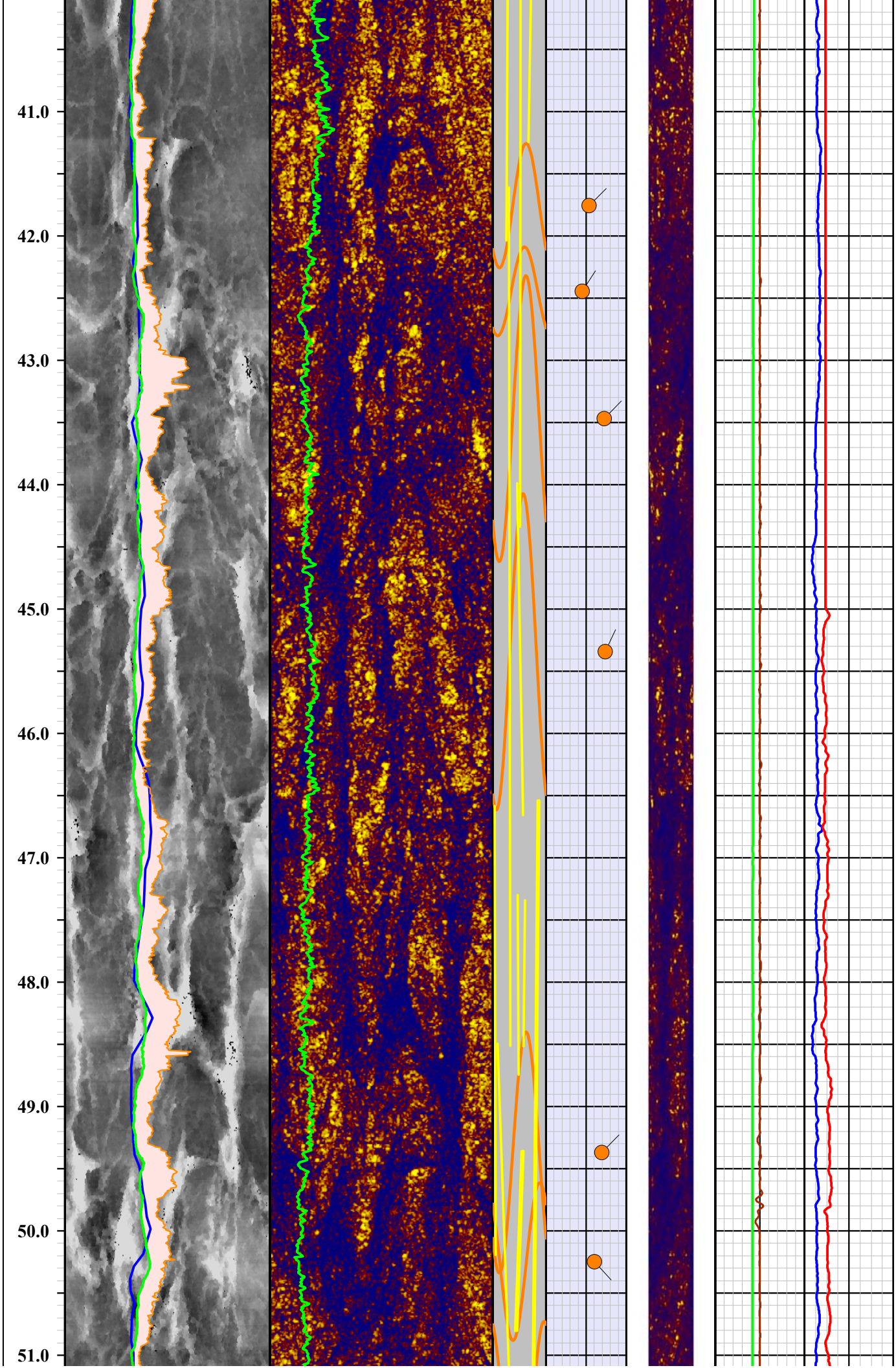
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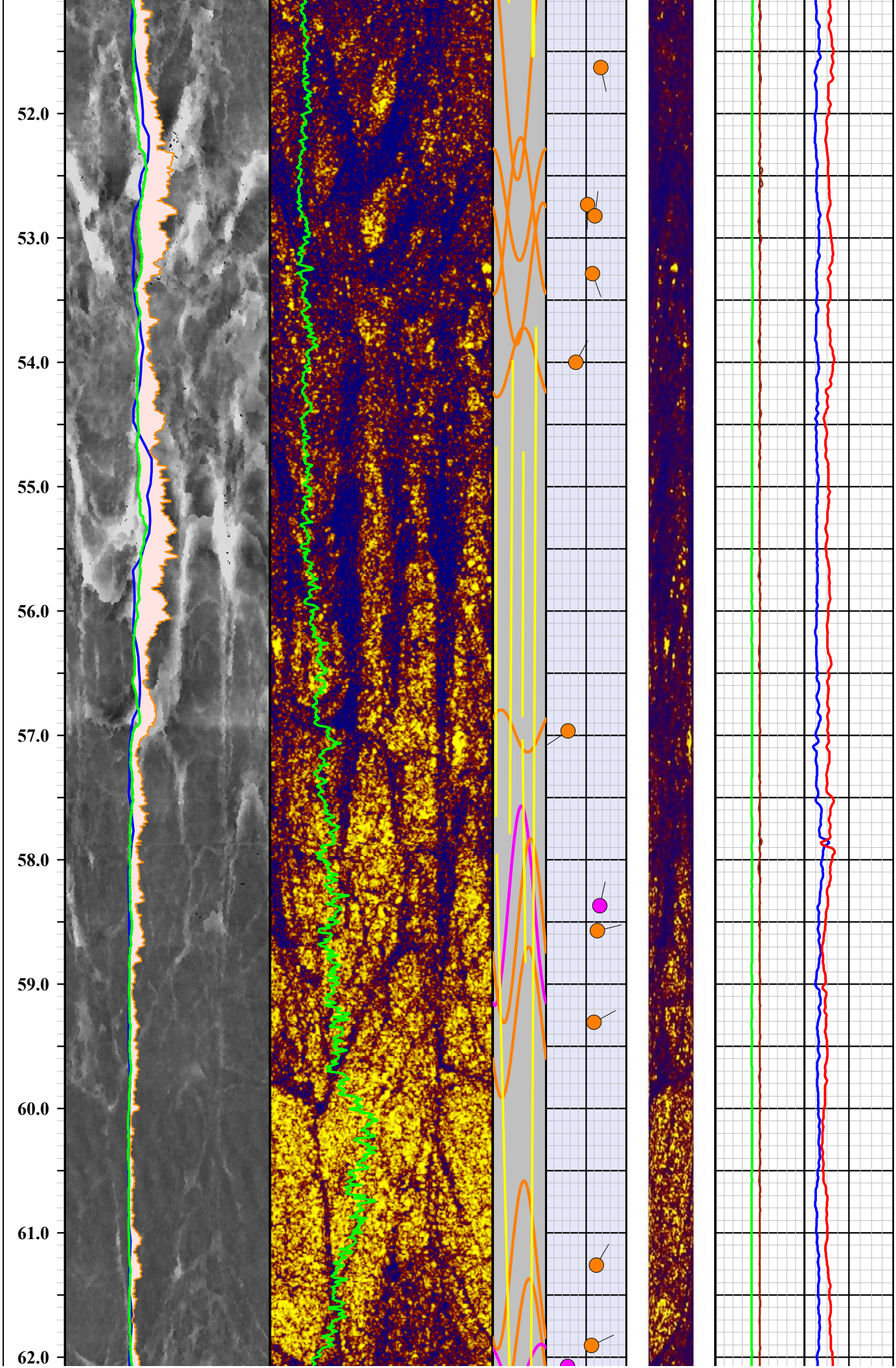
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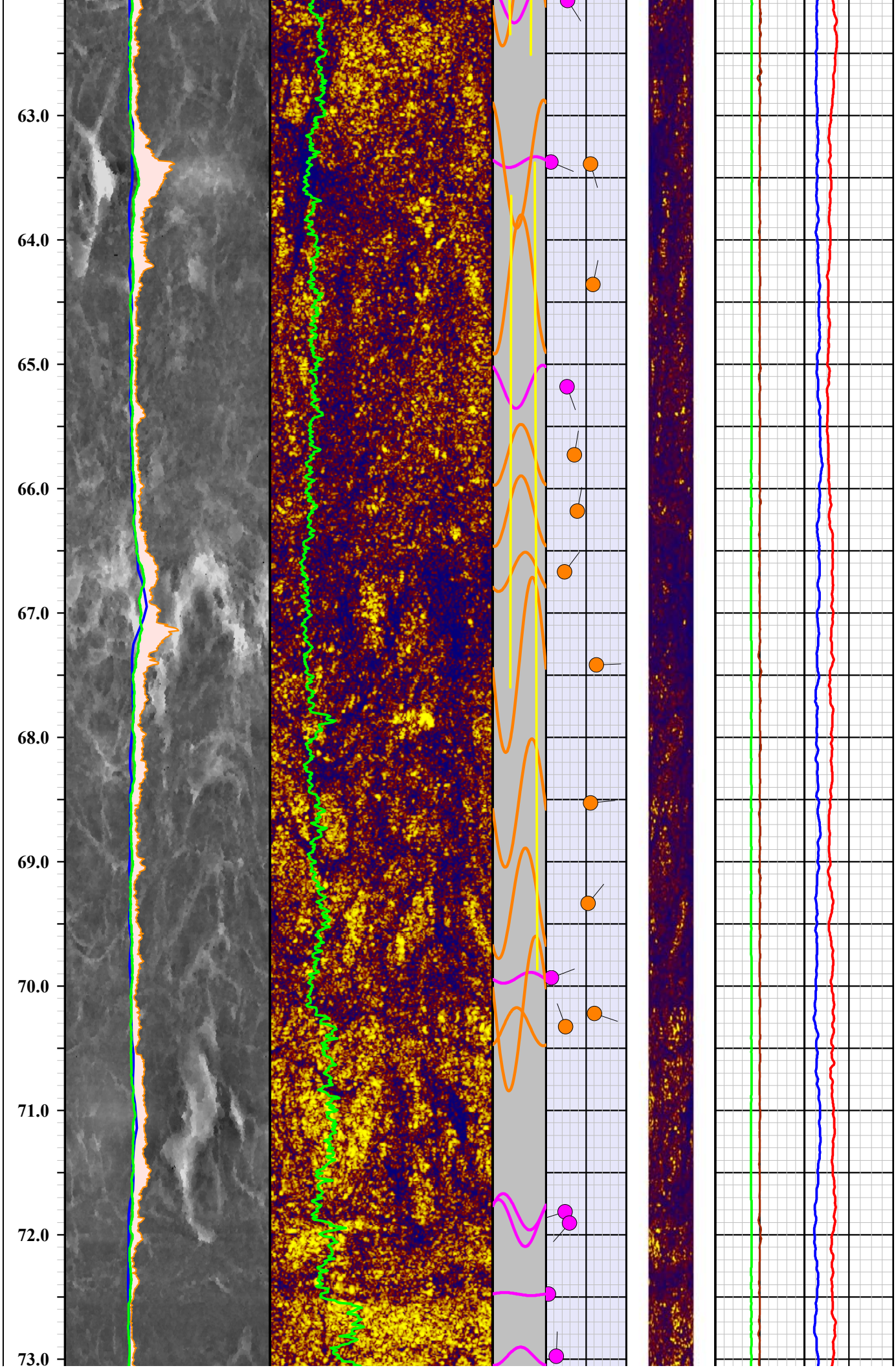
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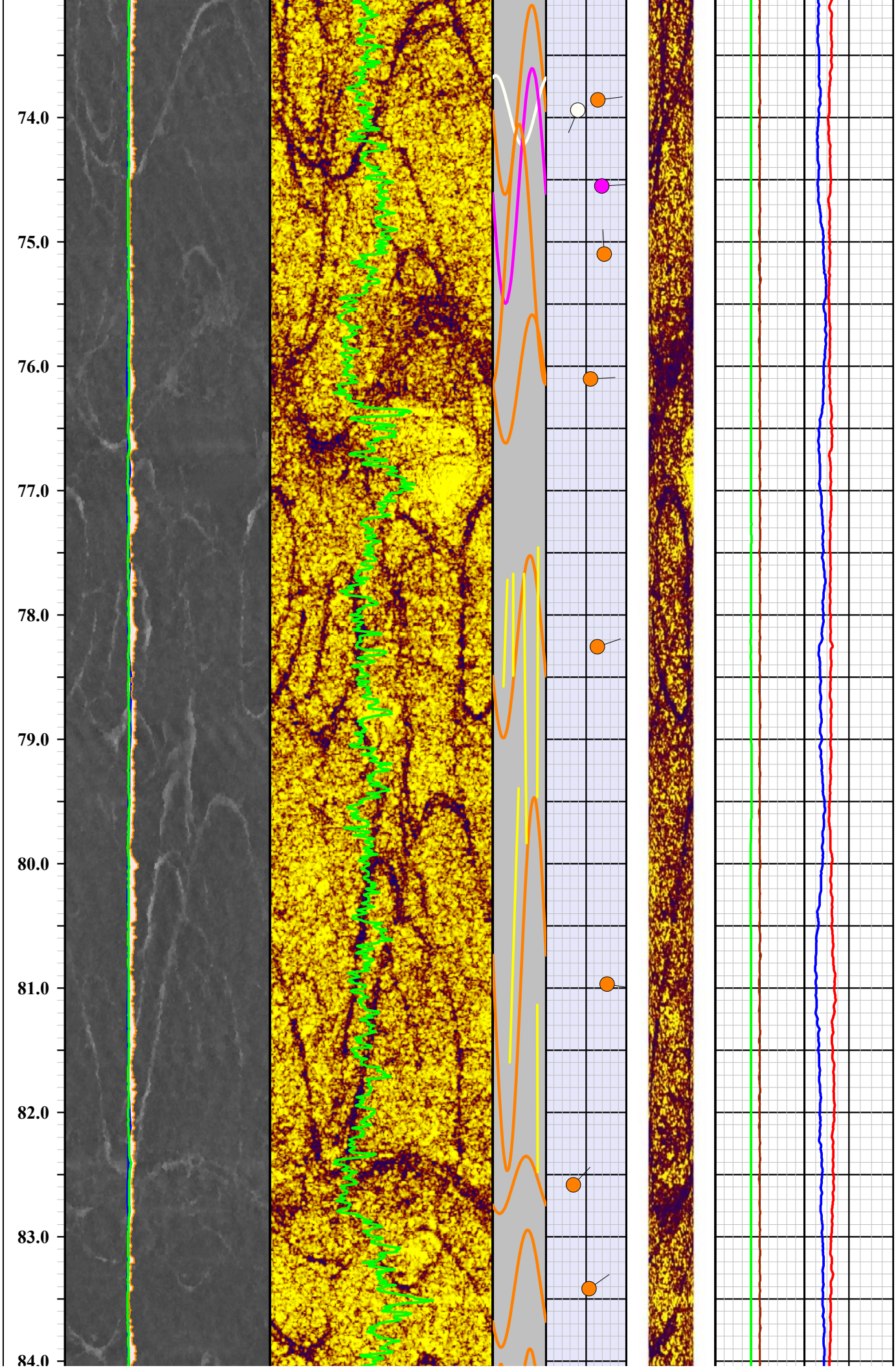
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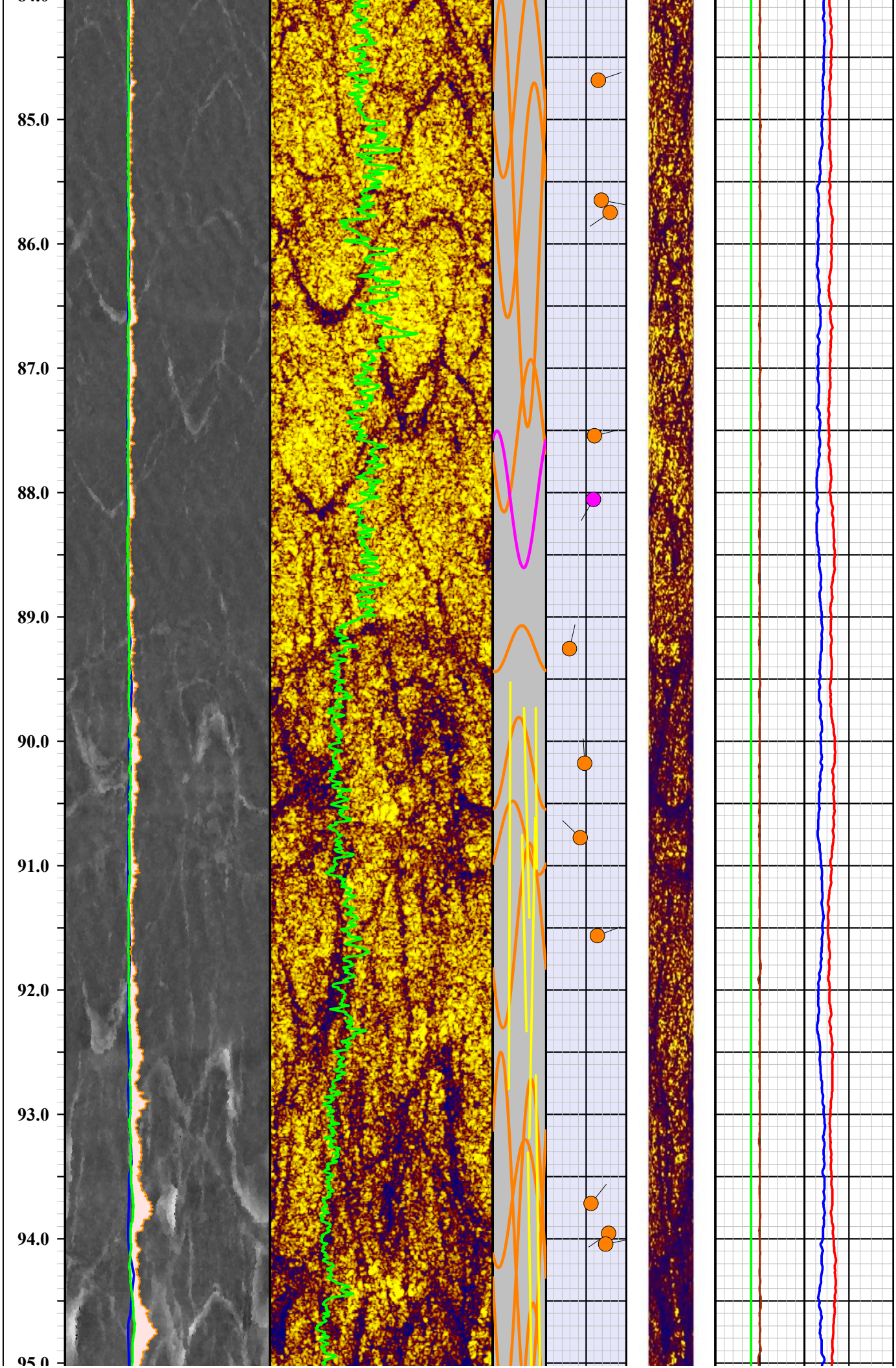
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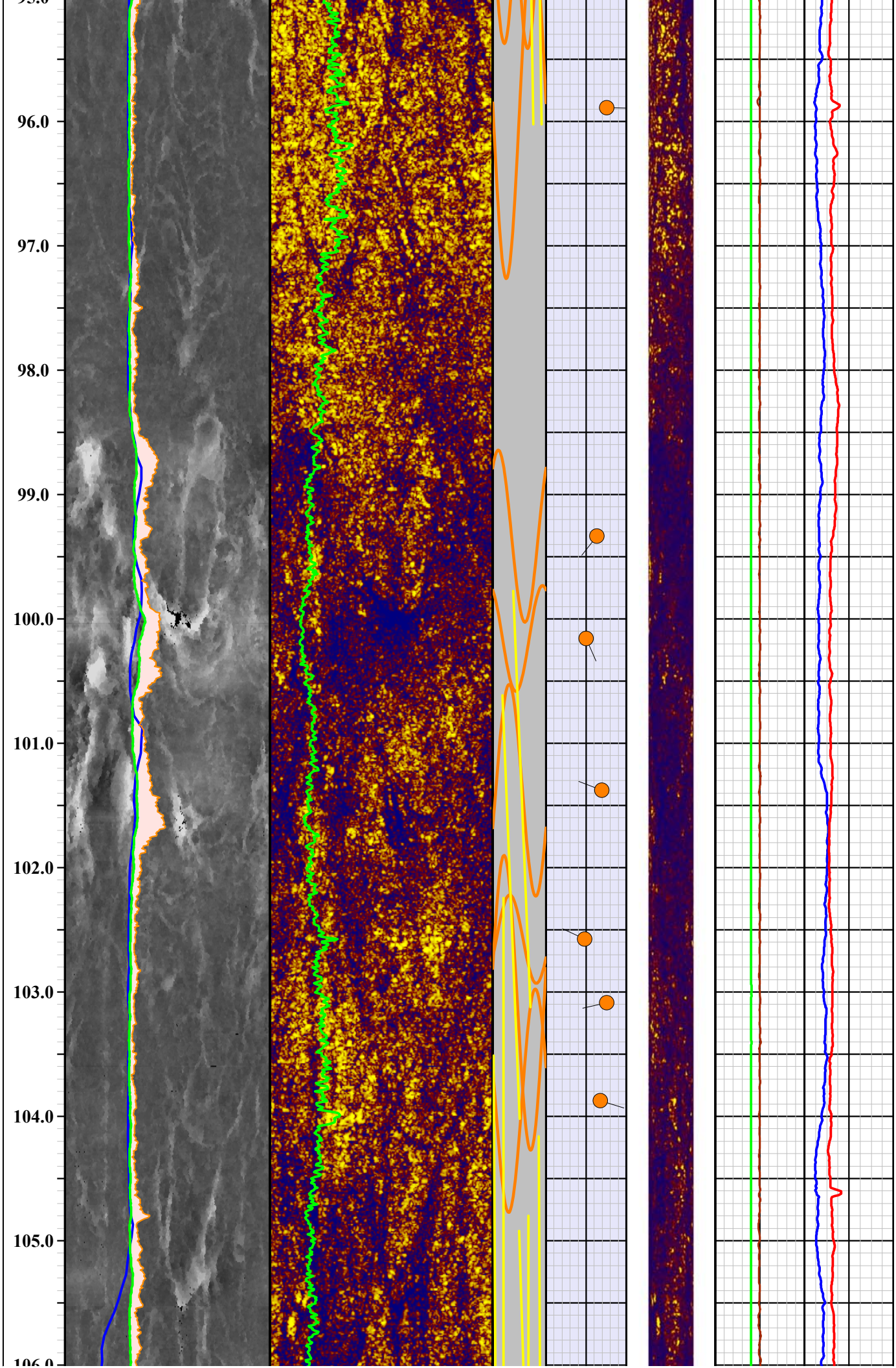
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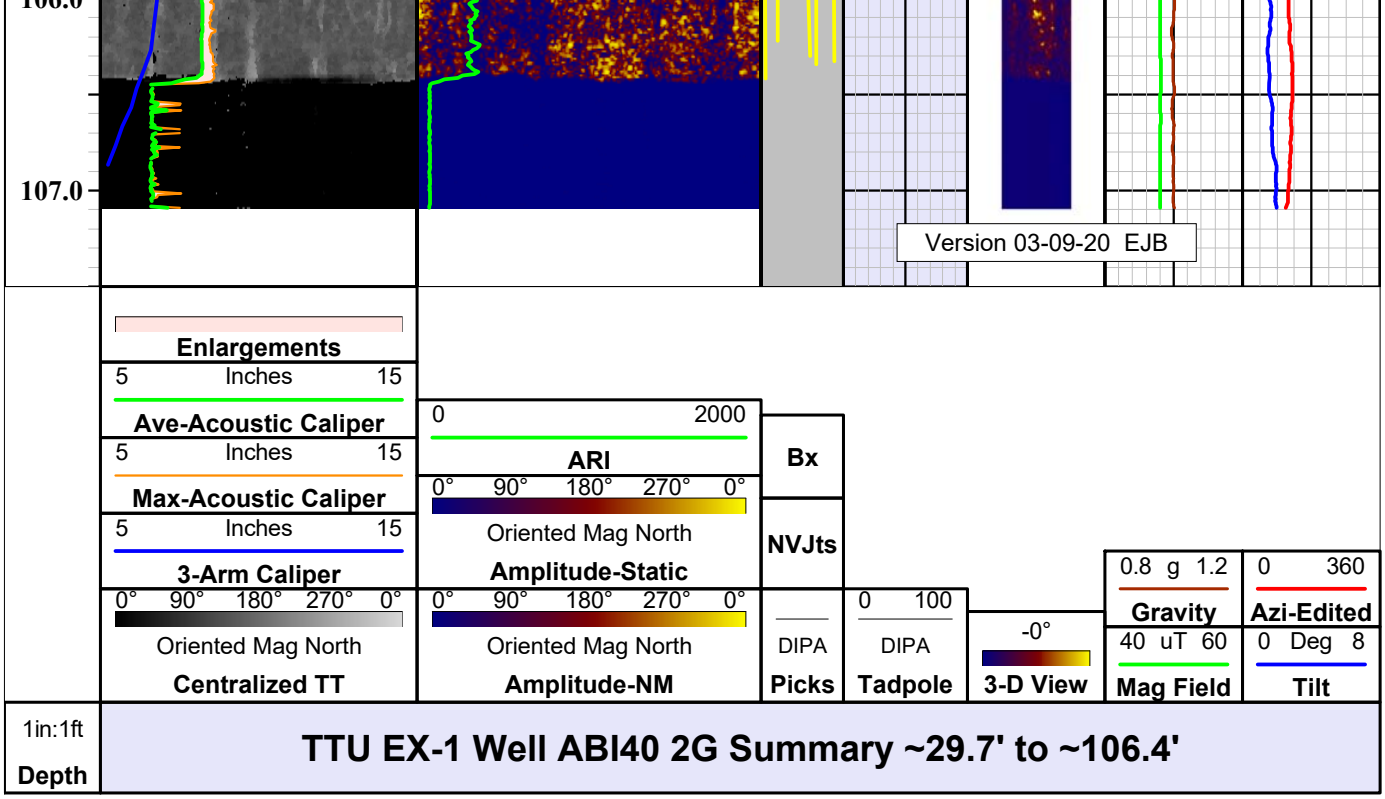


Legend

Mnemonics	Description
Centralized TT	2D plot of acoustic image travel time with probe position centralized. Oriented to magnetic north and plotted from left to right N-E-S-W-N.
3-Arm Caliper	3-arm mechanical caliper of hole diameter plotted from 5 to 15 inches (blue line).
Max-Acoustic Caliper	Maximum acoustic caliper of hole diameter calculated from Travel Time data and plotted as orange line from 5 to 15 inches.
Ave-Acoustic Caliper	Average acoustic caliper of hole diameter calculated from Travel Time data and plotted as bright green line from 5 to 15 inches.
Enlargements	Pink shaded zone between Ave-Acoustic Caliper and Max-Acoustic Caliper calculated from Travel Time data showing borehole enlargment.
Amplitude-NM	2D plot of unfiltered acoustic image amplitude oriented to magnetic north. Plotted from left to right N-E-S-W-N. Image toggled off.
Amplitude-Static	2D plot of acoustic image amplitude with Static normalization filter oriented to magnetic north. Plotted from left to right N-E-S-W-N. Image toggled on.
ARI	Acoustic Reflectance Index or relative rock hardness from ABI Amplitude log. Plotted 0 (soft) to 2000 (harder) as green line.
Picks	Planar strucutral features picked on acoustic borehole image shown as colored sinusoid (color designation shown on header) DIPA = dip apparent hole axis.
NVJts	Near Vertical (near parallel to hole axis) joint/fracture features picked on acoustic

	borehole image shown as colored sinusoid (color designation shown on header).
Bx	Apparent Breccia or Congomerate zones and Vugs/Vesicles/Cavities.
3-D View	3D cylindrical projection of ABI image using Centralized TT log for hole shape looking from North.
Tadpole	Tadpole plot of the ABI feature picks (fractures and bedding planes); plotted from 0 to 90 dip - see legend above. DIPT = True orientation; features corrected for hole deviation.
Mag Field	Total magnetic field strength as measured by fluxgate magnetometer in OBI or ABI deviation sensor - plotted 40-60 uT (green line).
Gravity	Total gravity (probe acceleration) as measured by 3-axis accelerometers in ABI deviation sensor - plotted 0.8-1.2 g (brown line).
Azi-Edited	Direction of tool tilt plotted 0 to 360 deg; edited for anomalous magnetic influence - represents borehole deviation direction (red line).
Tilt	Tool tilt (vertical = 0 and horizontal = 90) plotted 0 to 8 deg; represents borehole deviation tilt from vertical (blue line).
	Mnemonics prepared by Erika J Beam Version 03-09-20

QL ABI-40 2G Acoustic Borehole Imager

Probe Top = Depth Ref.

Tool SN: 143003, 143009 & 192302

Four Conductor MSI Probe Top

APS Probe Orientation Sensor
3-Axis Magnetometer
3-Axis Accellerometer

Probe Length = 1.62 m or 5.25 ft

Probe Weight = 6.7 kg or 14.7 lbs

Distance from Acoustic Image Window to Orientation Sensor = 0.92 m or 3 ft

Inclination Accuracy = +/- 0.5 deg
Azimuth Accuracy = +/- 1.2 deg

Beam Width = 1.5 mm

Frequency = 1.2 MHz

Temperature Range: 0 - 70 Deg C (32 - 158 Deg F)
Pressure Range: 0 - 200 bar (0 - 2900 psi)

Run Centralized with External Bow Spring Centralizers

Can only be logged in fluid filled holes

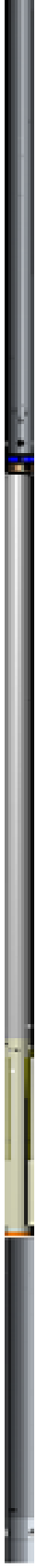
1.6" or 40 mm Diameter

MSI Gamma-Caliper-Temperature-Fluid Resistivity

Probe Top = Depth Ref.

Probe Length = 2.59 m or 8.5 ft
Probe Weight = 6.80 kg or 15.0 lbs

Natural Gamma and Caliper can only be collected logging up hole.



Fluid Temperature/Resistivity can only be collected logging down hole.

Temperature Rating: 70 Deg C (158 Deg F)
Presure Rating: 200 bar (2900 psi)

Natural Gamma Ray = 0.76 m (29.75 in)

NOTE: Lengths on a particular tool may vary from those listed on this document due to probe sizes and styles utilized

3-Arm Caliper = 1.44 m (56.75 in)

Distance from tool top: 2.20 m (86.5 in)

Available Arm Sizes: 3", 9", and 15"

TFR (Temperature/Fluid Resistivity) = 0.39 m (15.5 in)

1.375" or 34.9 mm Diameter

Southwest Exploration Services, LLC
borehole geophysics & video services

Company	GEOSYNTEC
Well	TTU EX-1
Field	TALLEY
County	MARICOPA
State	ARIZONA

Final Acoustic Televiewer Summary

Southwest Exploration Services, LLC

borehole geophysics & video services

COMPANY	GEOSYNTEC
WELL ID	TTU EX-1
FIELD	TALLEY
COUNTY	MARICOPA STATE ARIZONA

TYPE OF LOGS: GAMMA - CALIPER
MORE: TEMP / FLUID RES

LOCATION

SEC TWP RGE

OTHER SERVICES
ACOUSTIC TELEVIEWER
OPTICAL TELEVIEWER

PERMANENT DATUM		ELEVATION	K.B.
LOG MEAS. FROM	GROUND LEVEL	ABOVE PERM. DATUM	D.F.
DRILLING MEAS. FROM	GROUND LEVEL		G.L.

DATE	02-16-20	TYPE FLUID IN HOLE	FORMATION WATER
RUN No	2	MUD WEIGHT	N/A
TYPE LOG	GAMMA-CALIPER-TFR	VISCOSITY	N/A
DEPTH-DRILLER	110.0 FT	LEVEL	~30 FT
DEPTH-LOGGER	109.0 FT	MAX. REC. TEMP.	29.2 DEG C
BTM LOGGED INTERVAL	109.0 FT	IMAGE ORIENTED TO:	N/A
TOP LOGGED INTERVAL	SURFACE	SAMPLE INTERVAL	0.1 FT
DRILLER / RIG#	N/A	LOGGING TRUCK	TRUCK #310
RECORDED BY / Logging Eng.	E. BEAM / T. GODSEY	TOOL STRING/SN	MSI COMBO TOOL SN 5546
WITNESSED BY	FABRIZIO - GEOSYNTEC	LOG TIME:ON SITE/OFF SITE	7:00 AM

RUN	BOREHOLE RECORD			CASING RECORD			
NO.	BIT	FROM	TO	SIZE	WGT.	FROM	TO
1	?	SURFACE	20 FT	8.5 IN	STEEL	SURFACE	20 FT
2	8 IN	20 FT	TOTAL DEPTH				
3							

COMMENTS:

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Tool Summary:

Date	02-16-20	**Date**	02-16-20	**Date**	02-16-20		
Run No.	1	**Run No.**	2	**Run No.**	3		
Tool Model	ALT QL OBI40 2G	**Tool Model**	MSI COMBO TOOL	**Tool Model**	ALT QL ABI40 2G		
Tool SN	170106	**Tool SN**	5446	**Tool SN**	192302		
From	SURFACE	**From**	SURFACE	**From**	28.0 FT		
To	52.0 FT	**To**	109.0 FT	**To**	108.0 FT		
Recorded By	E. BEAM	**Recorded By**	E. BEAM	**Recorded By**	E. BEAM		
Truck No	310	**Truck No**	310	**Truck No**	310		
Operation Check	01-30-20	**Operation Check**	02-16-20	**Operation Check**	02-14-20		
Calibration Check	N/A	**Calibration Check**	02-16-20	**Calibration Check**	N/A		
Time Logged	7:30 AM	**Time Logged**	8:15 AM	**Time Logged**	8:30 AM		

Date		**Date**		**Date**			
Run No.	4	**Run No.**	5	**Run No.**	6		
Tool Model		**Tool Model**		**Tool Model**			
Tool SN		**Tool SN**		**Tool SN**			
From		**From**		**From**			
To		**To**		**To**			
Recorded By		**Recorded By**		**Recorded By**			
Truck No		**Truck No**		**Truck No**			
Operation Check		**Operation Check**		**Operation Check**			
Calibration Check		**Calibration Check**		**Calibration Check**			
Time Logged		**Time Logged**		**Time Logged**			

Additional Comments:

Caliper Arms Used: 9" **Calibration Points:** 4" & 10"

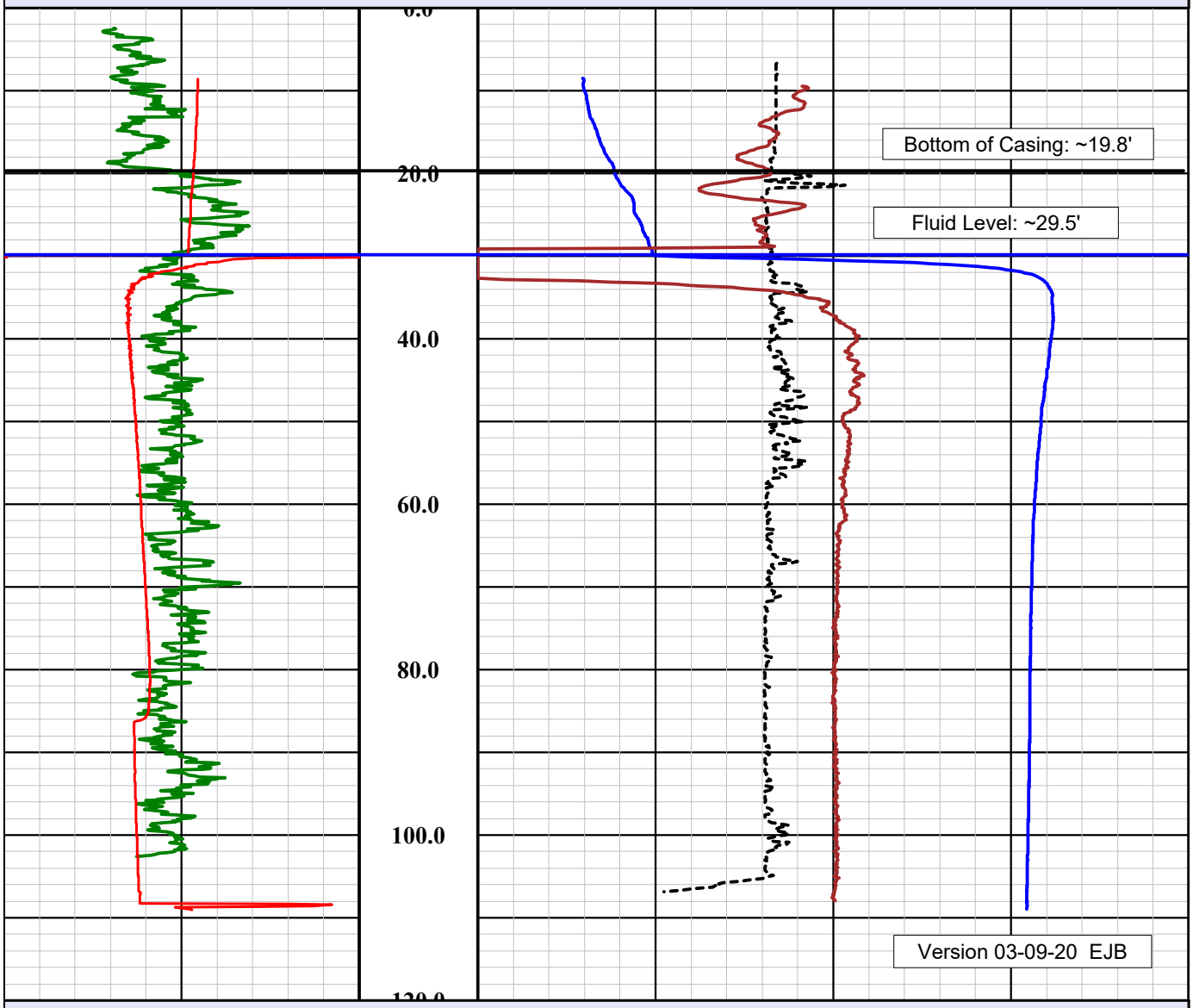
E-Log Calibration Range: N/A **Calibration Points:** N/A

Disclaimer:

All interpretations of log data are opinions based on inferences from electrical or other measurements. We do not guarantee the accuracy or correctness of any interpretations or recommendations and shall not be liable or responsible for any loss, costs, damages, or expenses incurred or sustained by anyone resulting from any interpretation made by any of our employees or agents. These interpretations are also subject to our general terms and conditions set out in our current Service Invoice.

Nat. Gamma	Depth	3-Arm Caliper
0 API 200	1in:20ft	0 Inches 20
Fluid Resistivity		**Temperature**
0 Ohm-m 20		10 Deg C 30
		2-Ft Diff. Temp.
		-1 Deg C 1

TTU EX-1 Well GCT Summary Surface to ~109.2'



TTU EX-1 Well GCT Summary Surface to ~109.2'

		-1 Deg C 1
		2-Ft Diff. Temp.
0 Ohm-m 20		10 Deg C 30

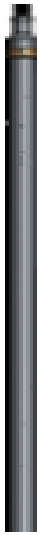
Fluid Resistivity		Temperature
0 API 200	1in:20ft	0 Inches 20
Nat. Gamma	Depth	3-Arm Caliper

Legend

Mnemonics	Description
Nat. Gamma	Natural gamma ray log plotted 0 to 200 API (green line).
Fluid Resistivity	Electrical resistivity of a borehole's fluid plotted from 0 to 20 ohm-m as red line.
3-Arm Caliper	3-arm mechanical caliper of hole diameter plotted from 0 to 20 inches (black dashed line).
Temperature	Borehole fluid temperature plotted from 10 to 30 degrees C (blue line).
2-Ft Diff. Temp.	Differential temperature over 2-ft spacing (brown line).
	Mnemonics prepared by Erika J. Beam Version 03-09-20

MSI Gamma-Caliper-Temperature-Fluid Resistivity

Probe Top = Depth Ref.



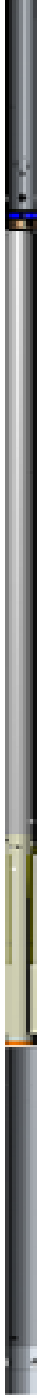
Single Conductor MSI Probe Top

Probe Length = 2.59 m or 8.5 ft
Probe Weight = 6.80 kg or 15.0 lbs

Natural Gamma and Caliper can only be collected logging up hole.

Fluid Temperature/Resistivity can only be collected logging down hole.

Temperature Rating: 70 Deg C (158 Deg F)
Presure Rating: 200 bar (2900 psi)



Natural Gamma Ray = 0.76 m (29.75 in)

NOTE: Lengths on a particular tool may vary from those listed on this document due to probe sizes and styles utilized

3-Arm Caliper = 1.44 m (56.75 in)

Distance from tool top: 2.20 m (86.5 in)

Available Arm Sizes: 3", 9", and 15"

TFR (Temperature/Fluid Resistivity) = 0.39 m (15.5 in)

1.375" or 34.9 mm Diameter

Southwest Exploration Services, LLC
borehole geophysics & video services

Company	GEOSYNTEC
Well	TTU EX-1
Field	TALLEY
County	MARICOPA
State	ARIZONA

Final **GCT Summary**

Southwest Exploration Services, LLC

borehole geophysics & video services

COMPANY	GEOSYNTEC
WELL ID	TTU EX-1
FIELD	TALLEY
COUNTY	MARICOPA STATE ARIZONA

TYPE OF LOGS: OPTICAL TELEVIEWER
MORE: GAMMA - CALIPER

LOCATION

SEC TWP RGE

OTHER SERVICES
ACOUSTIC TELEVIEWER
TEMPERATURE
FLUID RESISTIVITY

PERMANENT DATUM		ELEVATION	K.B.
LOG MEAS. FROM	GROUND LEVEL	ABOVE PERM. DATUM	D.F.
DRILLING MEAS. FROM	GROUND LEVEL		G.L.

DATE	02-16-20	TYPE FLUID IN HOLE	FORMATION WATER
RUN No	1	MUD WEIGHT	N/A
TYPE LOG	OPTICAL TELEVIEWER	VISCOSITY	N/A
DEPTH-DRILLER	110.0 FT	LEVEL	~30 FT
DEPTH-LOGGER	109.0 FT	MAX. REC. TEMP.	29.2 DEG C
BTM LOGGED INTERVAL	52.00 FT	IMAGE ORIENTED TO:	MAGNETIC NORTH
TOP LOGGED INTERVAL	SURFACE	SAMPLE INTERVAL	0.035 FT
DRILLER / RIG#	N/A	LOGGING TRUCK	TRUCK #310
RECORDED BY / Logging Eng.	E. BEAM / T. GODSEY	TOOL STRING/SN	ALT QL OBI40 2G SN 170106
WITNESSED BY	FABRIZIO - GEOSYNTEC	LOG TIME:ON SITE/OFF SITE	7:00 AM

RUN	BOREHOLE RECORD			CASING RECORD			
NO.	BIT	FROM	TO	SIZE	WGT.	FROM	TO
1	?	SURFACE	20 FT	8.5 IN	STEEL	SURFACE	20 FT
2	8 IN	20 FT	TOTAL DEPTH				
3							

COMMENTS:

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Tool Summary:

Date	02-16-20	**Date**	02-16-20	**Date**	02-16-20		
Run No.	1	**Run No.**	2	**Run No.**	3		
Tool Model	ALT QL OBI40 2G	**Tool Model**	MSI COMBO TOOL	**Tool Model**	ALT QL ABI40 2G		
Tool SN	170106	**Tool SN**	5446	**Tool SN**	192302		
From	SURFACE	**From**	SURFACE	**From**	28.0 FT		
To	52.0 FT	**To**	109.0 FT	**To**	108.0 FT		
Recorded By	E. BEAM	**Recorded By**	E. BEAM	**Recorded By**	E. BEAM		
Truck No	310	**Truck No**	310	**Truck No**	310		
Operation Check	01-30-20	**Operation Check**	02-16-20	**Operation Check**	02-14-20		
Calibration Check	N/A	**Calibration Check**	02-16-20	**Calibration Check**	N/A		
Time Logged	7:30 AM	**Time Logged**	8:15 AM	**Time Logged**	8:30 AM		

Date		**Date**		**Date**			
Run No.	4	**Run No.**	5	**Run No.**	6		
Tool Model		**Tool Model**		**Tool Model**			
Tool SN		**Tool SN**		**Tool SN**			
From		**From**		**From**			
To		**To**		**To**			
Recorded By		**Recorded By**		**Recorded By**			
Truck No		**Truck No**		**Truck No**			
Operation Check		**Operation Check**		**Operation Check**			
Calibration Check		**Calibration Check**		**Calibration Check**			
Time Logged		**Time Logged**		**Time Logged**			

Additional Comments:

Caliper Arms Used: 9" **Calibration Points:** 4" & 10"

E-Log Calibration Range: N/A **Calibration Points:** N/A

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Image Features Legend

- Btm of Casing
- Filled Fracture / Joint
- Bedding / Banding / Foliation / Veins
- Partially Open Joint / Fracture
- Minor Open Joint / Fracture
- OJ/Fx terminates at Fx intersection
- Unclassified
- Sulfide Vein
- Breakouts
- Major Open Joint / Fracture
- Fluid Level

Breakout Legend

- Broken Zone / Undifferentiated
- Major Breakout
- Minor Breakout
- Tensile Fracture
- Filled Near Vertical Joint/Fx
- Near Vertical Joint/Fx

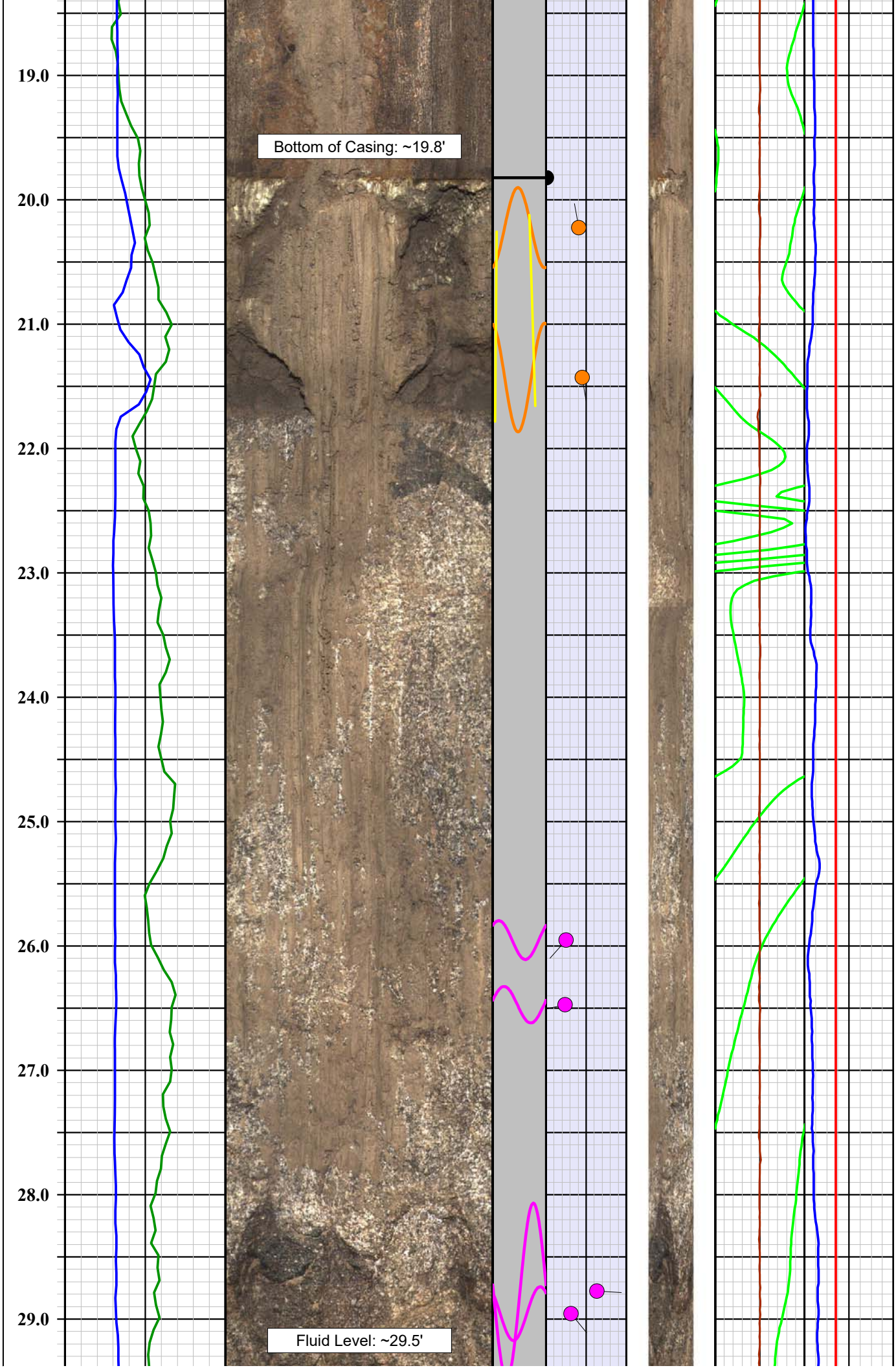
Bx Legend

- Breccia or Conglomerate
- Large Vugs/Vesicles (> 6")
- Medium Vugs/Vesicles (2-6")
- Small Vugs/Vesicles (< 2")
- Conglomerate - sand matrix supported
- Conglomerate - mud matrix supported
- Conglomerate - clast supported

TTU EX-1 Well OBI40 2G Summary ~19.8' to ~106.4'

Depth 1in:1ft

Nat. Gamma	3-Arm Caliper	Image-NM	Picks	Tadpole	3-D View	Mag Field	Tilt
0 API 200	5 Inches 15	Oriented Mag North 0° 90° 180° 270° 0°	DIPA	DIPT 0 100	-0°	40 uT 60	0 Deg 8
			NVJts			Gravity 0.8 g 1.2	Azi-Edited 0 360
		Image_15.0'-45.0' Non Oriented, Rot'd by 60.4 Deg 0° 90° 180° 270° 0°	Bx				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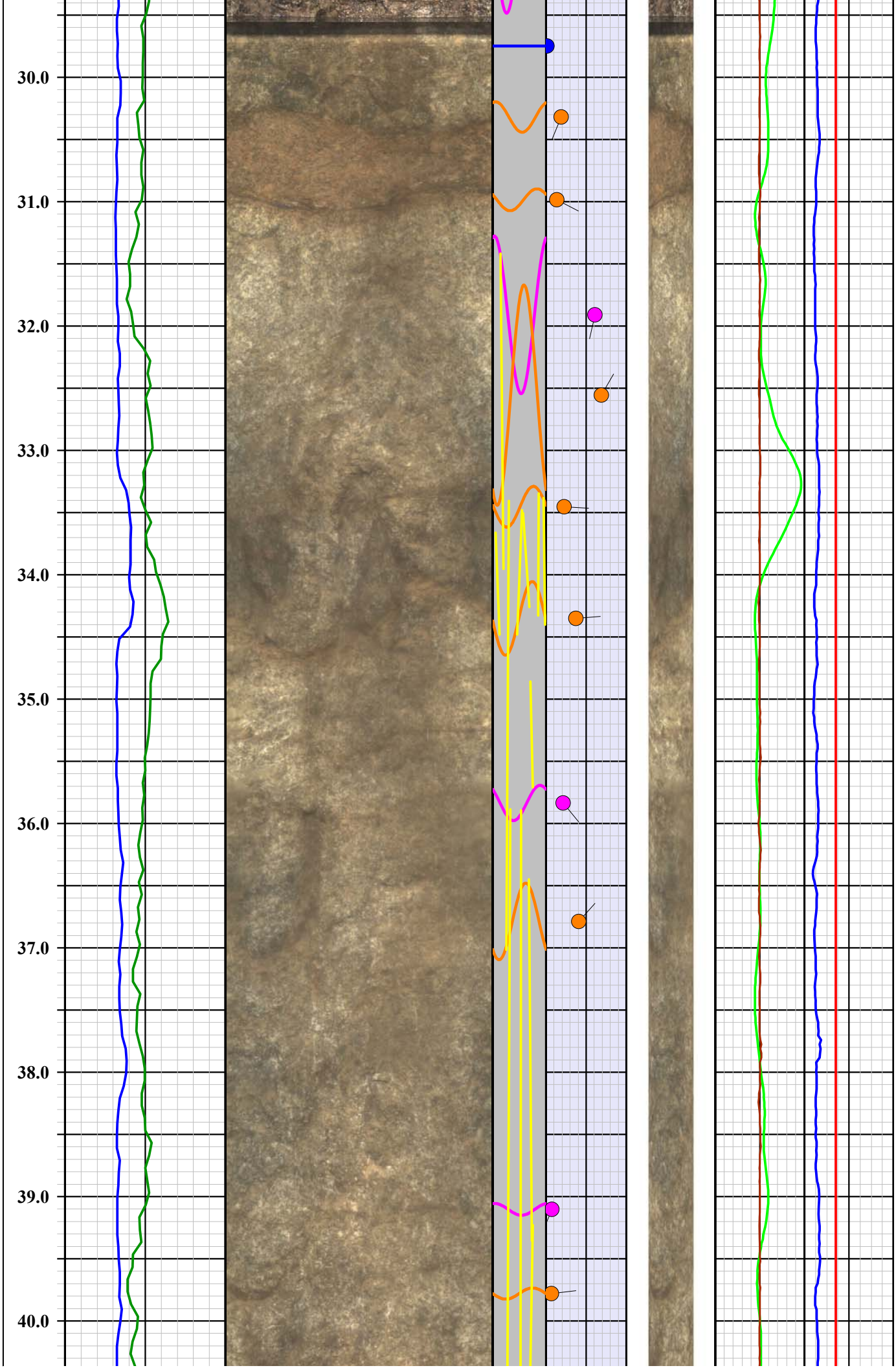
Bottom of Casing: ~19.8'
Fluid Level: ~29.5'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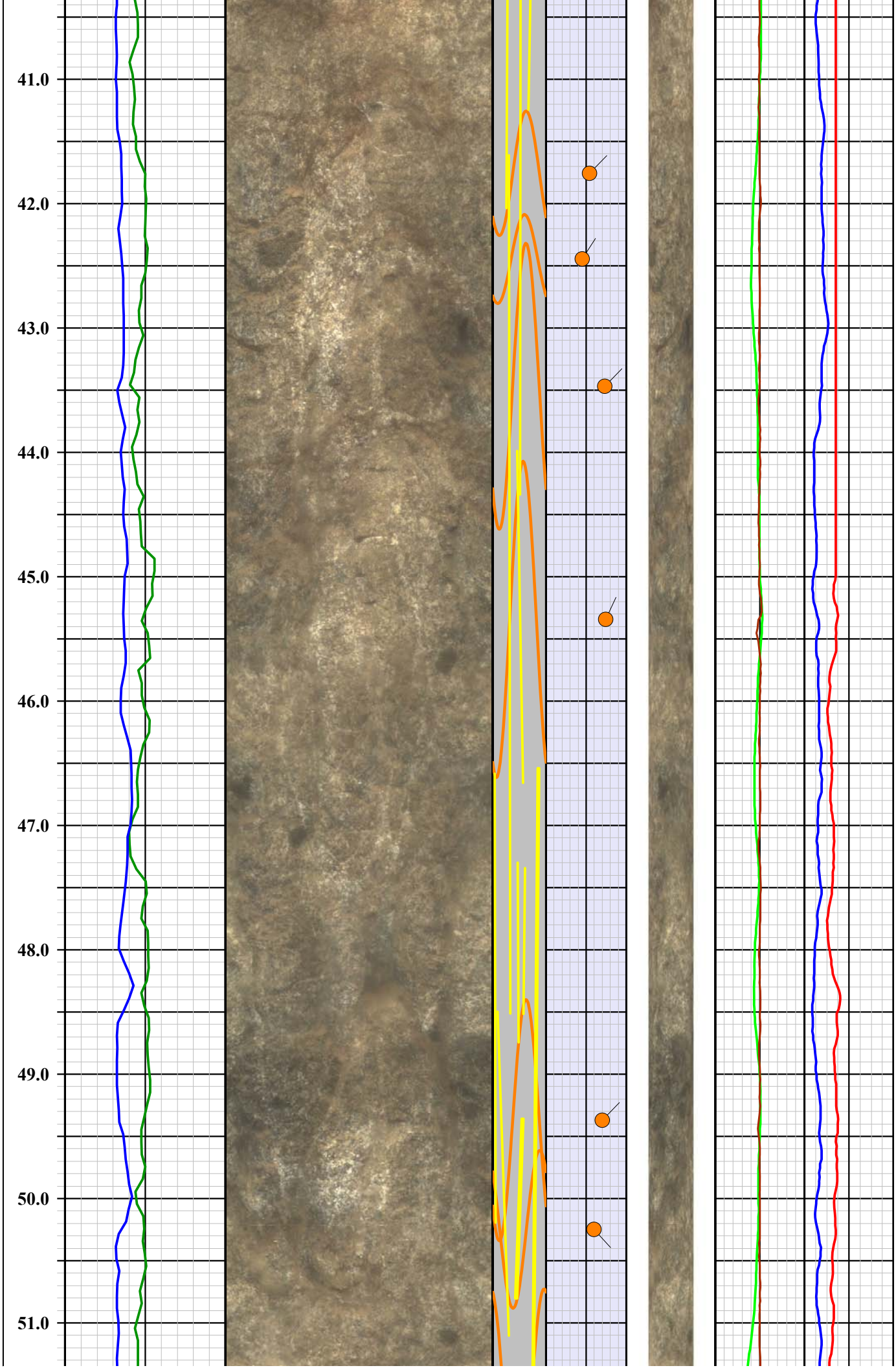
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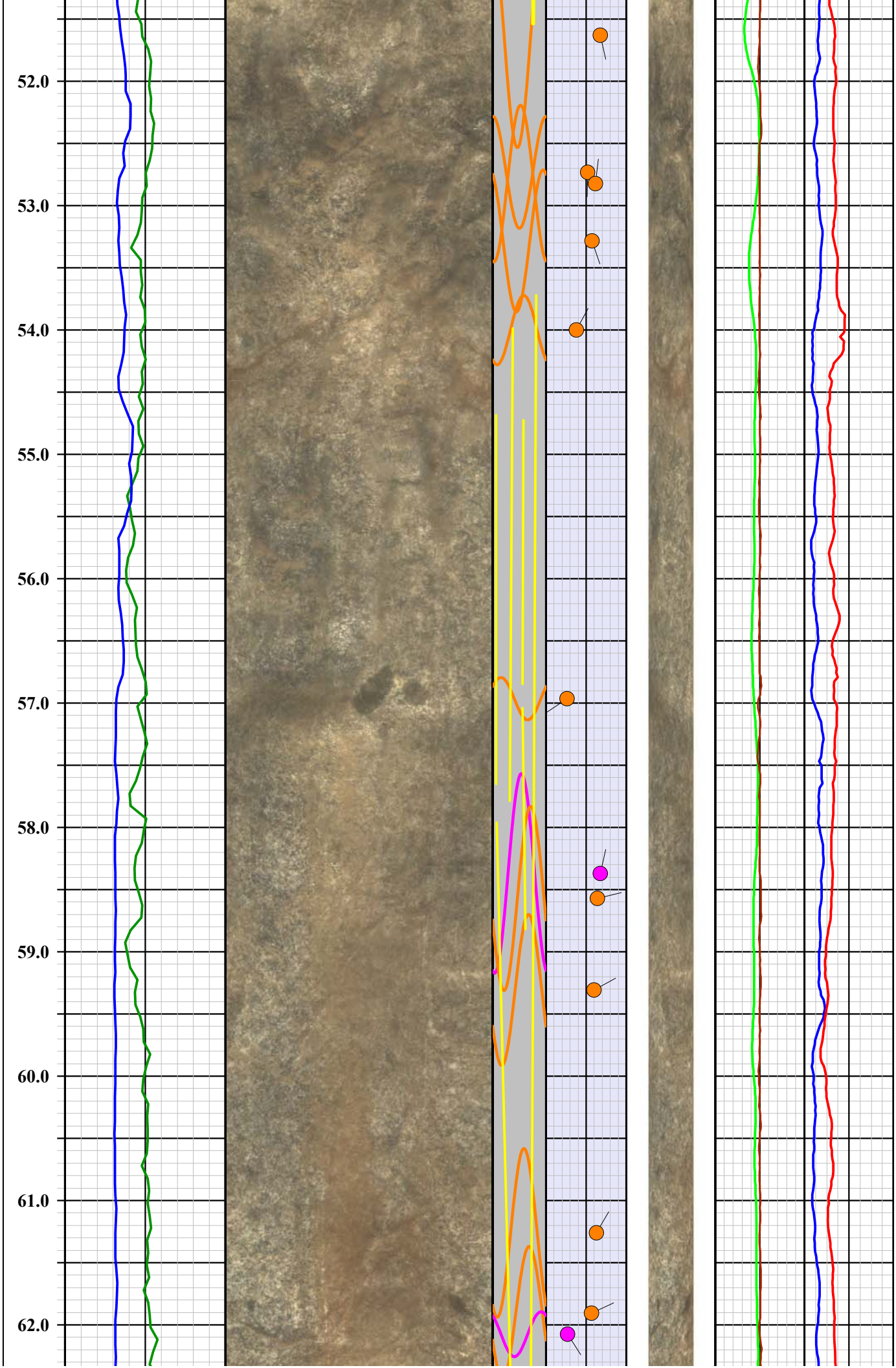
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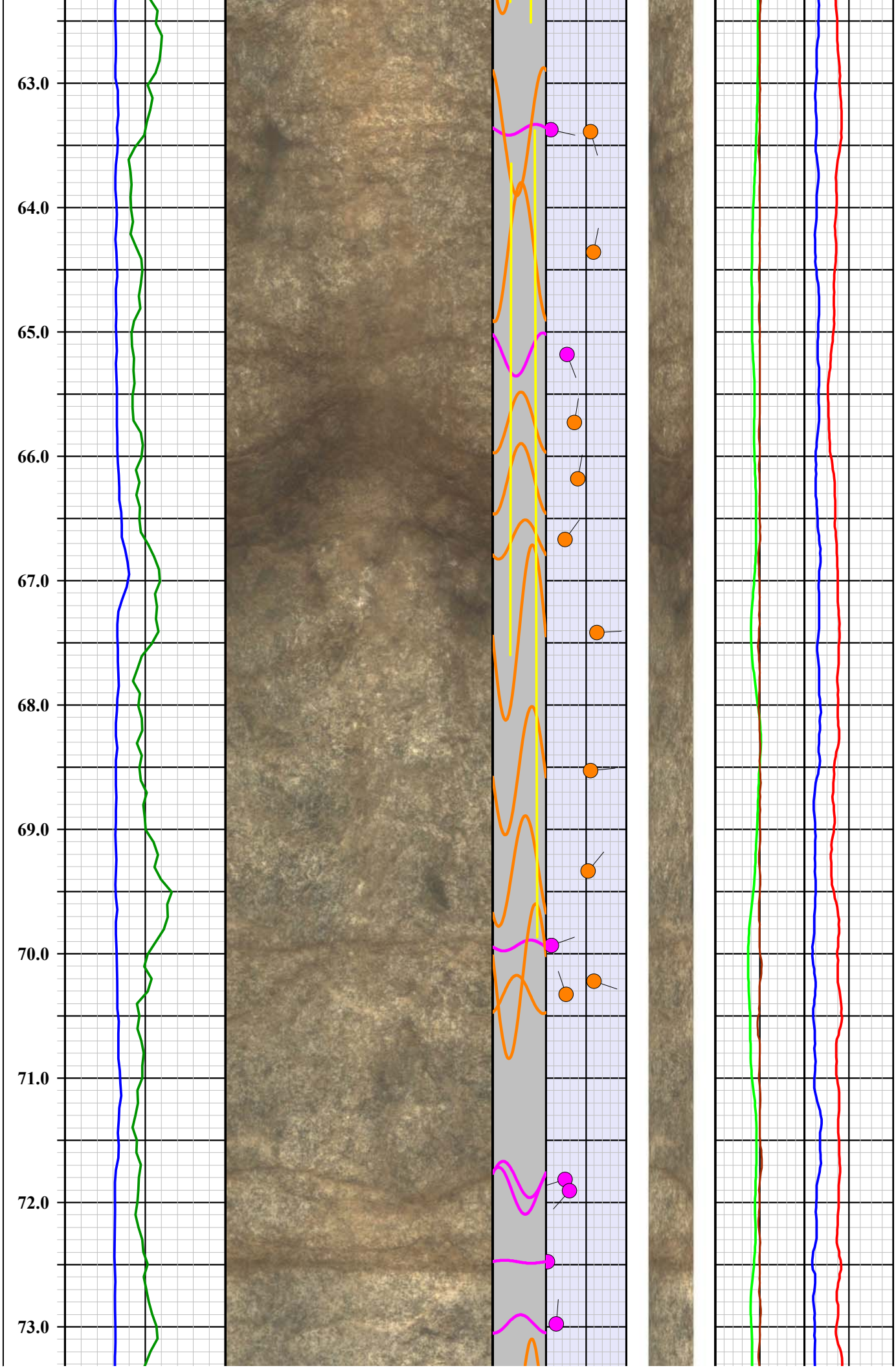
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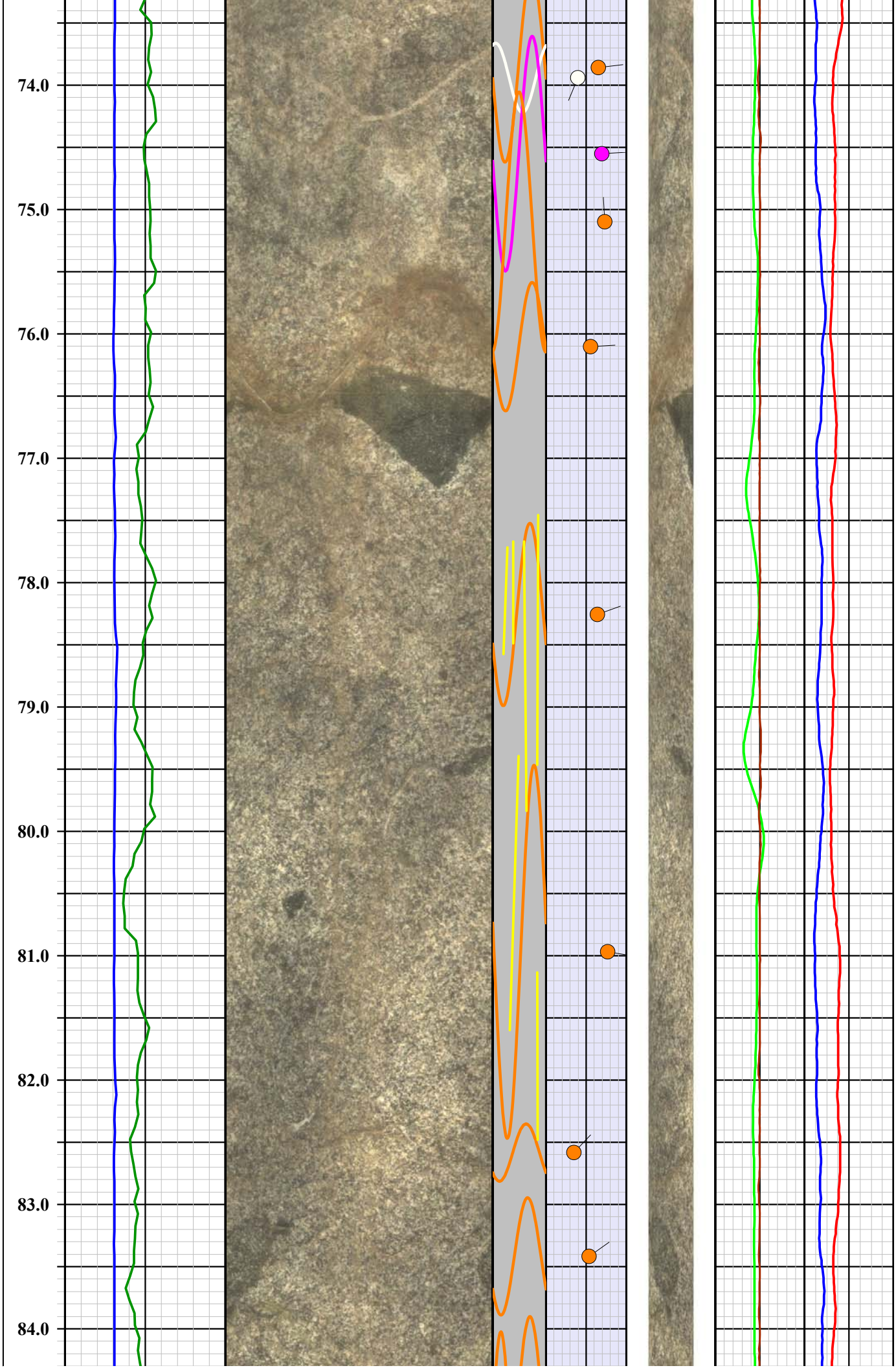
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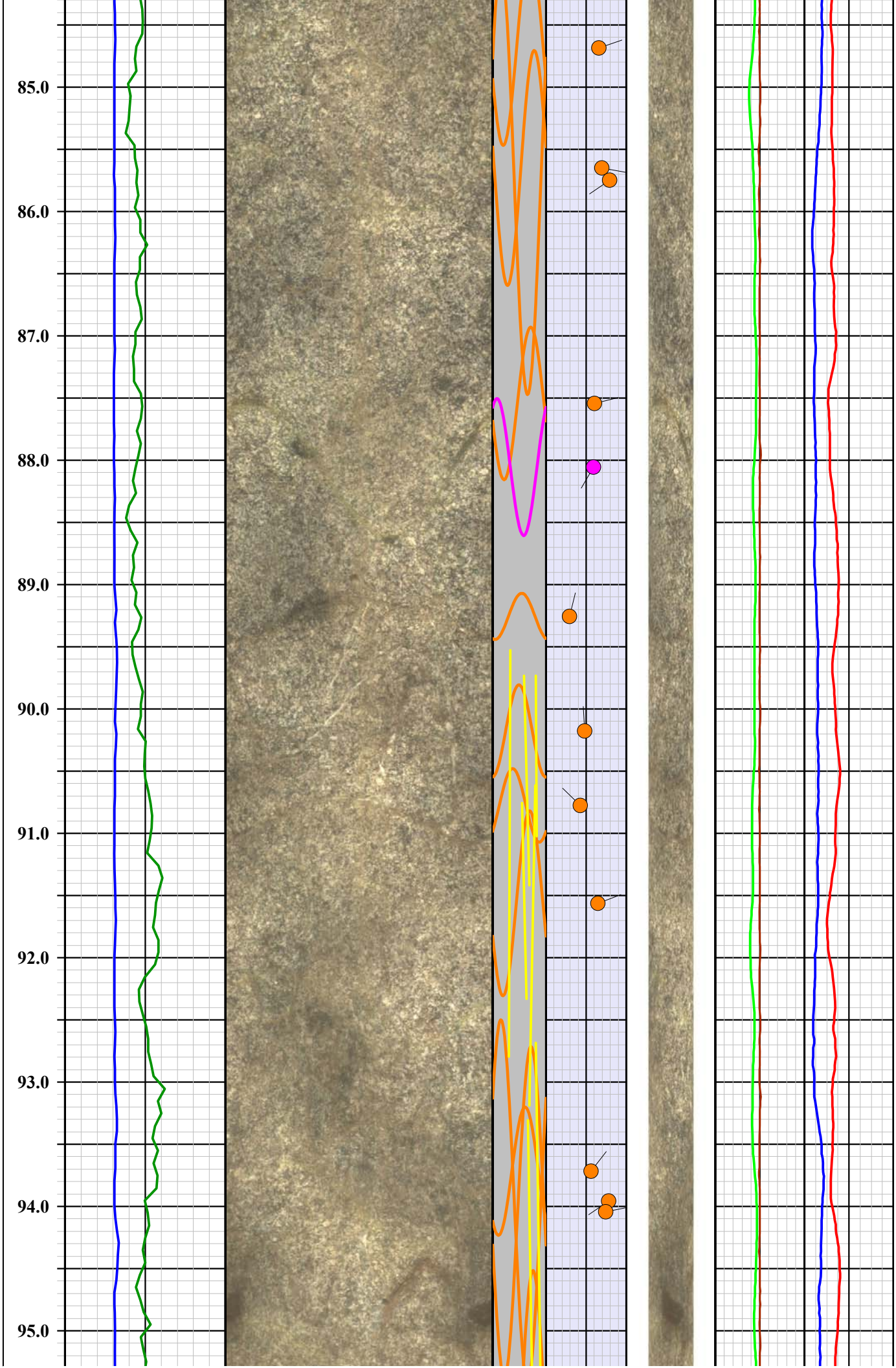
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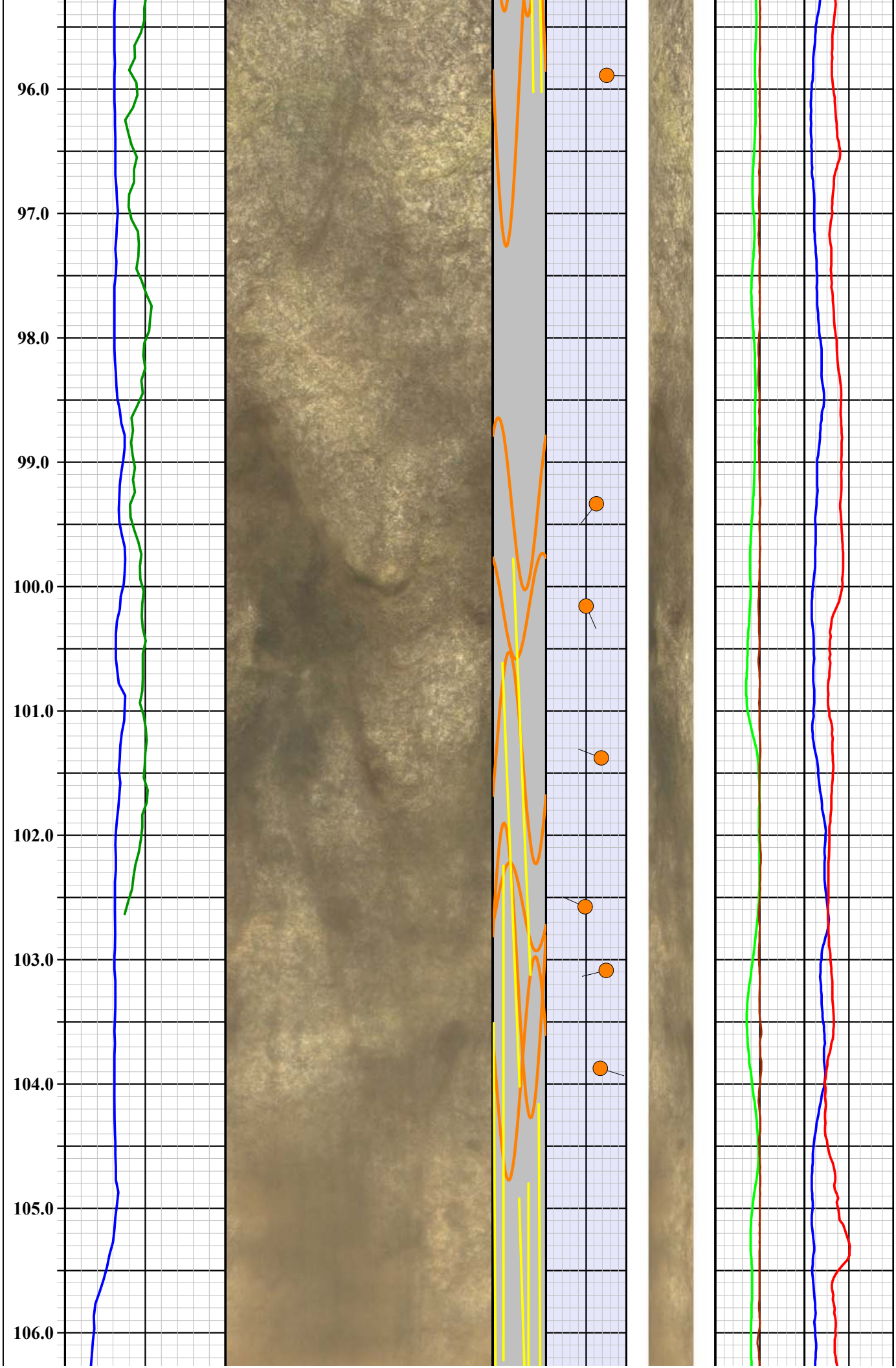
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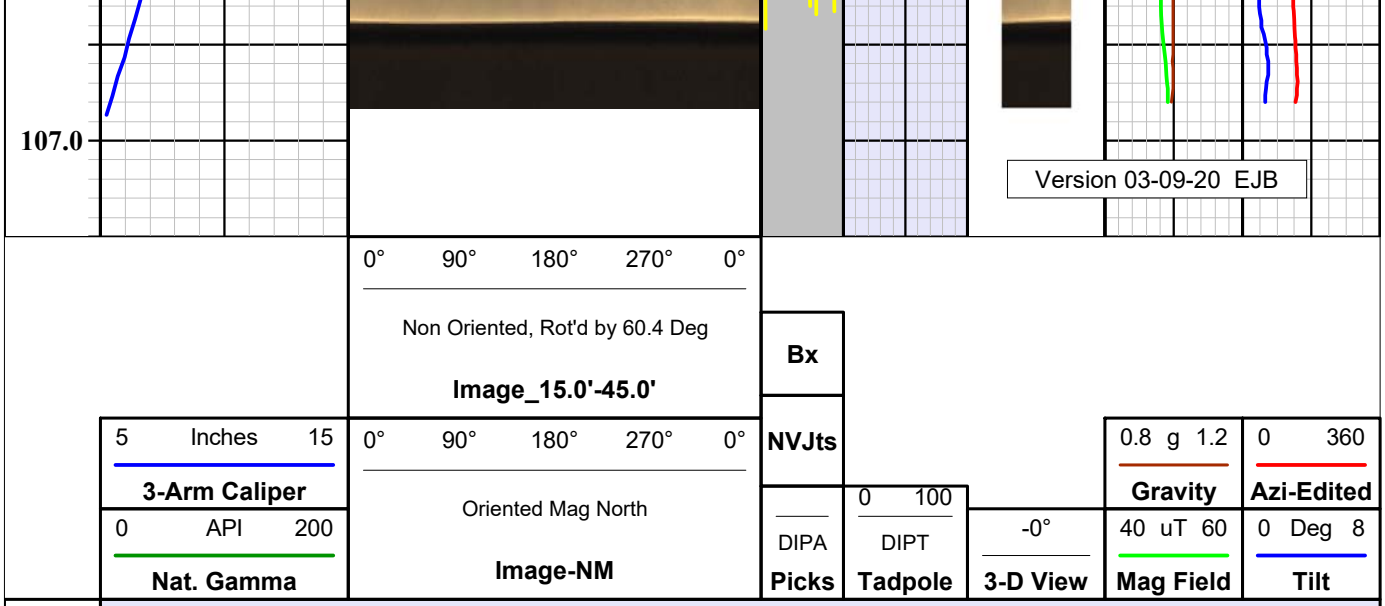
106.0



Legend

Mnemonics	Description
3-Arm Caliper	3-arm mechanical caliper of hole diameter plotted from 5 to 15 inches (blue line).
Nat. Gamma	Natural gamma ray log plotted from 0 to 200 API units (green line).
Image-NM	2D plot of optical image oriented to magnetic north. Plotted from left to right N-E-S-W-N.
Image_15.0'-45.0'	2D plot of optical image non-oriented and rotated by 60.4 deg to correct for magnetic affect in proximity of steel casing. Plotted from left to right N-E-S-W-N.
Picks	Planar strucutral features picked on optical borehole image shown as colored sinusoid (color designation shown on header) DIPA = dip apparent hole axis.
NVJts	Near Vertical (near parallel to hole axis) joint/fracture features picked on optical borehole image shown as colored sinusoid (color designation shown on header).
Bx	Apparent Breccia or Congomerate zones and Vugs/Vesicles/Cavities.
3-D View	3D cylindrical projection of OBI image viewed from north.
Tadpole	Tadpole plot of the OBI feature picks (fractures and bedding planes); plotted from 0 to 90 dip - see legend above. DIPT = True orientation; features corrected for hole deviation.
Mag Field	Total magnetic field strength as measured by fluxgate magnetometer in OBI or ABI deviation sensor - plotted 40-60 uT (green line).
Gravity	Total gravity (probe acceleration) as measured by 3-axis accelerometers in OBI deviation sensor - plotted 0.8-1.2 g (brown line).

Azi-Edited	Direction of tool tilt plotted 0 to 360 deg; edited for anomalous magnetic influence - represents borehole deviation direction (red line).
Tilt	Tool tilt (vertical = 0 and horizontal = 90) plotted 0 to 8 deg; represents borehole deviation tilt from vertical (blue line).
	Mnemonics prepared by Erika J Beam Version 03-09-20

QL OBI-40 2G Optical Borehole Imager

Probe Top = Depth Ref.

Tool SN: 145010, 152511 & 170106

Four Conductor MSI Probe Top

APS Probe Orientation Sensor
3-Axis Magnetometer
3-Axis Accellerometer

Probe Length = 1.66 m or 5.46 ft

Probe Weight = 5.3 kg or 11.7 lbs

Distance from Optical Image Window to Orientation Sensor = 0.9 m or 3 ft

Inclination Accuracy = +/- 0.5 deg
Azimuth Accuracy = +/- 1.0 deg

Temperature Range: 0 - 70 Deg C (32 - 158 Deg F)
Pressure Range: 0 - 200 bar (0 - 2900 psi)

External Bow Spring Centralizers

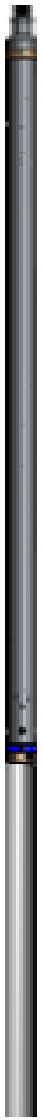
Operates in dry or clear water conditions.

OBI Imaging Window

1.6" or 40 mm Diameter

MSI Gamma-Caliper-Temperature-Fluid Resistivity

Probe Top = Depth Ref.



Single Conductor MSI Probe Top

Probe Length = 2.59 m or 8.5 ft
Probe Weight = 6.80 kg or 15.0 lbs

Natural Gamma and Caliper can only be collected logging up hole.

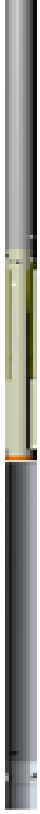
Fluid Temperature/Resistivity can only be collected logging down hole.

Temperature Rating: 70 Deg C (158 Deg F)
Presure Rating: 200 bar (2900 psi)

Natural Gamma Ray = 0.76 m (29.75 in)

NOTE: Lengths on a particular tool may vary from those listed on this document due to probe sizes and styles utilized

3-Arm Caliper = 1.44 m (56.75 in)



3-Arm Caliper = 1.44 m (56.75 in)

Distance from tool top: 2.20 m (86.5 in)

Available Arm Sizes: 3", 9", and 15"

TFR (Temperature/Fluid Resistivity) = 0.39 m (15.5 in)

1.375" or 34.9 mm Diameter

Southwest Exploration Services, LLC
borehole geophysics & video services

Company	GEOSYNTEC
Well	TTU EX-1
Field	TALLEY
County	MARICOPA
State	ARIZONA

Final Optical Televiewer Summary

Drill Hole: TTU EX-2 March 10, 2020, EJB

Geophysical Logs were collected by SwExp on February 16, 2020.
Features oriented to Magnetic North and corrected for borehole deviation to true orientation
Features picked/ranked by EJB Prior to March 10, 2020.

Ranking Scheme:

100 = Black = Bottom of Casing
104 = White = In-filled Joint/Fracture - mineralogy not determined
106 = Green = Bedding/banding/foliation
109 = Orange = Partially open Joint/Fracture
110 = Pink = Thin and/or discontinuous around circumference Joint/Fracture
111 = Yellow = Apparent Joint/Fracture terminates at fracture intersection
112 = Light Blue = Unclassified planar feature
305 = Red = Wide major Joint/Fracture
307 = Blue = Fluid Level

VFx = 2 Near vertical Joints/Fractures
VFx-W = 2 Wide Near vertical Joints/fractures
33 = >2 near vertical Joint/fractures
IFx = Possible drilling induced near vertical tensile fractures
Bx = Breccia/Collapse Breccia
Lg V = Large Vug/ Vugs/ or Vesicles (> 6" diameter)
MV = Medium Vug/ Vugs/ or Vesicles (2-6" diameter)
CNG = Small Vug/ Vugs/ or Vesicles (< 2" diameter)
Vein = infilled near vertical joint/fracture

Continuity
C1 Discontinuous - < 50%
C2 Slightly continuous - 50-75%
C3 Moderately continuous 75-100%
C4 High continuous – thin
C5 Very continuous – wide

Condition
0 – Smooth
1 – Rough
2 – Weathered
3 - Brec / Crushed
4 – Offset

Form
0 – Undulating/curved
1 – Planar
2 – Stepped
3 – Parting
4 – Styolitic

Remark
Open
Partially Open
Tight
Cemented/Filled
Partially Cemented

Filling (OBI)
No apparent filling
White soft
White
Dark soft
Dark
Sulfide/metallic
Stained Black
Stained Brown

Filling (ABI)
No apparent filling
Hard

Note: Some partially open features on the ABI image may be filled with soft material and may not be potential fluid pathways.

Image log was obtained in 2 pieces:
OBI from 20.0' to 108.3'
ABI from 38.9' to 108.3'

The OBI/ABI combined image from 20.0' to 108.3' is good throughout the logged interval.

*Depth for dipping fractures is midpoint depth; for near Vertical joints/fractures and Vugs it is Top Depth

Depth*	Btm Depth	Dip Dir	Tilt	Aperture	Classification	Continuity	Form	Condition	Filling	Remark
Ft	Ft	Deg	Deg	Inch/10						
20.04		134.0	0.80	0.00	100 - Bottom of Casing	C3 Moderately continuous 75-100%	1 - Planar	0 - Smooth		
21.02		295.8	15.17	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
26.05		64.2	18.06	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	0 - Smooth	No apparent filling	Partially Open
29.82		352.2	79.72	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
31.27		0.3	67.99	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
32.27		165.0	11.03	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
32.65		173.5	14.43	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
33.49		336.2	41.21	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
35.00		5.6	65.27	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
35.53		38.4	43.56	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
38.10		86.3	58.15	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
38.90		134.0	1.00	0.00	307 - Fluid Level	C3 Moderately continuous 75-100%	1 - Planar	0 - Smooth		
41.69		58.5	73.25	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
42.01		60.3	13.46	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
44.54		211.2	65.45	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
47.98		333.0	77.27	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
48.88		342.6	69.80	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
50.61		56.3	18.07	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
51.97		274.3	13.69	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
53.29		204.8	63.46	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
54.19		216.6	74.98	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
55.72		208.6	71.22	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
57.04		247.6	53.00	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
57.31		91.3	18.25	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
59.03		218.1	64.07	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
60.04		201.3	69.30	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
60.36		88.8	4.35	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
61.75		59.2	7.73	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
62.10		109.2	8.53	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
63.48		213.1	53.53	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
63.66		25.8	41.89	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
64.59		218.4	62.25	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
64.69		39.9	47.59	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
65.05		206.4	59.03	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
65.66		23.5	43.34	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
65.91		216.2	55.16	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
67.30		218.4	67.70	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
68.51		203.4	70.40	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
69.69		208.5	43.14	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
70.32		208.7	72.77	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
72.64		198.1	40.42	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
75.03		203.1	53.00	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
75.50		217.9	49.25	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
76.17		206.5	60.28	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open

77.84		189.2	46.27	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
78.55		5.9	35.16	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
79.50		163.0	59.92	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
81.32		169.4	52.50	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	Stained Brown	Partially Open
81.72		161.1	61.00	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	Stained Brown	Partially Open
82.91		110.4	45.78	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
83.70		59.1	22.33	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
84.41		77.1	38.17	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
85.67		84.9	41.54	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
87.23		213.3	57.76	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
87.61		95.9	7.20	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
93.46		134.1	12.20	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
94.59		157.4	77.57	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
94.62		27.7	37.26	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
96.62		39.5	48.88	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
97.46		34.8	23.75	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
98.07		291.7	27.14	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
98.67		94.0	16.04	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
99.19		59.0	58.06	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
99.98		248.6	67.46	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
100.38		218.0	66.66	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
100.55		237.7	59.20	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
100.84		1.1	21.61	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
101.20		9.2	55.26	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
101.99		233.6	58.38	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
104.24		345.9	51.03	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
104.45		338.1	30.75	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
104.80		114.3	78.64	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
106.53		204.3	66.19	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open

Vugs and Bx Features

VFx = 2 Near vertical Joints/Fractures
VFx-W = 2 Wide Near vertical Joints/fractures
33 = >2 near vertical Joint/fractures
IFx = Possible drilling induced near vertical tensile fractures
Bx = Breccia/Collapse Breccia
Lg V = Large Vug/ Vugs/ or Vesicles (> 6" diameter)
MV = Medium Vug/ Vugs/ or Vesicles (2-6" diameter)
CNG = Small Vug/ Vugs/ or Vesicles (< 2" diameter)
Vein = infilled near vertical joint/fracture
7 = Conglomerate - Sand matrix supported
8 = Conglomerate - Mud matrix supported
9 = Conglomerate - Clast supported

Breccia/Vugs/Vesicles Etc. on OBI/ABI combined image from 20.0' to 108.3'

Depth	Btm Depth				Ranking/Description
Ft	Ft				

Near Vertical (Near parallel to hole axis) Features

0 = Gray = Broken Zone/Undifferentiated
1 = Red = Major Breakout
2 = Orange = Minor Breakout
3 = Light Blue = Tensile Fracture
4 = Green = Filled Near Vertical Joint/Fx
5 = Yellow = Near Vertical Joint/Fx

OBI/ABI combined image from 20.0' to 108.3'

Depth* = mid-point of near vertical feature.
Tilt is referenced to hole axis - 0 Deg tilt is parallel to hole axis

Depth*	Azimuth	Tilt	Length	Opening	Classification
Ft	Deg	Deg	Ft	Deg	
40.20	263.7	-0.75	2.39	0.00	Near Vertical Joint/Fx
40.24	86.4	-0.61	2.59	0.00	Near Vertical Joint/Fx
41.55	303.3	0.64	1.42	0.00	Near Vertical Joint/Fx
41.61	132.5	-4.60	2.26	0.00	Near Vertical Joint/Fx
42.22	233.4	9.98	1.62	0.00	Near Vertical Joint/Fx
43.05	133.2	2.69	0.92	0.00	Near Vertical Joint/Fx
43.14	175.4	-10.26	1.74	0.00	Near Vertical Joint/Fx
43.36	219.6	-5.04	1.38	0.00	Near Vertical Joint/Fx
43.39	98.2	8.94	1.36	0.00	Near Vertical Joint/Fx
44.38	164.8	11.62	0.90	0.00	Near Vertical Joint/Fx
48.40	166.2	-0.47	3.79	0.00	Near Vertical Joint/Fx
48.98	258.5	0.58	3.11	0.00	Near Vertical Joint/Fx
51.65	67.9	-2.40	2.88	0.00	Near Vertical Joint/Fx
55.17	141.8	1.82	1.87	0.00	Near Vertical Joint/Fx
56.13	263.7	0.28	2.43	0.00	Near Vertical Joint/Fx
79.30	199.1	-3.49	1.55	0.00	Near Vertical Joint/Fx
87.13	191.2	-6.62	1.57	0.00	Near Vertical Joint/Fx
87.21	249.9	-3.05	1.17	0.00	Near Vertical Joint/Fx
91.01	31.0	5.25	3.32	0.00	Near Vertical Joint/Fx
91.33	239.3	-7.51	3.31	0.00	Near Vertical Joint/Fx
92.08	157.6	2.93	1.21	0.00	Near Vertical Joint/Fx
92.21	108.1	-3.74	1.07	0.00	Near Vertical Joint/Fx
96.93	323.7	-8.05	1.22	0.00	Near Vertical Joint/Fx
97.01	273.6	9.07	1.51	0.00	Near Vertical Joint/Fx

Southwest Exploration Services, LLC

borehole geophysics & video services

COMPANY	GEOSYNTEC
WELL ID	TTU EX-2
FIELD	TALLEY
COUNTY	MARICOPA STATE ARIZONA

TYPE OF LOGS: ACOUSTIC TELEVIEWER
MORE: CALIPER

LOCATION

SEC TWP RGE

OTHER SERVICES
GAMMA
TEMP / FLUID RES
OPTICAL TELEVIEWER

PERMANENT DATUM		ELEVATION	K.B.
LOG MEAS. FROM	GROUND LEVEL	ABOVE PERM. DATUM	D.F.
DRILLING MEAS. FROM	GROUND LEVEL		G.L.

DATE	02-16-20	TYPE FLUID IN HOLE	FORMATION WATER
RUN No	3	MUD WEIGHT	N/A
TYPE LOG	ACOUSTIC TELEVIEWER	VISCOSITY	N/A
DEPTH-DRILLER	110.0 FT	LEVEL	~39 FT
DEPTH-LOGGER	110.0 FT	MAX. REC. TEMP.	25.7 DEG C
BTM LOGGED INTERVAL	108.5 FT	IMAGE ORIENTED TO:	MAGNETIC NORTH
TOP LOGGED INTERVAL	38.0 FT	SAMPLE INTERVAL	0.1 FT
DRILLER / RIG#	N/A	LOGGING TRUCK	TRUCK #310
RECORDED BY / Logging Eng.	E. BEAM / T. GODSEY	TOOL STRING/SN	ALT QL ABI40 2G SN 192302
WITNESSED BY	FABRIZIO - GEOSYNTEC	LOG TIME:ON SITE/OFF SITE	7:00 AM

RUN	BOREHOLE RECORD			CASING RECORD			
NO.	BIT	FROM	TO	SIZE	WGT.	FROM	TO
1	?	SURFACE	20 FT	8.5 IN	STEEL	SURFACE	20 FT
2	8 IN	20 FT	TOTAL DEPTH				
3							

COMMENTS:

.

Tool Summary:

Date	02-16-20	**Date**	02-16-20	**Date**	02-16-20	**Date**	02-16-20
Run No.	1	**Run No.**	2	**Run No.**	3		
Tool Model	ALT QL OBI40 2G	**Tool Model**	MSI COMBO TOOL	**Tool Model**	ALT QL ABI40 2G		
Tool SN	170106	**Tool SN**	5446	**Tool SN**	192302		
From	SURFACE	**From**	SURFACE	**From**	37.0 FT		
To	108.5 FT	**To**	110.0 FT	**To**	108.5 FT		
Recorded By	E. BEAM	**Recorded By**	E. BEAM	**Recorded By**	E. BEAM		
Truck No	310	**Truck No**	310	**Truck No**	310		
Operation Check	01-30-20	**Operation Check**	02-16-20	**Operation Check**	02-14-20		
Calibration Check	N/A	**Calibration Check**	02-16-20	**Calibration Check**	N/A		
Time Logged	9:00 AM	**Time Logged**	9:30 AM	**Time Logged**	9:45 AM		

Date		**Date**		**Date**		**Date**	
Run No.	4	**Run No.**	5	**Run No.**	6		
Tool Model		**Tool Model**		**Tool Model**			
Tool SN		**Tool SN**		**Tool SN**			
From		**From**		**From**			
To		**To**		**To**			
Recorded By		**Recorded By**		**Recorded By**			
Truck No		**Truck No**		**Truck No**			
Operation Check		**Operation Check**		**Operation Check**			
Calibration Check		**Calibration Check**		**Calibration Check**			
Time Logged		**Time Logged**		**Time Logged**			

Additional Comments:

Caliper Arms Used: 9" **Calibration Points:** 4" & 10"

E-Log Calibration Range: N/A **Calibration Points:** N/A

Disclaimer:

All interpretations of log data are opinions based on inferences from electrical or other measurements. We do not guarantee the accuracy or correctness of any interpretations or recommendations and shall not be liable or responsible for any loss, costs, damages, or expenses incurred or sustained by anyone resulting from any interpretation made by any of our employees or agents. These interpretations are also subject to our general terms and conditions set out in our current Service Invoice.

Image Features Legend

- Btm of Casing
- Filled Fracture / Joint
- Bedding / Banding / Foliation / Veins
- Partially Open Joint / Fracture
- Minor Open Joint / Fracture
- OJ/Fx terminates at Fx intersection
- Unclassified
- Sulfide Vein
- Breakouts
- Major Open Joint / Fracture
- Fluid Level

Breakout Legend

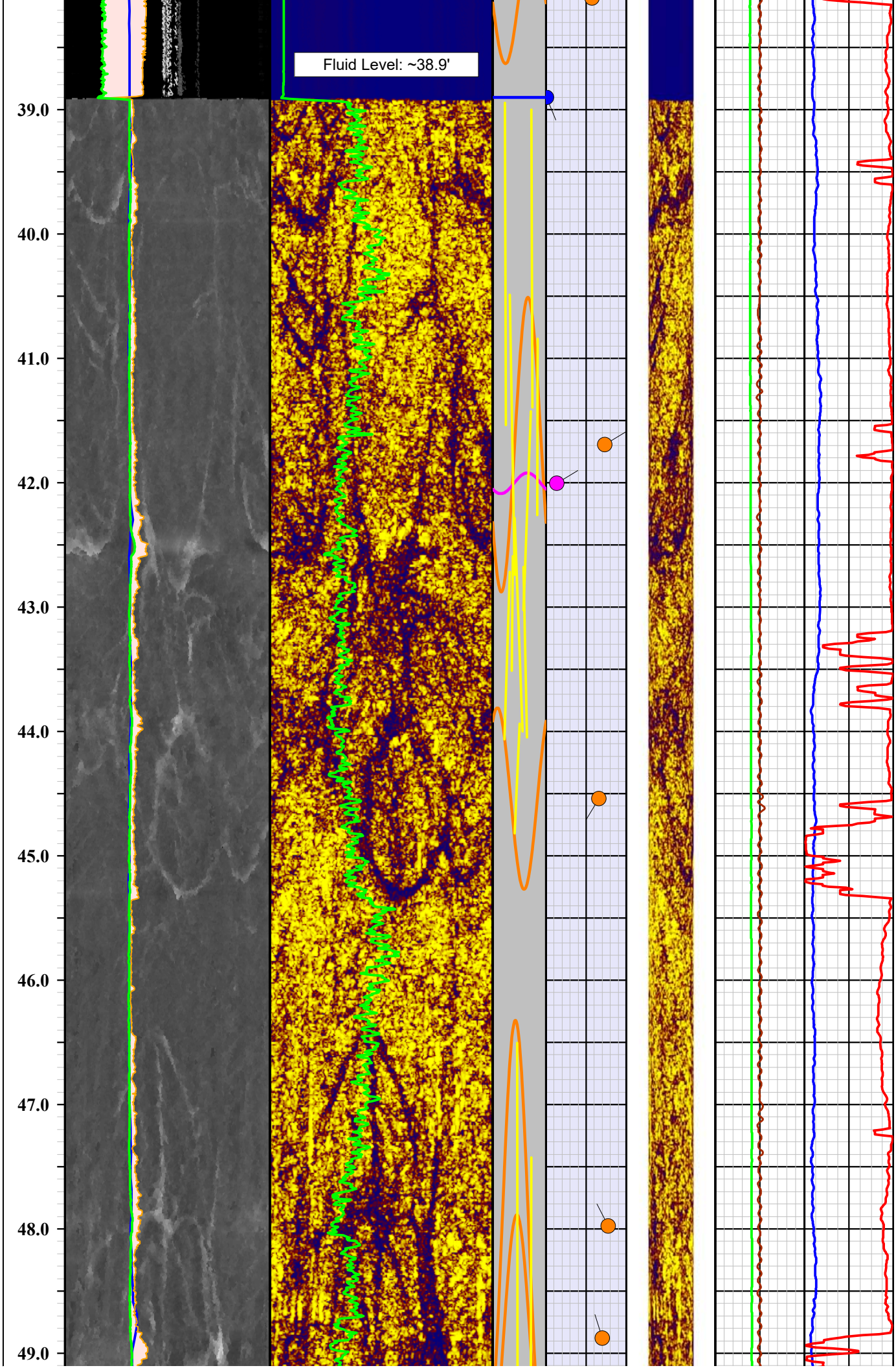
- Broken Zone / Undifferentiated
- Major Breakout
- Minor Breakout
- Tensile Fracture
- Filled Near Vertical Joint/Fx
- Near Vertical Joint/Fx

Bx Legend

- Breccia or Conglomerate
- Large Vugs/Vesicles (> 6")
- Medium Vugs/Vesicles (2-6")
- Small Vugs/Vesicles (< 2")
- Conglomerate - sand matrix supported
- Conglomerate - mud matrix supported
- Conglomerate - clast supported

Depth 1in:1ft	TTU EX-2 Well ABI40 2G Summary ~38.9' to ~108.3'						
	Centralized TT, Oriented Mag North, 0° 90° 180° 270° 0°	Amplitude-NM, Oriented Mag North, 0° 90° 180° 270° 0°	Picks: DIPA	Tadpole: DIPT, 0 100	3-D View, -0°	Mag Field: 40 uT 60	Tilt: 0 Deg 8
	3-Arm Caliper: 5 Inches 15	Amplitude-Static, Oriented Mag North, 0° 90° 180° 270° 0°	NVJts			Gravity: 0.8 g 1.2	Azimuth: 0 360
	Max-Acoustic Caliper: 5 Inches 15	ARI: 0 2000	Bx				
	Ave-Acoutic Caliper: 5 Inches 15						
	Enlargements						

38.0


Fluid Level: ~38.9'
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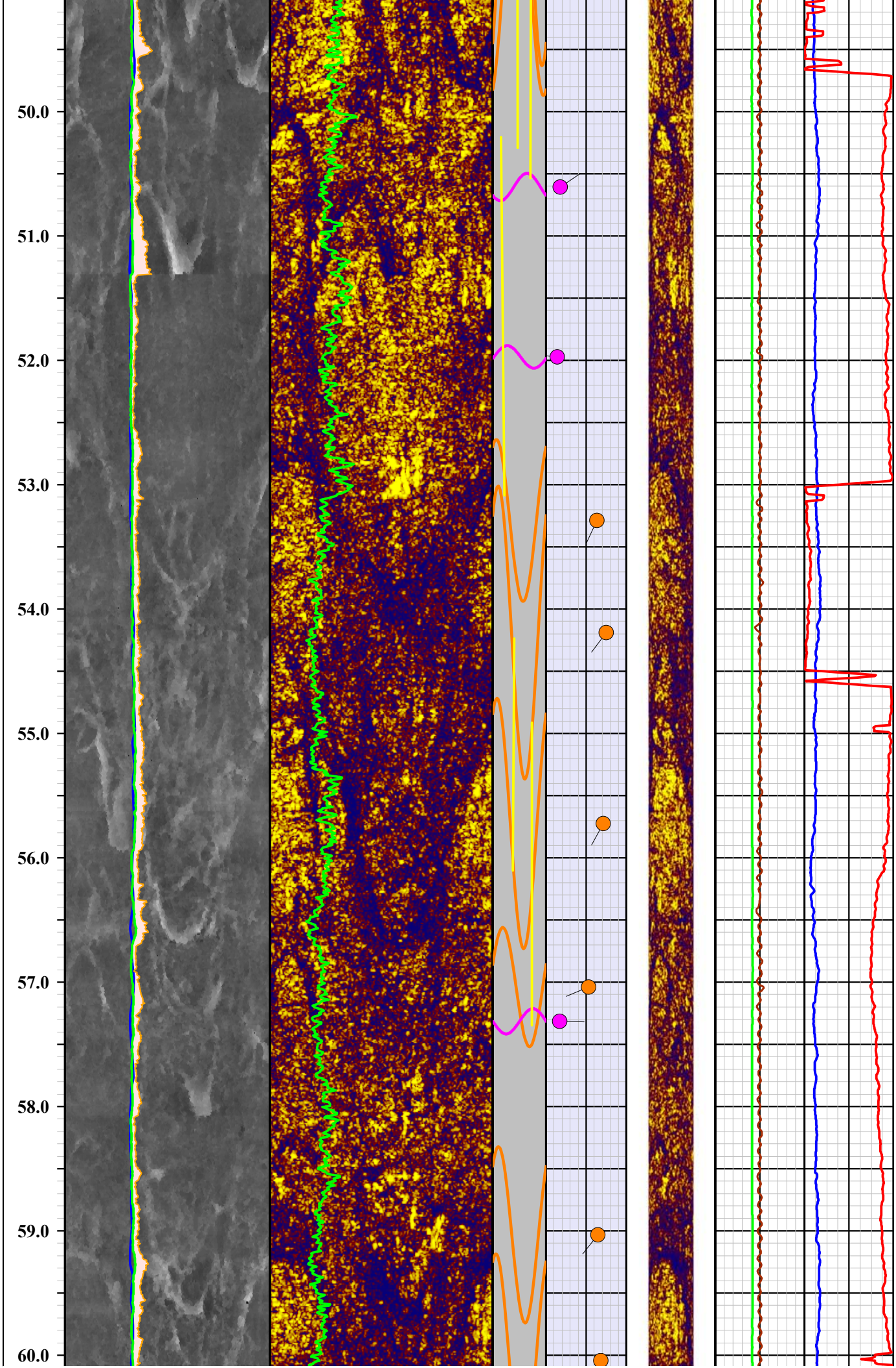
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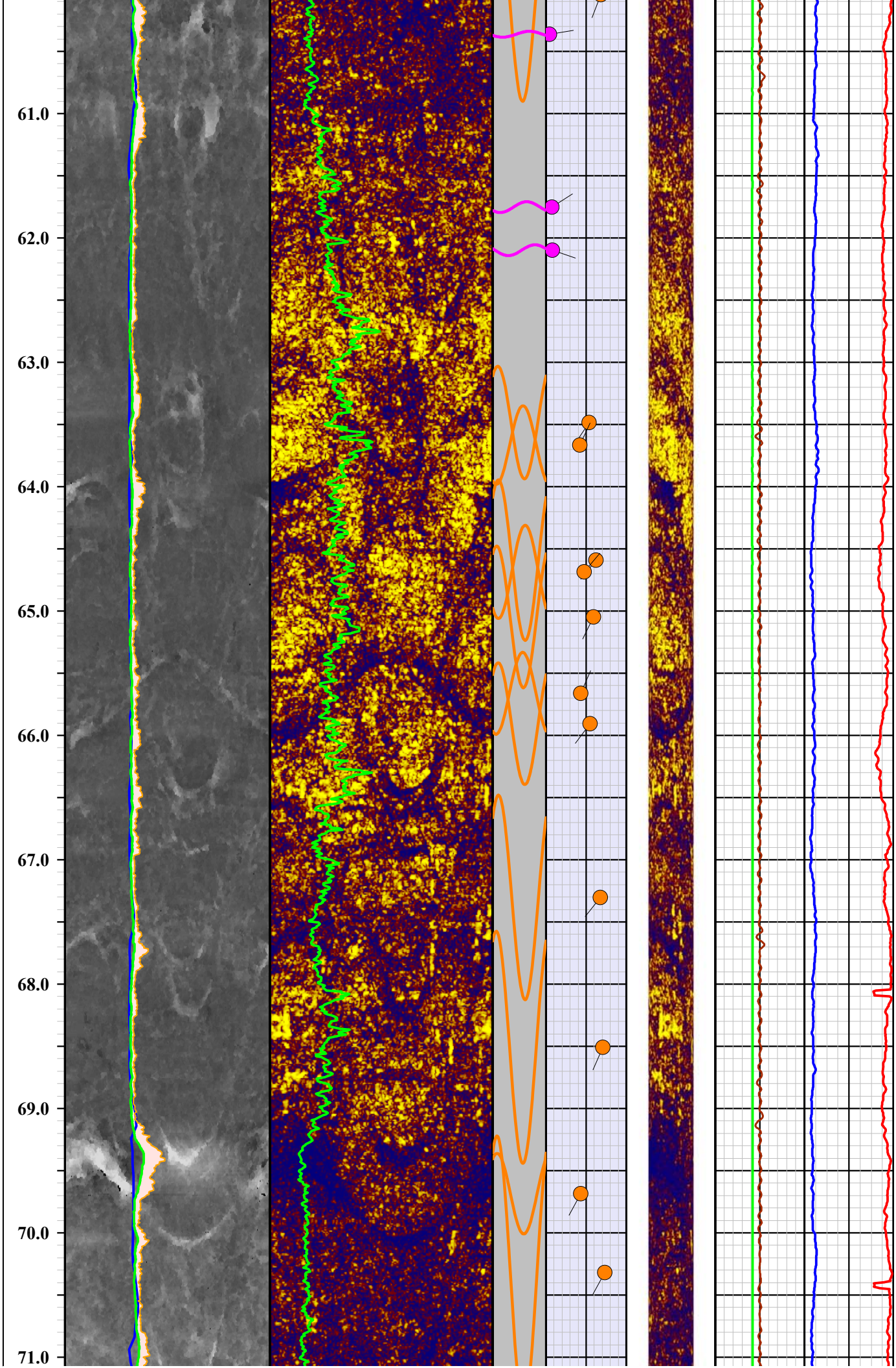
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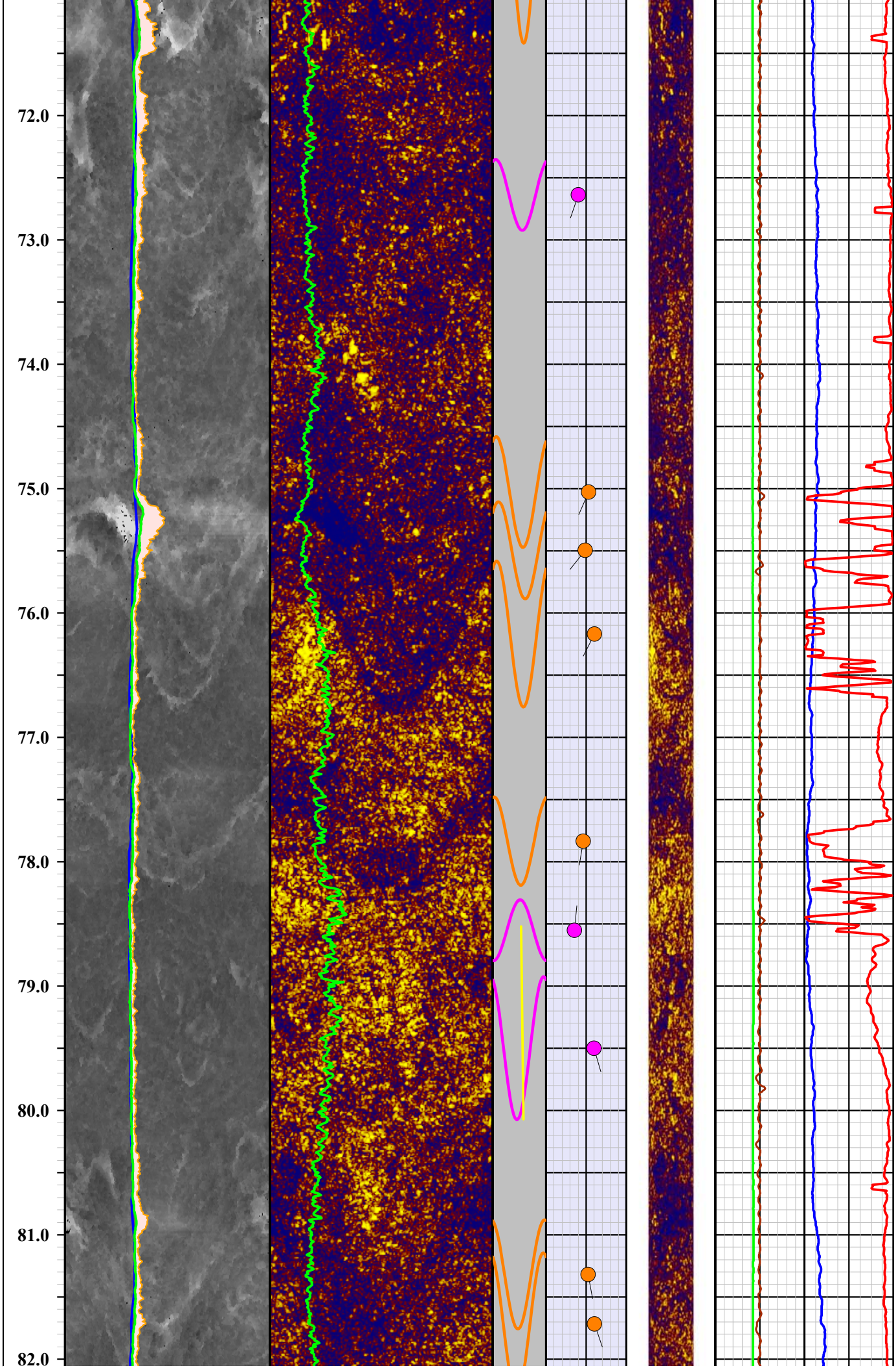
71.0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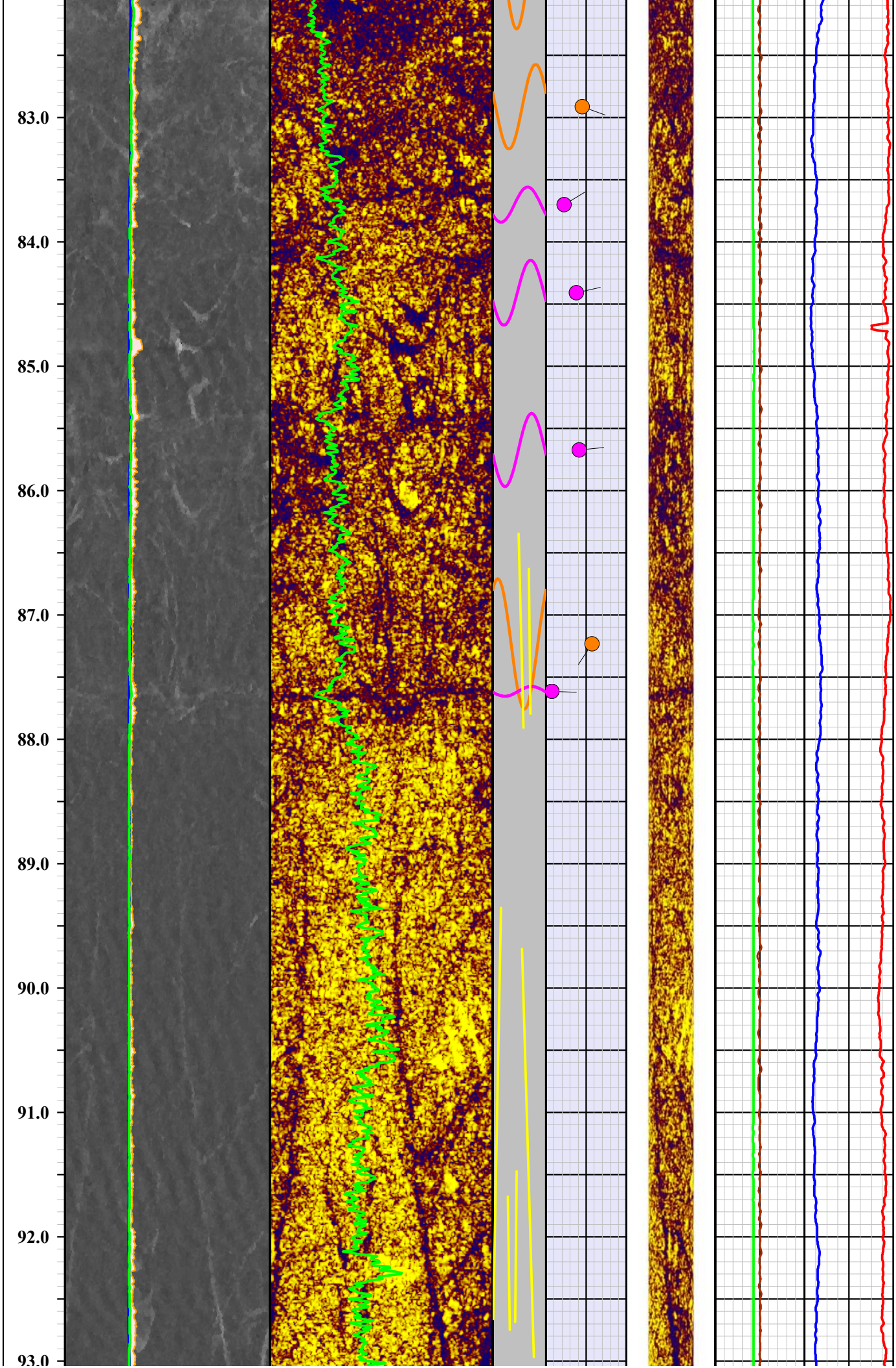
82.0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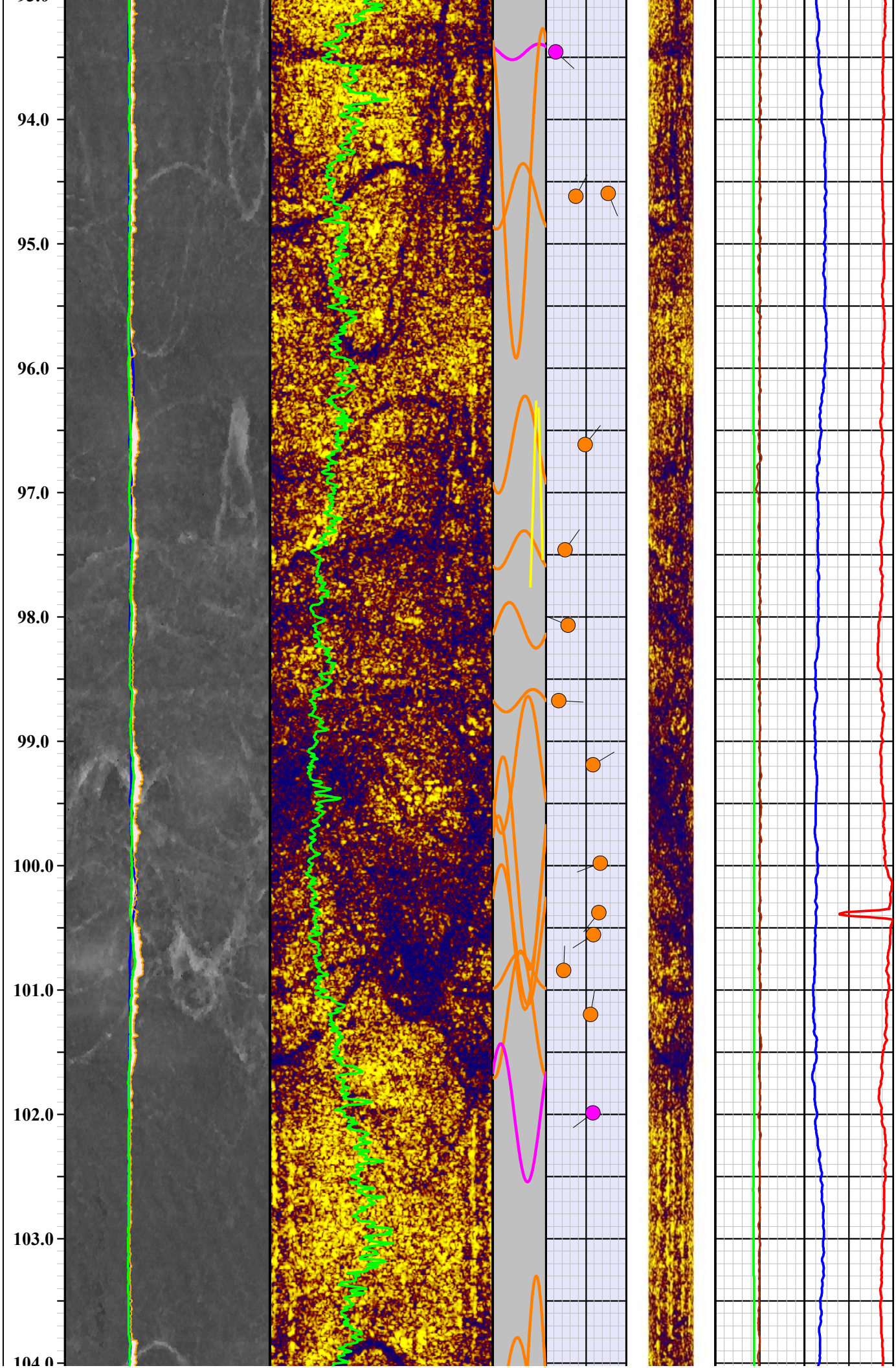
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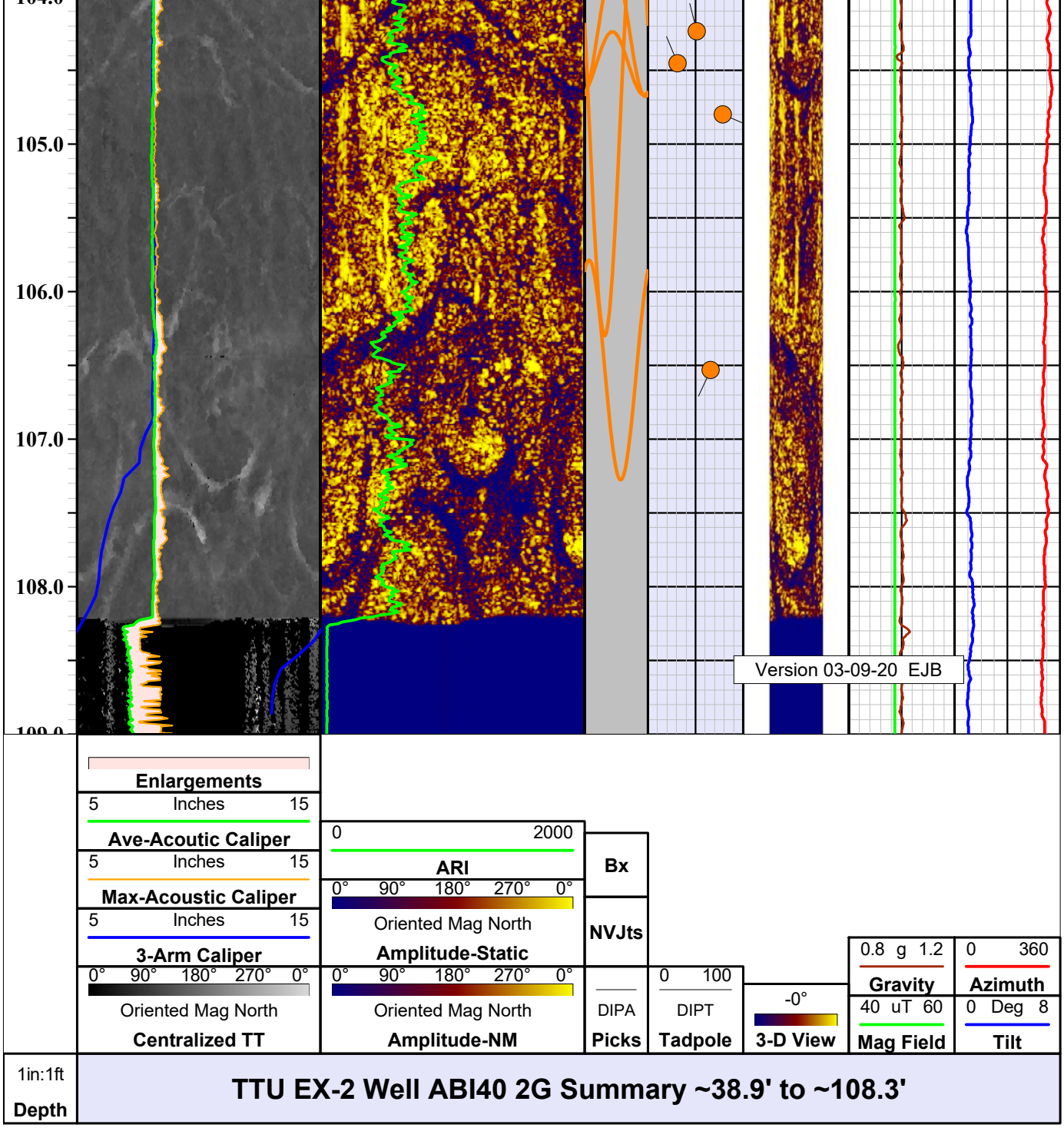


Legend

Mnemonics	Description
Centralized TT	2D plot of acoustic image travel time with probe position centralized. Oriented to magnetic north and plotted from left to right N-E-S-W-N.
3-Arm Caliper	3-arm mechanical caliper of hole diameter plotted from 5 to 15 inches (blue line).
Max-Acoustic Caliper	Maximum acoustic caliper of hole diameter calculated from Travel Time data and plotted as orange line from 5 to 15 inches.
Ave-Acoustic Caliper	Average acoustic caliper of hole diameter calculated from Travel Time data and plotted as bright green line from 5 to 15 inches.

Enlargements	Pink shaded zone between Ave-Acoustic Caliper and Max-Acoustic Caliper calculated from Travel Time data showing borehole enlargment.
Amplitude-NM	2D plot of unfiltered acoustic image amplitude oriented to magnetic north. Plotted from left to right N-E-S-W-N. Image toggled off.
Amplitude-Static	2D plot of acoustic image amplitude with Static normalization filter oriented to magnetic north. Plotted from left to right N-E-S-W-N. Image toggled on.
ARI	Acoustic Reflectance Index or relative rock hardness from ABI Amplitude log. Plotted 0 (soft) to 2000 (harder) as green line.
Picks	Planar strucutral features picked on acoustic borehole image shown as colored sinusoid (color designation shown on header) DIPA = dip apparent hole axis.
NVJts	Near Vertical (near parallel to hole axis) joint/fracture features picked on acoustic borehole image shown as colored sinusoid (color designation shown on header).
Bx	Apparent Breccia or Congomerate zones and Vugs/Vesicles/Cavities.
3-D View	3D cylindrical projection of ABI image using Centralized TT log for hole shape looking from North.
Tadpole	Tadpole plot of the ABI feature picks (fractures and bedding planes); plotted from 0 to 90 dip - see legend above. DIPT = True orientation; features corrected for hole deviation.
Mag Field	Total magnetic field strength as measured by fluxgate magnetometer in OBI or ABI deviation sensor - plotted 40-60 uT (green line).
Gravity	Total gravity (probe acceleration) as measured by 3-axis accelerometers in ABI deviation sensor - plotted 0.8-1.2 g (brown line).
Azimuth	Direction of tool tilt plotted 0 to 360 deg - represents borehole deviation direction (red line).
Tilt	Tool tilt (vertical = 0 and horizontal = 90) plotted 0 to 8 deg; represents borehole deviation tilt from vertical (blue line).

Mnemonics prepared by Erika J Beam
Version 03-09-20

QL ABI-40 2G Acoustic Borehole Imager

Probe Top = Depth Ref.

Tool SN: 143003, 143009 & 192302

Four Conductor MSI Probe Top

APS Probe Orientation Sensor
3-Axis Magnetometer
3-Axis Accellerometer

Probe Length = 1.62 m or 5.25 ft

Probe Weight = 6.7 kg or 14.7 lbs

Distance from Acoustic Image Window to Orientation Sensor = 0.92 m or 3 ft

Inclination Accuracy = +/- 0.5 deg
Azimuth Accuracy = +/- 1.2 deg

Beam Width = 1.5 mm

Frequency = 1.2 MHz

Temperature Range: 0 - 70 Deg C (32 - 158 Deg F)
Pressure Range: 0 - 200 bar (0 - 2900 psi)

Run Centralized with External Bow Spring Centralizers

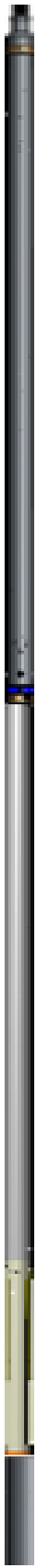
Can only be logged in fluid filled holes

ABI Imaging Window

1.6" or 40 mm Diameter

MSI Gamma-Caliper-Temperature-Fluid Resistivity

Probe Top = Depth Ref.



Single Conductor MSI Probe Top

Probe Length = 2.59 m or 8.5 ft
Probe Weight = 6.80 kg or 15.0 lbs

Natural Gamma and Caliper can only be collected logging up hole.

Fluid Temperature/Resistivity can only be collected logging down hole.

Temperature Rating: 70 Deg C (158 Deg F)
Presure Rating: 200 bar (2900 psi)

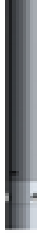
Natural Gamma Ray = 0.76 m (29.75 in)

NOTE: Lengths on a particular tool may vary from those listed on this document due to probe sizes and styles utilized

3-Arm Caliper = 1.44 m (56.75 in)

Distance from tool top: 2.20 m (86.5 in)

Available Arm Sizes: 3", 9", and 15"



TFR (Temperature/Fluid Resistivity) = 0.39 m (15.5 in)

1.375" or 34.9 mm Diameter

Southwest Exploration Services, LLC borehole geophysics & video services	Company GEOSYNTEC Well TTU EX-2 Field TALLEY County MARICOPA State ARIZONA

Final Acoustic Televiewer Summary

Southwest Exploration Services, LLC

borehole geophysics & video services

COMPANY	GEOSYNTEC
WELL ID	TTU EX-2
FIELD	TALLEY
COUNTY	MARICOPA STATE ARIZONA

TYPE OF LOGS: GAMMA - CALIPER
MORE: TEMP / FLUID RES

LOCATION

SEC TWP RGE

OTHER SERVICES
ACOUSTIC TELEVIEWER
OPTICAL TELEVIEWER

PERMANENT DATUM		ELEVATION	K.B.
LOG MEAS. FROM	GROUND LEVEL	ABOVE PERM. DATUM	D.F.
DRILLING MEAS. FROM	GROUND LEVEL		G.L.

DATE	02-16-20	TYPE FLUID IN HOLE	FORMATION WATER
RUN No	2	MUD WEIGHT	N/A
TYPE LOG	GAMMA-CALIPER-TFR	VISCOSITY	N/A
DEPTH-DRILLER	110.0 FT	LEVEL	~39 FT
DEPTH-LOGGER	110.0 FT	MAX. REC. TEMP.	25.7 DEG C
BTM LOGGED INTERVAL	110.0 FT	IMAGE ORIENTED TO:	N/A
TOP LOGGED INTERVAL	SURFACE	SAMPLE INTERVAL	0.1 FT
DRILLER / RIG#	N/A	LOGGING TRUCK	TRUCK #310
RECORDED BY / Logging Eng.	E. BEAM / T. GODSEY	TOOL STRING/SN	MSI COMBO TOOL SN 5546
WITNESSED BY	FABRIZIO - GEOSYNTEC	LOG TIME:ON SITE/OFF SITE	7:00 AM

RUN	BOREHOLE RECORD			CASING RECORD			
NO.	BIT	FROM	TO	SIZE	WGT.	FROM	TO
1	?	SURFACE	20 FT	8.5 IN	STEEL	SURFACE	20 FT
2	8 IN	20 FT	TOTAL DEPTH				
3							

COMMENTS:

.

Tool Summary:

Date	02-16-20	02-16-20	02-16-20
Run No.	1	2	3
Tool Model	ALT QL OBI40 2G	MSI COMBO TOOL	ALT QL ABI40 2G
Tool SN	170106	5446	192302
From	SURFACE	SURFACE	37.0 FT
To	108.5 FT	110.0 FT	108.5 FT
Recorded By	E. BEAM	E. BEAM	E. BEAM
Truck No	310	310	310
Operation Check	01-30-20	02-16-20	02-14-20
Calibration Check	N/A	02-16-20	N/A
Time Logged	9:00 AM	9:30 AM	9:45 AM

Date			
Run No.	4	5	6
Tool Model			
Tool SN			
From			
To			
Recorded By			
Truck No			
Operation Check			
Calibration Check			
Time Logged			

Additional Comments:

Caliper Arms Used: 9" **Calibration Points:** 4" & 10"

E-Log Calibration Range: N/A **Calibration Points:** N/A

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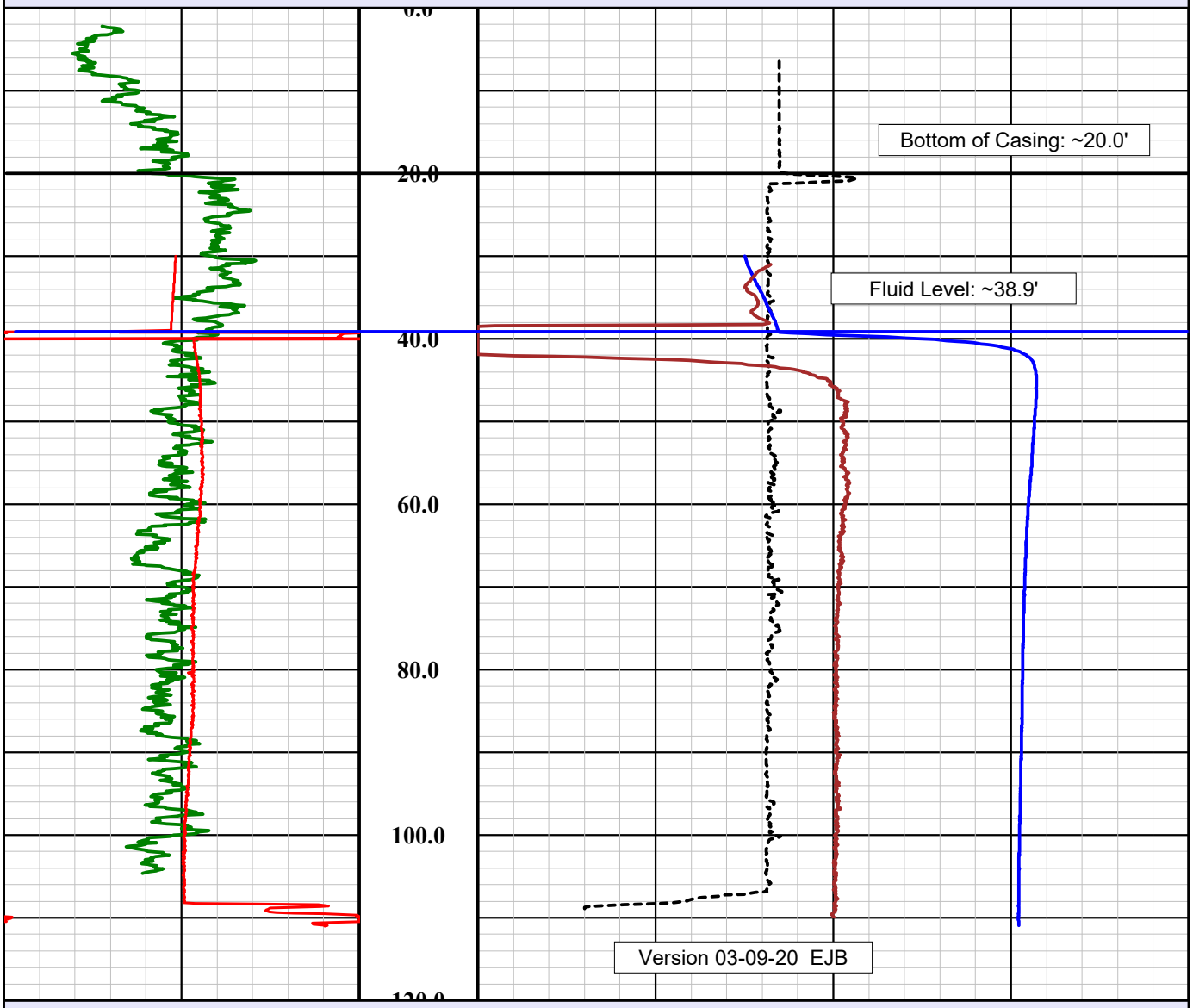
Nat. Gamma	Depth	3-Arm Caliper
0 API 200	1in:20ft	0 Inches 20
Fluid Resistivity		**Temperature**
0 Ohm-m 20		10 Deg C 30
		2-Ft Diff. Temp.
		-1 Deg C 1

TTU EX-2 Well GCT Summary Surface to ~111.0'



TTU EX-2 Well GCT Summary Surface to ~111.0'

		-1 Deg C 1
		2-Ft Diff. Temp.
0 Ohm-m 20		10 Deg C 30

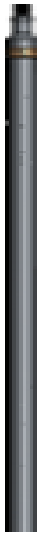
Fluid Resistivity		Temperature
0 API 200	1in:20ft	0 Inches 20
Nat. Gamma	Depth	3-Arm Caliper

Legend

Mnemonics	Description
Nat. Gamma	Natural gamma ray log plotted 0 to 200 API (green line).
Fluid Resistivity	Electrical resistivity of a borehole's fluid plotted from 0 to 20 ohm-m as red line.
3-Arm Caliper	3-arm mechanical caliper of hole diameter plotted from 0 to 20 inches (black dashed line).
Temperature	Borehole fluid temperature plotted from 10 to 30 degrees C (blue line).
2-Ft Diff. Temp.	Differential temperature over 2-ft spacing (brown line).
	Mnemonics prepared by Erika J. Beam Version 03-09-20

MSI Gamma-Caliper-Temperature-Fluid Resistivity

Probe Top = Depth Ref.



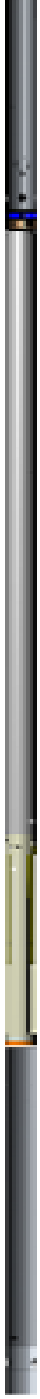
Single Conductor MSI Probe Top

Probe Length = 2.59 m or 8.5 ft
Probe Weight = 6.80 kg or 15.0 lbs

Natural Gamma and Caliper can only be collected logging up hole.

Fluid Temperature/Resistivity can only be collected logging down hole.

Temperature Rating: 70 Deg C (158 Deg F)
Presure Rating: 200 bar (2900 psi)



Natural Gamma Ray = 0.76 m (29.75 in)

NOTE: Lengths on a particular tool may vary from those listed on this document due to probe sizes and styles utilized

3-Arm Caliper = 1.44 m (56.75 in)

Distance from tool top: 2.20 m (86.5 in)

Available Arm Sizes: 3", 9", and 15"

TFR (Temperature/Fluid Resistivity) = 0.39 m (15.5 in)

1.375" or 34.9 mm Diameter

Southwest Exploration Services, LLC
borehole geophysics & video services

Company	GEOSYNTEC
Well	TTU EX-2
Field	TALLEY
County	MARICOPA
State	ARIZONA

Final GCT Summary

Southwest Exploration Services, LLC

borehole geophysics & video services

COMPANY	GEOSYNTEC
WELL ID	TTU EX-2
FIELD	TALLEY
COUNTY	MARICOPA STATE ARIZONA

TYPE OF LOGS: OPTICAL TELEVIEWER
MORE: GAMMA - CALIPER

LOCATION

SEC TWP RGE

OTHER SERVICES
ACOUSTIC TELEVIEWER
TEMP / FLUID RES.

PERMANENT DATUM		ELEVATION	K.B.
LOG MEAS. FROM	GROUND LEVEL	ABOVE PERM. DATUM	D.F.
DRILLING MEAS. FROM	GROUND LEVEL		G.L.

DATE	02-16-20	TYPE FLUID IN HOLE	FORMATION WATER
RUN No	2	MUD WEIGHT	N/A
TYPE LOG	OPTICAL TELEVIEWER	VISCOSITY	N/A
DEPTH-DRILLER	110.0 FT	LEVEL	~39 FT
DEPTH-LOGGER	110.0 FT	MAX. REC. TEMP.	25.7 DEG C
BTM LOGGED INTERVAL	108.5 FT	IMAGE ORIENTED TO:	MAGNETIC NORTH
TOP LOGGED INTERVAL	SURFACE	SAMPLE INTERVAL	0.010 FT
DRILLER / RIG#	N/A	LOGGING TRUCK	TRUCK #310
RECORDED BY / Logging Eng.	E. BEAM / T. GODSEY	TOOL STRING/SN	ALT QL OBI40 2G SN 170106
WITNESSED BY	FABRIZIO - GEOSYNTEC	LOG TIME:ON SITE/OFF SITE	7:00 AM

RUN	BOREHOLE RECORD			CASING RECORD			
NO.	BIT	FROM	TO	SIZE	WGT.	FROM	TO
1	?	SURFACE	20 FT	8.5 IN	STEEL	SURFACE	20 FT
2	8 IN	20 FT	TOTAL DEPTH				
3							

COMMENTS:

.

Tool Summary:

Date	02-16-20	**Date**	02-16-20	**Date**	02-16-20		
Run No.	1	**Run No.**	2	**Run No.**	3		
Tool Model	ALT QL OBI40 2G	**Tool Model**	MSI COMBO TOOL	**Tool Model**	ALT QL ABI40 2G		
Tool SN	170106	**Tool SN**	5446	**Tool SN**	192302		
From	SURFACE	**From**	SURFACE	**From**	37.0 FT		
To	108.5 FT	**To**	110.0 FT	**To**	108.5 FT		
Recorded By	E. BEAM	**Recorded By**	E. BEAM	**Recorded By**	E. BEAM		
Truck No	310	**Truck No**	310	**Truck No**	310		
Operation Check	01-30-20	**Operation Check**	02-16-20	**Operation Check**	02-14-20		
Calibration Check	N/A	**Calibration Check**	02-16-20	**Calibration Check**	N/A		
Time Logged	9:00 AM	**Time Logged**	9:30 AM	**Time Logged**	9:45 AM		
Date		**Date**		**Date**			
Run No.	4	**Run No.**	5	**Run No.**	6		
Tool Model		**Tool Model**		**Tool Model**			
Tool SN		**Tool SN**		**Tool SN**			
From		**From**		**From**			
To		**To**		**To**			
Recorded By		**Recorded By**		**Recorded By**			
Truck No		**Truck No**		**Truck No**			
Operation Check		**Operation Check**		**Operation Check**			
Calibration Check		**Calibration Check**		**Calibration Check**			
Time Logged		**Time Logged**		**Time Logged**			

Additional Comments:

Caliper Arms Used: 9" **Calibration Points:** 4" & 10"

E-Log Calibration Range: N/A **Calibration Points:** N/A

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Image Features Legend

- Btm of Casing
- Filled Fracture / Joint
- Bedding / Banding / Foliation / Veins
- Partially Open Joint / Fracture
- Minor Open Joint / Fracture
- OJ/Fx terminates at Fx intersection
- Unclassified
- Sulfide Vein
- Breakouts
- Major Open Joint / Fracture
- Fluid Level

Breakout Legend

- Broken Zone / Undifferentiated
- Major Breakout
- Minor Breakout
- Tensile Fracture
- Filled Near Vertical Joint/Fx
- Near Vertical Joint/Fx

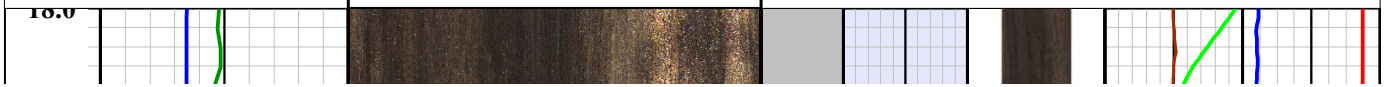
Bx Legend

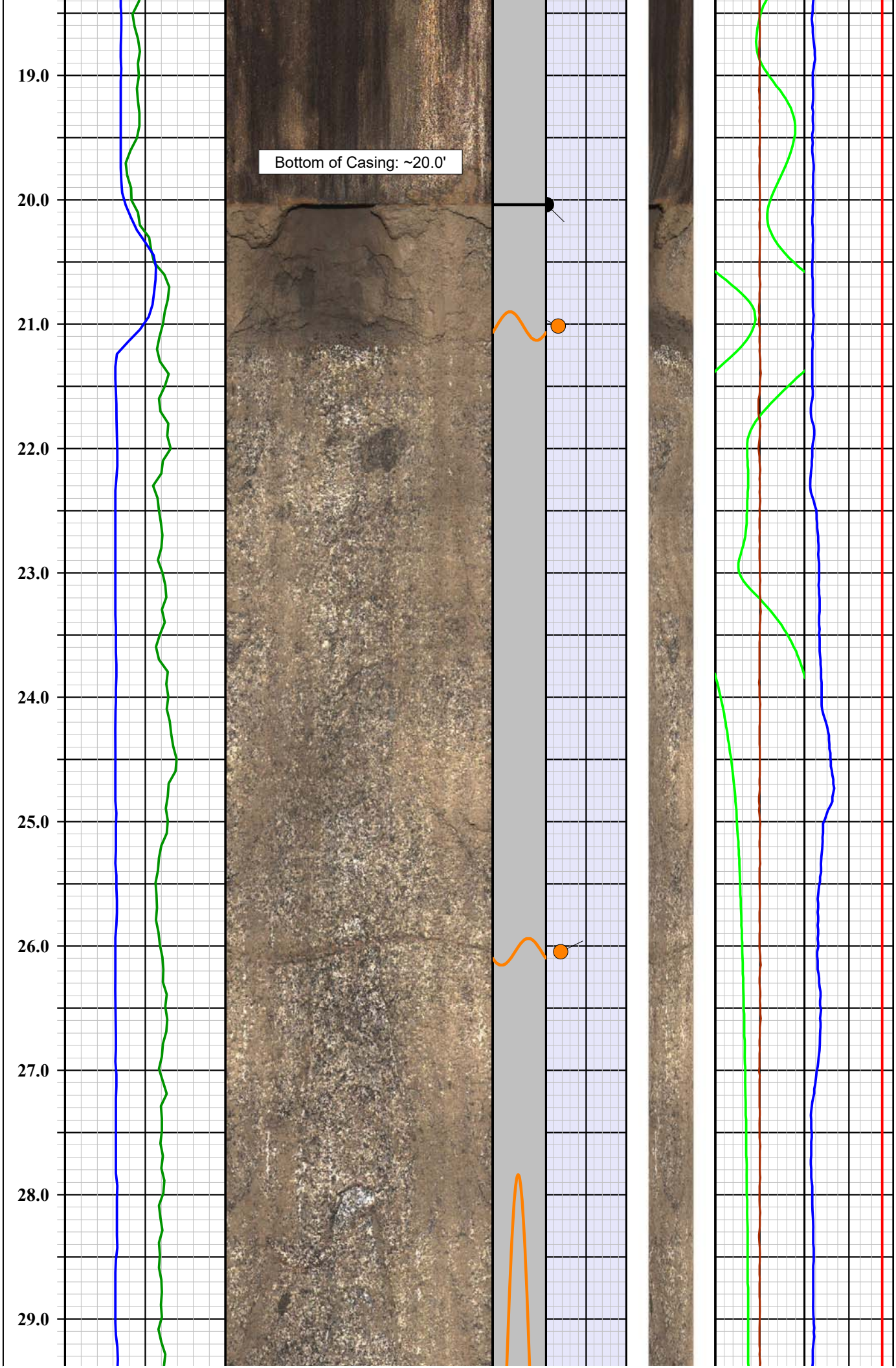
- Breccia or Conglomerate
- Large Vugs/Vesicles (> 6")
- Medium Vugs/Vesicles (2-6")
- Small Vugs/Vesicles (< 2")
- Conglomerate - sand matrix supported
- Conglomerate - mud matrix supported
- Conglomerate - clast supported

TTU EX-2 Well OBI40 2G Summary ~20.0' to ~108.3'

Depth 1in:1ft

Nat. Gamma	Image-NM	Picks	Tadpole	3-D View	Mag Field	Tilt
0 API 200	Oriented Mag North	DIPA	DIPT 0 100	-0°	40 uT 60	0 Deg 8
3-Arm Caliper					**Gravity**	**Azi-Edited**
5 Inches 15	0° 90° 180° 270° 0°	NVJts			0.8 g 1.2	0 360
	Image_18.0'-40.5'	Bx				
	Non Oriented, Rot'd by 88.4 Deg					
	0° 90° 180° 270° 0°					

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28.0
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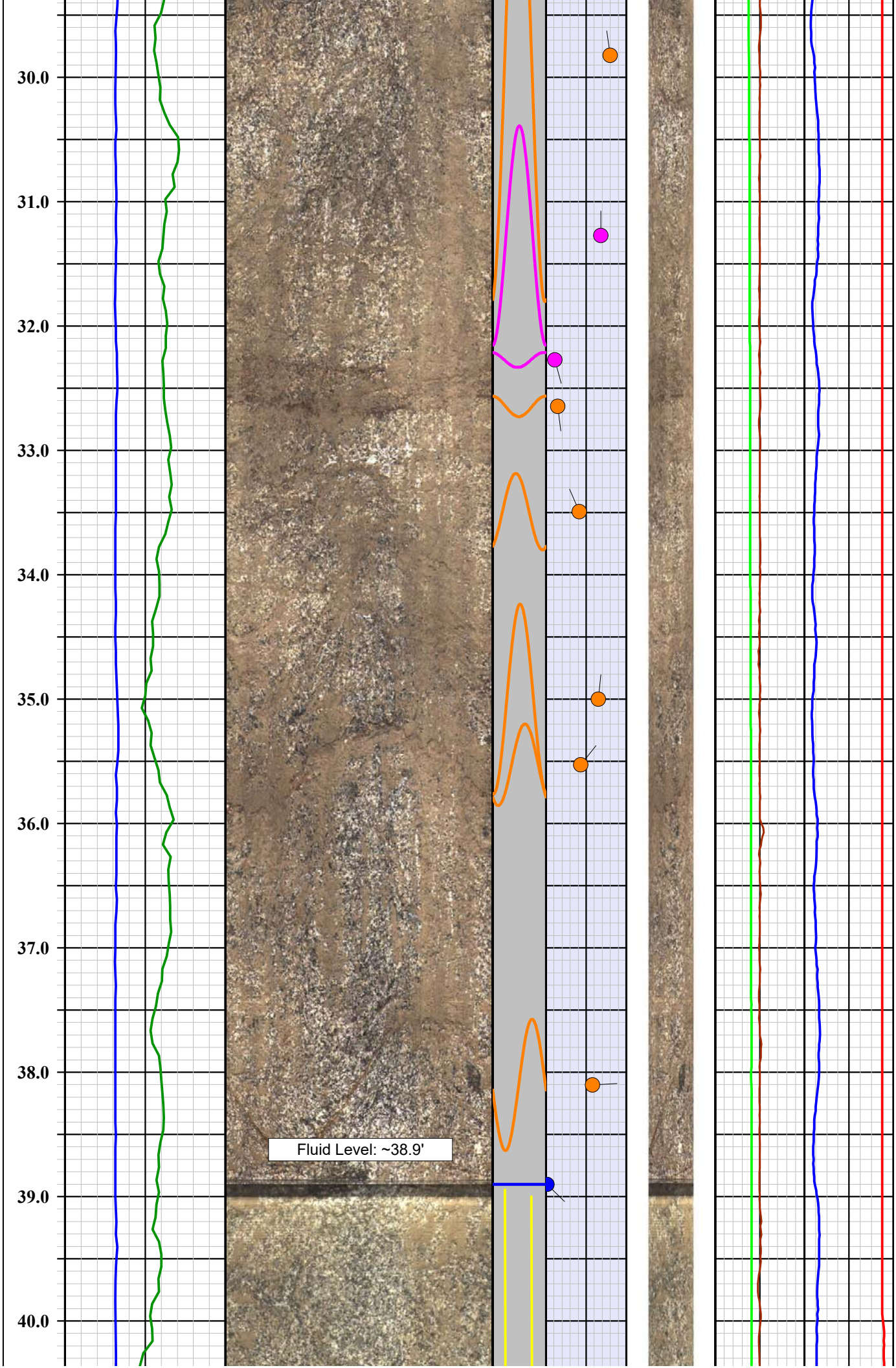
Bottom of Casing: ~20.0'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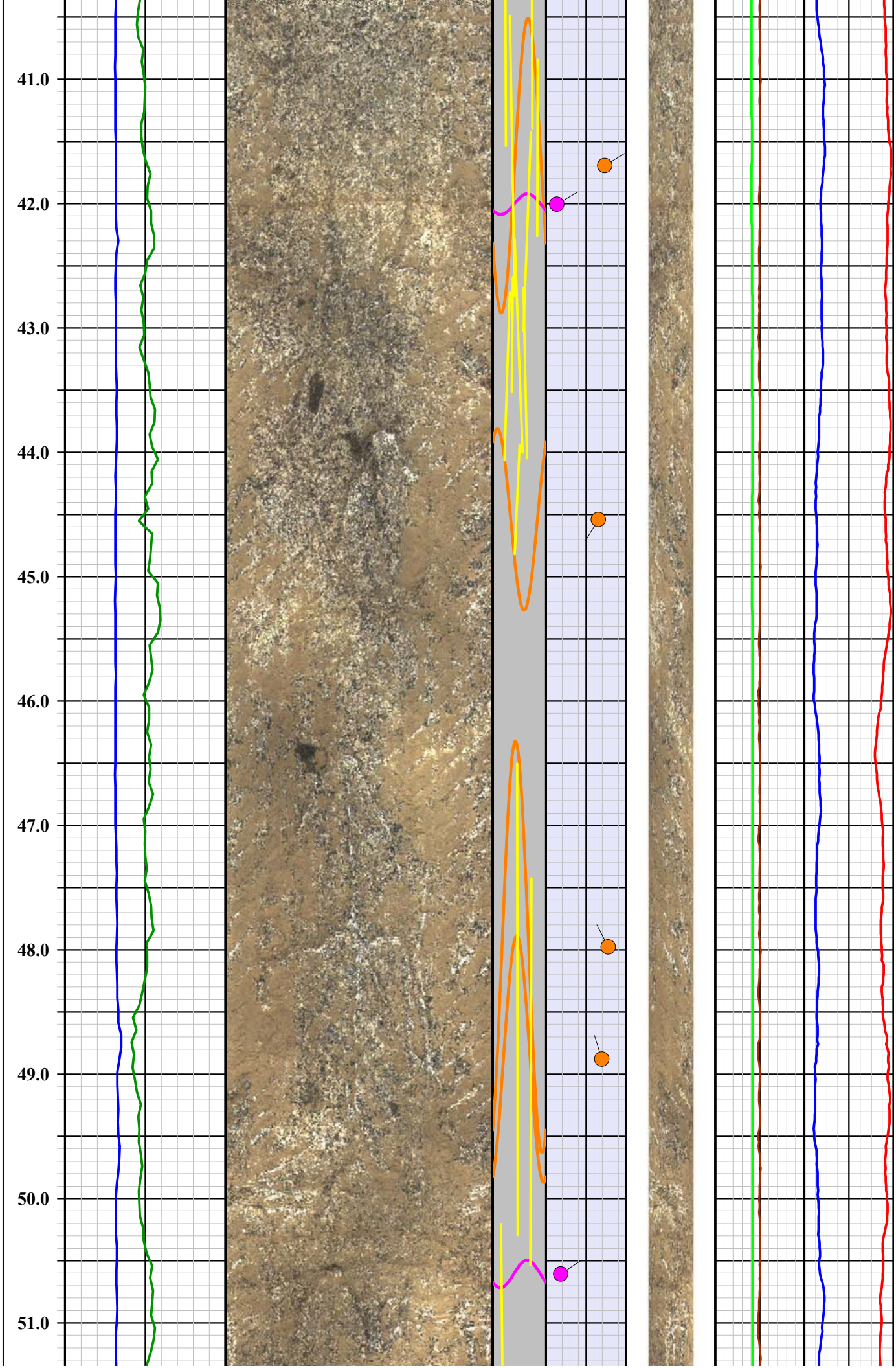
Fluid Level: ~38.9'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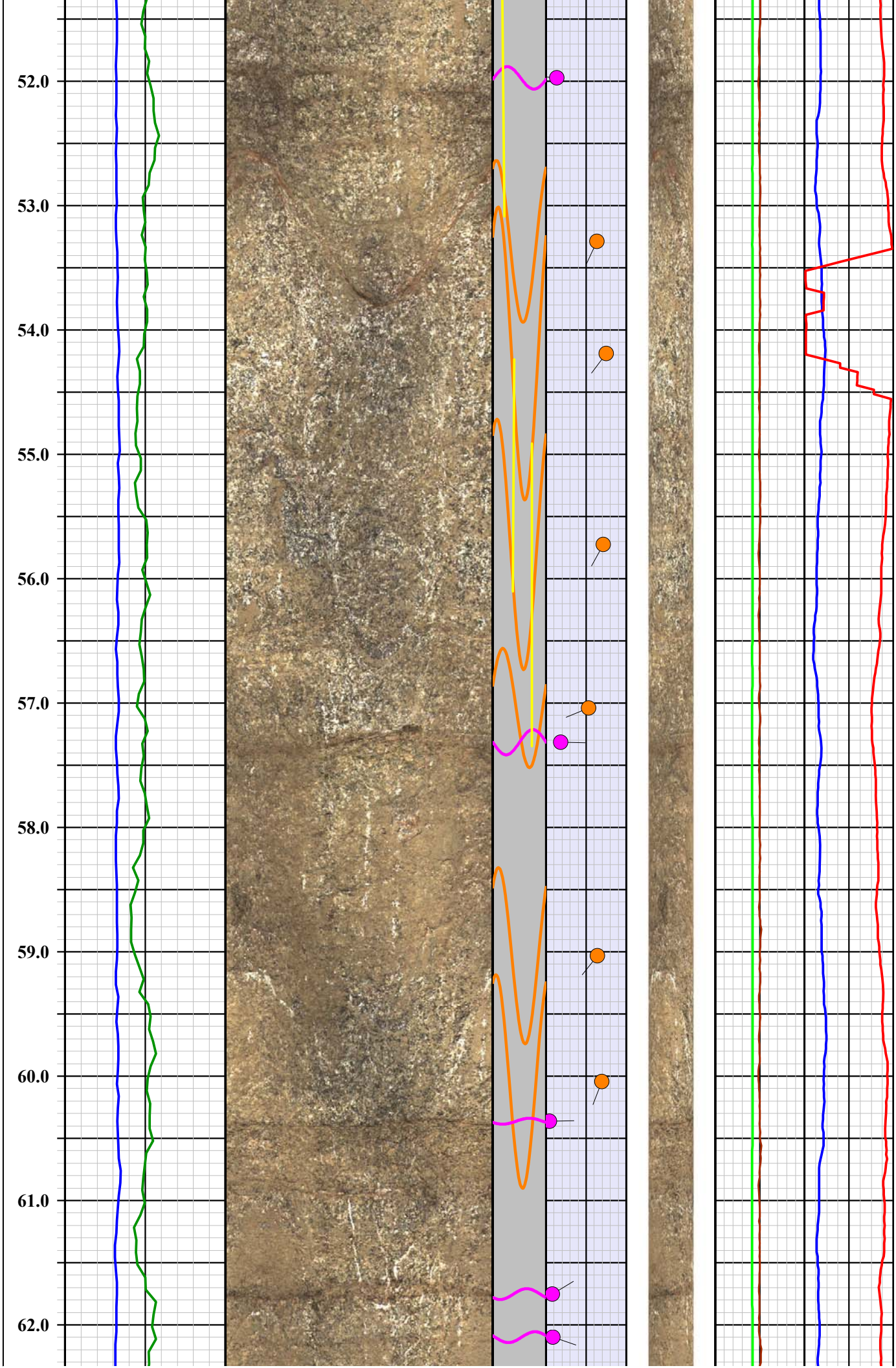
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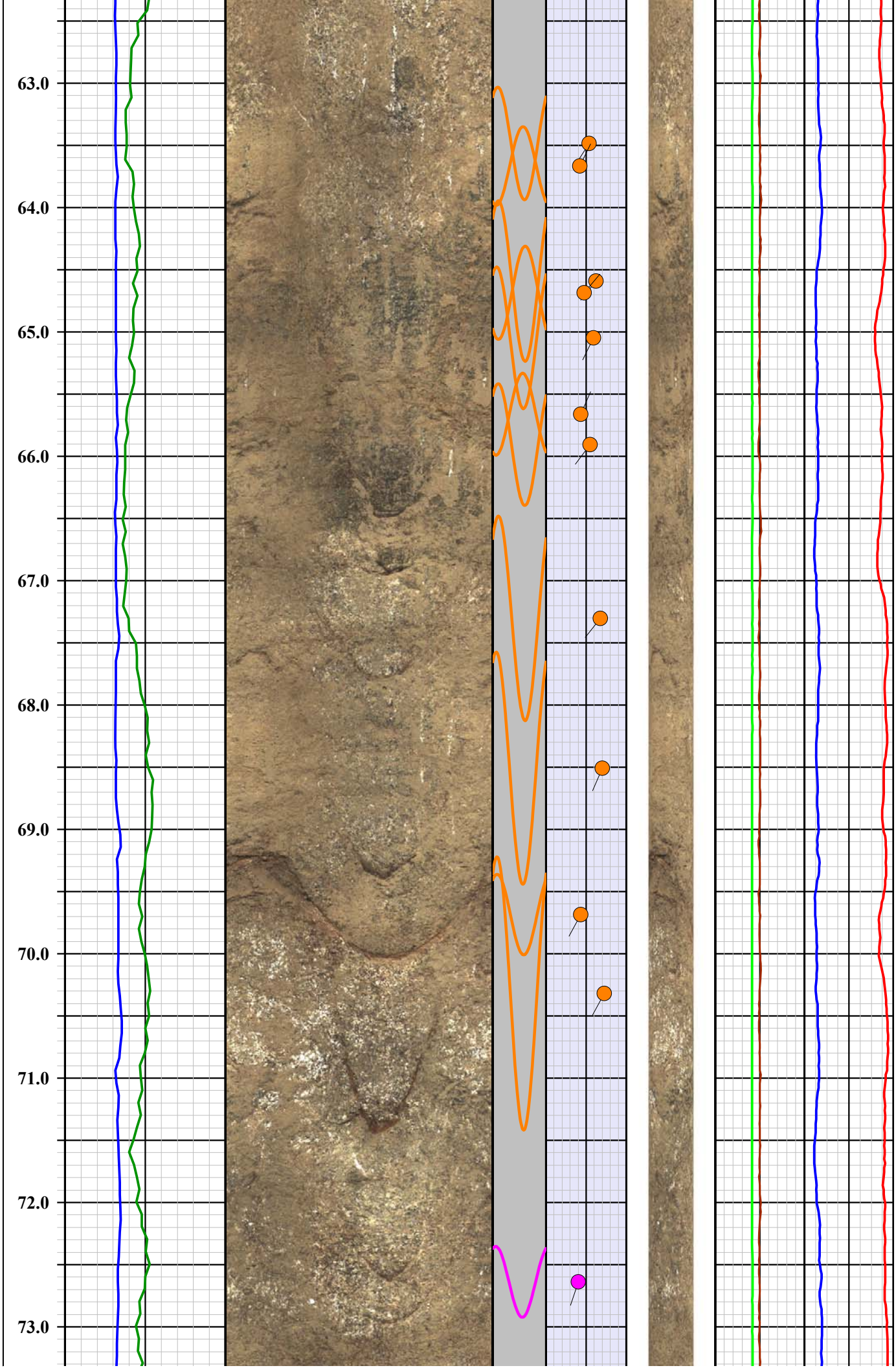
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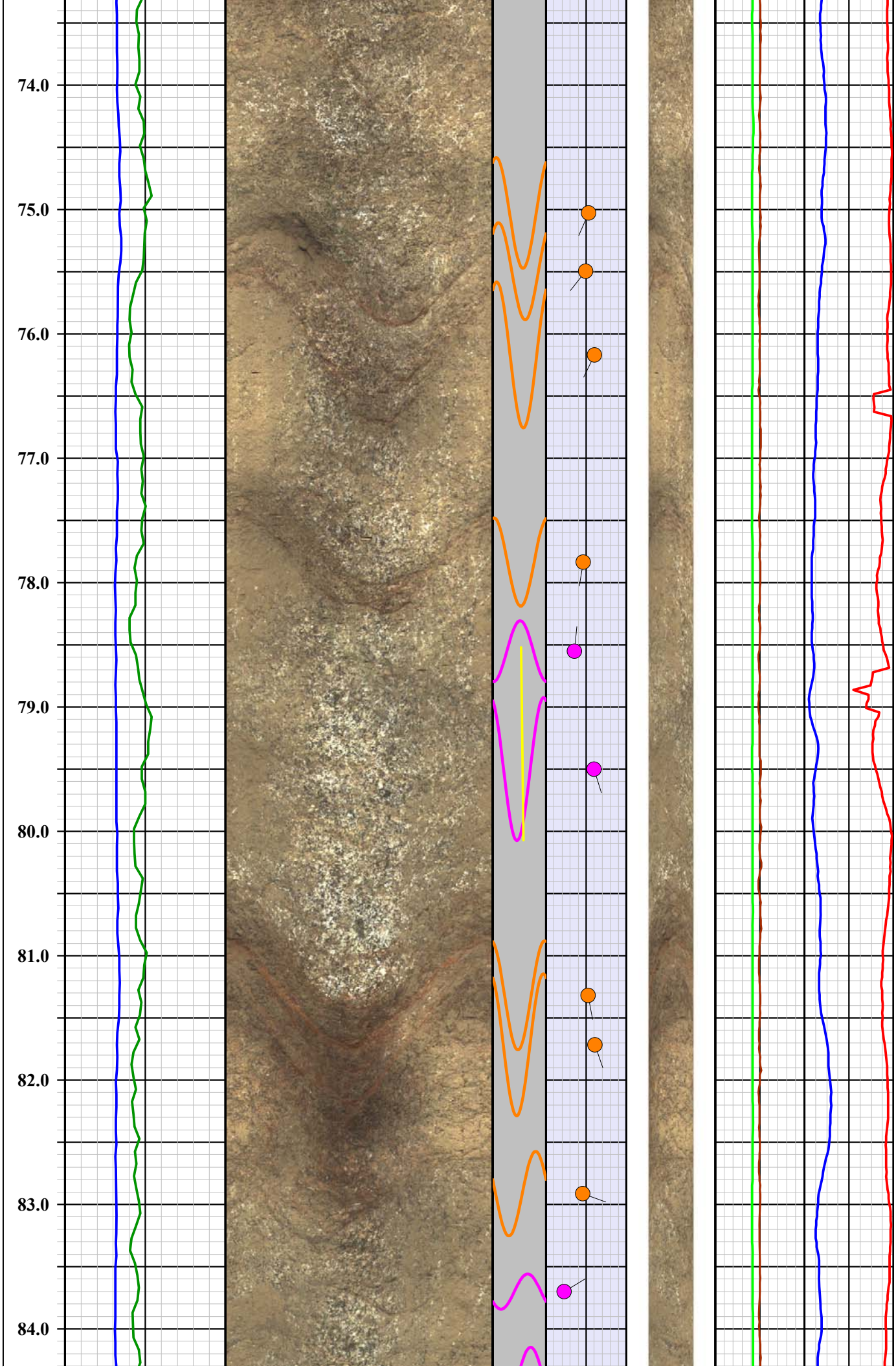
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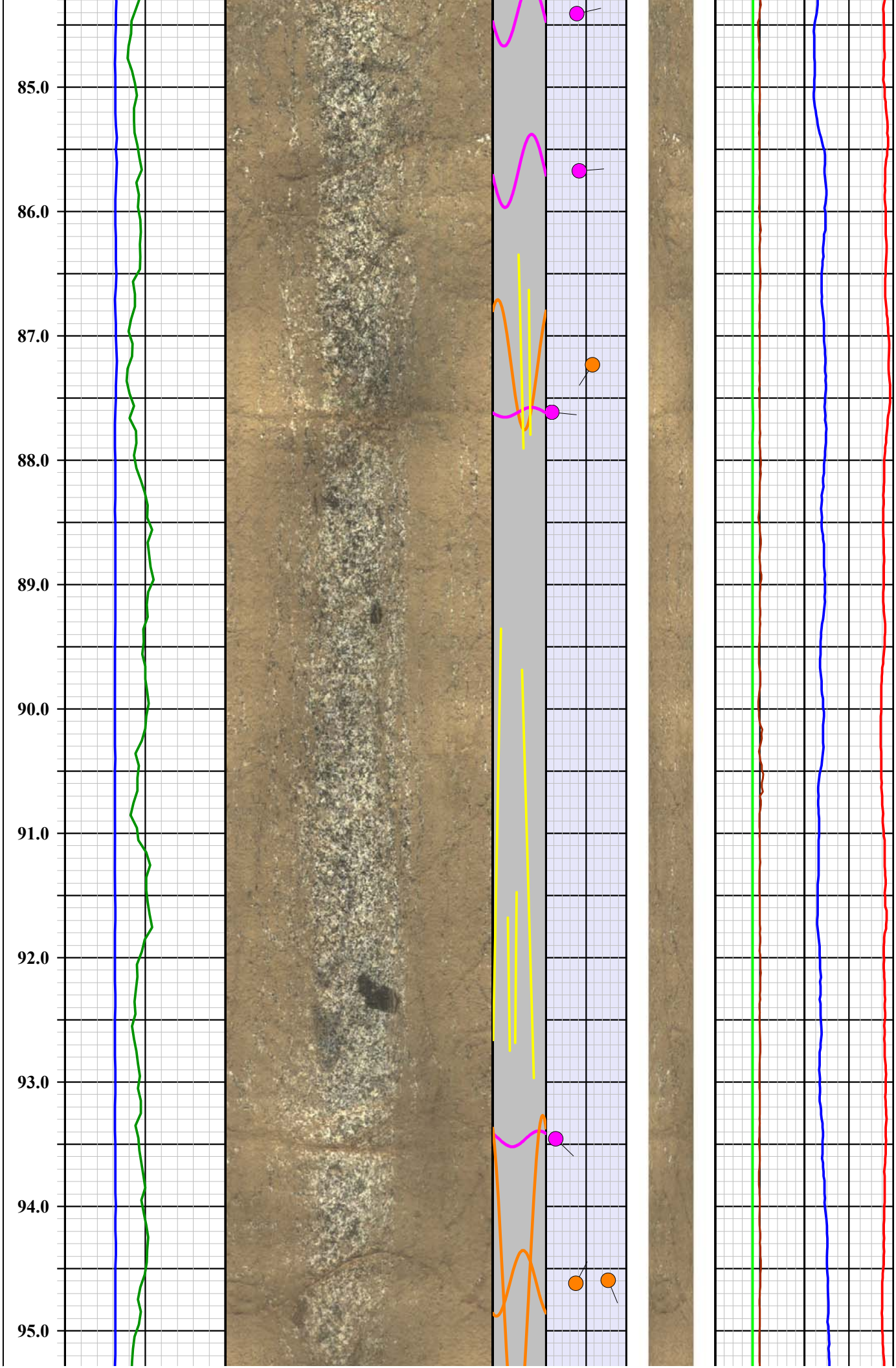
84.0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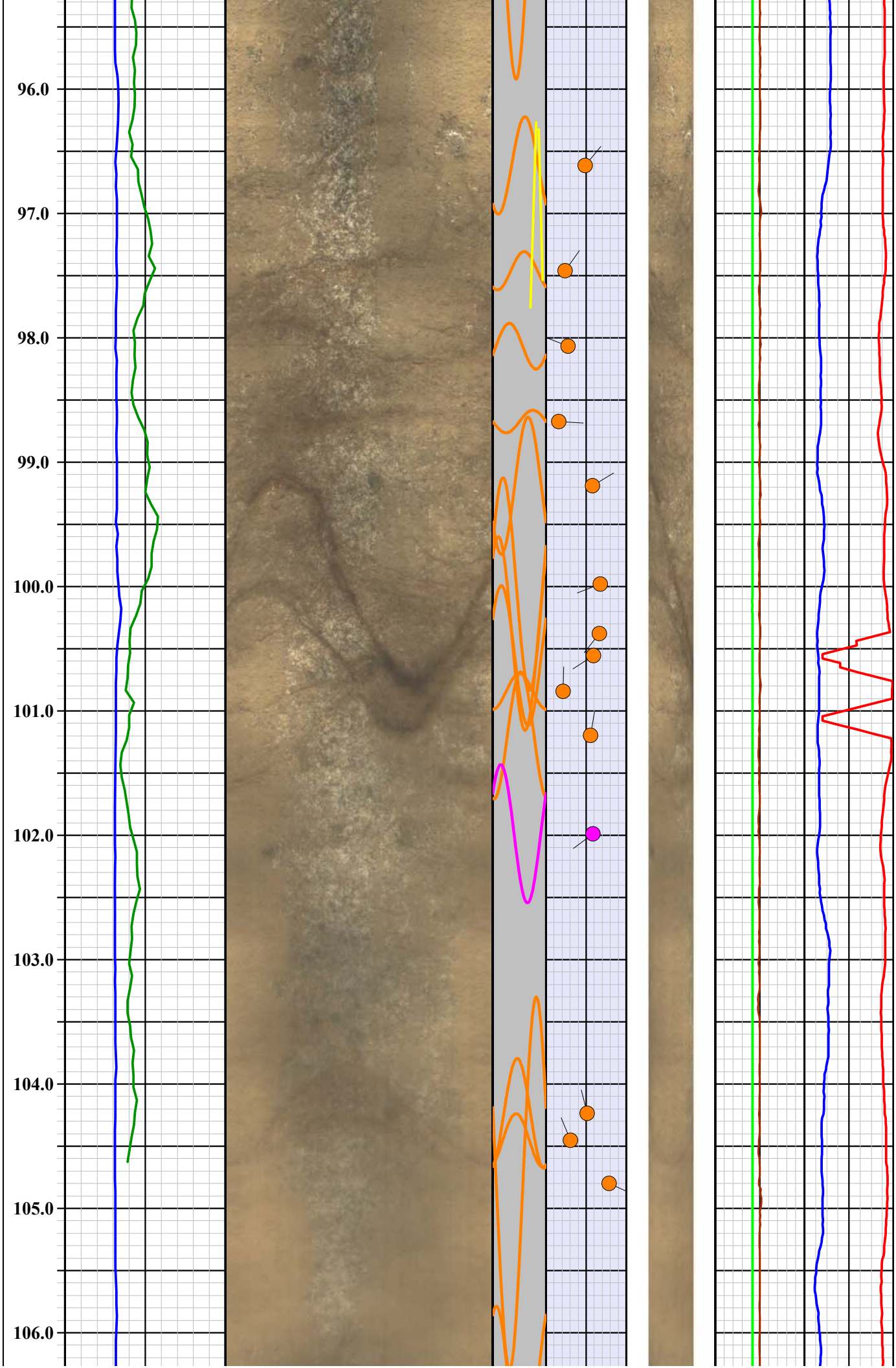
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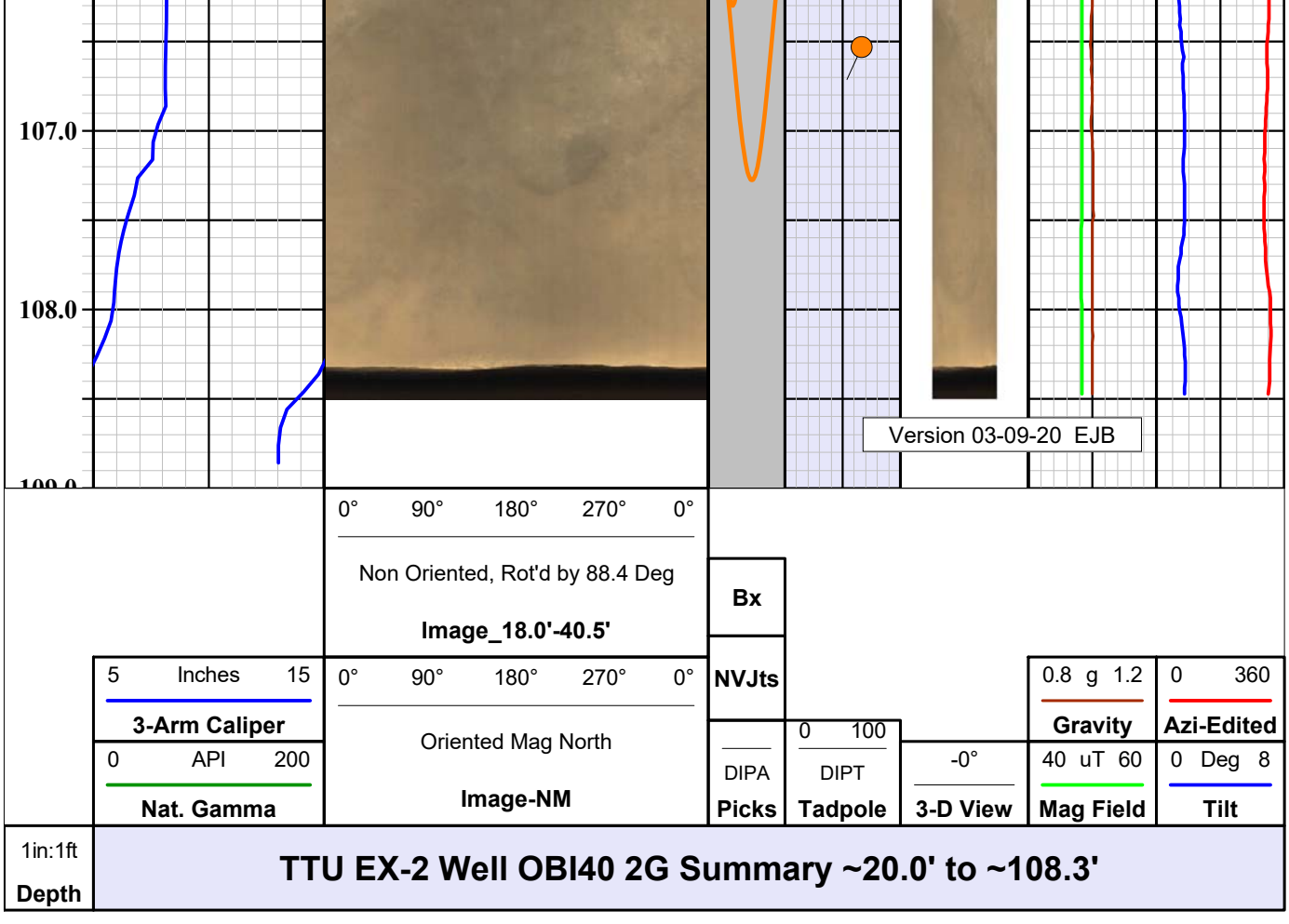
106.0



Legend

Mnemonics	Description
3-Arm Caliper	3-arm mechanical caliper of hole diameter plotted from 5 to 15 inches (blue line).
Nat. Gamma	Natural gamma ray log plotted from 0 to 200 API units (green line).
Image-NM	2D plot of optical image oriented to magnetic north. Plotted from left to right N-E-S-W-N.
Image_18.0'-40.5'	2D plot of optical image non-oriented and rotated by 88.4 deg to correct for magnetic affect in proximity of steel casing. Plotted from left to right N-E-S-W-N.
Picks	Planar strucutral features picked on optical borehole image shown as colored sinusoid (color designation shown on header) DIPA = dip apparent hole axis.
NVJts	Near Vertical (near parallel to hole axis) joint/fracture features picked on optical borehole image shown as colored sinusoid (color designation shown on header).
Bx	Apparent Breccia or Congomerate zones and Vugs/Vesicles/Cavities.
3-D View	3D cylindrical projection of OBI image viewed from north.
Tadpole	Tadpole plot of the OBI feature picks (fractures and bedding planes); plotted from 0 to 90 dip - see legend above. DIPT = True orientation; features corrected for hole deviation.

	hole deviation.
Mag Field	Total magnetic field strength as measured by fluxgate magnetometer in OBI or ABI deviation sensor - plotted 40-60 uT (green line).
Gravity	Total gravity (probe acceleration) as measured by 3-axis accelerometers in OBI deviation sensor - plotted 0.8-1.2 g (brown line).
Azi-Edited	Direction of tool tilt plotted 0 to 360 deg; edited for anomalous magnetic influence - represents borehole deviation direction (red line).
Tilt	Tool tilt (vertical = 0 and horizontal = 90) plotted 0 to 8 deg; represents borehole deviation tilt from vertical (blue line).
	Mnemonics prepared by Erika J Beam Version 03-09-20

QL OBI-40 2G Optical Borehole Imager

Probe Top = Depth Ref.

Tool SN: 145010, 152511 & 170106

Four Conductor MSI Probe Top

APS Probe Orientation Sensor
3-Axis Magnetometer
3-Axis Accellerometer

Probe Length = 1.66 m or 5.46 ft

Probe Weight = 5.3 kg or 11.7 lbs

Distance from Optical Image Window to Orientation Sensor = 0.9 m or 3 ft

Inclination Accuracy = +/- 0.5 deg
Azimuth Accuracy = +/- 1.0 deg

Temperature Range: 0 - 70 Deg C (32 - 158 Deg F)
Pressure Range: 0 - 200 bar (0 - 2900 psi)

External Bow Spring Centralizers

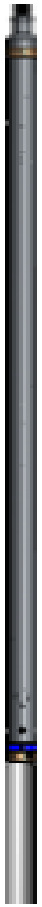
Operates in dry or clear water conditions.

OBI Imaging Window

1.6" or 40 mm Diameter

MSI Gamma-Caliper-Temperature-Fluid Resistivity

Probe Top = Depth Ref.



Single Conductor MSI Probe Top

Probe Length = 2.59 m or 8.5 ft
Probe Weight = 6.80 kg or 15.0 lbs

Natural Gamma and Caliper can only be collected logging up hole.

Fluid Temperature/Resistivity can only be collected logging down hole.

Temperature Rating: 70 Deg C (158 Deg F)
Presure Rating: 200 bar (2900 psi)

Natural Gamma Ray = 0.76 m (29.75 in)

NOTE: Lengths on a particular tool may vary from those listed on this document due to probe sizes and styles utilized

3-Arm Caliper = 1.44 m (56.75 in)

Distance from tool top: 2.20 m (86.5 in)

Available Arm Sizes: 3", 9", and 15"

TFR (Temperature/Fluid Resistivity) = 0.39 m (15.5 in)

1.375" or 34.9 mm Diameter

Southwest Exploration Services, LLC
borehole geophysics & video services

Company	GEOSYNTEC
Well	TTU EX-2
Field	TALLEY
County	MARICOPA
State	ARIZONA

Final Optical Televiewer Summary

Drill Hole: TTU EX-3 March 10, 2020, EJB

Geophysical Logs were collected by SwExp on February 16, 2020.
Features oriented to Magnetic North and corrected for borehole deviation to true orientation
Features picked/ranked by EJB Prior to March 10, 2020.

Ranking Scheme:

100 = Black = Bottom of Casing
104 = White = In-filled Joint/Fracture - mineralogy not determined
106 = Green = Bedding/banding/foliation
109 = Orange = Partially open Joint/Fracture
110 = Pink = Thin and/or discontinuous around circumference Joint/Fracture
111 = Yellow = Apparent Joint/Fracture terminates at fracture intersection
112 = Light Blue = Unclassified planar feature
305 = Red = Wide major Joint/Fracture
307 = Blue = Fluid Level

VFx = 2 Near vertical Joints/Fractures
VFx-W = 2 Wide Near vertical Joints/fractures
33 = >2 near vertical Joint/fractures
IFx = Possible drilling induced near vertical tensile fractures
Bx = Breccia/Collapse Breccia
Lg V = Large Vug/ Vugs/ or Vesicles (> 6" diameter)
MV = Medium Vug/ Vugs/ or Vesicles (2-6" diameter)
CNG = Small Vug/ Vugs/ or Vesicles (< 2" diameter)
Vein = infilled near vertical joint/fracture

Continuity
C1 Discontinuous - < 50%
C2 Slightly continuous - 50-75%
C3 Moderately continuous 75-100%
C4 High continuous – thin
C5 Very continuous – wide

Condition
0 – Smooth
1 – Rough
2 – Weathered
3 - Brec / Crushed
4 – Offset

Form
0 – Undulating/curved
1 – Planar
2 – Stepped
3 – Parting
4 – Styolitic

Remark
Open
Partially Open
Tight
Cemented/Filled
Partially Cemented

Filling (OBI)
No apparent filling
White soft
White
Dark soft
Dark
Sulfide/metallic
Stained Black
Stained Brown

Filling (ABI)
No apparent filling
Hard

Note: Some partially open features on the ABI image may be filled with soft material and may not be potential fluid pathways.

Image log was obtained in 2 pieces:
OBI from 20.4' to 100.9'
ABI from 45.7' to 100.5'

The OBI/ABI combined image from 20.4' to 100.9' is good throughout the logged interval.

*Depth for dipping fractures is midpoint depth; for near Vertical joints/fractures and Vugs it is Top Depth

Depth*	Btm Depth	Dip Dir	Tilt	Aperture	Classification	Continuity	Form	Condition	Filling	Remark
Ft	Ft	Deg	Deg	Inch/10						
20.40		7.6	1.40	0.00	100 - Bottom of Casing	C3 Moderately continuous 75-100%	1 - Planar	0 - Smooth		
22.20		150.2	22.87	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
26.80		203.6	53.22	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
28.42		317.0	66.50	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
30.72		72.0	63.28	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
32.96		219.7	74.09	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	Stained Brown	Partially Open
39.74		94.1	49.50	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
40.02		20.0	49.45	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
40.48		171.1	53.00	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
41.95		167.7	50.10	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
45.32		54.8	21.41	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
45.69		92.0	0.80	0.00	307 - Fluid Level	C3 Moderately continuous 75-100%	1 - Planar	0 - Smooth		
46.91		240.5	55.14	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
47.82		156.4	22.53	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
49.92		281.7	75.49	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
50.84		327.3	65.56	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
51.74		338.3	50.75	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
52.94		336.8	47.04	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
54.71		55.8	61.99	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
55.53		70.3	61.75	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
56.98		348.8	63.50	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
58.85		272.7	50.07	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
60.17		90.8	42.29	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
60.52		278.0	57.88	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
61.26		269.4	58.16	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
61.72		271.7	21.04	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
63.13		204.4	29.12	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
64.39		63.2	38.05	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
65.10		277.6	54.89	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
65.83		270.6	63.28	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
66.28		223.3	48.89	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
67.93		254.9	68.00	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
68.04		202.1	11.84	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
69.64		253.3	58.20	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
72.18		98.0	24.86	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
73.22		207.4	23.65	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
74.24		148.1	7.07	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
75.02		3.3	56.72	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
75.09		180.8	12.31	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
76.87		338.8	56.47	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
77.19		337.6	58.17	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
77.50		322.2	57.35	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
78.21		319.2	54.34	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
79.02		328.4	43.62	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open

81.04		342.9	78.88	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
81.37		342.5	55.99	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
82.82		254.9	56.85	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
83.94		332.1	52.01	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
84.70		359.0	48.87	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
86.11		262.7	77.92	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
86.23		23.0	74.82	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	White	Tight
86.79		11.1	58.33	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
87.94		341.2	45.60	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
88.24		352.9	50.49	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
88.88		11.1	31.67	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
89.04		216.2	64.09	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
90.52		338.1	54.00	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	White	Partially Open
90.60		217.3	65.63	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
91.23		348.3	50.60	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
92.26		338.4	77.40	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
93.07		348.2	41.38	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	White	Partially Open
94.06		349.7	29.21	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
94.56		319.5	53.36	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
95.10		41.7	40.70	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
96.51		350.9	61.22	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	White	Tight
97.08		347.0	61.41	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	White	Partially Open
97.63		333.4	52.64	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	White	Partially Open
98.17		337.4	56.59	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	White	Partially Open
99.30		29.1	52.30	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	White	Partially Open

Vugs and Bx Features

VFx = 2 Near vertical Joints/Fractures
VFx-W = 2 Wide Near vertical Joints/fractures
33 = >2 near vertical Joint/fractures
IFx = Possible drilling induced near vertical tensile fractures
Bx = Breccia/Collapse Breccia
Lg V = Large Vug/ Vugs/ or Vesicles (> 6" diameter)
MV = Medium Vug/ Vugs/ or Vesicles (2-6" diameter)
CNG = Small Vug/ Vugs/ or Vesicles (< 2" diameter)
Vein = infilled near vertical joint/fracture
7 = Conglomerate - Sand matrix supported
8 = Conglomerate - Mud matrix supported
9 = Conglomerate - Clast supported

Breccia/Vugs/Vesicles Etc. on OBI/ABI combined image from 20.4' to 100.9'

Depth	Btm Depth				Ranking/Description
Ft	Ft				
76.24	82.81				Breccia/Collapse Breccia

Near Vertical (Near parallel to hole axis) Features

0 = Gray = Broken Zone/Undifferentiated
1 = Red = Major Breakout
2 = Orange = Minor Breakout
3 = Light Blue = Tensile Fracture
4 = Green = Filled Near Vertical Joint/Fx
5 = Yellow = Near Vertical Joint/Fx

OBI/ABI combined image from 20.4' to 100.9'

Depth* = mid-point of near vertical feature.
Tilt is referenced to hole axis - 0 Deg tilt is parallel to hole axis

Depth*	Azimuth	Tilt	Length	Opening	Classification
Ft	Deg	Deg	Ft	Deg	
40.03	180.3	-5.33	0.58	0.00	Near Vertical Joint/Fx
40.11	212.5	-10.19	0.49	0.00	Near Vertical Joint/Fx
49.46	109.5	-11.83	1.56	0.00	Near Vertical Joint/Fx
49.67	184.0	-6.31	2.88	0.00	Near Vertical Joint/Fx
49.79	64.6	-13.17	1.69	0.00	Near Vertical Joint/Fx
50.22	250.6	-0.75	2.39	0.00	Near Vertical Joint/Fx
52.66	298.7	0.67	1.00	0.00	Near Vertical Joint/Fx
63.68	224.2	-0.63	1.07	0.00	Near Vertical Joint/Fx
64.02	120.0	5.06	1.33	0.00	Near Vertical Joint/Fx
67.80	224.8	1.16	4.92	0.00	Near Vertical Joint/Fx
67.92	300.7	4.13	4.33	0.00	Near Vertical Joint/Fx
69.00	311.2	9.58	1.39	0.00	Near Vertical Joint/Fx
70.83	114.1	-2.50	1.37	0.00	Near Vertical Joint/Fx
71.22	54.7	-0.52	1.34	0.00	Near Vertical Joint/Fx
78.14	112.1	0.39	3.48	0.00	Near Vertical Joint/Fx
78.19	197.1	-3.65	3.83	0.00	Near Vertical Joint/Fx
85.52	46.2	6.19	1.69	0.00	Near Vertical Joint/Fx
87.04	260.4	-11.24	1.99	0.00	Near Vertical Joint/Fx
92.96	153.0	7.79	2.27	0.00	Near Vertical Joint/Fx

Southwest Exploration Services, LLC

borehole geophysics & video services

COMPANY	GEOSYNTEC
WELL ID	TTU EX-3
FIELD	TALLEY
COUNTY	MARICOPA STATE ARIZONA

TYPE OF LOGS: ACOUSTIC TELEVIEWER
MORE: CALIPER

LOCATION

SEC TWP RGE

OTHER SERVICES
GAMMA
TEMP / FLUID RES.
OPTICAL TELEVIEWER

PERMANENT DATUM		ELEVATION	K.B.
LOG MEAS. FROM	GROUND LEVEL	ABOVE PERM. DATUM	D.F.
DRILLING MEAS. FROM	GROUND LEVEL		G.L.

DATE	02-16-20	TYPE FLUID IN HOLE	FORMATION WATER
RUN No	3	MUD WEIGHT	N/A
TYPE LOG	ACOUSTIC TELEVIEWER	VISCOSITY	N/A
DEPTH-DRILLER	110.0 FT	LEVEL	~46 FT
DEPTH-LOGGER	101.0 FT	MAX. REC. TEMP.	25.6 DEG C
BTM LOGGED INTERVAL	101.0 FT	IMAGE ORIENTED TO:	MAGNETIC NORTH
TOP LOGGED INTERVAL	40.0 FT	SAMPLE INTERVAL	0.010 FT
DRILLER / RIG#	N/A	LOGGING TRUCK	TRUCK #310
RECORDED BY / Logging Eng.	E. BEAM / T. GODSEY	TOOL STRING/SN	ALT QL ABI40 2G SN 192302
WITNESSED BY	FABRIZIO - GEOSYNTEC	LOG TIME:ON SITE/OFF SITE	7:00 AM

RUN	BOREHOLE RECORD			CASING RECORD			
NO.	BIT	FROM	TO	SIZE	WGT.	FROM	TO
1	?	SURFACE	20 FT	8.5 IN	STEEL	SURFACE	20 FT
2	8 IN	20 FT	TOTAL DEPTH				
3							

COMMENTS:

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Tool Summary:

Date	02-16-20	**Date**	02-16-20	**Date**	02-16-20		
Run No.	1	**Run No.**	2	**Run No.**	3		
Tool Model	ALT QL OBI40 2G	**Tool Model**	MSI COMBO TOOL	**Tool Model**	ALT QL ABI40 2G		
Tool SN	170106	**Tool SN**	5446	**Tool SN**	192302		
From	SURFACE	**From**	SURFACE	**From**	40.0 FT		
To	101.0 FT	**To**	101.0 FT	**To**	101.0 FT		
Recorded By	E. BEAM	**Recorded By**	E. BEAM	**Recorded By**	E. BEAM		
Truck No	310	**Truck No**	310	**Truck No**	310		
Operation Check	01-30-20	**Operation Check**	02-16-20	**Operation Check**	02-14-20		
Calibration Check	N/A	**Calibration Check**	02-16-20	**Calibration Check**	N/A		
Time Logged	10:20 AM	**Time Logged**	10:45 AM	**Time Logged**	10:55 AM		
Date		**Date**		**Date**			
Run No.	4	**Run No.**	5	**Run No.**	6		
Tool Model		**Tool Model**		**Tool Model**			
Tool SN		**Tool SN**		**Tool SN**			
From		**From**		**From**			
To		**To**		**To**			
Recorded By		**Recorded By**		**Recorded By**			
Truck No		**Truck No**		**Truck No**			
Operation Check		**Operation Check**		**Operation Check**			
Calibration Check		**Calibration Check**		**Calibration Check**			
Time Logged		**Time Logged**		**Time Logged**			

Additional Comments:

Caliper Arms Used: 9" **Calibration Points:** 4" & 10"

E-Log Calibration Range: N/A **Calibration Points:** N/A

Disclaimer:

All interpretations of log data are opinions based on inferences from electrical or other measurements. We do not guarantee the accuracy or correctness of any interpretations or recommendations and shall not be liable or responsible for any loss, costs, damages, or expenses incurred or sustained by anyone resulting from any interpretation made by any of our employees or agents. These interpretations are also subject to our general terms and conditions set out in our current Service Invoice.

Image Features Legend

- Btm of Casing
- Filled Fracture / Joint
- Bedding / Banding / Foliation / Veins
- Partially Open Joint / Fracture
- Minor Open Joint / Fracture
- OJ/Fx terminates at Fx intersection
- Unclassified
- Sulfide Vein
- Breakouts
- Major Open Joint / Fracture
- Fluid Level

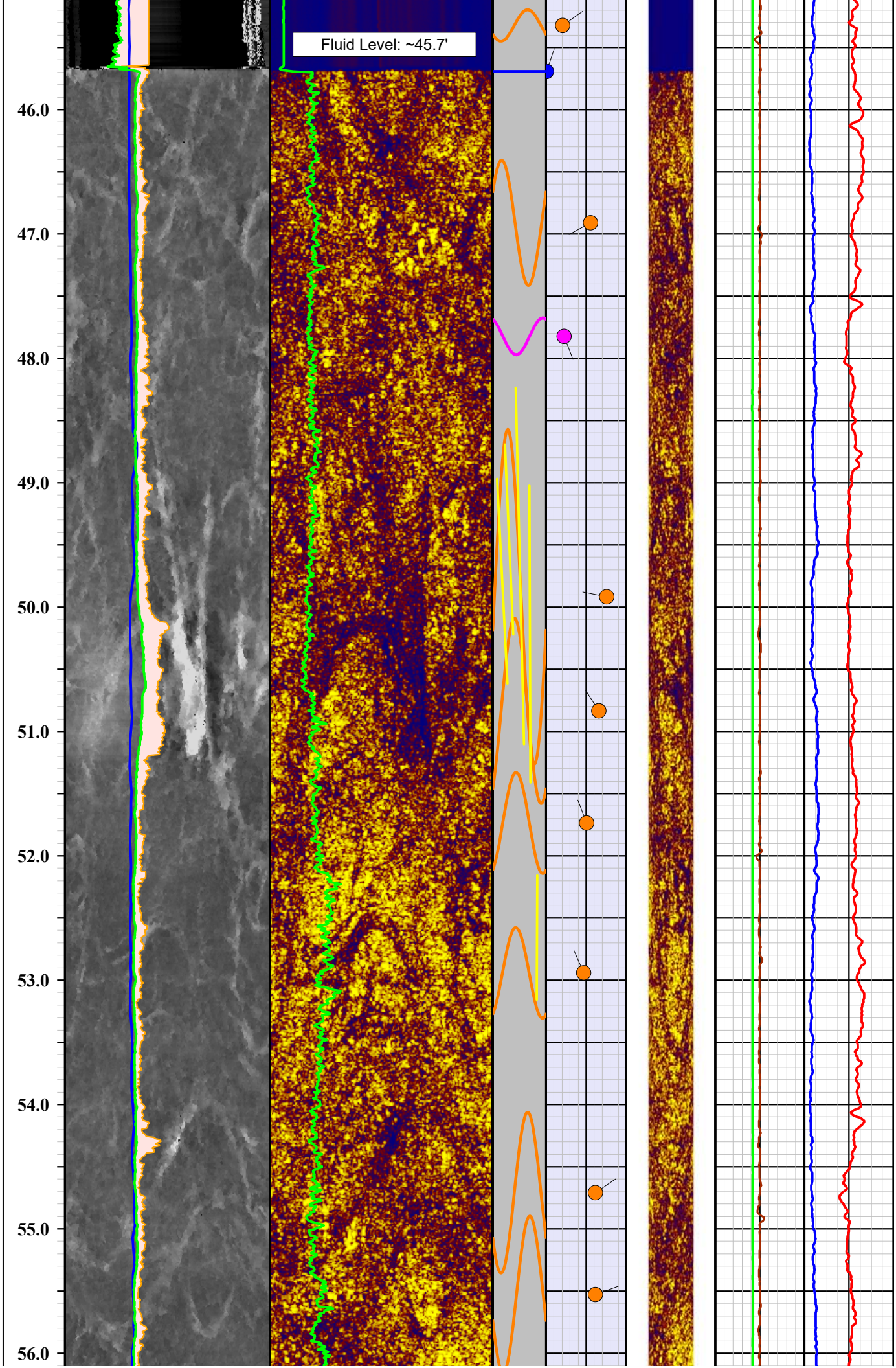
Breakout Legend

- Broken Zone / Undifferentiated
- Major Breakout
- Minor Breakout
- Tensile Fracture
- Filled Near Vertical Joint/Fx
- Near Vertical Joint/Fx

Bx Legend

- Breccia or Conglomerate
- Large Vugs/Vesicles (> 6")
- Medium Vugs/Vesicles (2-6")
- Small Vugs/Vesicles (< 2")
- Conglomerate - sand matrix supported
- Conglomerate - mud matrix supported
- Conglomerate - clast supported

Depth 1in:1ft	TTU EX-3 Well ABI40 2G Summary ~45.7' to ~100.5'						
	Centralized TT, Oriented Mag North, 0° 90° 180° 270° 0°	Amplitude-NM, Oriented Mag North, 0° 90° 180° 270° 0°	Picks DIPA	Tadpole DIPT, 0 100	3-D View, -0°	Mag Field, 40 uT 60	Tilt, 0 Deg 8
	3-Arm Caliper, 5 Inches 15	Amplitude-Static, Oriented Mag North, 0° 90° 180° 270° 0°	NVJts			Gravity, 0.8 g 1.2	Azimuth, 0 360
	Max-Acoustic Caliper, 5 Inches 15	ARI, 0 2000	Bx				
	Ave-Acoustic Caliper, 5 Inches 15						
	Enlargements						


Fluid Level: ~45.7'
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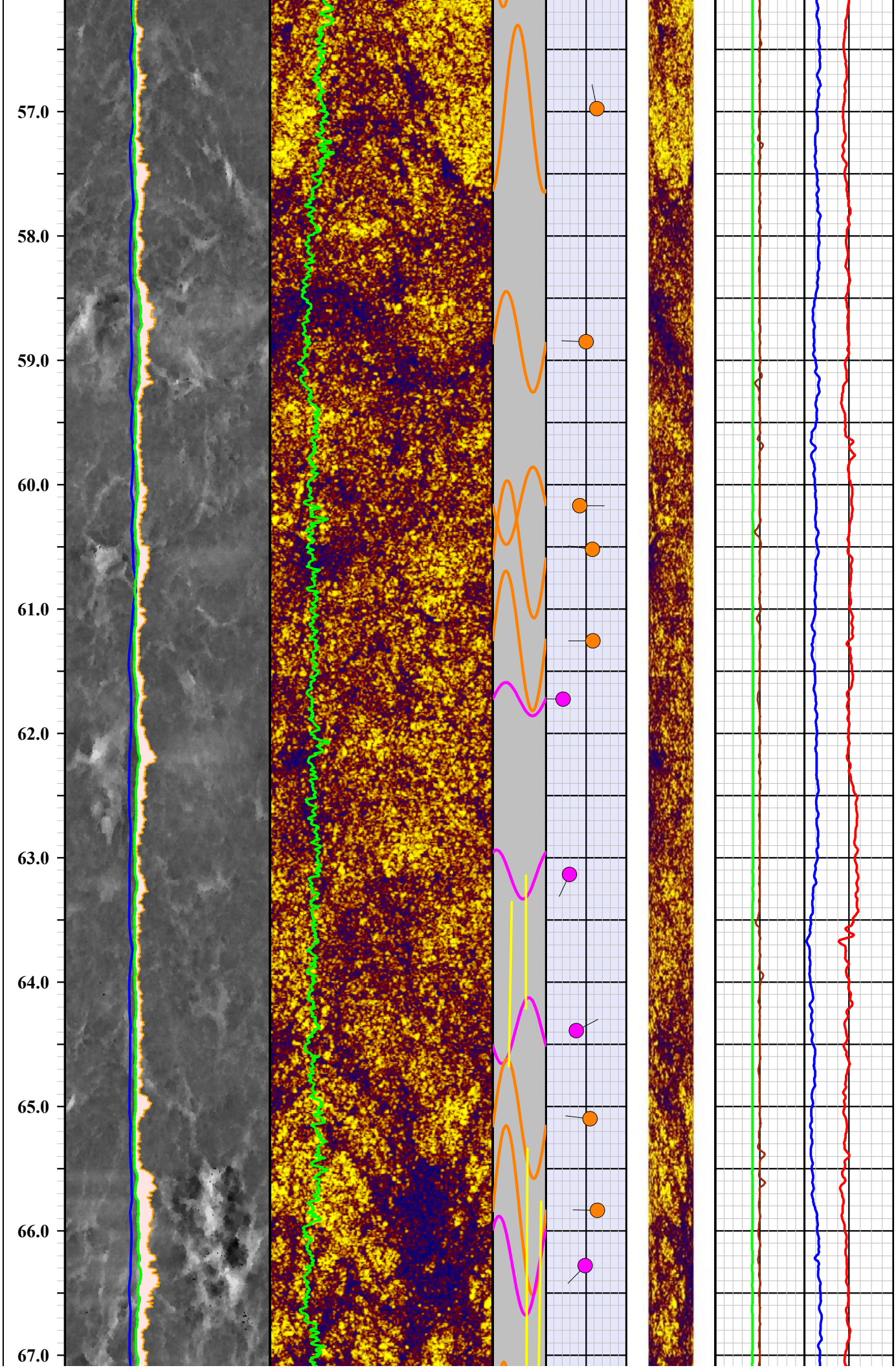
56.0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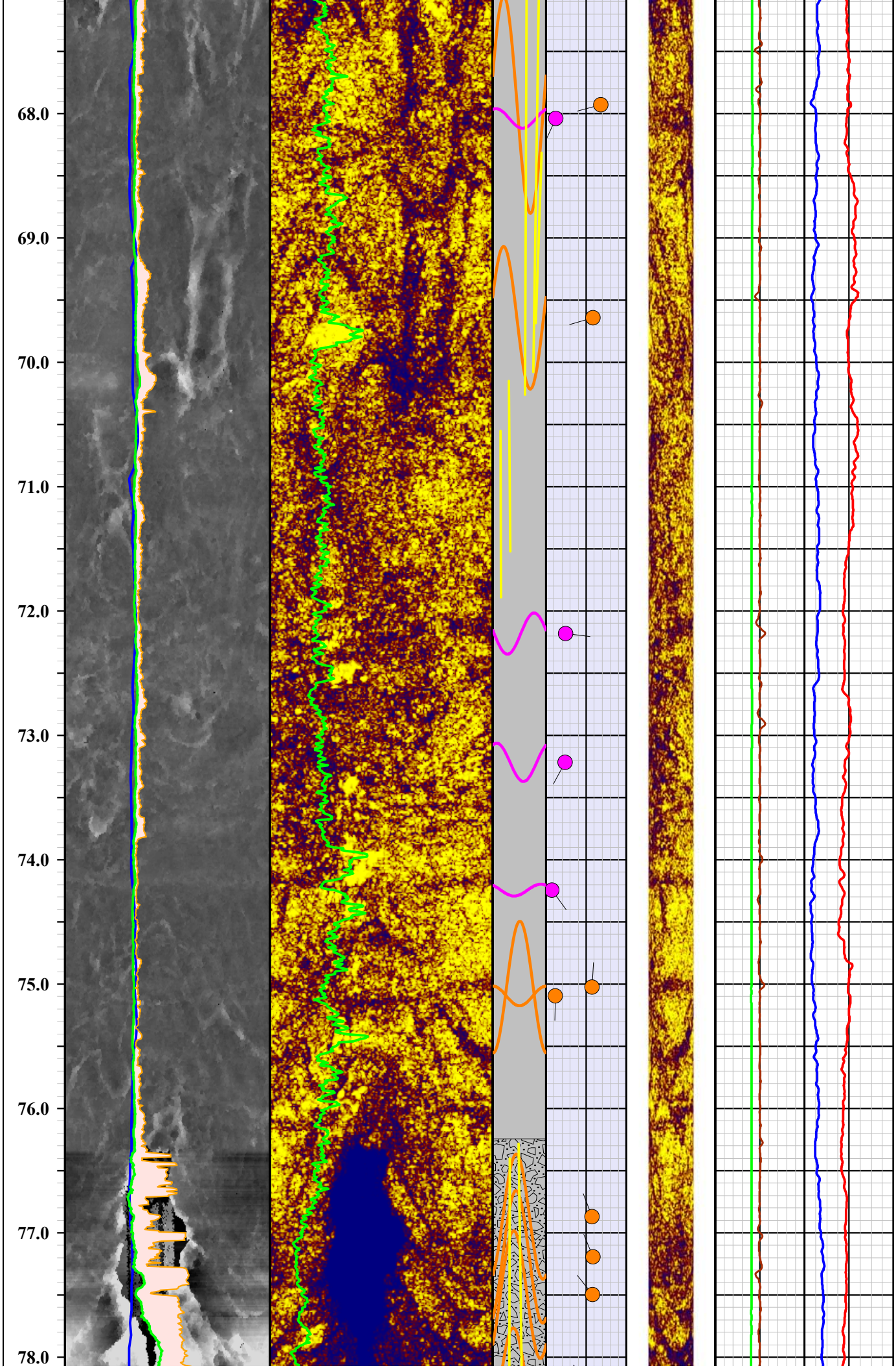
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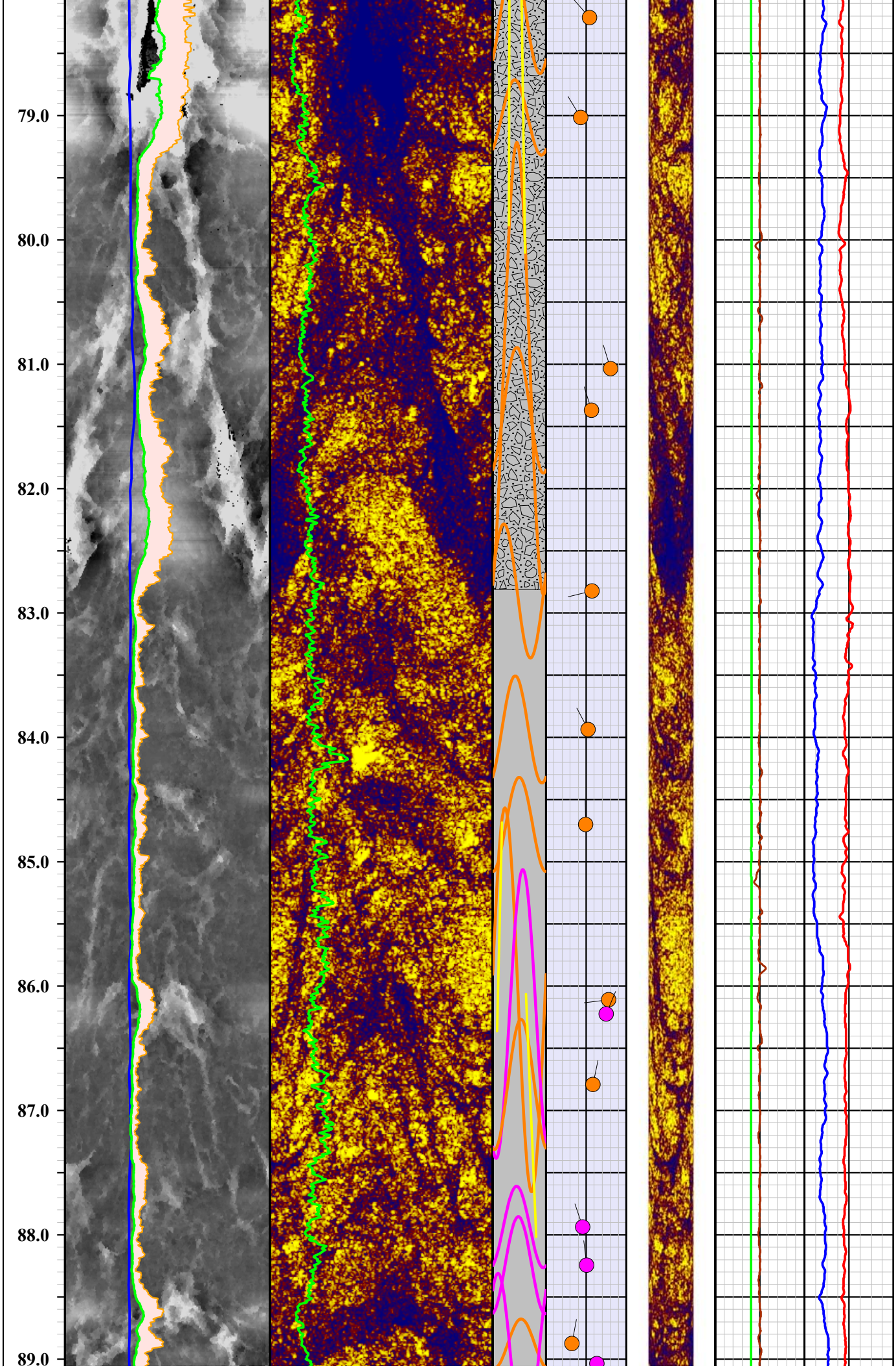
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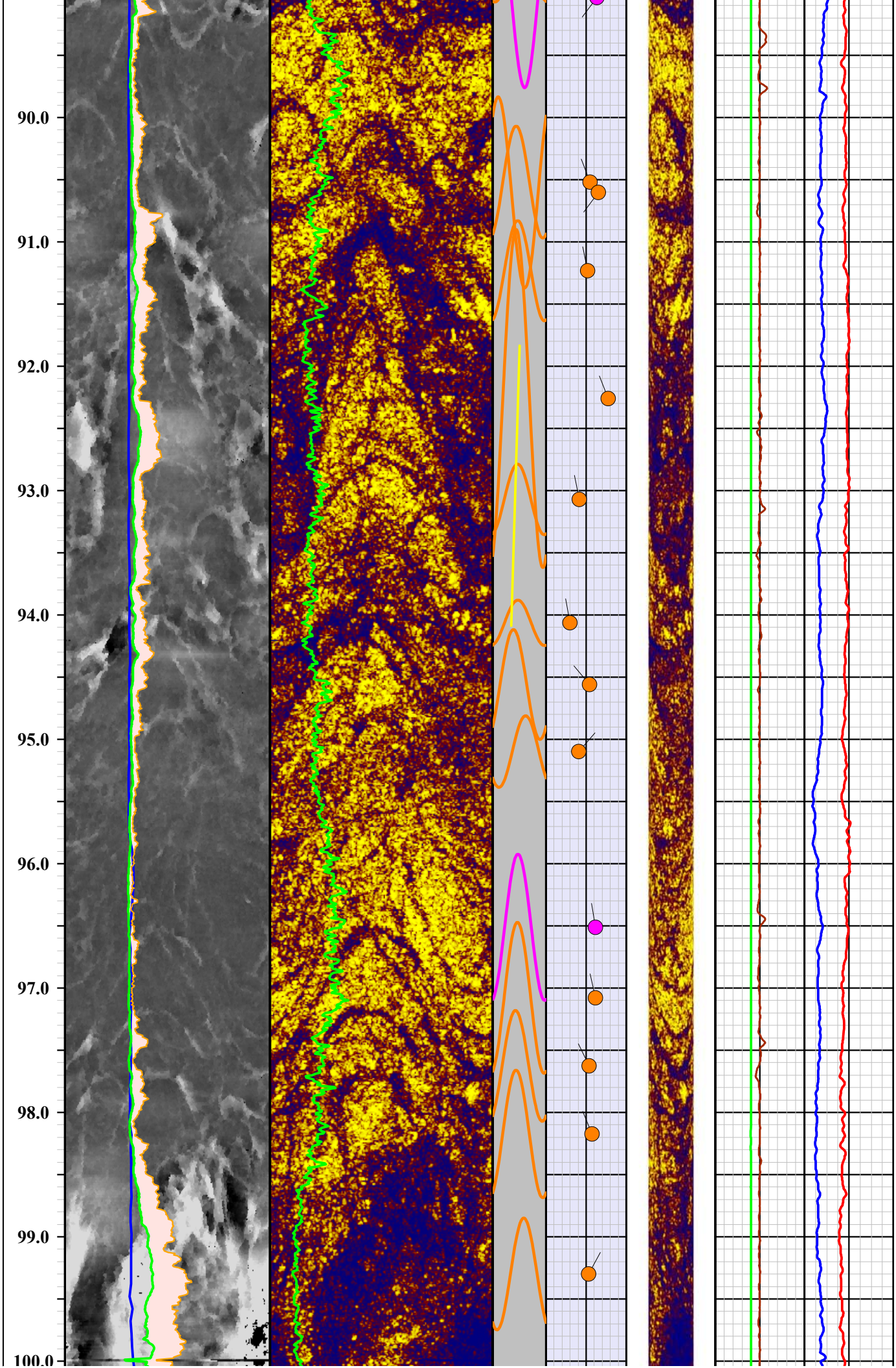
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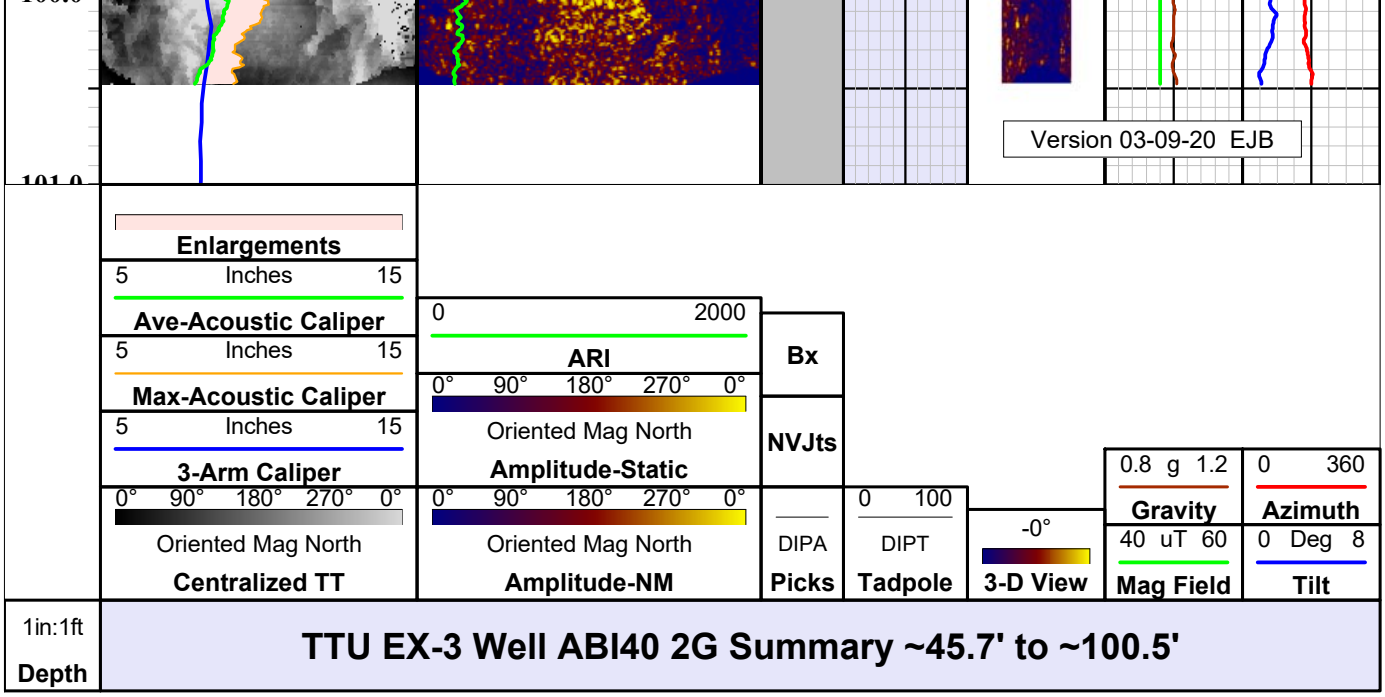


Legend

Mnemonics	Description
Centralized TT	2D plot of acoustic image travel time with probe position centralized. Oriented to magnetic north and plotted from left to right N-E-S-W-N.
3-Arm Caliper	3-arm mechanical caliper of hole diameter plotted from 5 to 15 inches (blue line).
Max-Acoustic Caliper	Maximum acoustic caliper of hole diameter calculated from Travel Time data and plotted as orange line from 5 to 15 inches.
Ave-Acoustic Caliper	Average acoustic caliper of hole diameter calculated from Travel Time data and plotted as bright green line from 5 to 15 inches.
Enlargements	Pink shaded zone between Ave-Acoustic Caliper and Max-Acoustic Caliper calculated from Travel Time data showing borehole enlargment.
Amplitude-NM	2D plot of unfiltered acoustic image amplitude oriented to magnetic north. Plotted from left to right N-E-S-W-N. Image toggled off.
Amplitude-Static	2D plot of acoustic image amplitude with Static normalization filter oriented to magnetic north. Plotted from left to right N-E-S-W-N. Image toggled on.
ARI	Acoustic Reflectance Index or relative rock hardness from ABI Amplitude log. Plotted 0 (soft) to 2000 (harder) as green line.
Picks	Planar strucutral features picked on acoustic borehole image shown as colored sinusoid (color designation shown on header) DIPA = dip apparent hole axis.
NVJts	Near Vertical (near parallel to hole axis) joint/fracture features picked on acoustic borehole image shown as colored sinusoid (color designation shown on header).
Bx	Apparent Breccia or Conglomerate zones and Vugs/Vesicles/Cavities

Bx	Apparent Breccia or Conglomerate zones and Vugs/Vesicles/Cavities.
3-D View	3D cylindrical projection of ABI image using Centralized TT log for hole shape looking from North.
Tadpole	Tadpole plot of the ABI feature picks (fractures and bedding planes); plotted from 0 to 90 dip - see legend above. DIPT = True orientation; features corrected for hole deviation.
Mag Field	Total magnetic field strength as measured by fluxgate magnetometer in OBI or ABI deviation sensor - plotted 40-60 uT (green line).
Gravity	Total gravity (probe acceleration) as measured by 3-axis accelerometers in ABI deviation sensor - plotted 0.8-1.2 g (brown line).
Azimuth	Direction of tool tilt plotted 0 to 360 deg - represents borehole deviation direction (red line).
Tilt	Tool tilt (vertical = 0 and horizontal = 90) plotted 0 to 8 deg; represents borehole deviation tilt from vertical (blue line).
	Mnemonics prepared by Erika J Beam Version 03-09-20

QL ABI-40 2G Acoustic Borehole Imager

Probe Top = Depth Ref.

Tool SN: 143003, 143009 & 192302

Four Conductor MSI Probe Top

APS Probe Orientation Sensor
3-Axis Magnetometer
3-Axis Accellerometer

Probe Length = 1.62 m or 5.25 ft

Probe Weight = 6.7 kg or 14.7 lbs

Distance from Acoustic Image Window to Orientation Sensor = 0.92 m or 3 ft

Inclination Accuracy = +/- 0.5 deg
Azimuth Accuracy = +/- 1.2 deg

Beam Width = 1.5 mm

Frequency = 1.2 MHz

Temperature Range: 0 - 70 Deg C (32 - 158 Deg F)
Pressure Range: 0 - 200 bar (0 - 2900 psi)

Run Centralized with External Bow Spring Centralizers

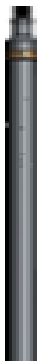
Can only be logged in fluid filled holes

ABI Imaging Window

1.6" or 40 mm Diameter

MSI Gamma-Caliper-Temperature-Fluid Resistivity

Probe Top = Depth Ref.

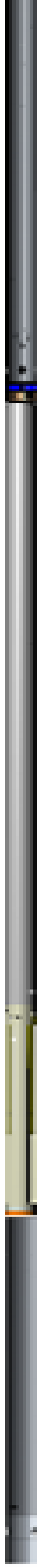


Single Conductor MSI Probe Top

Probe Length = 2.59 m or 8.5 ft
Probe Weight = 6.80 kg or 15.0 lbs

Natural Gamma and Caliper can only be collected logging up hole.

Fluid Temperature/Resistivity can only be collected logging down hole.



Temperature Rating: 70 Deg C (158 Deg F)
Presure Rating: 200 bar (2900 psi)

Natural Gamma Ray = 0.76 m (29.75 in)

NOTE: Lengths on a particular tool may vary from those listed on this document due to probe sizes and styles utilized

3-Arm Caliper = 1.44 m (56.75 in)

Distance from tool top: 2.20 m (86.5 in)

Available Arm Sizes: 3", 9", and 15"

TFR (Temperature/Fluid Resistivity) = 0.39 m (15.5 in)

1.375" or 34.9 mm Diameter

Southwest Exploration Services, LLC
borehole geophysics & video services

Company	GEOSYNTEC
Well	TTU EX-3
Field	TALLEY
County	MARICOPA
State	ARIZONA

Final **Acoustic Televiewer Summary**

Southwest Exploration Services, LLC

borehole geophysics & video services

COMPANY	GEOSYNTEC
WELL ID	TTU EX-3
FIELD	TALLEY
COUNTY	MARICOPA STATE ARIZONA

TYPE OF LOGS: GAMMA - CALIPER
MORE: TEMP / FLUID RES

LOCATION

SEC TWP RGE

OTHER SERVICES
ACOUSTIC TELEVIEWER
OPTICAL TELEVIEWER

PERMANENT DATUM		ELEVATION	K.B.
LOG MEAS. FROM	GROUND LEVEL	ABOVE PERM. DATUM	D.F.
DRILLING MEAS. FROM	GROUND LEVEL		G.L.

DATE	02-16-20	TYPE FLUID IN HOLE	FORMATION WATER
RUN No	2	MUD WEIGHT	N/A
TYPE LOG	GAMMA-CALIPER-TFR	VISCOSITY	N/A
DEPTH-DRILLER	110.0 FT	LEVEL	~46 FT
DEPTH-LOGGER	101.0 FT	MAX. REC. TEMP.	25.6 DEG C
BTM LOGGED INTERVAL	101.0 FT	IMAGE ORIENTED TO:	N/A
TOP LOGGED INTERVAL	SURFACE	SAMPLE INTERVAL	0.1 FT
DRILLER / RIG#	N/A	LOGGING TRUCK	TRUCK #310
RECORDED BY / Logging Eng.	E. BEAM / T. GODSEY	TOOL STRING/SN	MSI COMBO TOOL SN 5546
WITNESSED BY	FABRIZIO - GEOSYNTEC	LOG TIME:ON SITE/OFF SITE	7:00 AM

RUN	BOREHOLE RECORD			CASING RECORD			
NO.	BIT	FROM	TO	SIZE	WGT.	FROM	TO
1	?	SURFACE	20 FT	8.5 IN	STEEL	SURFACE	20 FT
2	8 IN	20 FT	TOTAL DEPTH				
3							

COMMENTS:

.

Tool Summary:

Date	02-16-20	**Date**	02-16-20	**Date**	02-16-20		
Run No.	1	**Run No.**	2	**Run No.**	3		
Tool Model	ALT QL OBI40 2G	**Tool Model**	MSI COMBO TOOL	**Tool Model**	ALT QL ABI40 2G		
Tool SN	170106	**Tool SN**	5446	**Tool SN**	192302		
From	SURFACE	**From**	SURFACE	**From**	40.0 FT		
To	101.0 FT	**To**	101.0 FT	**To**	101.0 FT		
Recorded By	E. BEAM	**Recorded By**	E. BEAM	**Recorded By**	E. BEAM		
Truck No	310	**Truck No**	310	**Truck No**	310		
Operation Check	01-30-20	**Operation Check**	02-16-20	**Operation Check**	02-14-20		
Calibration Check	N/A	**Calibration Check**	02-16-20	**Calibration Check**	N/A		
Time Logged	10:20 AM	**Time Logged**	10:45 AM	**Time Logged**	10:55 AM		

Date		**Date**		**Date**			
Run No.	4	**Run No.**	5	**Run No.**	6		
Tool Model		**Tool Model**		**Tool Model**			
Tool SN		**Tool SN**		**Tool SN**			
From		**From**		**From**			
To		**To**		**To**			
Recorded By		**Recorded By**		**Recorded By**			
Truck No		**Truck No**		**Truck No**			
Operation Check		**Operation Check**		**Operation Check**			
Calibration Check		**Calibration Check**		**Calibration Check**			
Time Logged		**Time Logged**		**Time Logged**			

Additional Comments:

Caliper Arms Used: 9" **Calibration Points:** 4" & 10"

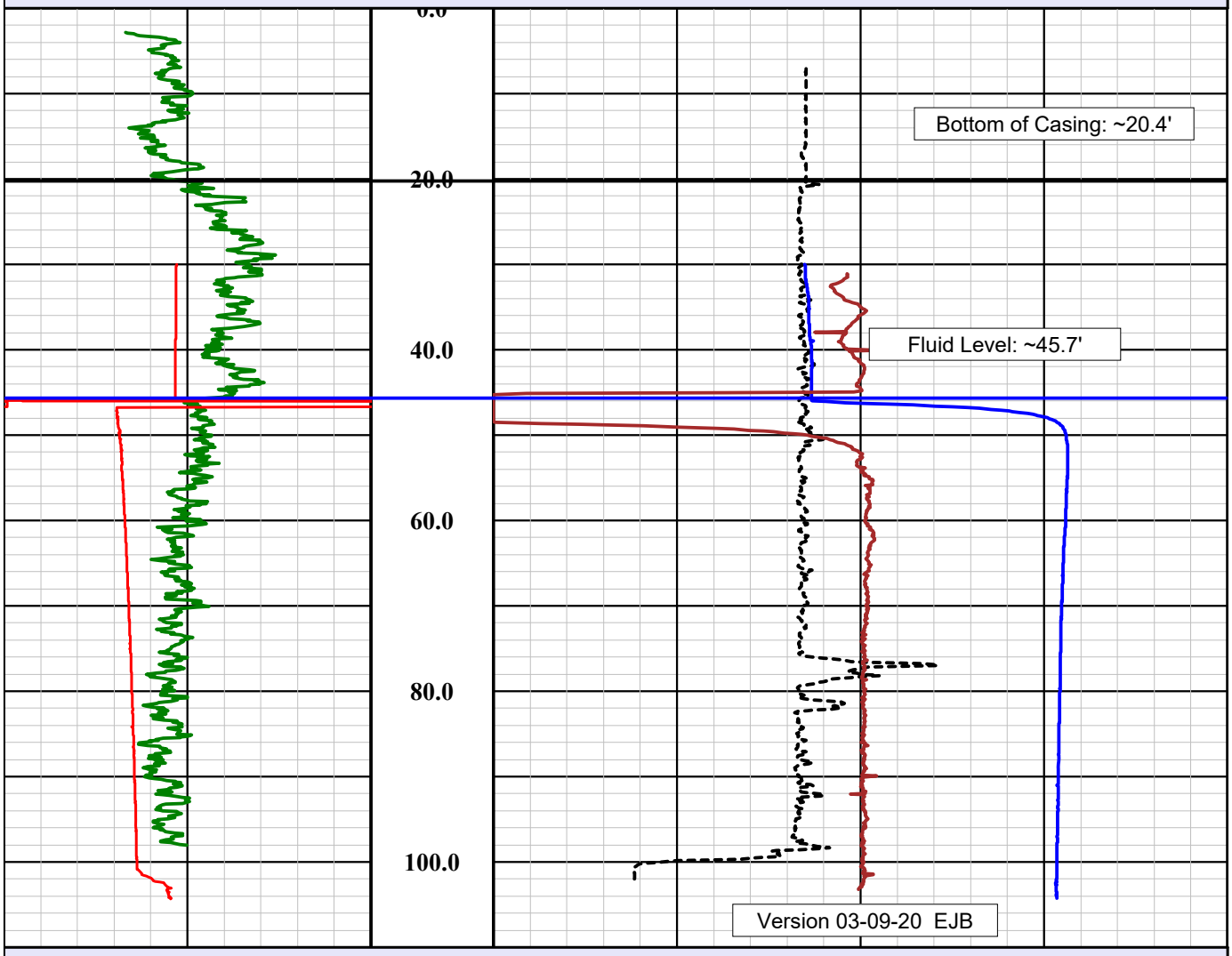
E-Log Calibration Range: N/A **Calibration Points:** N/A

Disclaimer:

All interpretations of log data are opinions based on inferences from electrical or other measurements. We do not guarantee the accuracy or correctness of any interpretations or recommendations and shall not be liable or responsible for any loss, costs, damages, or expenses incurred or sustained by anyone resulting from any interpretation made by any of our employees or agents. These interpretations are also subject to our general terms and conditions set out in our current Service Invoice.

Nat. Gamma	Depth	3-Arm Caliper
0 API 200	1in:20ft	0 Inches 20
Fluid Resistivity		**Temperature**
0 Ohm-m 20		10 Deg C 30
		2-Ft Diff. Temp.
		-1 Deg C 1

TTU EX-3 Well GCT Summary Surface to ~104.4'



TTU EX-3 Well GCT Summary Surface to ~104.4'

		-1 Deg C 1
		2-Ft Diff. Temp.
0 Ohm-m 20		10 Deg C 30
Fluid Resistivity		**Temperature**
0 API 200	1in:20ft	0 Inches 20

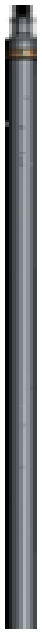
Nat. Gamma	Depth	3-Arm Caliper

Legend

Mnemonics	Description
Nat. Gamma	Natural gamma ray log plotted 0 to 200 API (green line).
Fluid Resistivity	Electrical resistivity of a borehole's fluid plotted from 0 to 20 ohm-m as red line.
3-Arm Caliper	3-arm mechanical caliper of hole diameter plotted from 0 to 20 inches (black dashed line).
Temperature	Borehole fluid temperature plotted from 10 to 30 degrees C (blue line).
2-Ft Diff. Temp.	Differential temperature over 2-ft spacing (brown line).
	Mnemonics prepared by Erika J. Beam Version 03-09-20

MSI Gamma-Caliper-Temperature-Fluid Resistivity

Probe Top = Depth Ref.



Single Conductor MSI Probe Top

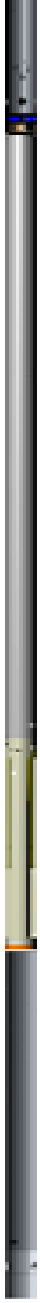
Probe Length = 2.59 m or 8.5 ft
Probe Weight = 6.80 kg or 15.0 lbs

Natural Gamma and Caliper can only be collected logging up hole.

Fluid Temperature/Resistivity can only be collected logging down hole.

Temperature Rating: 70 Deg C (158 Deg F)
Presure Rating: 200 bar (2900 psi)

Natural Gamma Ray = 0.76 m (29.75 in)



NOTE: Lengths on a particular tool may vary from those listed on this document due to probe sizes and styles utilized

3-Arm Caliper = 1.44 m (56.75 in)

Distance from tool top: 2.20 m (86.5 in)

Available Arm Sizes: 3", 9", and 15"

TFR (Temperature/Fluid Resistivity) = 0.39 m (15.5 in)

1.375" or 34.9 mm Diameter

Southwest Exploration Services, LLC
borehole geophysics & video services

Company	GEOSYNTEC
Well	TTU EX-3
Field	TALLEY
County	MARICOPA
State	ARIZONA

Final GCT Summary

Southwest Exploration Services, LLC

borehole geophysics & video services

COMPANY	GEOSYNTEC
WELL ID	TTU EX-3
FIELD	TALLEY
COUNTY	MARICOPA STATE ARIZONA

TYPE OF LOGS: OPTICAL TELEVIEWER
MORE: GAMMA - CALIPER

LOCATION

SEC TWP RGE

OTHER SERVICES
ACOUSTIC TELEVIEWER
TEMP / FLUID RES.

PERMANENT DATUM		ELEVATION	K.B.
LOG MEAS. FROM	GROUND LEVEL	ABOVE PERM. DATUM	D.F.
DRILLING MEAS. FROM	GROUND LEVEL		G.L.

DATE	02-16-20	TYPE FLUID IN HOLE	FORMATION WATER
RUN No	1	MUD WEIGHT	N/A
TYPE LOG	OPTICAL TELEVIEWER	VISCOSITY	N/A
DEPTH-DRILLER	110.0 FT	LEVEL	~46 FT
DEPTH-LOGGER	101.0 FT	MAX. REC. TEMP.	25.6 DEG C
BTM LOGGED INTERVAL	101.0 FT	IMAGE ORIENTED TO:	MAGNETIC NORTH
TOP LOGGED INTERVAL	SURFACE	SAMPLE INTERVAL	0.035 FT
DRILLER / RIG#	N/A	LOGGING TRUCK	TRUCK #310
RECORDED BY / Logging Eng.	E. BEAM / T. GODSEY	TOOL STRING/SN	ALT QL OBI40 2G SN 170106
WITNESSED BY	FABRIZIO - GEOSYNTEC	LOG TIME:ON SITE/OFF SITE	7:00 AM

RUN	BOREHOLE RECORD			CASING RECORD			
NO.	BIT	FROM	TO	SIZE	WGT.	FROM	TO
1	?	SURFACE	20 FT	8.5 IN	STEEL	SURFACE	20 FT
2	8 IN	20 FT	TOTAL DEPTH				
3							

COMMENTS:

.

Tool Summary:

Date	02-16-20	**Date**	02-16-20	**Date**	02-16-20		
Run No.	1	**Run No.**	2	**Run No.**	3		
Tool Model	ALT QL OBI40 2G	**Tool Model**	MSI COMBO TOOL	**Tool Model**	ALT QL ABI40 2G		
Tool SN	170106	**Tool SN**	5446	**Tool SN**	192302		
From	SURFACE	**From**	SURFACE	**From**	40.0 FT		
To	101.0 FT	**To**	101.0 FT	**To**	101.0 FT		
Recorded By	E. BEAM	**Recorded By**	E. BEAM	**Recorded By**	E. BEAM		
Truck No	310	**Truck No**	310	**Truck No**	310		
Operation Check	01-30-20	**Operation Check**	02-16-20	**Operation Check**	02-14-20		
Calibration Check	N/A	**Calibration Check**	02-16-20	**Calibration Check**	N/A		
Time Logged	10:20 AM	**Time Logged**	10:45 AM	**Time Logged**	10:55 AM		
Date		**Date**		**Date**			
Run No.	4	**Run No.**	5	**Run No.**	6		
Tool Model		**Tool Model**		**Tool Model**			
Tool SN		**Tool SN**		**Tool SN**			
From		**From**		**From**			
To		**To**		**To**			
Recorded By		**Recorded By**		**Recorded By**			
Truck No		**Truck No**		**Truck No**			
Operation Check		**Operation Check**		**Operation Check**			
Calibration Check		**Calibration Check**		**Calibration Check**			
Time Logged		**Time Logged**		**Time Logged**			

Additional Comments:

Caliper Arms Used: 9" **Calibration Points:** 4" & 10"

E-Log Calibration Range: N/A **Calibration Points:** N/A

Disclaimer:

All interpretations of log data are opinions based on inferences from electrical or other measurements. We do not guarantee the accuracy or correctness of any interpretations or recommendations and shall not be liable or responsible for any loss, costs, damages, or expenses incurred or sustained by anyone resulting from any interpretation made by any of our employees or agents. These interpretations are also subject to our general terms and conditions set out in our current Service Invoice.

Image Features Legend

- Btm of Casing
- Filled Fracture / Joint
- Bedding / Banding / Foliation / Veins
- Partially Open Joint / Fracture
- Minor Open Joint / Fracture
- OJ/Fx terminates at Fx intersection
- Unclassified
- Sulfide Vein
- Breakouts
- Major Open Joint / Fracture
- Fluid Level

Breakout Legend

- Broken Zone / Undifferentiated
- Major Breakout
- Minor Breakout
- Tensile Fracture
- Filled Near Vertical Joint/Fx
- Near Vertical Joint/Fx

Bx Legend

- Breccia or Conglomerate
- Large Vugs/Vesicles (> 6")
- Medium Vugs/Vesicles (2-6")
- Small Vugs/Vesicles (< 2")
- Conglomerate - sand matrix supported
- Conglomerate - mud matrix supported
- Conglomerate - clast supported

TTU EX-3 Well OBI40 2G Summary ~20.4' to ~100.9'

Depth 1in:1ft

Nat. Gamma	3-Arm Caliper	Image-NM	Picks	Tadpole	3-D View	Mag Field	Tilt	Gravity	Azi-Edited
0 API 200	5 Inches 15	Oriented Mag North 0° 90° 180° 270° 0°	DIPA	DIPT 0 100	-0°	40 uT 60	0 Deg 8	0.8 g 1.2	0 360

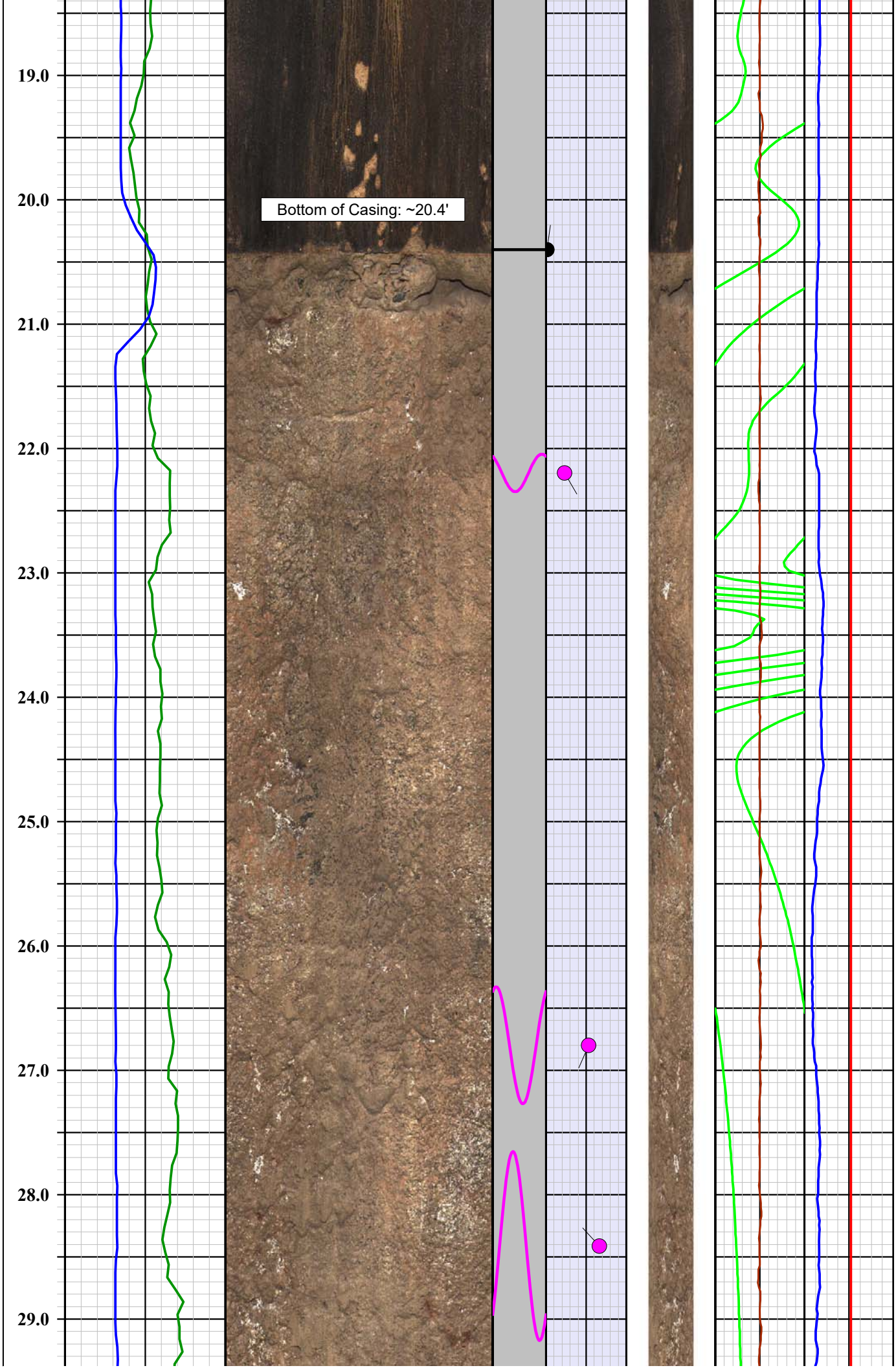
NVJts

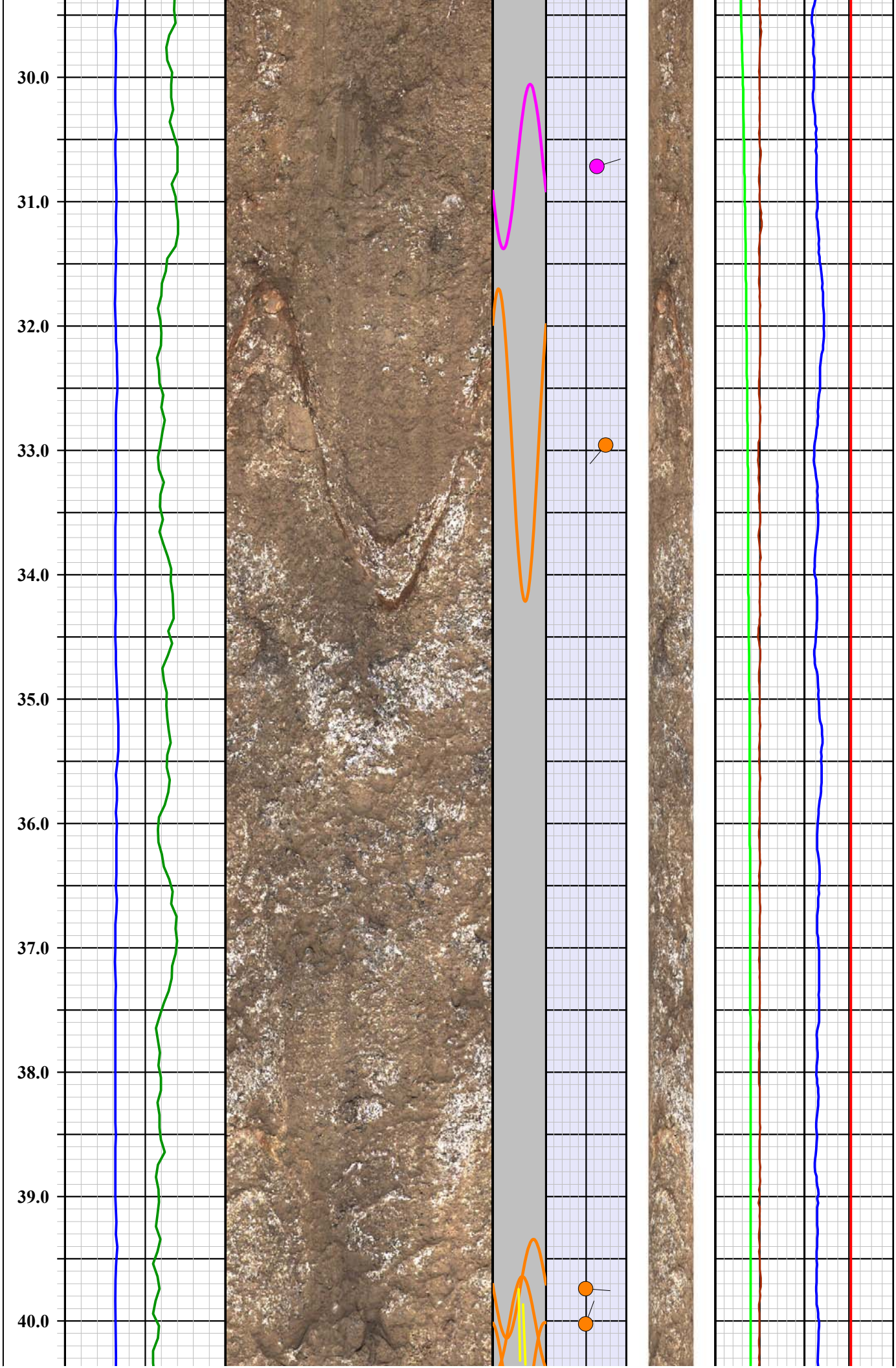
Bx

Image_18.0'-43.0'

Non Oriented, Rot'd by 72.8 Deg

0° 90° 180° 270° 0°


19.0
20.0
21.0
22.0
23.0
24.0
25.0
26.0
27.0
28.0
29.0
Bottom of Casing: ~20.4'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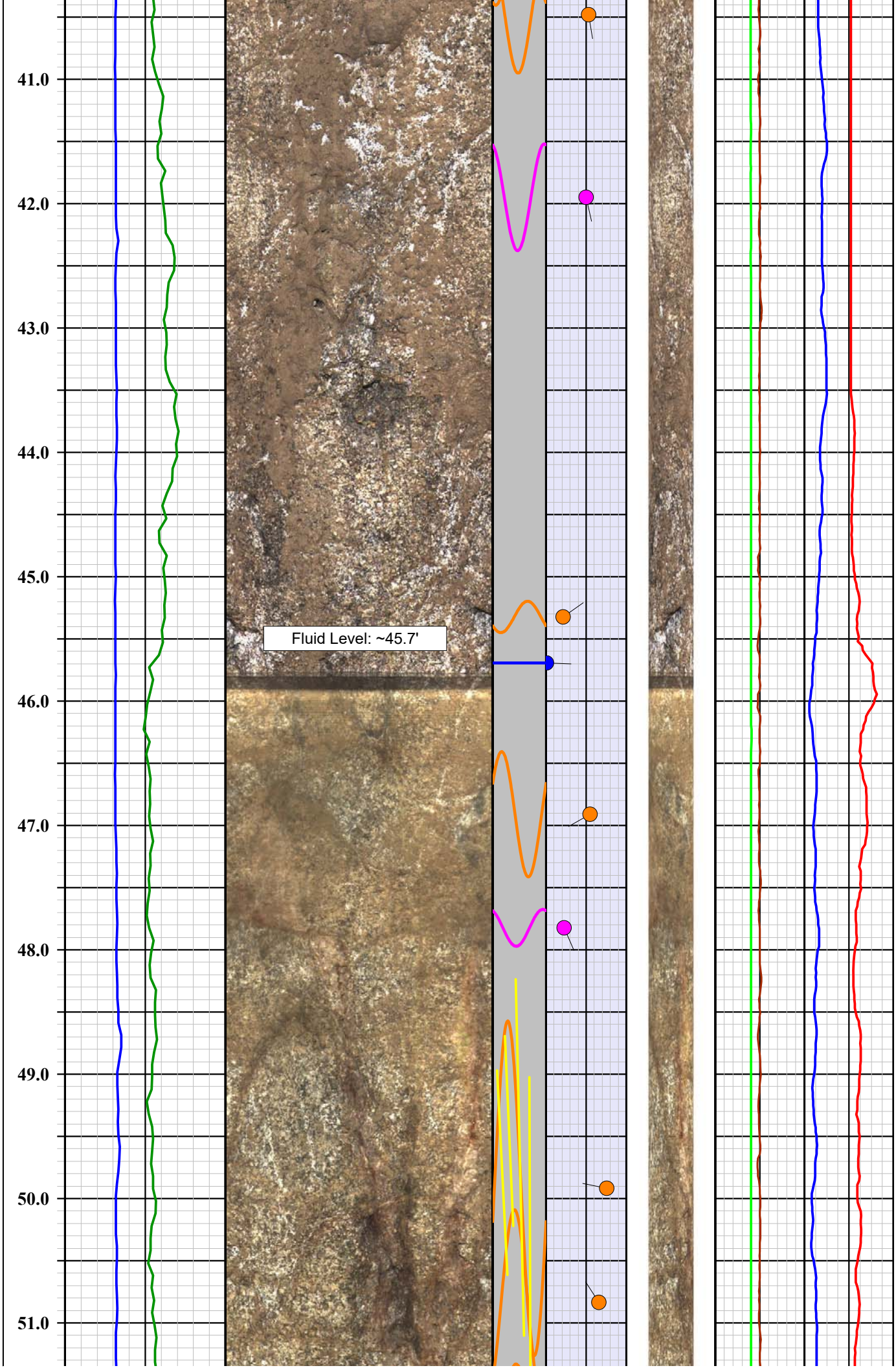
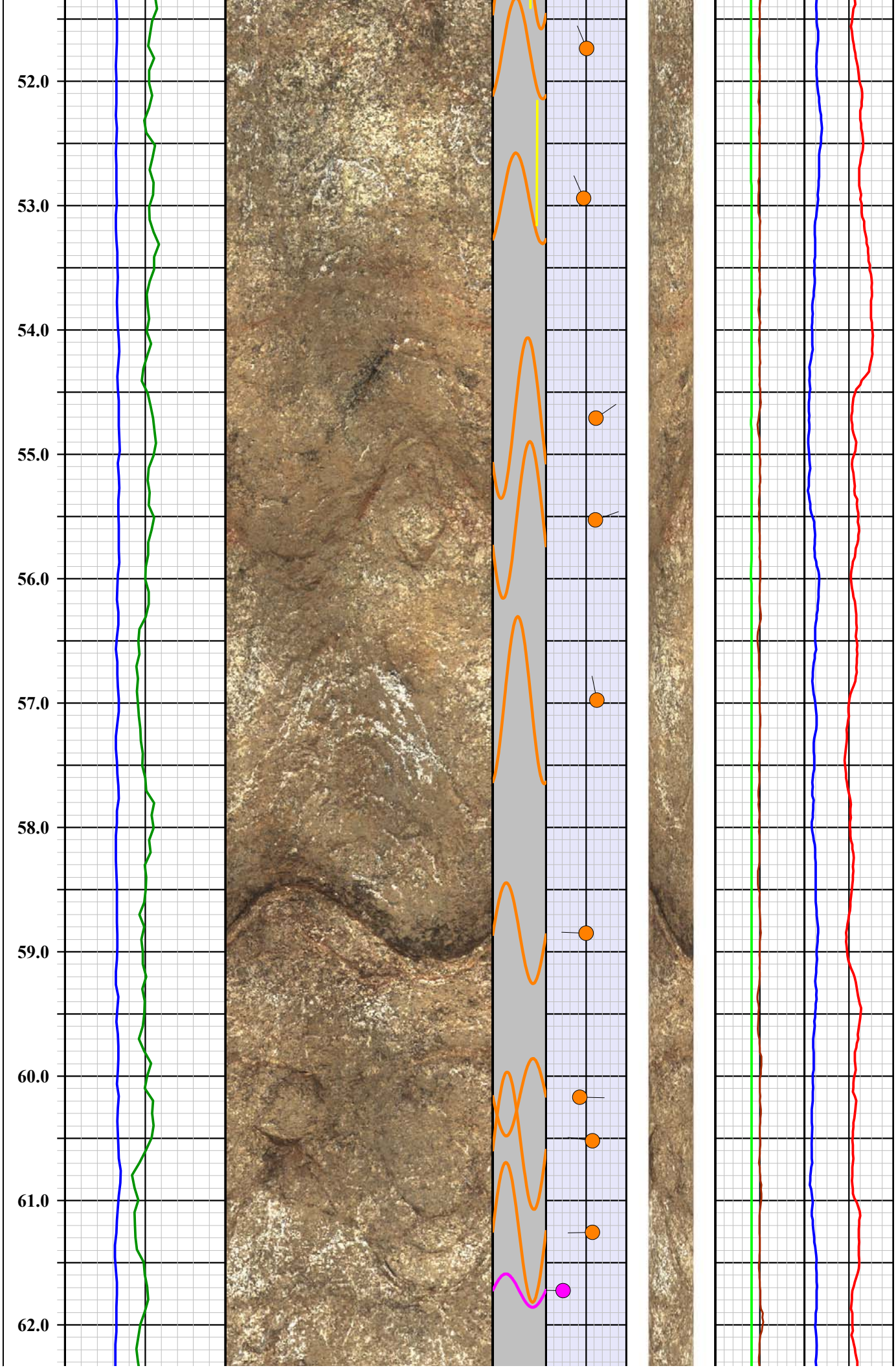
31.0
32.0
33.0
34.0
35.0
36.0
37.0
38.0
39.0
40.0


41.0
42.0
43.0
44.0
45.0
46.0
47.0
48.0
49.0
50.0
51.0
Fluid Level: ~45.7'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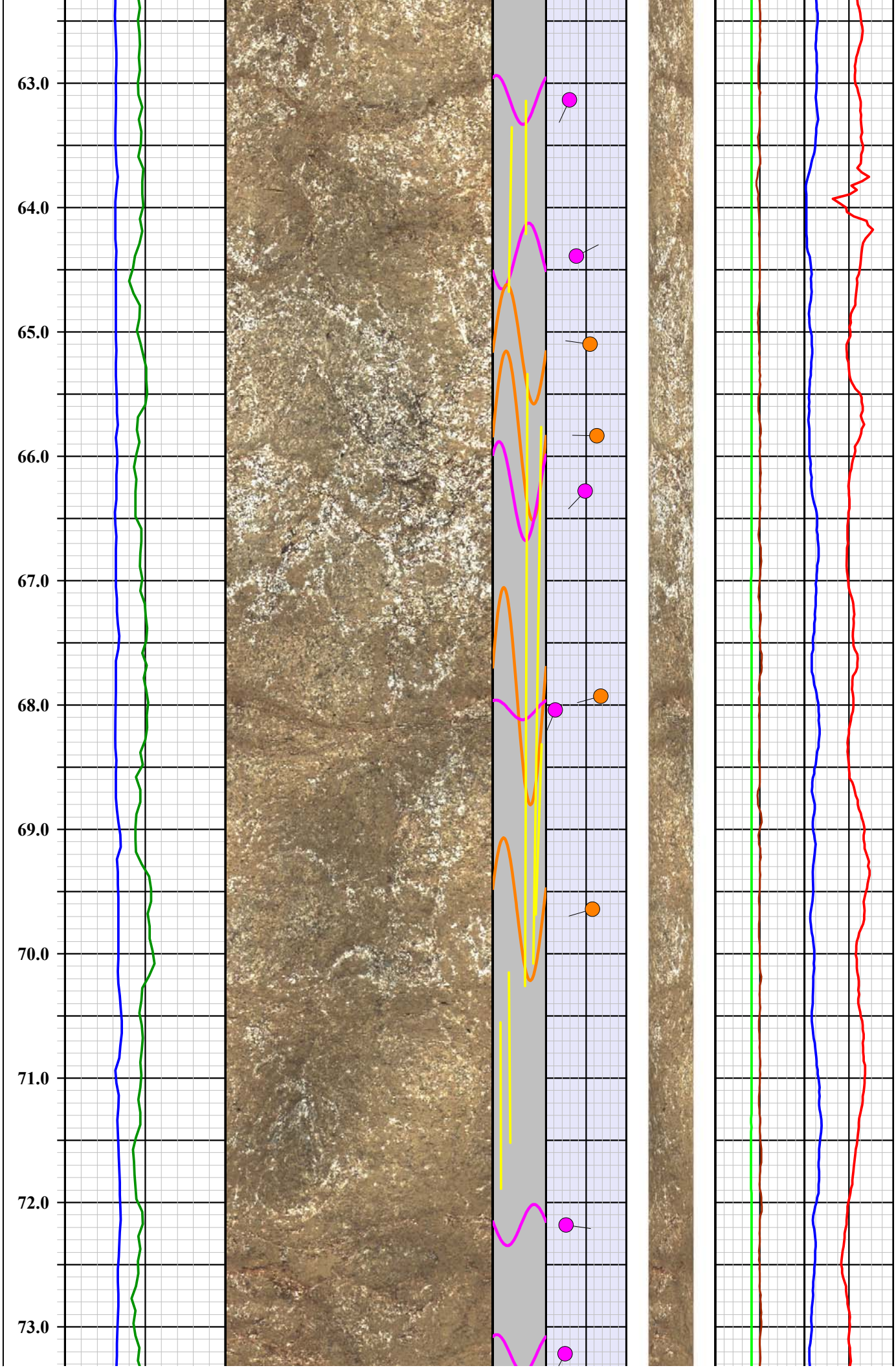
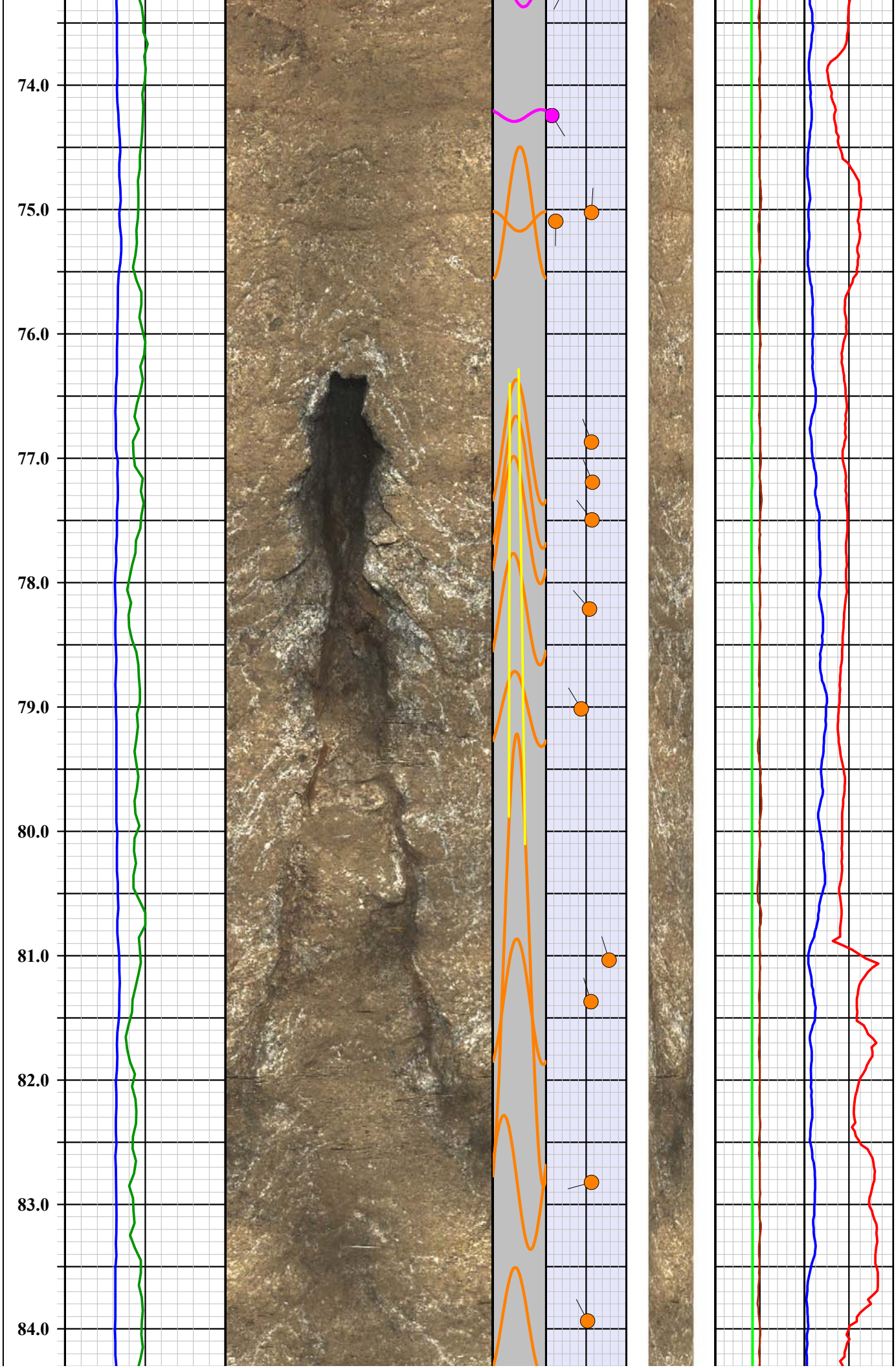
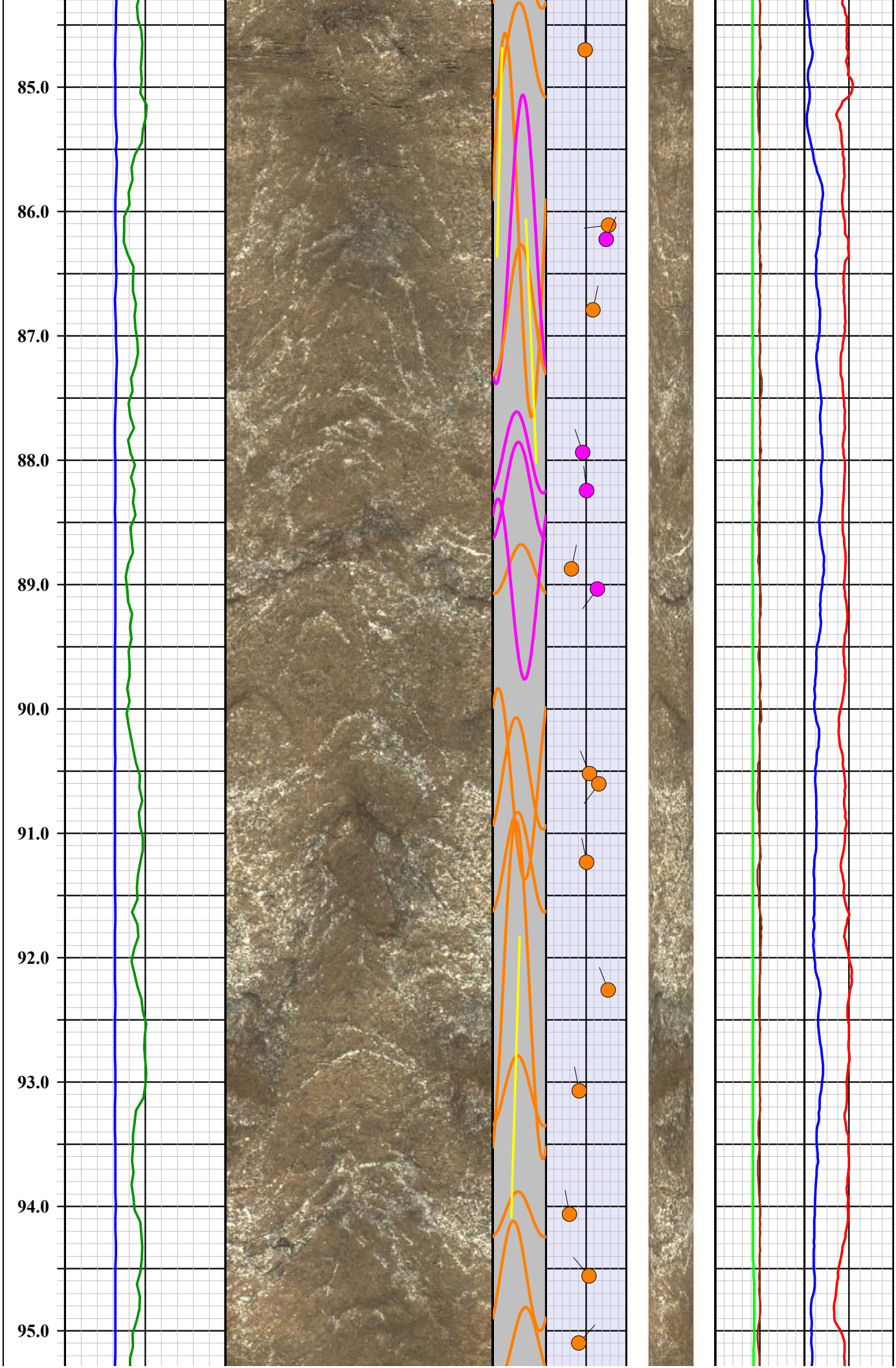
53.0
54.0
55.0
56.0
57.0
58.0
59.0
60.0
61.0
62.0


63.0
64.0
65.0
66.0
67.0
68.0
69.0
70.0
71.0
72.0
73.0


74.0
75.0
76.0
77.0
78.0
79.0
80.0
81.0
82.0
83.0
84.0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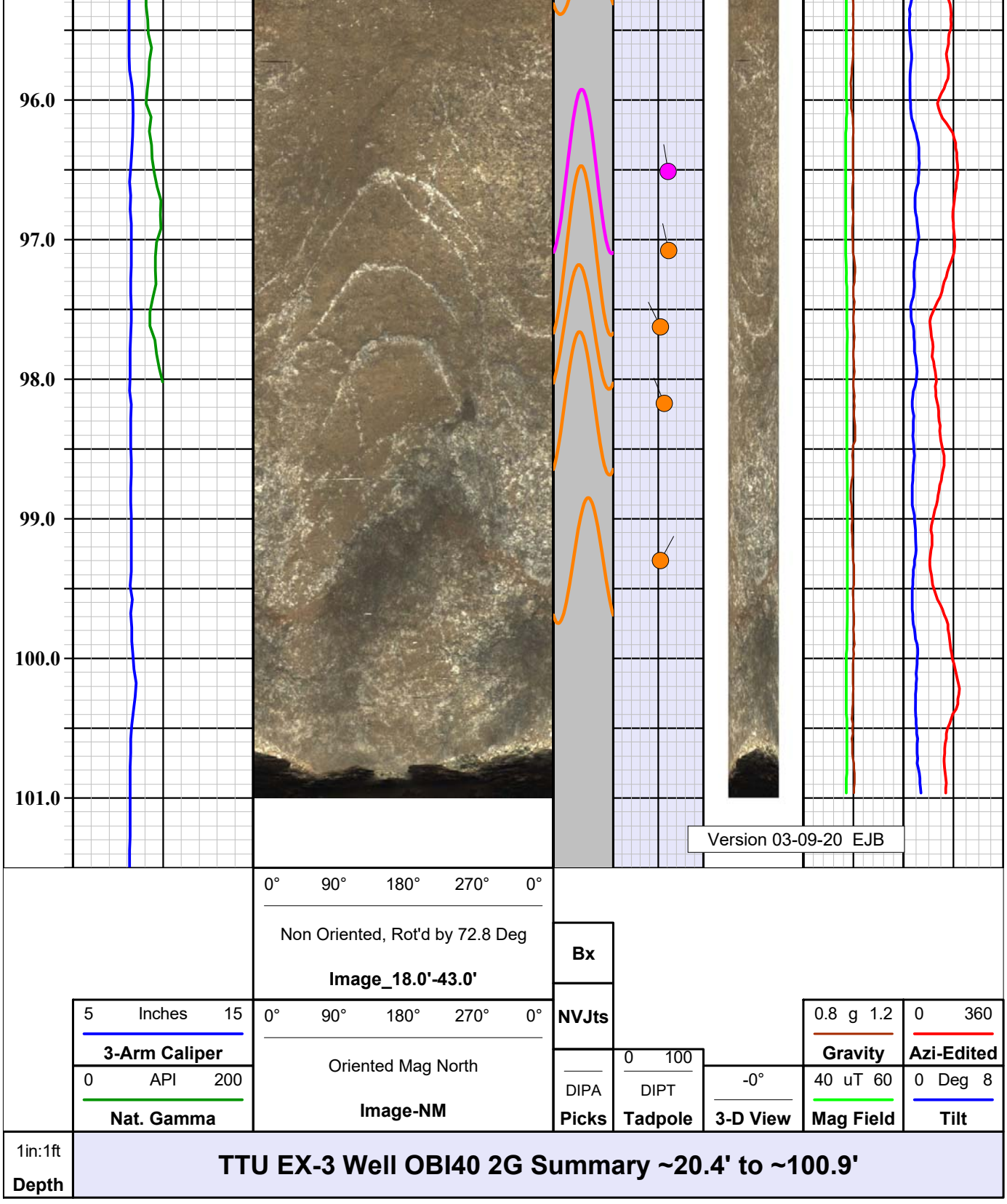
86.0
87.0
88.0
89.0
90.0
91.0
92.0
93.0
94.0
95.0



Legend

Mnemonics	Description
3-Arm Caliper	3-arm mechanical caliper of hole diameter plotted from 5 to 15 inches (blue line).
Nat. Gamma	Natural gamma ray log plotted from 0 to 200 API units (green line).
Image-NM	2D plot of optical image oriented to magnetic north. Plotted from left to right N-E-S-W-N.

Image_18.0'-43.0'	2D plot of optical image non-oriented and rotated by 72.8 deg to correct for magnetic affect in proximity of steel casing. Plotted from left to right N-E-S-W-N.
Picks	Planar strucutral features picked on optical borehole image shown as colored sinusoid (color designation shown on header) DIPA = dip apparent hole axis.
NVJts	Near Vertical (near parallel to hole axis) joint/fracture features picked on optical borehole image shown as colored sinusoid (color designation shown on header).
Bx	Apparent Breccia or Congomerate zones and Vugs/Vesicles/Cavities.
3-D View	3D cylindrical projection of OBI image viewed from north.
Tadpole	Tadpole plot of the OBI feature picks (fractures and bedding planes); plotted from 0 to 90 dip - see legend above. DIPT = True orientation; features corrected for hole deviation.
Mag Field	Total magnetic field strength as measured by fluxgate magnetometer in OBI or ABI deviation sensor - plotted 40-60 uT (green line).
Gravity	Total gravity (probe acceleration) as measured by 3-axis accelerometers in OBI deviation sensor - plotted 0.8-1.2 g (brown line).
Azi-Edited	Direction of tool tilt plotted 0 to 360 deg; edited for anomalous magnetic influence - represents borehole deviation direction (red line).
Tilt	Tool tilt (vertical = 0 and horizontal = 90) plotted 0 to 8 deg; represents borehole deviation tilt from vertical (blue line).
	Mnemonics prepared by Erika J Beam Version 03-09-20

QL OBI-40 2G Optical Borehole Imager

Probe Top = Depth Ref.

Tool SN: 145010, 152511 & 170106

Four Conductor MSI Probe Top

APS Probe Orientation Sensor
3-Axis Magnetometer
3-Axis Accellerometer

Probe Length = 1.66 m or 5.46 ft

Probe Weight = 5.3 kg or 11.7 lbs

Distance from Optical Image Window to Orientation Sensor = 0.9 m or 3 ft

Inclination Accuracy = +/- 0.5 deg
Azimuth Accuracy = +/- 1.0 deg

Temperature Range: 0 - 70 Deg C (32 - 158 Deg F)
Pressure Range: 0 - 200 bar (0 - 2900 psi)

External Bow Spring Centralizers

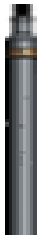
Operates in dry or clear water conditions.

OBI Imaging Window

1.6" or 40 mm Diameter

MSI Gamma-Caliper-Temperature-Fluid Resistivity

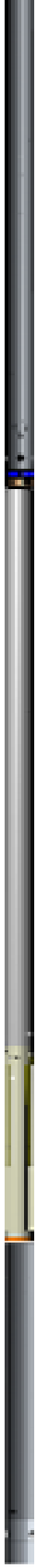
Probe Top = Depth Ref.



Single Conductor MSI Probe Top

Probe Length = 2.59 m or 8.5 ft
Probe Weight = 6.80 kg or 15.0 lbs

Natural Gamma and Caliper can only be collected logging up hole



Natural Gamma and Caliper can only be collected logging up hole.

Fluid Temperature/Resistivity can only be collected logging down hole.

Temperature Rating: 70 Deg C (158 Deg F)
Presure Rating: 200 bar (2900 psi)

Natural Gamma Ray = 0.76 m (29.75 in)

NOTE: Lengths on a particular tool may vary from those listed on this document due to probe sizes and styles utilized

3-Arm Caliper = 1.44 m (56.75 in)

Distance from tool top: 2.20 m (86.5 in)

Available Arm Sizes: 3", 9", and 15"

TFR (Temperature/Fluid Resistivity) = 0.39 m (15.5 in)

1.375" or 34.9 mm Diameter

Southwest Exploration Services, LLC
borehole geophysics & video services

Company	GEOSYNTEC
Well	TTU EX-3
Field	TALLEY
County	MARICOPA
State	ARIZONA

Final Optical Televiewer Summary

Final Optical Televiewer Summary

Drill Hole: TTU EX-4 March 10, 2020, EJB

Geophysical Logs were collected by SwExp on February 16, 2020.
Features oriented to Magnetic North and corrected for borehole deviation to true orientation
Features picked/ranked by EJB Prior to March 10, 2020.

Ranking Scheme:

100 = Black = Bottom of Casing
104 = White = In-filled Joint/Fracture - mineralogy not determined
106 = Green = Bedding/banding/foliation
109 = Orange = Partially open Joint/Fracture
110 = Pink = Thin and/or discontinuous around circumference Joint/Fracture
111 = Yellow = Apparent Joint/Fracture terminates at fracture intersection
112 = Light Blue = Unclassified planar feature
305 = Red = Wide major Joint/Fracture
307 = Blue = Fluid Level

VFx = 2 Near vertical Joints/Fractures
VFx-W = 2 Wide Near vertical Joints/fractures
33 = >2 near vertical Joint/fractures
IFx = Possible drilling induced near vertical tensile fractures
Bx = Breccia/Collapse Breccia
Lg V = Large Vug/ Vugs/ or Vesicles (> 6" diameter)
MV = Medium Vug/ Vugs/ or Vesicles (2-6" diameter)
CNG = Small Vug/ Vugs/ or Vesicles (< 2" diameter)
Vein = infilled near vertical joint/fracture

Continuity
C1 Discontinuous - < 50%
C2 Slightly continuous - 50-75%
C3 Moderately continuous 75-100%
C4 High continuous – thin
C5 Very continuous – wide

Condition
0 – Smooth
1 – Rough
2 – Weathered
3 - Brec / Crushed
4 – Offset

Form
0 – Undulating/curved
1 – Planar
2 – Stepped
3 – Parting
4 – Styolitic

Remark
Open
Partially Open
Tight
Cemented/Filled
Partially Cemented

Filling (OBI)
No apparent filling
White soft
White
Dark soft
Dark
Sulfide/metallic
Stained Black
Stained Brown

Filling (ABI)
No apparent filling
Hard

Note: Some partially open features on the ABI image may be filled with soft material and may not be potential fluid pathways.

Image log was obtained in 2 pieces:
OBI from 19.8' to 105.3'
ABI from 46.3' to 105.2'

The OBI/ABI combined image from 19.8' to 105.3' is good throughout the logged interval.

*Depth for dipping fractures is midpoint depth; for near Vertical joints/fractures and Vugs it is Top Depth

Depth*	Btm Depth	Dip Dir	Tilt	Aperture	Classification	Continuity	Form	Condition	Filling	Remark
Ft	Ft	Deg	Deg	Inch/10						
19.77		34.6	0.50	0.00	100 - Bottom of Casing	C3 Moderately continuous 75-100%	1 - Planar	0 - Smooth	no data	no data
23.51		269.8	57.82	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
33.85		243.5	56.80	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
46.31		39.9	0.39	0.00	307 - Fluid Level	C3 Moderately continuous 75-100%	1 - Planar	0 - Smooth	no data	no data
50.30		259.0	53.95	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
50.57		27.1	64.17	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
53.63		222.6	40.87	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
57.86		348.9	62.70	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
58.11		77.2	67.58	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
59.02		279.1	60.11	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
59.63		322.6	53.05	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
60.45		291.3	65.19	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
60.65		283.5	59.02	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
61.44		285.6	61.24	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	0 - Smooth	No apparent filling	Tight
66.30		49.8	27.03	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	0 - Smooth	No apparent filling	Tight
68.56		20.5	78.44	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
69.88		21.4	45.62	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
71.22		330.6	53.30	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
74.35		233.5	49.36	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
75.96		337.9	56.13	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
77.78		187.4	73.00	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
78.59		4.0	77.18	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
82.57		188.3	74.48	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
85.07		187.2	63.94	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
85.85		340.4	79.04	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
89.01		302.6	79.02	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
91.61		117.1	77.90	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
92.06		235.2	60.37	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
92.74		89.4	21.95	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
93.11		224.7	42.32	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
94.52		212.5	66.65	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
95.87		335.8	67.46	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
96.63		21.6	38.98	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
99.48		334.4	62.89	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
99.51		211.9	39.64	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
100.63		137.3	58.55	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
101.76		155.3	70.10	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
102.76		229.1	50.99	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
103.24		204.0	26.05	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
104.24		101.4	21.33	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight

Vugs and Bx Features

VFx = 2 Near vertical Joints/Fractures
VFx-W = 2 Wide Near vertical Joints/fractures
33 = >2 near vertical Joint/fractures
IFx = Possible drilling induced near vertical tensile fractures
Bx = Breccia/Collapse Breccia
Lg V = Large Vug/ Vugs/ or Vesicles (> 6" diameter)
MV = Medium Vug/ Vugs/ or Vesicles (2-6" diameter)
CNG = Small Vug/ Vugs/ or Vesicles (< 2" diameter)
Vein = infilled near vertical joint/fracture
7 = Conglomerate - Sand matrix supported
8 = Conglomerate - Mud matrix supported
9 = Conglomerate - Clast supported

Breccia/Vugs/Vesicles Etc. on OBI/ABI combined image from 19.8' to 105.3'

Depth	Btm Depth				Ranking/Description
Ft	Ft				

Near Vertical (Near parallel to hole axis) Features

0 = Gray = Broken Zone/Undifferentiated
1 = Red = Major Breakout
2 = Orange = Minor Breakout
3 = Light Blue = Tensile Fracture
4 = Green = Filled Near Vertical Joint/Fx
5 = Yellow = Near Vertical Joint/Fx

OBI/ABI combined image from 19.8' to 105.3'

Depth* = mid-point of near vertical feature.
Tilt is referenced to hole axis - 0 Deg tilt is parallel to hole axis

Depth*	Azimuth	Tilt	Length	Opening	Classification
Ft	Deg	Deg	Ft	Deg	
49.53	227.5	2.25	0.70	0.00	Near Vertical Joint/Fx
56.74	121.3	-8.54	2.07	0.00	Near Vertical Joint/Fx
58.10	57.4	-9.80	2.48	0.00	Near Vertical Joint/Fx
62.37	285.5	-6.37	1.26	0.00	Near Vertical Joint/Fx
62.79	79.8	-12.19	1.06	0.00	Near Vertical Joint/Fx
62.87	2.6	17.06	1.51	0.00	Near Vertical Joint/Fx
64.13	345.5	-5.56	0.93	0.00	Near Vertical Joint/Fx
64.48	79.8	5.55	2.30	0.00	Near Vertical Joint/Fx
64.62	322.4	-5.93	1.54	0.00	Near Vertical Joint/Fx
68.08	97.6	-8.03	1.73	0.00	Near Vertical Joint/Fx
68.65	344.8	-0.35	1.93	0.00	Near Vertical Joint/Fx
70.35	146.4	0.68	2.02	0.00	Near Vertical Joint/Fx
70.83	242.6	-2.00	3.90	0.00	Near Vertical Joint/Fx
72.46	158.9	0.46	3.95	0.00	Near Vertical Joint/Fx

72.89	315.8	4.83	2.66	0.00	Near Vertical Joint/Fx
73.27	207.0	-0.65	2.50	0.00	Near Vertical Joint/Fx
73.65	38.9	-0.45	5.05	0.00	Near Vertical Joint/Fx
75.12	336.3	-1.20	3.03	0.00	Near Vertical Joint/Fx
75.34	143.1	-8.89	1.94	0.00	Near Vertical Joint/Fx
79.21	309.9	-0.43	4.24	0.00	Near Vertical Joint/Fx
80.30	101.5	-1.49	5.58	0.00	Near Vertical Joint/Fx
81.32	156.3	0.00	3.15	0.00	Near Vertical Joint/Fx
81.41	191.2	0.25	2.70	0.00	Near Vertical Joint/Fx
83.06	266.4	6.89	3.73	0.00	Near Vertical Joint/Fx
87.84	83.1	10.48	1.83	0.00	Near Vertical Joint/Fx
96.08	320.4	4.64	3.07	5.27	Near Vertical Joint/Fx
96.35	218.9	1.45	2.98	0.00	Near Vertical Joint/Fx
97.21	143.1	2.75	4.52	0.00	Near Vertical Joint/Fx
97.37	48.8	-1.32	3.55	0.00	Near Vertical Joint/Fx
103.00	119.3	0.91	3.91	0.00	Near Vertical Joint/Fx
103.59	216.3	-1.08	2.27	0.00	Near Vertical Joint/Fx

Southwest Exploration Services, LLC

borehole geophysics & video services

COMPANY	GEOSYNTEC
WELL ID	TTU EX-4
FIELD	TALLEY
COUNTY	MARICOPA STATE ARIZONA

TYPE OF LOGS: ACOUSTIC TELEVIEWER
MORE: CALIPER

LOCATION

SEC TWP RGE

OTHER SERVICES
GAMMA
TEMP / FLUID RES.
OPTICAL TELEVIEWER

PERMANENT DATUM		ELEVATION	K.B.
LOG MEAS. FROM	GROUND LEVEL	ABOVE PERM. DATUM	D.F.
DRILLING MEAS. FROM	GROUND LEVEL		G.L.

DATE	02-16-20	TYPE FLUID IN HOLE	FORMATION WATER
RUN No	2	MUD WEIGHT	N/A
TYPE LOG	ACOUSTIC TELEVIEWER	VISCOSITY	N/A
DEPTH-DRILLER	110.0 FT	LEVEL	~46 FT
DEPTH-LOGGER	110.0 FT	MAX. REC. TEMP.	25.7 DEG C
BTM LOGGED INTERVAL	106.0 FT	IMAGE ORIENTED TO:	MAGNETIC NORTH
TOP LOGGED INTERVAL	46.0 FT	SAMPLE INTERVAL	0.010 FT
DRILLER / RIG#	N/A	LOGGING TRUCK	TRUCK #310
RECORDED BY / Logging Eng.	E. BEAM / T. GODSEY	TOOL STRING/SN	ALT QL ABI40 2G SN 192302
WITNESSED BY	FABRIZIO - GEOSYNTEC	LOG TIME:ON SITE/OFF SITE	7:00 AM

RUN	BOREHOLE RECORD			CASING RECORD			
NO.	BIT	FROM	TO	SIZE	WGT.	FROM	TO
1	?	SURFACE	20 FT	8.5 IN	STEEL	SURFACE	20 FT
2	8 IN	20 FT	TOTAL DEPTH				
3							

COMMENTS:

.

Tool Summary:

Date	02-16-20	**Date**	02-16-20	**Date**	02-16-20		
Run No.	1	**Run No.**	2	**Run No.**	3		
Tool Model	ALT QL OBI40 2G	**Tool Model**	MSI COMBO TOOL	**Tool Model**	ALT QL ABI40 2G		
Tool SN	170106	**Tool SN**	5446	**Tool SN**	192302		
From	SURFACE	**From**	SURFACE	**From**	46.0 FT		
To	106.0 FT	**To**	108.0 FT	**To**	106.0 FT		
Recorded By	E. BEAM	**Recorded By**	E. BEAM	**Recorded By**	E. BEAM		
Truck No	310	**Truck No**	310	**Truck No**	310		
Operation Check	01-30-20	**Operation Check**	02-16-20	**Operation Check**	02-14-20		
Calibration Check	N/A	**Calibration Check**	02-16-20	**Calibration Check**	N/A		
Time Logged	11:30 AM	**Time Logged**	11:55 AM	**Time Logged**	12:10 PM		
Date		**Date**		**Date**			
Run No.	4	**Run No.**	5	**Run No.**	6		
Tool Model		**Tool Model**		**Tool Model**			
Tool SN		**Tool SN**		**Tool SN**			
From		**From**		**From**			
To		**To**		**To**			
Recorded By		**Recorded By**		**Recorded By**			
Truck No		**Truck No**		**Truck No**			
Operation Check		**Operation Check**		**Operation Check**			
Calibration Check		**Calibration Check**		**Calibration Check**			
Time Logged		**Time Logged**		**Time Logged**			

Additional Comments:

Caliper Arms Used: 9" **Calibration Points:** 4" & 10"

E-Log Calibration Range: N/A **Calibration Points:** N/A

Disclaimer:

All interpretations of log data are opinions based on inferences from electrical or other measurements. We do not guarantee the accuracy or correctness of any interpretations or recommendations and shall not be liable or responsible for any loss, costs, damages, or expenses incurred or sustained by anyone resulting from any interpretation made by any of our employees or agents. These interpretations are also subject to our general terms and conditions set out in our current Service Invoice.

Image Features Legend

- Btm of Casing
- Filled Fracture / Joint
- Bedding / Banding / Foliation / Veins
- Partially Open Joint / Fracture
- Minor Open Joint / Fracture
- OJ/Fx terminates at Fx intersection
- Unclassified
- Sulfide Vein
- Breakouts
- Major Open Joint / Fracture
- Fluid Level

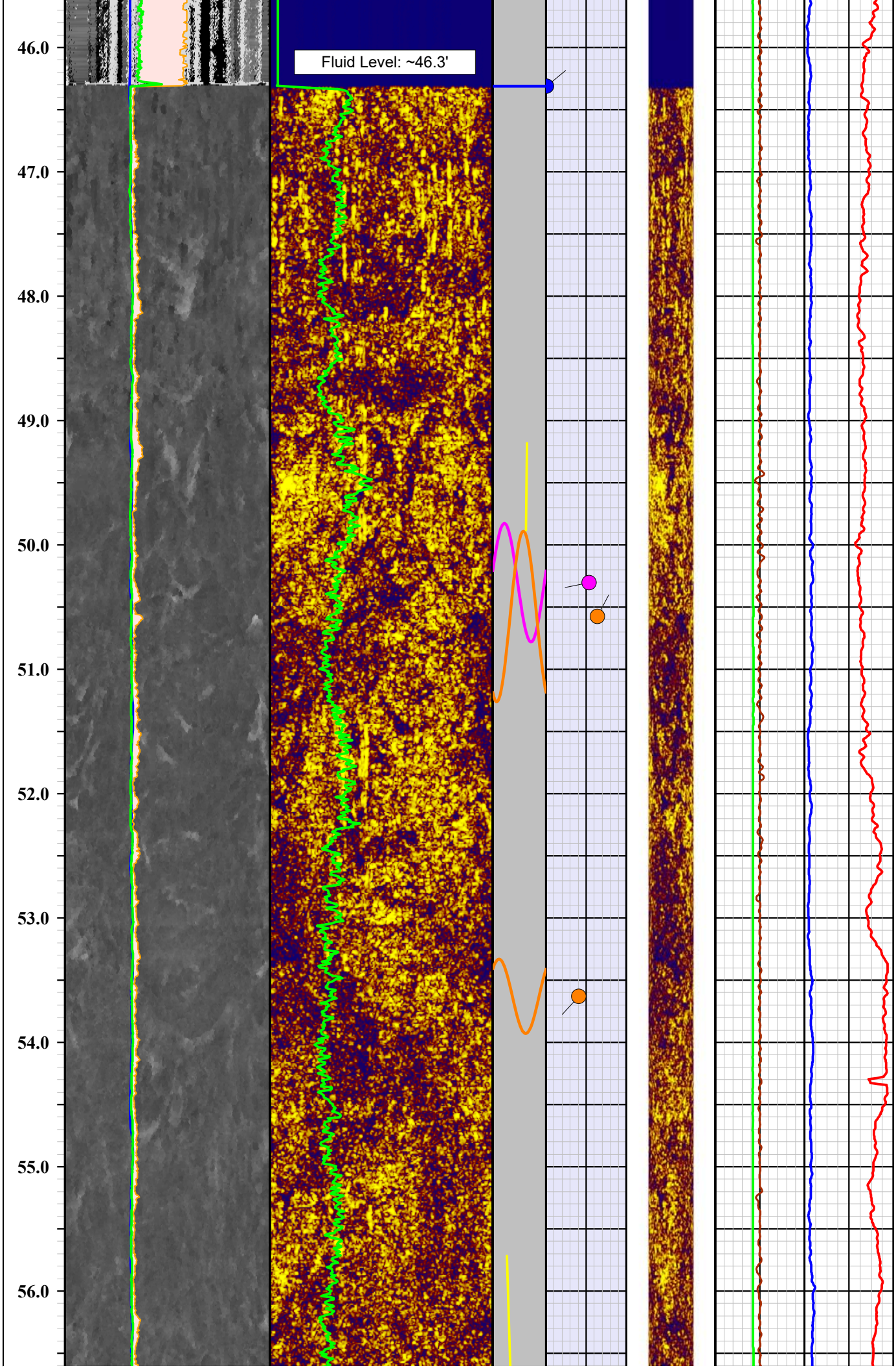
Breakout Legend

- Broken Zone / Undifferentiated
- Major Breakout
- Minor Breakout
- Tensile Fracture
- Filled Near Vertical Joint/Fx
- Near Vertical Joint/Fx

Bx Legend

- Breccia or Conglomerate
- Large Vugs/Vesicles (> 6")
- Medium Vugs/Vesicles (2-6")
- Small Vugs/Vesicles (< 2")
- Conglomerate - sand matrix supported
- Conglomerate - mud matrix supported
- Conglomerate - clast supported

Depth 1in:1ft	TTU EX-4 Well ABI40 2G Summary ~46.3' to ~105.2'						
	Centralized TT, Oriented Mag North (0° 90° 180° 270° 0°)	Amplitude-NM, Oriented Mag North (0° 90° 180° 270° 0°)	Picks: DIPA	Tadpole: DIPT (0 100)	3-D View (-0°)	Mag Field (40 uT 60)	Tilt (0 Deg 8)
	3-Arm Caliper (5 Inches 15)	Amplitude-Static, Oriented Mag North (0° 90° 180° 270° 0°)	NVJts			Gravity (0.8 g 1.2)	Azimuth (0 360)
	Max-Acoustic Caliper (5 Inches 15)	ARI (0 2000)	Bx				
	Ave-Acoustic Caliper (5 Inches 15)						
	Enlargements						


Fluid Level: ~46.3'
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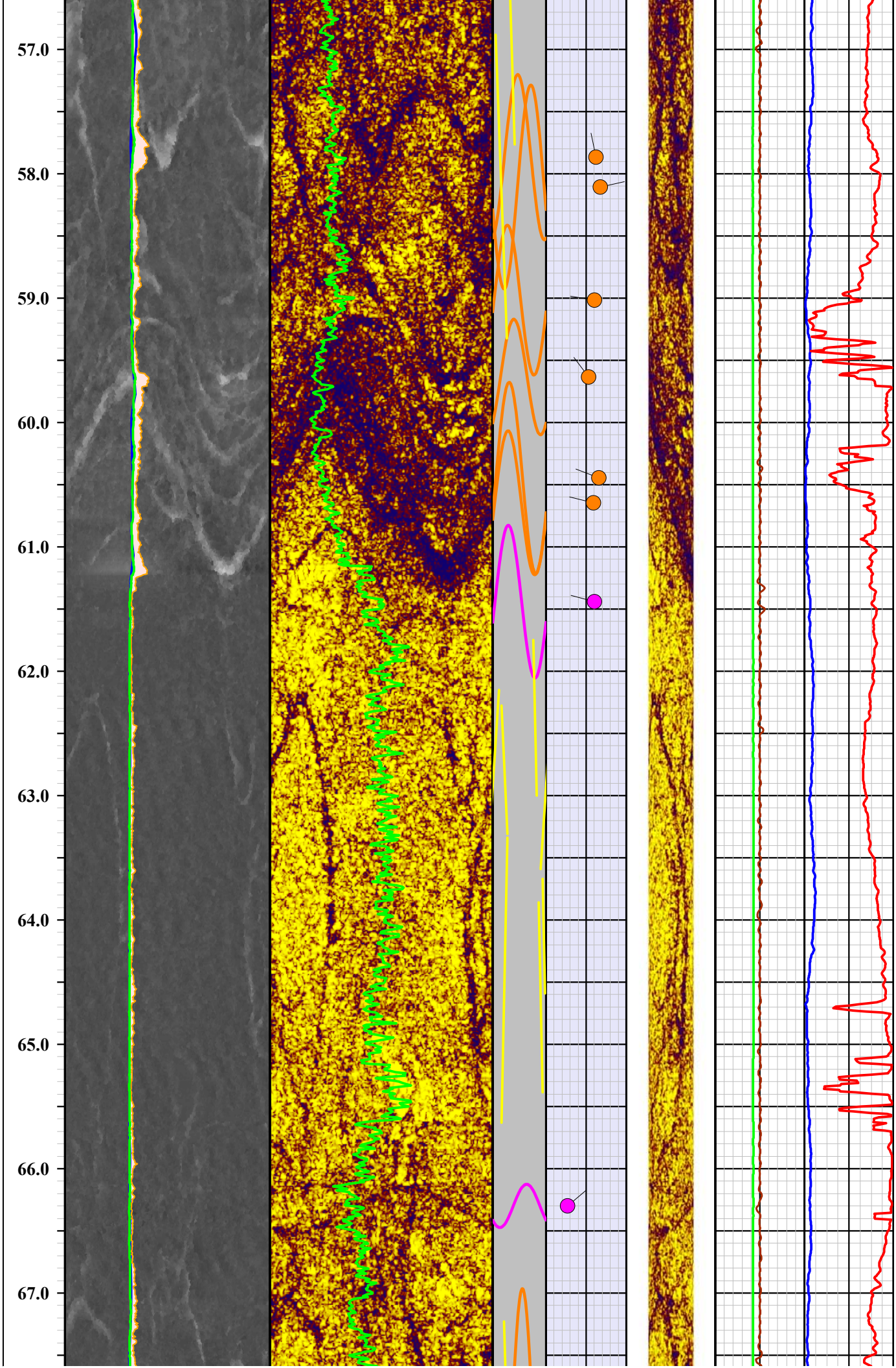
56.0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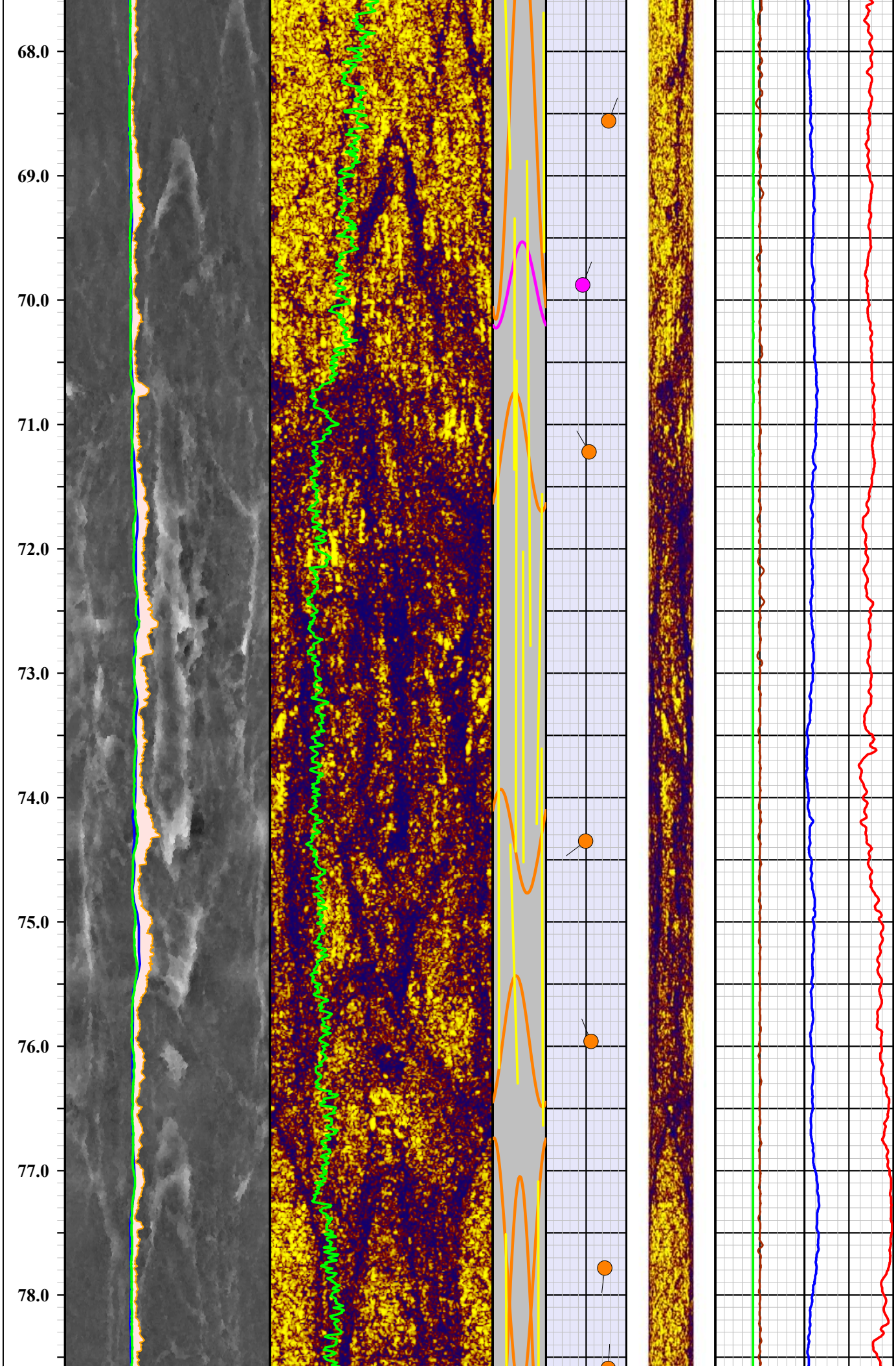
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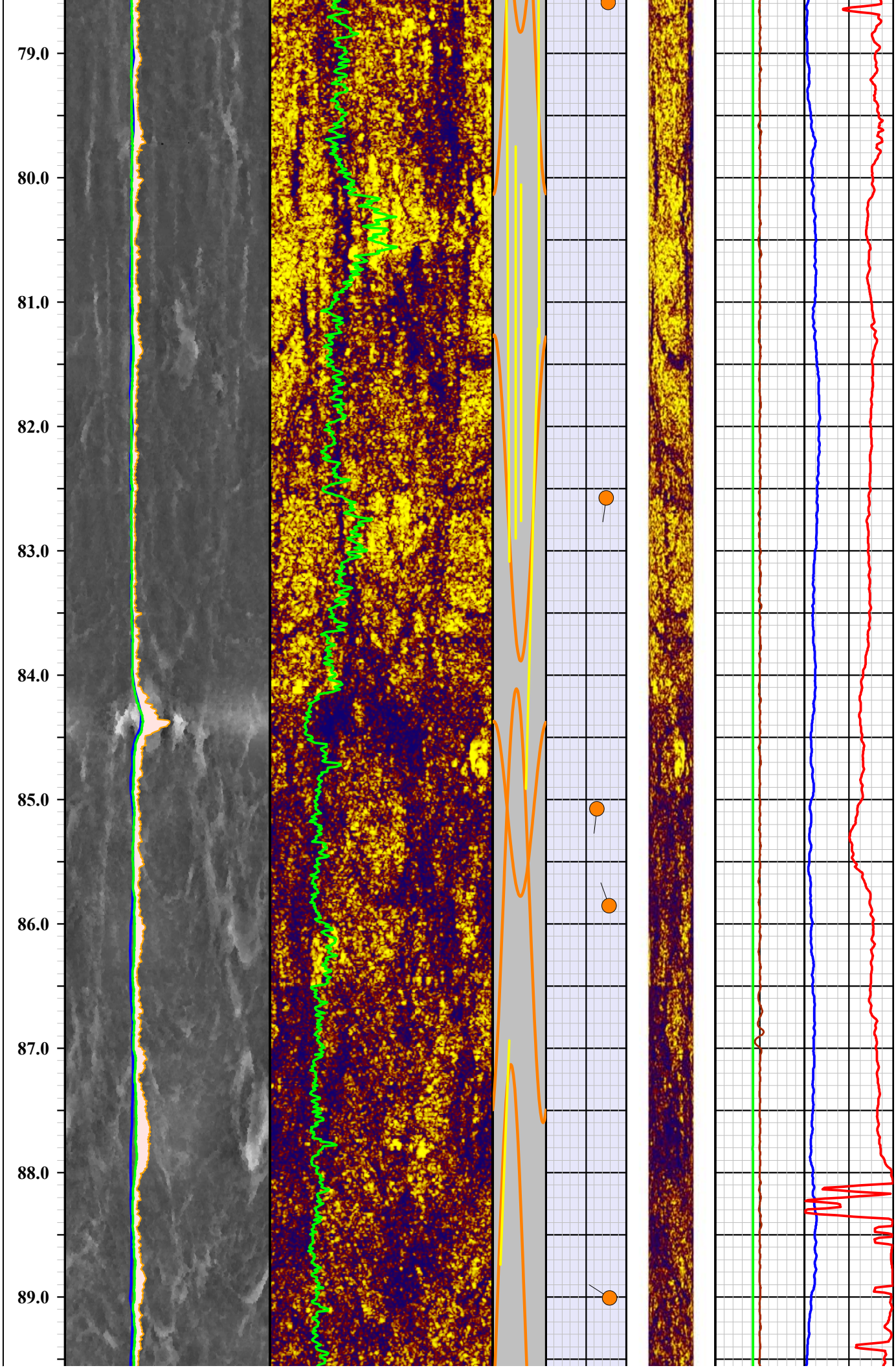
78.0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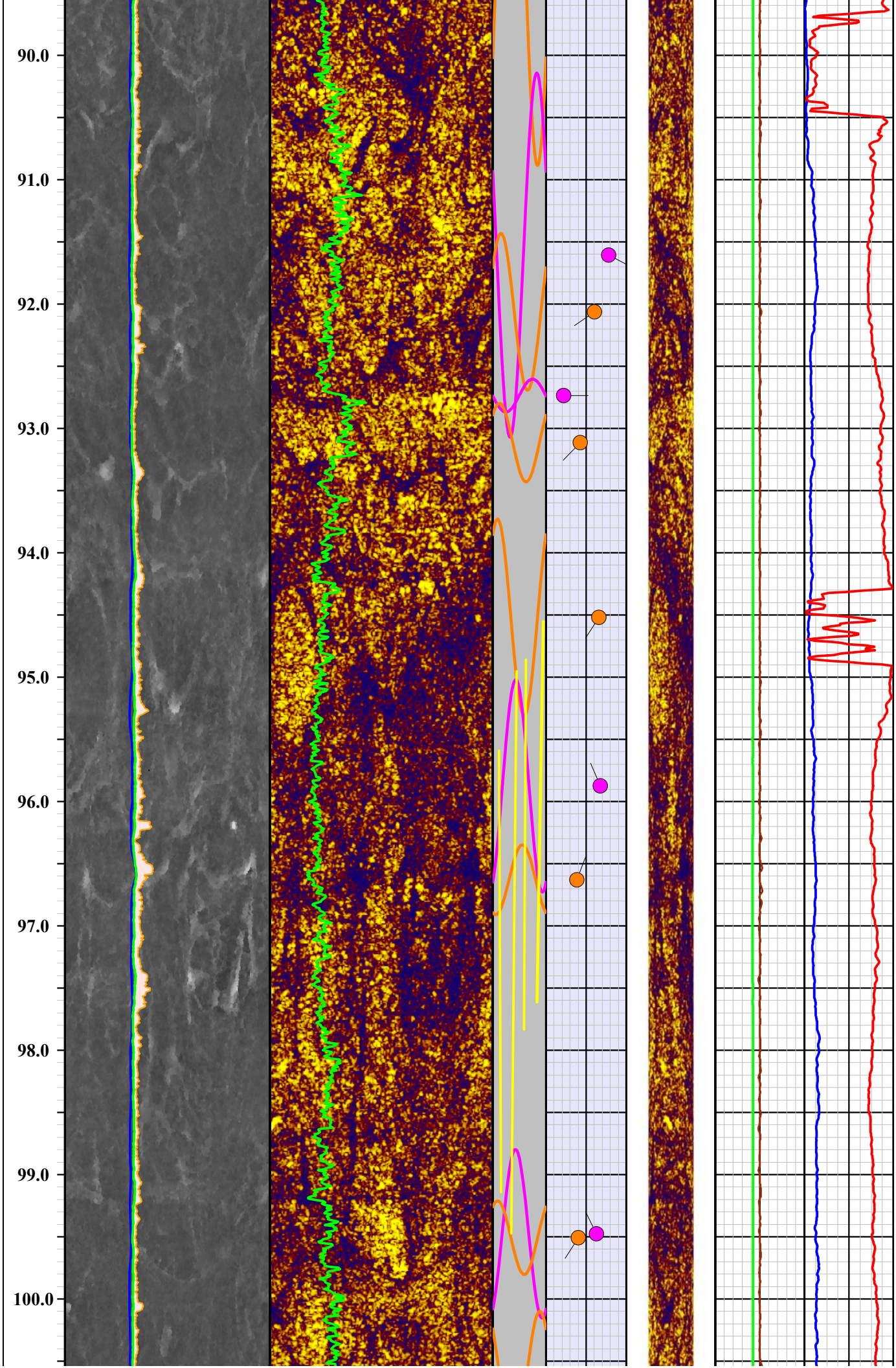
89.0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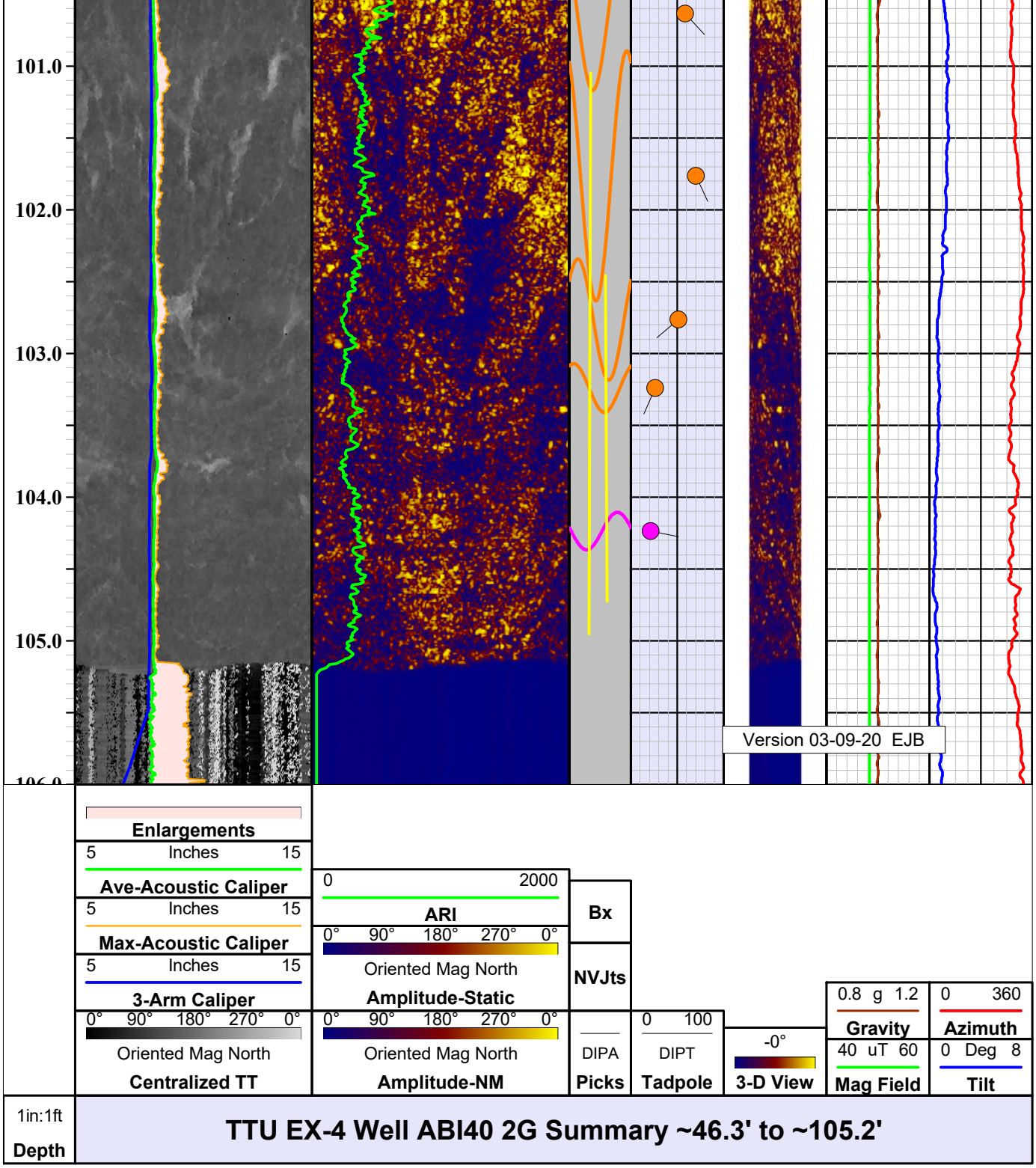


Legend

Mnemonics	Description
Centralized TT	2D plot of acoustic image travel time with probe position centralized. Oriented to magnetic north and plotted from left to right N-E-S-W-N.
3-Arm Caliper	3-arm mechanical caliper of hole diameter plotted from 5 to 15 inches (blue line).
Max-Acoustic Caliper	Maximum acoustic caliper of hole diameter calculated from Travel Time data and plotted as orange line from 5 to 15 inches.

Ave-Acoustic Caliper	Average acoustic caliper of hole diameter calculated from Travel Time data and plotted as bright green line from 5 to 15 inches.
Enlargements	Pink shaded zone between Ave-Acoustic Caliper and Max-Acoustic Caliper calculated from Travel Time data showing borehole enlargment.
Amplitude-NM	2D plot of unfiltered acoustic image amplitude oriented to magnetic north. Plotted from left to right N-E-S-W-N. Image toggled off.
Amplitude-Static	2D plot of acoustic image amplitude with Static normalization filter oriented to magnetic north. Plotted from left to right N-E-S-W-N. Image toggled on.
ARI	Acoustic Reflectance Index or relative rock hardness from ABI Amplitude log. Plotted 0 (soft) to 2000 (harder) as green line.
Picks	Planar strucutral features picked on acoustic borehole image shown as colored sinusoid (color designation shown on header) DIPA = dip apparent hole axis.
NVJts	Near Vertical (near parallel to hole axis) joint/fracture features picked on acoustic borehole image shown as colored sinusoid (color designation shown on header).
Bx	Apparent Breccia or Congomerate zones and Vugs/Vesicles/Cavities.
3-D View	3D cylindrical projection of ABI image using Centralized TT log for hole shape looking from North.
Tadpole	Tadpole plot of the ABI feature picks (fractures and bedding planes); plotted from 0 to 90 dip - see legend above. DIPT = True orientation; features corrected for hole deviation.
Mag Field	Total magnetic field strength as measured by fluxgate magnetometer in OBI or ABI deviation sensor - plotted 40-60 uT (green line).
Gravity	Total gravity (probe acceleration) as measured by 3-axis accelerometers in ABI deviation sensor - plotted 0.8-1.2 g (brown line).
Azimuth	Direction of tool tilt plotted 0 to 360 deg - represents borehole deviation direction (red line).
Tilt	Tool tilt (vertical = 0 and horizontal = 90) plotted 0 to 8 deg; represents borehole deviation tilt from vertical (blue line).

Mnemonics prepared by Erika J Beam
Version 03-09-20

QL ABI-40 2G Acoustic Borehole Imager

Probe Top = Depth Ref.

Tool SN: 143003, 143009 & 192302

Four Conductor MSI Probe Top

APS Probe Orientation Sensor
3-Axis Magnetometer
3-Axis Accellerometer

Probe Length = 1.62 m or 5.25 ft

Probe Weight = 6.7 kg or 14.7 lbs

Distance from Acoustic Image Window to Orientation Sensor = 0.92 m or 3 ft

Inclination Accuracy = +/- 0.5 deg
Azimuth Accuracy = +/- 1.2 deg

Beam Width = 1.5 mm

Frequency = 1.2 MHz

Temperature Range: 0 - 70 Deg C (32 - 158 Deg F)
Pressure Range: 0 - 200 bar (0 - 2900 psi)

Run Centralized with External Bow Spring Centralizers

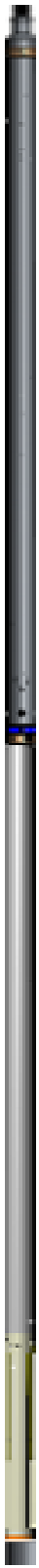
Can only be logged in fluid filled holes

ABI Imaging Window

1.6" or 40 mm Diameter

MSI Gamma-Caliper-Temperature-Fluid Resistivity

Probe Top = Depth Ref.



Single Conductor MSI Probe Top

Probe Length = 2.59 m or 8.5 ft
Probe Weight = 6.80 kg or 15.0 lbs

Natural Gamma and Caliper can only be collected logging up hole.

Fluid Temperature/Resistivity can only be collected logging down hole.

Temperature Rating: 70 Deg C (158 Deg F)
Presure Rating: 200 bar (2900 psi)

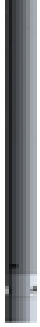
Natural Gamma Ray = 0.76 m (29.75 in)

NOTE: Lengths on a particular tool may vary from those listed on this document due to probe sizes and styles utilized

3-Arm Caliper = 1.44 m (56.75 in)

Distance from tool top: 2.20 m (86.5 in)

Available Arm Sizes: 3", 9", and 15"



TFR (Temperature/Fluid Resistivity) = 0.39 m (15.5 in)

1.375" or 34.9 mm Diameter

Southwest Exploration Services, LLC borehole geophysics & video services	Company GEOSYNTEC Well TTU EX-4 Field TALLEY County MARICOPA State ARIZONA

Final Acoustic Televiewer Summary

Southwest Exploration Services, LLC

borehole geophysics & video services

COMPANY	GEOSYNTEC
WELL ID	TTU EX-4
FIELD	TALLEY
COUNTY	MARICOPA STATE ARIZONA

TYPE OF LOGS: GAMMA - CALIPER
MORE: TEMP / FLUID RES

LOCATION

SEC TWP RGE

OTHER SERVICES
ACOUSTIC TELEVIEWER
OPTICAL TELEVIEWER

PERMANENT DATUM		ELEVATION	K.B.
LOG MEAS. FROM	GROUND LEVEL	ABOVE PERM. DATUM	D.F.
DRILLING MEAS. FROM	GROUND LEVEL		G.L.

DATE	02-16-20	TYPE FLUID IN HOLE	FORMATION WATER
RUN No	2	MUD WEIGHT	N/A
TYPE LOG	GAMMA-CALIPER-TFR	VISCOSITY	N/A
DEPTH-DRILLER	110.0 FT	LEVEL	~46 FT
DEPTH-LOGGER	110.0 FT	MAX. REC. TEMP.	25.7 DEG C
BTM LOGGED INTERVAL	110.0 FT	IMAGE ORIENTED TO:	N/A
TOP LOGGED INTERVAL	SURFACE	SAMPLE INTERVAL	0.1 FT
DRILLER / RIG#	N/A	LOGGING TRUCK	TRUCK #310
RECORDED BY / Logging Eng.	E. BEAM / T. GODSEY	TOOL STRING/SN	MSI COMBO TOOL SN 5546
WITNESSED BY	FABRIZIO - GEOSYNTEC	LOG TIME:ON SITE/OFF SITE	7:00 AM

RUN	BOREHOLE RECORD			CASING RECORD			
NO.	BIT	FROM	TO	SIZE	WGT.	FROM	TO
1	?	SURFACE	20 FT	8.5 IN	STEEL	SURFACE	20 FT
2	8 IN	20 FT	TOTAL DEPTH				
3							

COMMENTS:

.

Tool Summary:

Date	02-16-20	**Date**	02-16-20	**Date**	02-16-20		
Run No.	1	**Run No.**	2	**Run No.**	3		
Tool Model	ALT QL OBI40 2G	**Tool Model**	MSI COMBO TOOL	**Tool Model**	ALT QL ABI40 2G		
Tool SN	170106	**Tool SN**	5446	**Tool SN**	192302		
From	SURFACE	**From**	SURFACE	**From**	46.0 FT		
To	106.0 FT	**To**	108.0 FT	**To**	106.0 FT		
Recorded By	E. BEAM	**Recorded By**	E. BEAM	**Recorded By**	E. BEAM		
Truck No	310	**Truck No**	310	**Truck No**	310		
Operation Check	01-30-20	**Operation Check**	02-16-20	**Operation Check**	02-14-20		
Calibration Check	N/A	**Calibration Check**	02-16-20	**Calibration Check**	N/A		
Time Logged	11:30 AM	**Time Logged**	11:55 AM	**Time Logged**	12:10 PM		

Date		**Date**		**Date**			
Run No.	4	**Run No.**	5	**Run No.**	6		
Tool Model		**Tool Model**		**Tool Model**			
Tool SN		**Tool SN**		**Tool SN**			
From		**From**		**From**			
To		**To**		**To**			
Recorded By		**Recorded By**		**Recorded By**			
Truck No		**Truck No**		**Truck No**			
Operation Check		**Operation Check**		**Operation Check**			
Calibration Check		**Calibration Check**		**Calibration Check**			
Time Logged		**Time Logged**		**Time Logged**			

Additional Comments:

Caliper Arms Used: 9" **Calibration Points:** 4" & 10"

E-Log Calibration Range: N/A **Calibration Points:** N/A

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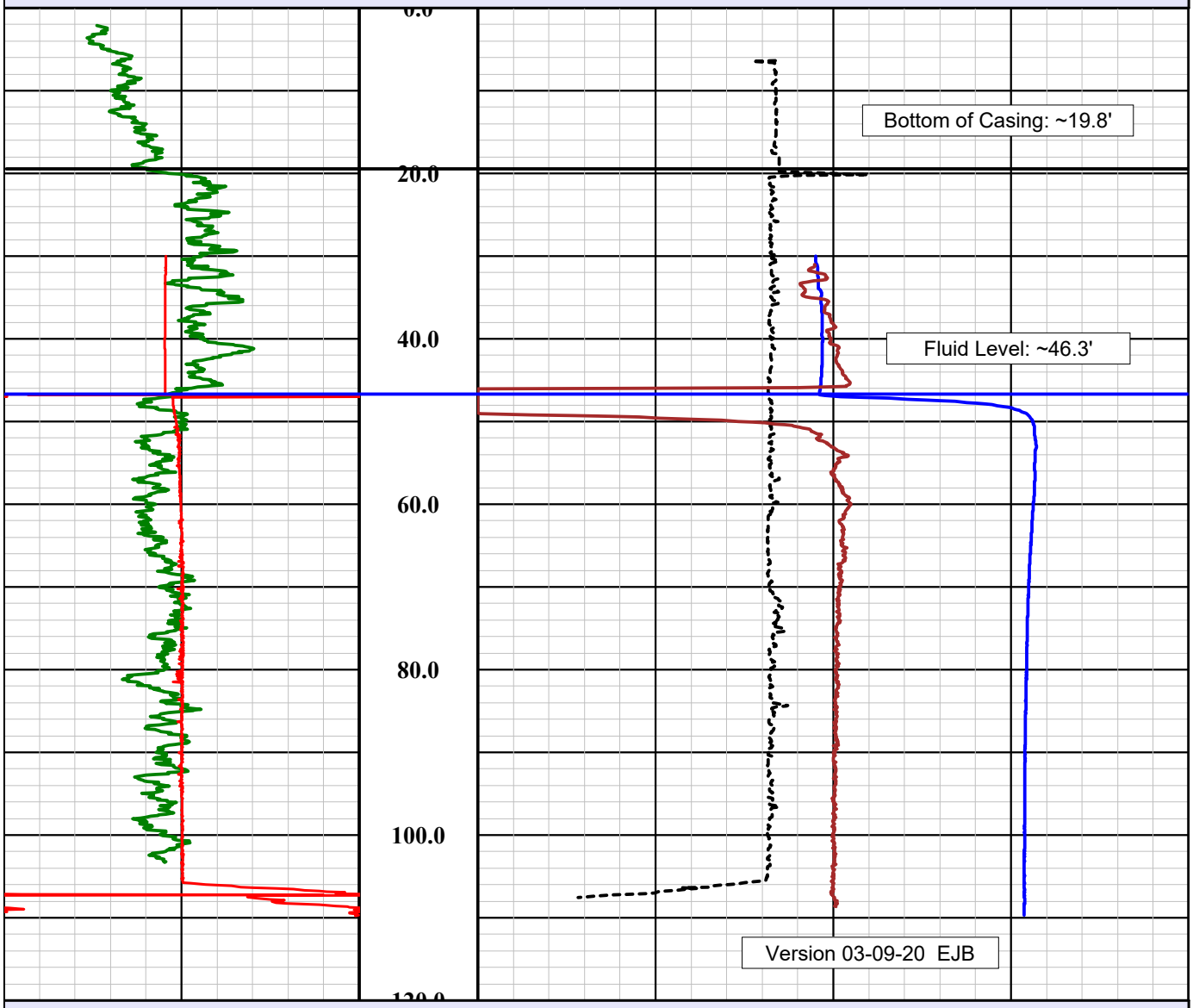
Nat. Gamma	Depth	3-Arm Caliper
0 API 200	1in:20ft	0 Inches 20
Fluid Resistivity		**Temperature**
0 Ohm-m 20		10 Deg C 30
		2-Ft Diff. Temp.
		-1 Deg C 1

TTU EX-4 Well GCT Summary Surface to ~110.0'



TTU EX-4 Well GCT Summary Surface to ~110.0'

		-1 Deg C 1
		2-Ft Diff. Temp.
0 Ohm-m 20		10 Deg C 30

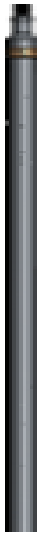
Fluid Resistivity		Temperature
0 API 200	1in:20ft	0 Inches 20
Nat. Gamma	Depth	3-Arm Caliper

Legend

Mnemonics	Description
Nat. Gamma	Natural gamma ray log plotted 0 to 200 API (green line).
Fluid Resistivity	Electrical resistivity of a borehole's fluid plotted from 0 to 20 ohm-m as red line.
3-Arm Caliper	3-arm mechanical caliper of hole diameter plotted from 0 to 20 inches (black dashed line).
Temperature	Borehole fluid temperature plotted from 10 to 30 degrees C (blue line).
2-Ft Diff. Temp.	Differential temperature over 2-ft spacing (brown line).
	Mnemonics prepared by Erika J. Beam Version 03-09-20

MSI Gamma-Caliper-Temperature-Fluid Resistivity

Probe Top = Depth Ref.



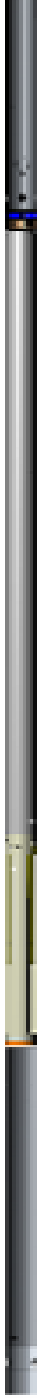
Single Conductor MSI Probe Top

Probe Length = 2.59 m or 8.5 ft
Probe Weight = 6.80 kg or 15.0 lbs

Natural Gamma and Caliper can only be collected logging up hole.

Fluid Temperature/Resistivity can only be collected logging down hole.

Temperature Rating: 70 Deg C (158 Deg F)
Presure Rating: 200 bar (2900 psi)



Natural Gamma Ray = 0.76 m (29.75 in)

NOTE: Lengths on a particular tool may vary from those listed on this document due to probe sizes and styles utilized

3-Arm Caliper = 1.44 m (56.75 in)

Distance from tool top: 2.20 m (86.5 in)

Available Arm Sizes: 3", 9", and 15"

TFR (Temperature/Fluid Resistivity) = 0.39 m (15.5 in)

1.375" or 34.9 mm Diameter

Southwest Exploration Services, LLC
borehole geophysics & video services

Company	GEOSYNTEC
Well	TTU EX-4
Field	TALLEY
County	MARICOPA
State	ARIZONA

Final GCT Summary

Southwest Exploration Services, LLC

borehole geophysics & video services

COMPANY	GEOSYNTEC
WELL ID	TTU EX-4
FIELD	TALLEY
COUNTY	MARICOPA STATE ARIZONA

TYPE OF LOGS: OPTICAL TELEVIEWER
MORE: GAMMA - CALIPER

LOCATION

SEC TWP RGE

OTHER SERVICES
ACOUSTIC TELEVIEWER
TEMP / FLUID RES

PERMANENT DATUM		ELEVATION	K.B.
LOG MEAS. FROM	GROUND LEVEL	ABOVE PERM. DATUM	D.F.
DRILLING MEAS. FROM	GROUND LEVEL		G.L.

DATE	02-16-20	TYPE FLUID IN HOLE	FORMATION WATER
RUN No	1	MUD WEIGHT	N/A
TYPE LOG	OPTICAL TELEVIEWER	VISCOSITY	N/A
DEPTH-DRILLER	110.0 FT	LEVEL	~46 FT
DEPTH-LOGGER	110.0 FT	MAX. REC. TEMP.	25.7 DEG C
BTM LOGGED INTERVAL	106.0 FT	IMAGE ORIENTED TO:	MAGNETIC NORTH
TOP LOGGED INTERVAL	SURFACE	SAMPLE INTERVAL	0.035 FT
DRILLER / RIG#	N/A	LOGGING TRUCK	TRUCK #310
RECORDED BY / Logging Eng.	E. BEAM / T. GODSEY	TOOL STRING/SN	ALT QL OBI40 2G SN 170106
WITNESSED BY	FABRIZIO - GEOSYNTEC	LOG TIME:ON SITE/OFF SITE	7:00 AM

RUN	BOREHOLE RECORD			CASING RECORD			
NO.	BIT	FROM	TO	SIZE	WGT.	FROM	TO
1	?	SURFACE	20 FT	8.5 IN	STEEL	SURFACE	20 FT
2	8 IN	20 FT	TOTAL DEPTH				
3							

COMMENTS:

.

Tool Summary:

Date	02-16-20	**Date**	02-16-20	**Date**	02-16-20		
Run No.	1	**Run No.**	2	**Run No.**	3		
Tool Model	ALT QL OBI40 2G	**Tool Model**	MSI COMBO TOOL	**Tool Model**	ALT QL ABI40 2G		
Tool SN	170106	**Tool SN**	5446	**Tool SN**	192302		
From	SURFACE	**From**	SURFACE	**From**	46.0 FT		
To	106.0 FT	**To**	108.0 FT	**To**	106.0 FT		
Recorded By	E. BEAM	**Recorded By**	E. BEAM	**Recorded By**	E. BEAM		
Truck No	310	**Truck No**	310	**Truck No**	310		
Operation Check	01-30-20	**Operation Check**	02-16-20	**Operation Check**	02-14-20		
Calibration Check	N/A	**Calibration Check**	02-16-20	**Calibration Check**	N/A		
Time Logged	11:30 AM	**Time Logged**	11:55 AM	**Time Logged**	12:10 PM		

Date		**Date**		**Date**			
Run No.	4	**Run No.**	5	**Run No.**	6		
Tool Model		**Tool Model**		**Tool Model**			
Tool SN		**Tool SN**		**Tool SN**			
From		**From**		**From**			
To		**To**		**To**			
Recorded By		**Recorded By**		**Recorded By**			
Truck No		**Truck No**		**Truck No**			
Operation Check		**Operation Check**		**Operation Check**			
Calibration Check		**Calibration Check**		**Calibration Check**			
Time Logged		**Time Logged**		**Time Logged**			

Additional Comments:

Caliper Arms Used: 9" **Calibration Points:** 4" & 10"

E-Log Calibration Range: N/A **Calibration Points:** N/A

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Image Features Legend

- Btm of Casing
- Filled Fracture / Joint
- Bedding / Banding / Foliation / Veins
- Partially Open Joint / Fracture
- Minor Open Joint / Fracture
- OJ/Fx terminates at Fx intersection
- Unclassified
- Sulfide Vein
- Breakouts
- Major Open Joint / Fracture
- Fluid Level

Breakout Legend

- Broken Zone / Undifferentiated
- Major Breakout
- Minor Breakout
- Tensile Fracture
- Filled Near Vertical Joint/Fx
- Near Vertical Joint/Fx

Bx Legend

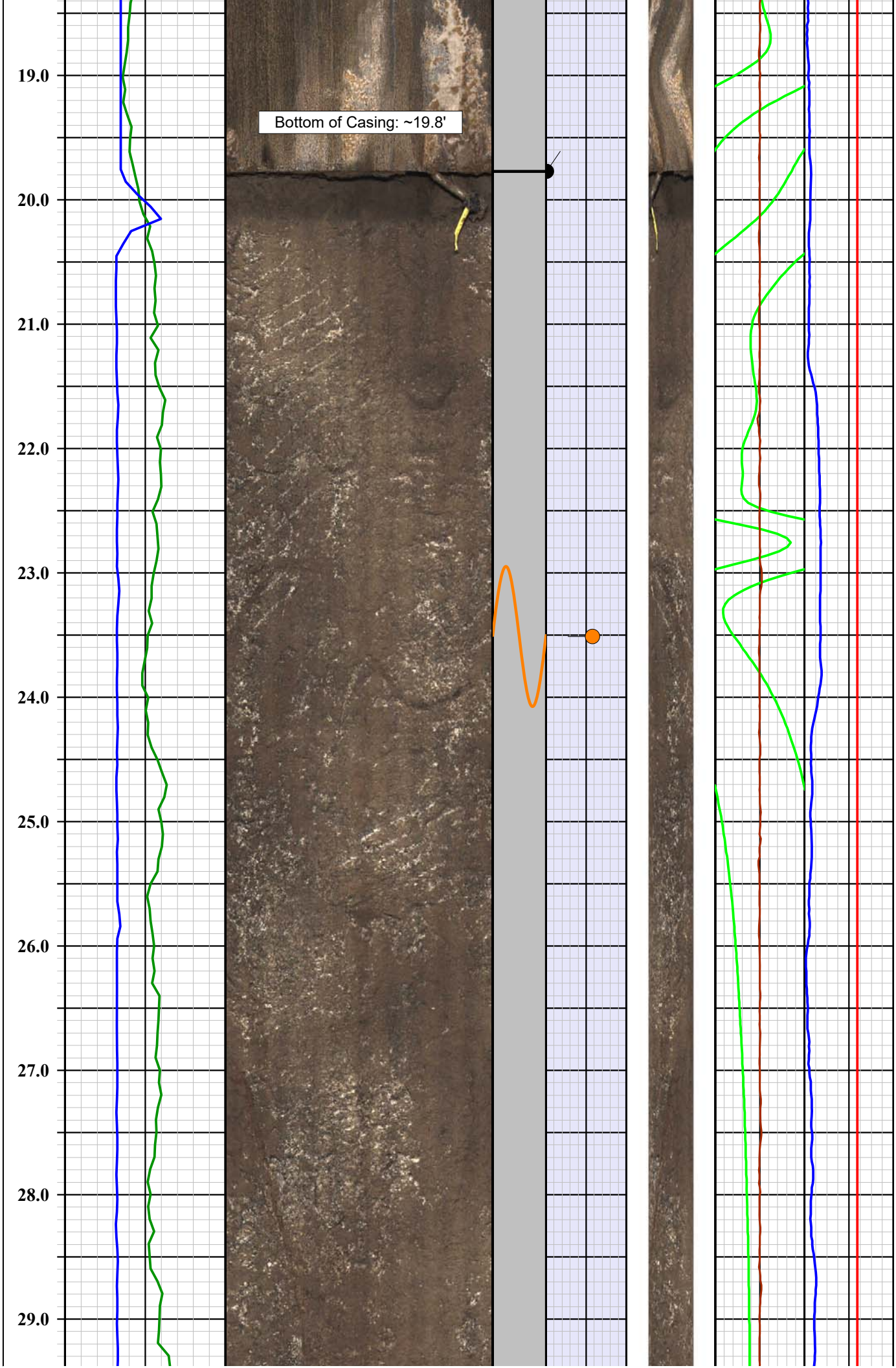
- Breccia or Conglomerate
- Large Vugs/Vesicles (> 6")
- Medium Vugs/Vesicles (2-6")
- Small Vugs/Vesicles (< 2")
- Conglomerate - sand matrix supported
- Conglomerate - mud matrix supported
- Conglomerate - clast supported

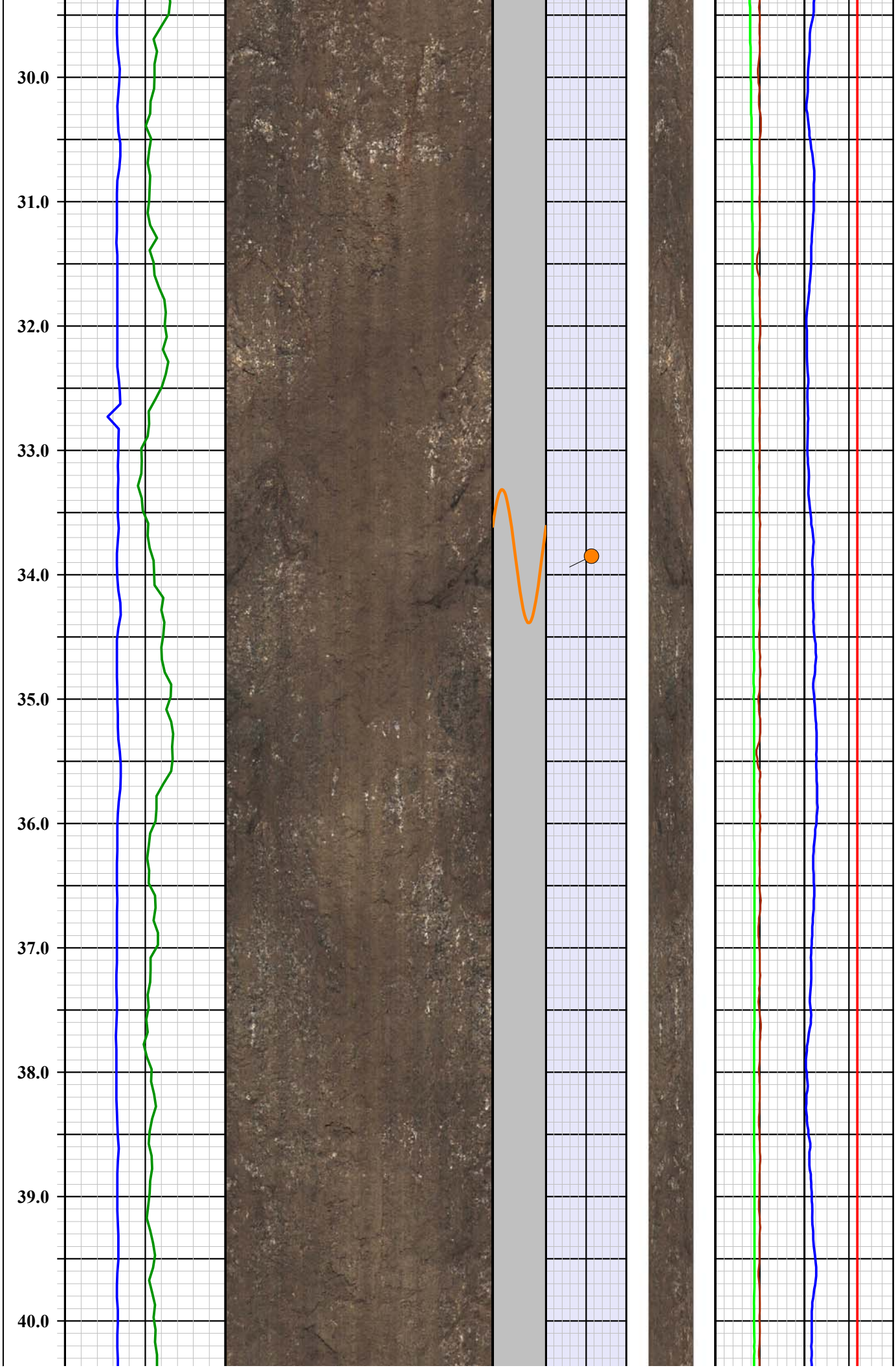
TTU EX-4 Well OBI40 2G Summary ~19.8' to ~105.3'

Depth 1in:1ft

Nat. Gamma	Image-NM	Picks	Tadpole	3-D View	Mag Field	Tilt
0 API 200	Oriented Mag North	DIPA	DIPT 0 100	-0°	40 uT 60	0 Deg 8
3-Arm Caliper	0° 90° 180° 270° 0°	NVJts			**Gravity**	**Azi-Edited**
5 Inches 15					0.8 g 1.2	0 360
	Image_18.0'-45.0'	Bx				
	Non Oriented, Rot'd by 12.0 Deg					
	0° 90° 180° 270° 0°					

18.0


19.0
20.0
21.0
22.0
23.0
24.0
25.0
26.0
27.0
28.0
29.0
Bottom of Casing: ~19.8'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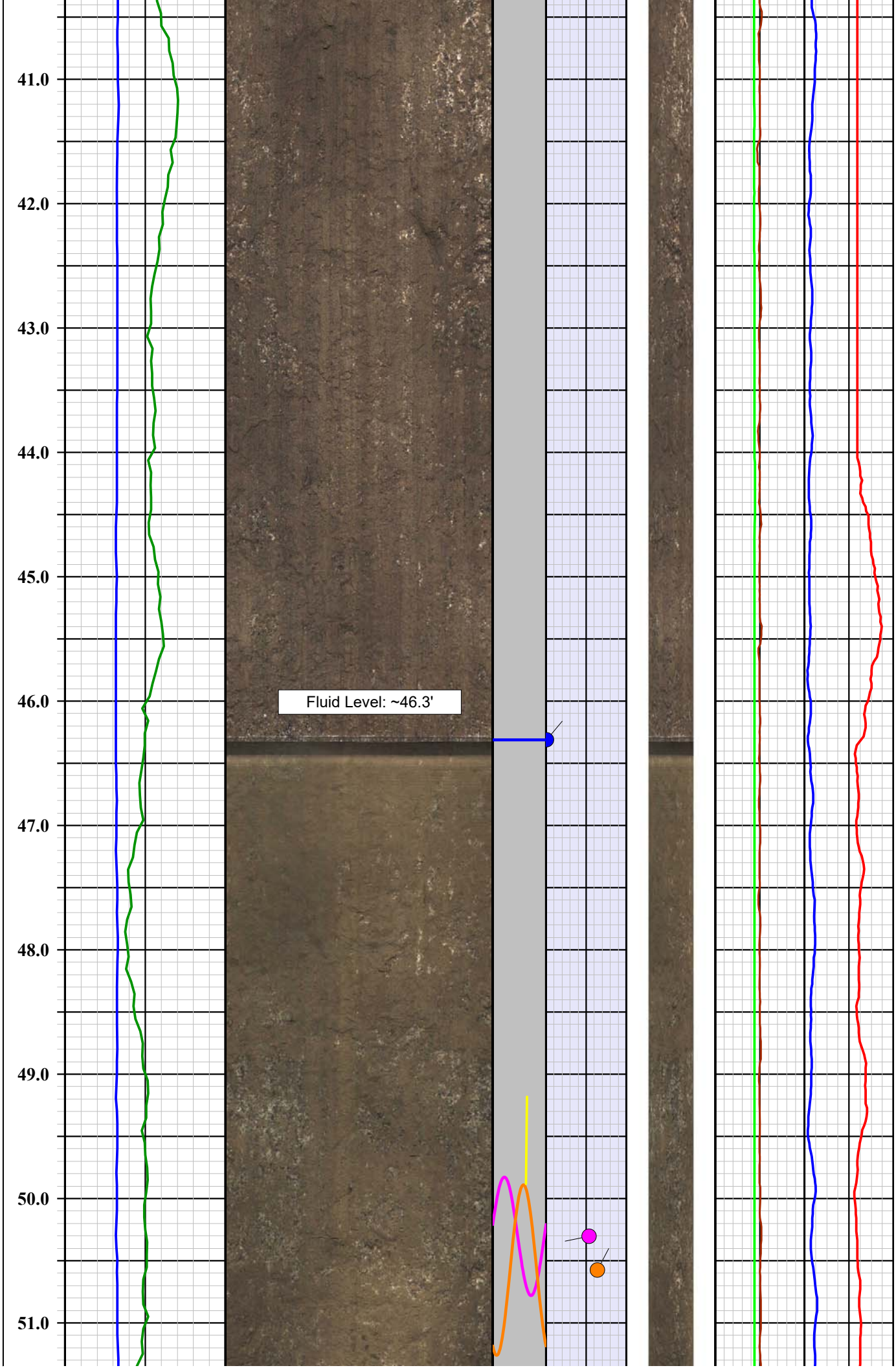
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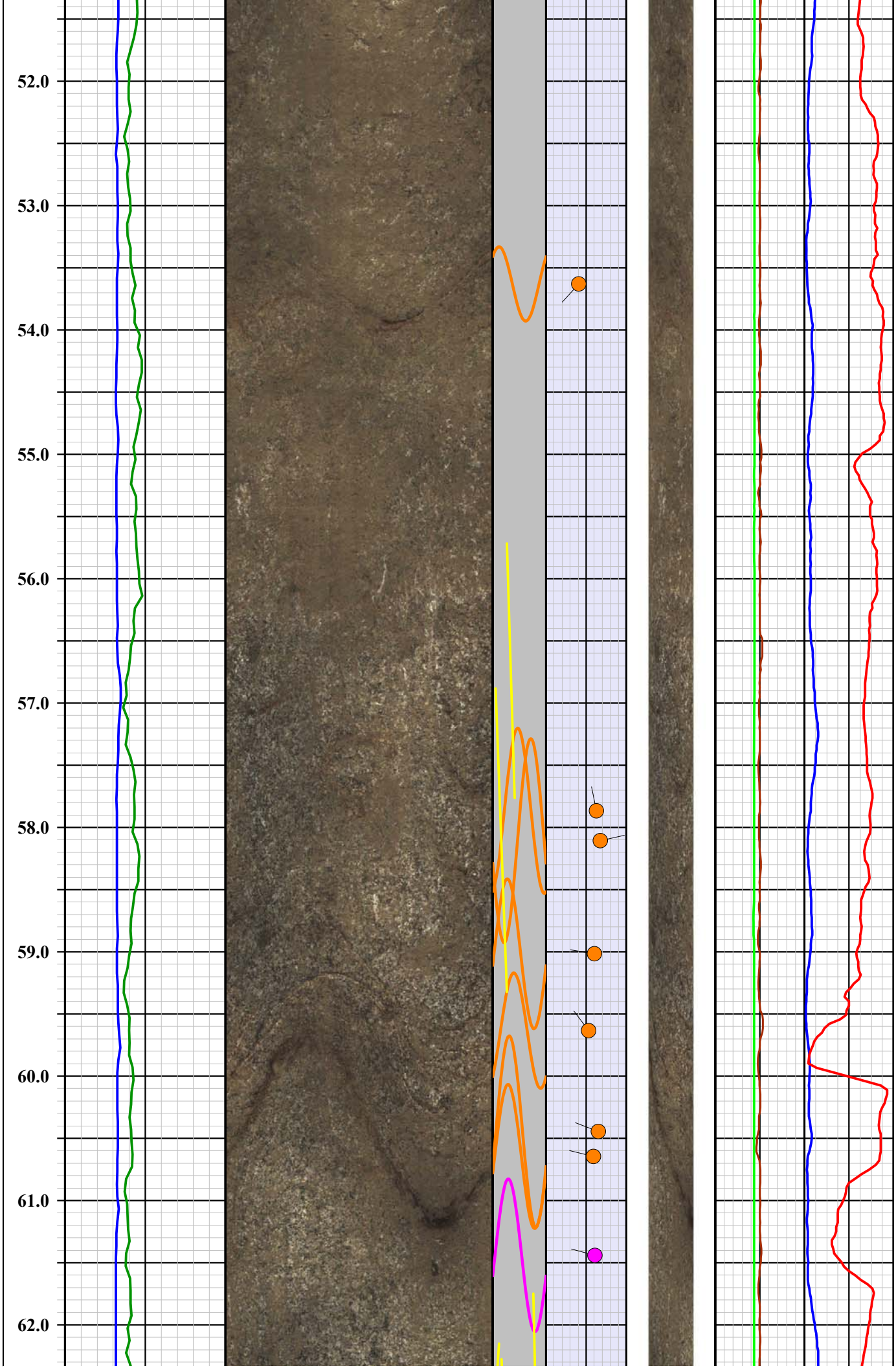
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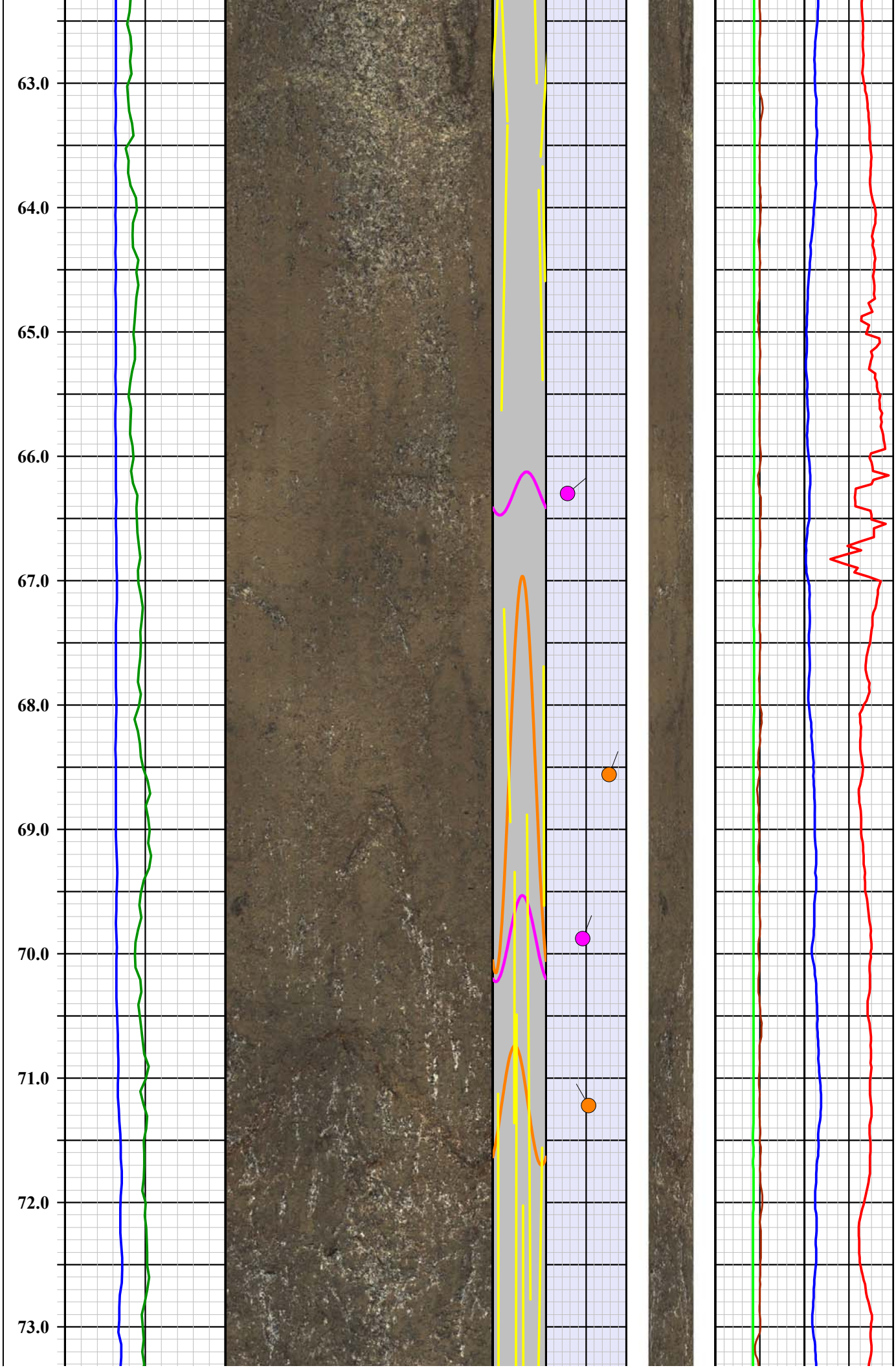
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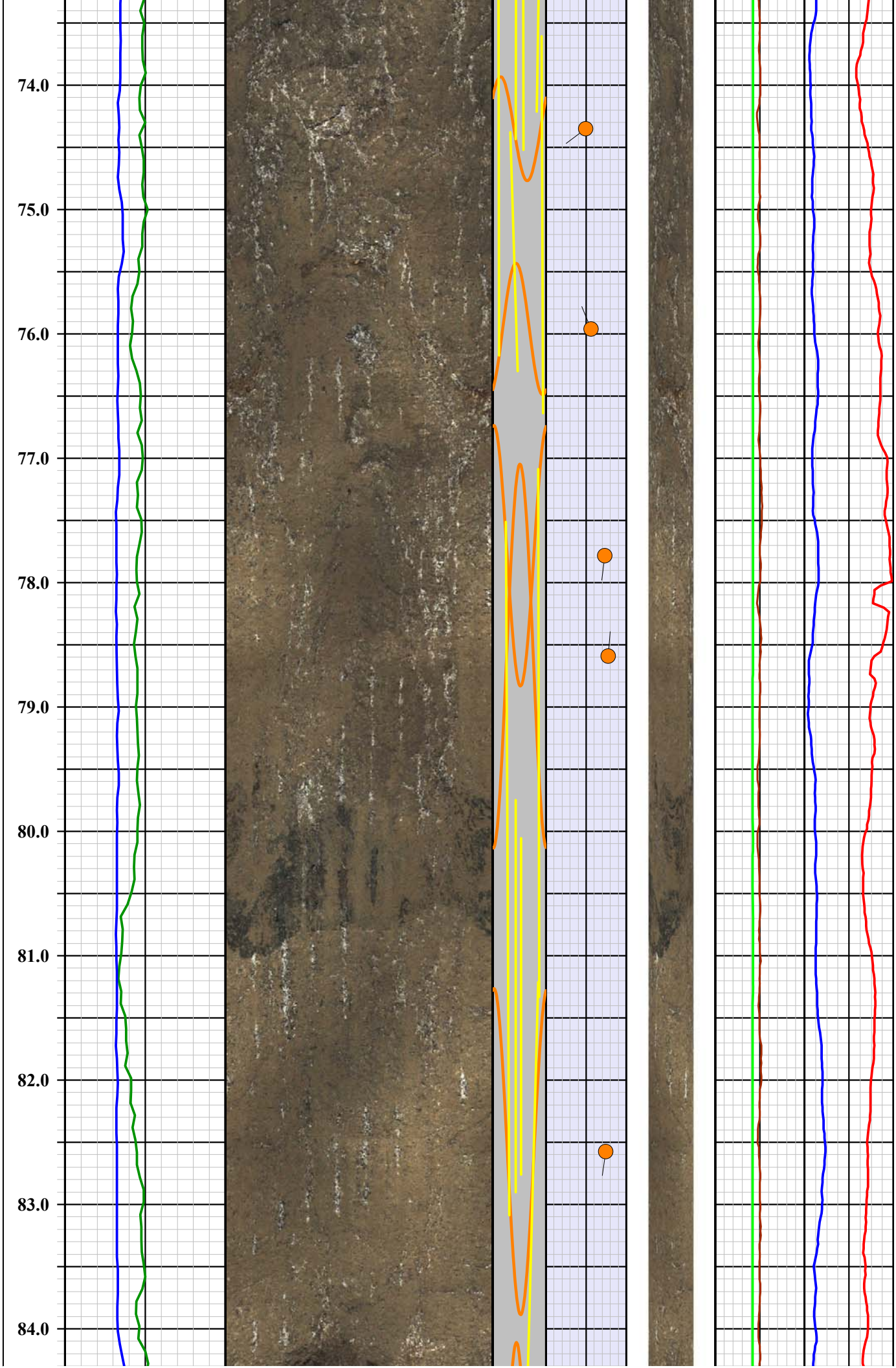
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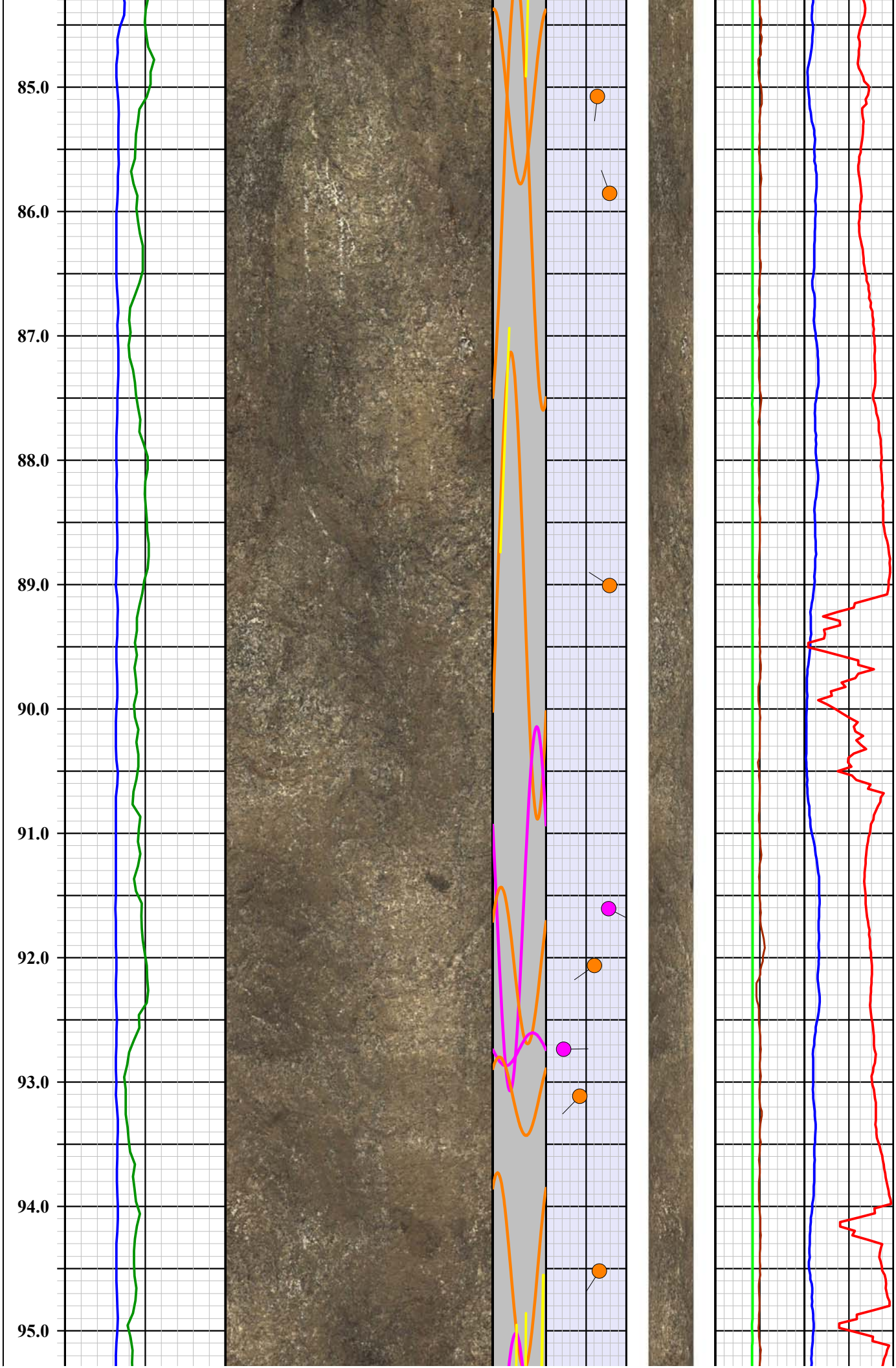
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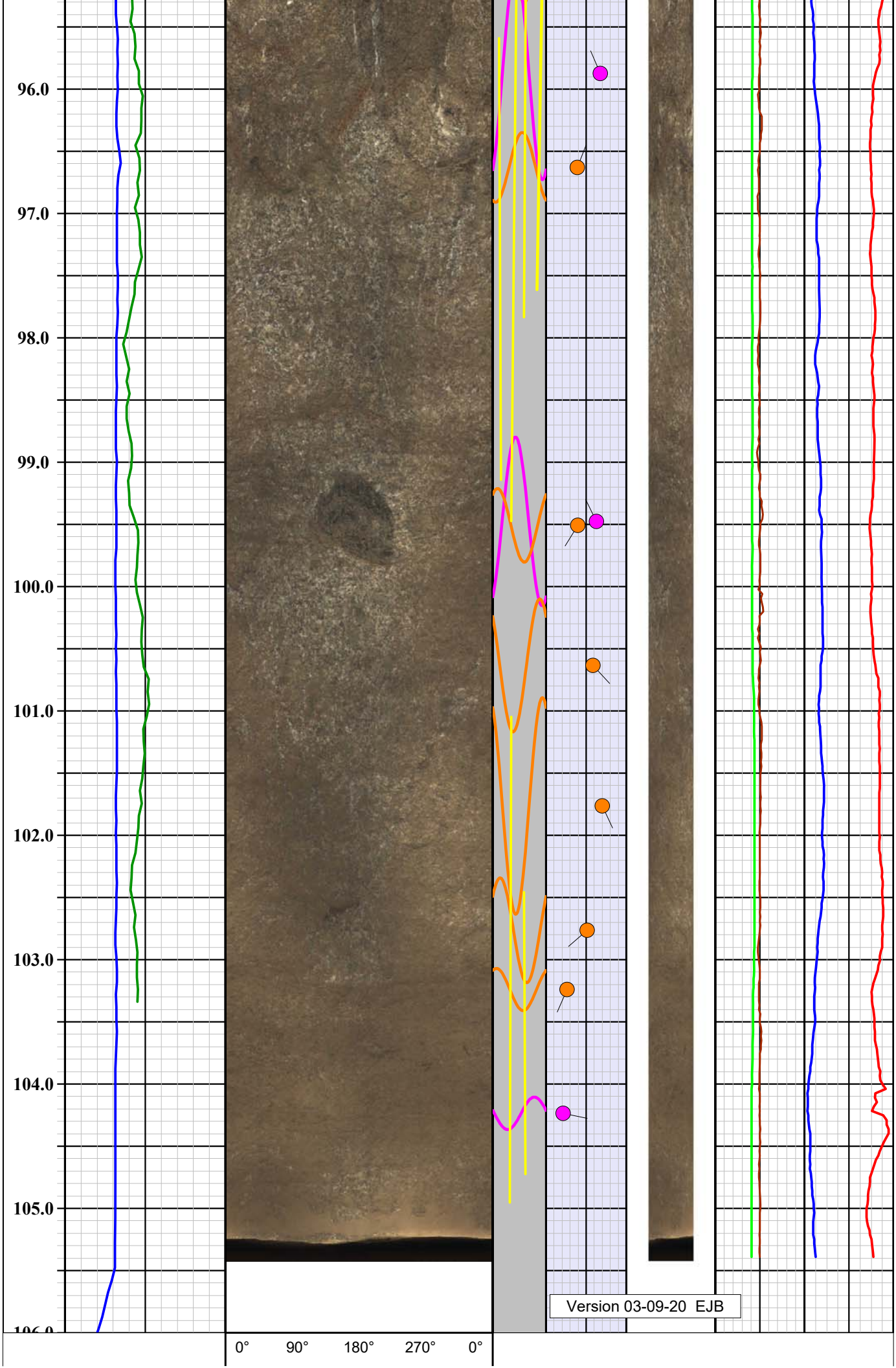
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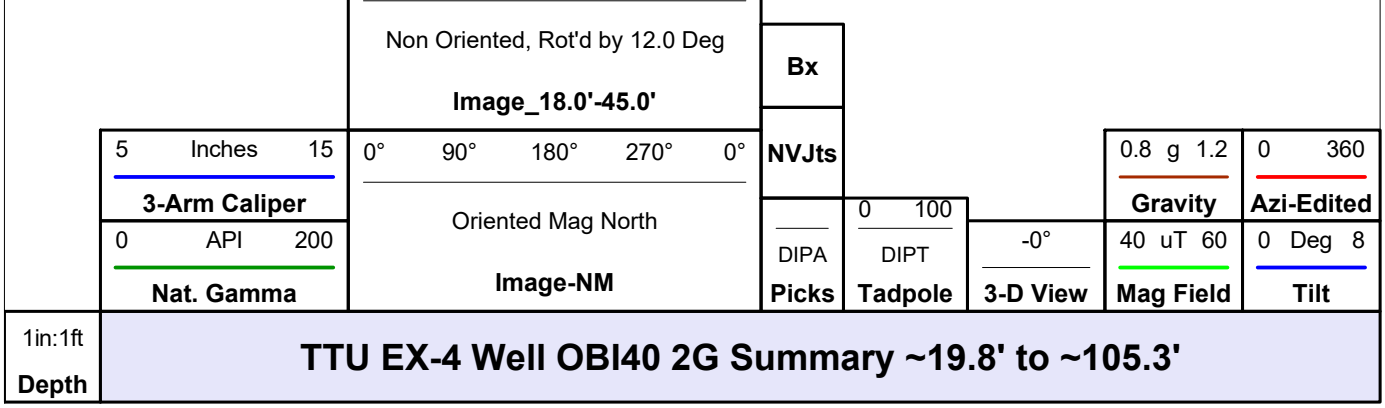
90°
180°
270°
0°
Version 03-09-20 EJB



Legend

Mnemonics	Description
3-Arm Caliper	3-arm mechanical caliper of hole diameter plotted from 5 to 15 inches (blue line).
Nat. Gamma	Natural gamma ray log plotted from 0 to 200 API units (green line).
Image-NM	2D plot of optical image oriented to magnetic north. Plotted from left to right N-E-S-W-N.
Image_18.0'-45.0'	2D plot of optical image non-oriented and rotated by 12.0 deg to correct for magnetic affect in proximity of steel casing. Plotted from left to right N-E-S-W-N.
Picks	Planar strucutral features picked on optical borehole image shown as colored sinusoid (color designation shown on header) DIPA = dip apparent hole axis.
NVJts	Near Vertical (near parallel to hole axis) joint/fracture features picked on optical borehole image shown as colored sinusoid (color designation shown on header).
Bx	Apparent Breccia or Congomerate zones and Vugs/Vesicles/Cavities.
3-D View	3D cylindrical projection of OBI image viewed from north.
Tadpole	Tadpole plot of the OBI feature picks (fractures and bedding planes); plotted from 0 to 90 dip - see legend above. DIPT = True orientation; features corrected for hole deviation.
Mag Field	Total magnetic field strength as measured by fluxgate magnetometer in OBI or ABI deviation sensor - plotted 40-60 uT (green line).
Gravity	Total gravity (probe acceleration) as measured by 3-axis accelerometers in OBI deviation sensor - plotted 0.8-1.2 g (brown line).
Azi-Edited	Direction of tool tilt plotted 0 to 360 deg; edited for anomalous magnetic influence - represents borehole deviation direction (red line).
Tilt	Tool tilt (vertical = 0 and horizontal = 90) plotted 0 to 8 deg; represents borehole deviation tilt from vertical (blue line).

Mnemonics prepared by Erika J Beam
Version 03-09-20

QL OBI-40 2G Optical Borehole Imager

Probe Top = Depth Ref.

Tool SN: 145010, 152511 & 170106

Four Conductor MSI Probe Top

APS Probe Orientation Sensor
3-Axis Magnetometer
3-Axis Accellerometer

Probe Length = 1.66 m or 5.46 ft

Probe Weight = 5.3 kg or 11.7 lbs

Distance from Optical Image Window to Orientation Sensor = 0.9 m or 3 ft

Inclination Accuracy = +/- 0.5 deg
Azimuth Accuracy = +/- 1.0 deg

Temperature Range: 0 - 70 Deg C (32 - 158 Deg F)
Pressure Range: 0 - 200 bar (0 - 2900 psi)

External Bow Spring Centralizers

Operates in dry or clear water conditions.

OBI Imaging Window

1.6" or 40 mm Diameter

MSI Gamma-Caliper-Temperature-Fluid Resistivity

Probe Top = Depth Ref.

Single Conductor MSI Probe Top

Probe Length = 2.59 m or 8.5 ft
Probe Weight = 6.80 kg or 15.0 lbs

Natural Gamma and Caliper can only be collected logging up hole.

Fluid Temperature/Resistivity can only be collected logging down hole.

Temperature Rating: 70 Deg C (158 Deg F)
Presure Rating: 200 bar (2900 psi)

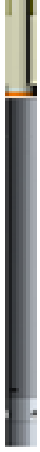
Natural Gamma Ray = 0.76 m (29.75 in)

NOTE: Lengths on a particular tool may vary from those listed on this document due to probe sizes and styles utilized

3-Arm Caliper = 1.44 m (56.75 in)

Distance from tool top: 2.20 m (86.5 in)

Available Arm Sizes: 3", 9", and 15"



TFR (Temperature/Fluid Resistivity) = 0.39 m (15.5 in)

1.375" or 34.9 mm Diameter

Southwest Exploration Services, LLC
borehole geophysics & video services

Company	GEOSYNTEC
Well	TTU EX-4
Field	TALLEY
County	MARICOPA
State	ARIZONA

Final Optical Televiewer Summary

Drill Hole: TTU EX-5 March 10, 2020, EJB

Geophysical Logs were collected by SwExp on February 16, 2020.
Features oriented to Magnetic North and corrected for borehole deviation to true orientation
Features picked/ranked by EJB Prior to March 10, 2020.

Ranking Scheme:

100 = Black = Bottom of Casing
104 = White = In-filled Joint/Fracture - mineralogy not determined
106 = Green = Bedding/banding/foliation
109 = Orange = Partially open Joint/Fracture
110 = Pink = Thin and/or discontinuous around circumference Joint/Fracture
111 = Yellow = Apparent Joint/Fracture terminates at fracture intersection
112 = Light Blue = Unclassified planar feature
305 = Red = Wide major Joint/Fracture
307 = Blue = Fluid Level

VFx = 2 Near vertical Joints/Fractures
VFx-W = 2 Wide Near vertical Joints/fractures
33 = >2 near vertical Joint/fractures
IFx = Possible drilling induced near vertical tensile fractures
Bx = Breccia/Collapse Breccia
Lg V = Large Vug/ Vugs/ or Vesicles (> 6" diameter)
MV = Medium Vug/ Vugs/ or Vesicles (2-6" diameter)
CNG = Small Vug/ Vugs/ or Vesicles (< 2" diameter)
Vein = infilled near vertical joint/fracture

Continuity
C1 Discontinuous - < 50%
C2 Slightly continuous - 50-75%
C3 Moderately continuous 75-100%
C4 High continuous – thin
C5 Very continuous – wide

Condition
0 – Smooth
1 – Rough
2 – Weathered
3 - Brec / Crushed
4 – Offset

Form
0 – Undulating/curved
1 – Planar
2 – Stepped
3 – Parting
4 – Styolitic

Remark
Open
Partially Open
Tight
Cemented/Filled
Partially Cemented

Filling (OBI)
No apparent filling
White soft
White
Dark soft
Dark
Sulfide/metallic
Stained Black
Stained Brown

Filling (ABI)
No apparent filling
Hard

Note: Some partially open features on the ABI image may be filled with soft material and may not be potential fluid pathways.

Image log was obtained in 2 pieces:
OBI from 19.8' to 108.7'
ABI from 68.8' to 108.1'

The OBI/ABI combined image from 19.8' to 108.7' is good throughout the logged interval.

*Depth for dipping fractures is midpoint depth; for near Vertical joints/fractures and Vugs it is Top Depth

Depth*	Btm Depth	Dip Dir	Tilt	Aperture	Classification	Continuity	Form	Condition	Filling	Remark
Ft	Ft	Deg	Deg	Inch/10						
19.85		202.9	2.97	0.00	100 - Bottom of Casing	C2 Slightly continuous - 50-75%	1 - Planar	0 - Smooth		
25.88		125.1	41.28	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
29.02		32.6	58.11	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
45.62		319.5	54.18	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
50.61		344.1	29.49	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
68.75		22.7	0.40	0.00	307 - Fluid Level	C3 Moderately continuous 75-100%	1 - Planar	0 - Smooth		
75.02		0.6	48.67	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
75.80		18.6	32.00	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
75.90		21.0	56.48	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
77.15		220.3	65.60	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
80.42		218.5	62.35	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
82.52		49.9	43.51	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
83.30		60.3	37.96	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
84.47		353.6	52.01	0.00	110 - Minor Joint/Fracture	C2 Slightly continuous - 50-75%	1 - Planar	1 - Rough	No apparent filling	Tight
85.06		186.2	69.37	0.00	110 - Minor Joint/Fracture	C2 Slightly continuous - 50-75%	1 - Planar	1 - Rough	No apparent filling	Tight
86.01		17.9	49.98	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
89.02		30.4	72.93	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
91.06		214.1	64.03	0.00	110 - Minor Joint/Fracture	C2 Slightly continuous - 50-75%	1 - Planar	1 - Rough	No apparent filling	Tight
93.21		21.6	59.37	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
99.49		199.7	56.67	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
102.01		188.2	54.39	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
102.46		204.9	58.79	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
102.89		187.8	70.41	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
105.24		181.4	43.27	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
105.24		347.5	46.05	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
106.12		232.0	45.88	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open

Vugs and Bx Features

VFx = 2 Near vertical Joints/Fractures
VFx-W = 2 Wide Near vertical Joints/fractures
33 = >2 near vertical Joint/fractures
IFx = Possible drilling induced near vertical tensile fractures
Bx = Breccia/Collapse Breccia
Lg V = Large Vug/ Vugs/ or Vesicles (> 6" diameter)
MV = Medium Vug/ Vugs/ or Vesicles (2-6" diameter)
CNG = Small Vug/ Vugs/ or Vesicles (< 2" diameter)
Vein = infilled near vertical joint/fracture
7 = Conglomerate - Sand matrix supported
8 = Conglomerate - Mud matrix supported
9 = Conglomerate - Clast supported

Breccia/Vugs/Vesicles Etc. on OBI/ABI combined image from 19.8' to 108.7'

Depth	Btm Depth				Ranking/Description
Ft	Ft				

Near Vertical (Near parallel to hole axis) Features

0 = Gray = Broken Zone/Undifferentiated
1 = Red = Major Breakout
2 = Orange = Minor Breakout
3 = Light Blue = Tensile Fracture
4 = Green = Filled Near Vertical Joint/Fx
5 = Yellow = Near Vertical Joint/Fx

OBI/ABI combined image from 19.8' to 108.7'

Depth* = mid-point of near vertical feature.
Tilt is referenced to hole axis - 0 Deg tilt is parallel to hole axis

Depth*	Azimuth	Tilt	Length	Opening	Classification
Ft	Deg	Deg	Ft	Deg	
69.78	179.3	0.00	1.68	0.00	Near Vertical Joint/Fx
70.07	91.7	-12.09	1.69	0.00	Near Vertical Joint/Fx
70.23	269.0	9.93	1.89	0.00	Near Vertical Joint/Fx
84.12	313.2	-12.38	1.69	0.00	Near Vertical Joint/Fx
85.45	269.7	-5.62	4.00	0.00	Near Vertical Joint/Fx
89.35	158.2	-0.99	8.46	0.00	Near Vertical Joint/Fx
91.70	258.5	-0.13	3.47	0.00	Near Vertical Joint/Fx
93.51	71.2	-7.64	3.54	0.00	Near Vertical Joint/Fx
96.15	304.6	0.36	5.17	0.00	Near Vertical Joint/Fx
96.97	65.9	4.68	4.94	0.00	Near Vertical Joint/Fx
98.47	186.6	-8.53	1.04	0.00	Near Vertical Joint/Fx
98.54	150.3	-8.22	0.89	0.00	Near Vertical Joint/Fx
101.35	86.4	0.00	6.24	0.00	Near Vertical Joint/Fx

Southwest Exploration Services, LLC

borehole geophysics & video services

COMPANY	GEOSYNTEC
WELL ID	TTU EX-5
FIELD	TALLEY
COUNTY	MARICOPA STATE ARIZONA

TYPE OF LOGS: ACOUSTIC TELEVIEWER
MORE: CALIPER

LOCATION

SEC TWP RGE

OTHER SERVICES
GAMMA
TEMP / FLUID RES
OPTICAL TELEVIEWER

PERMANENT DATUM		ELEVATION	K.B.
LOG MEAS. FROM	GROUND LEVEL	ABOVE PERM. DATUM	D.F.
DRILLING MEAS. FROM	GROUND LEVEL		G.L.

DATE	02-16-20	TYPE FLUID IN HOLE	FORMATION WATER
RUN No	3	MUD WEIGHT	N/A
TYPE LOG	ACOUSTIC TELEVIEWER	VISCOSITY	N/A
DEPTH-DRILLER	110.0 FT	LEVEL	~70 FT
DEPTH-LOGGER	110.0 FT	MAX. REC. TEMP.	25.6 DEG C
BTM LOGGED INTERVAL	109.0 FT	IMAGE ORIENTED TO:	MAGNETIC NORTH
TOP LOGGED INTERVAL	69.0 FT	SAMPLE INTERVAL	0.010 FT
DRILLER / RIG#	N/A	LOGGING TRUCK	TRUCK #310
RECORDED BY / Logging Eng.	E. BEAM / T. GODSEY	TOOL STRING/SN	ALT QL ABI40 2G SN 192302
WITNESSED BY	FABRIZIO - GEOSYNTEC	LOG TIME:ON SITE/OFF SITE	7:00 AM

RUN	BOREHOLE RECORD			CASING RECORD			
NO.	BIT	FROM	TO	SIZE	WGT.	FROM	TO
1	?	SURFACE	20 FT	8.5 IN	STEEL	SURFACE	20 FT
2	8 IN	20 FT	TOTAL DEPTH				
3							

COMMENTS:

.

Tool Summary:

Date	02-16-20	**Date**	02-16-20	**Date**	02-16-20	**Date**	
Run No.	1	**Run No.**	2	**Run No.**	3	**Run No.**	4
Tool Model	ALT QL OBI40 2G	**Tool Model**	MSI COMBO TOOL	**Tool Model**	ALT QL ABI40 2G	**Tool Model**	
Tool SN	170106	**Tool SN**	5446	**Tool SN**	192302	**Tool SN**	
From	SURFACE	**From**	SURFACE	**From**	69.0 FT	**From**	
To	109.0 FT	**To**	110.0 FT	**To**	109.0 FT	**To**	
Recorded By	E. BEAM	**Recorded By**	E. BEAM	**Recorded By**	E. BEAM	**Recorded By**	
Truck No	310	**Truck No**	310	**Truck No**	310	**Truck No**	
Operation Check	01-30-20	**Operation Check**	02-16-20	**Operation Check**	02-14-20	**Operation Check**	
Calibration Check	N/A	**Calibration Check**	02-16-20	**Calibration Check**	N/A	**Calibration Check**	
Time Logged	12:40 PM	**Time Logged**	1:05 PM	**Time Logged**	1:20 PM	**Time Logged**	

Date		**Date**		**Date**		**Date**	
Run No.	5	**Run No.**	6	**Run No.**		**Run No.**	
Tool Model		**Tool Model**		**Tool Model**		**Tool Model**	
Tool SN		**Tool SN**		**Tool SN**		**Tool SN**	
From		**From**		**From**		**From**	
To		**To**		**To**		**To**	
Recorded By		**Recorded By**		**Recorded By**		**Recorded By**	
Truck No		**Truck No**		**Truck No**		**Truck No**	
Operation Check		**Operation Check**		**Operation Check**		**Operation Check**	
Calibration Check		**Calibration Check**		**Calibration Check**		**Calibration Check**	
Time Logged		**Time Logged**		**Time Logged**		**Time Logged**	

Additional Comments:

Caliper Arms Used: 9" **Calibration Points:** 4" & 10"

E-Log Calibration Range: N/A **Calibration Points:** N/A

Disclaimer:

All interpretations of log data are opinions based on inferences from electrical or other measurements. We do not guarantee the accuracy or correctness of any interpretations or recommendations and shall not be liable or responsible for any loss, costs, damages, or expenses incurred or sustained by anyone resulting from any interpretation made by any of our employees or agents. These interpretations are also subject to our general terms and conditions set out in our current Service Invoice.

Image Features Legend

- Btm of Casing
- Filled Fracture / Joint
- Bedding / Banding / Foliation / Veins
- Partially Open Joint / Fracture
- Minor Open Joint / Fracture
- OJ/Fx terminates at Fx intersection
- Unclassified
- Sulfide Vein
- Breakouts
- Major Open Joint / Fracture
- Fluid Level

Breakout Legend

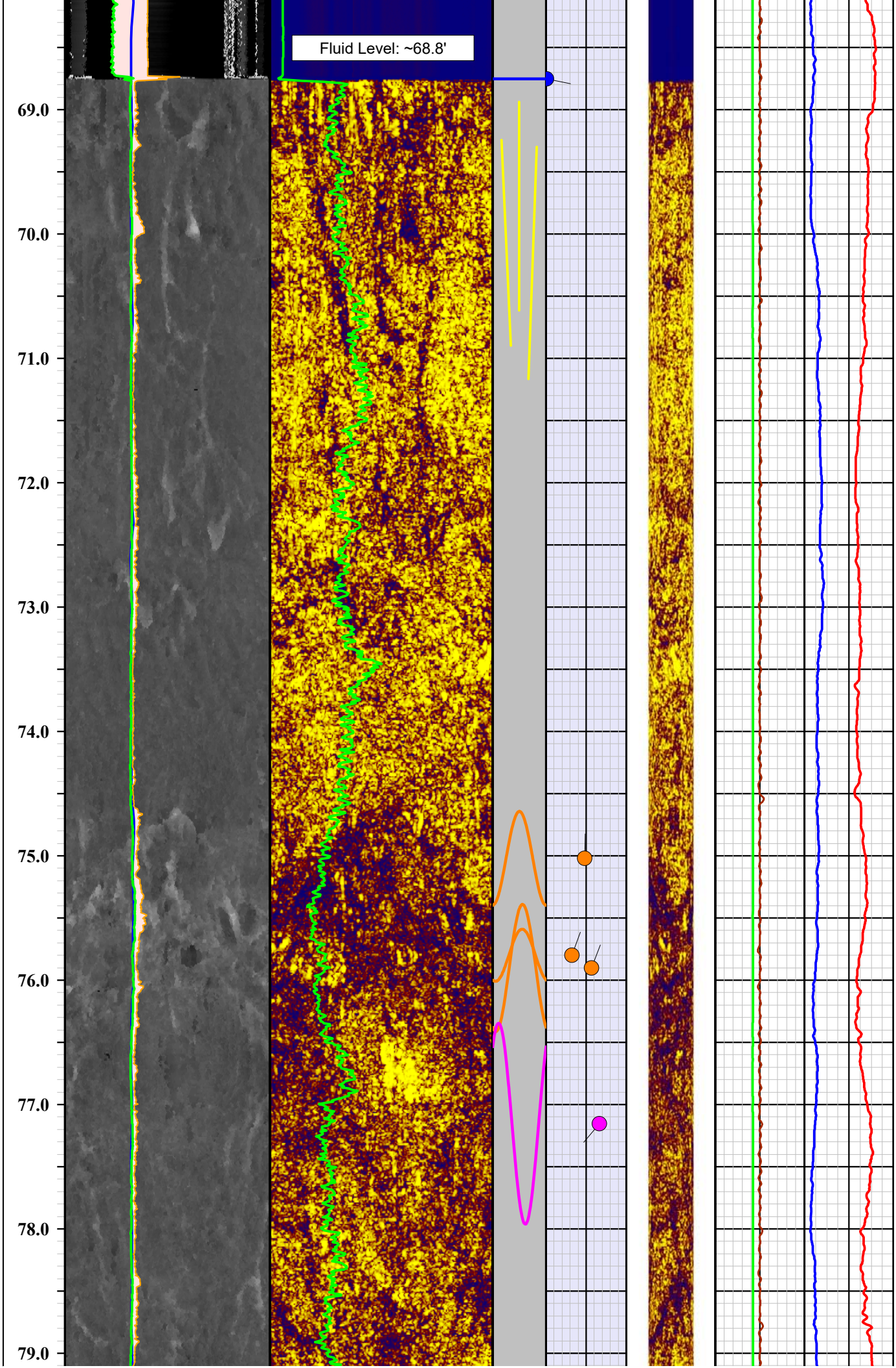
- Broken Zone / Undifferentiated
- Major Breakout
- Minor Breakout
- Tensile Fracture
- Filled Near Vertical Joint/Fx
- Near Vertical Joint/Fx

Bx Legend

- Breccia or Conglomerate
- Large Vugs/Vesicles (> 6")
- Medium Vugs/Vesicles (2-6")
- Small Vugs/Vesicles (< 2")
- Conglomerate - sand matrix supported
- Conglomerate - mud matrix supported
- Conglomerate - clast supported

Depth 1in:1ft	TTU EX-5 Well ABI40 2G Summary ~68.8' to ~108.1'						
	Centralized TT, Oriented Mag North, 0° 90° 180° 270° 0°	Amplitude-NM, Oriented Mag North, 0° 90° 180° 270° 0°	Picks: DIPA	Tadpole: DIPT, 0 100	3-D View, -0°	Mag Field: 40 uT 60	Tilt: 0 Deg 8
	3-Arm Caliper: 5 Inches 15	Amplitude-Static, Oriented Mag North, 0° 90° 180° 270° 0°	NVJts			Gravity: 0.8 g 1.2	Azimuth: 0 360
	Max-Acoustic Caliper: 5 Inches 15	ARI: 0 2000	Bx				
	Ave-Acoustic Caliper: 5 Inches 15						
	Enlargements						

68.0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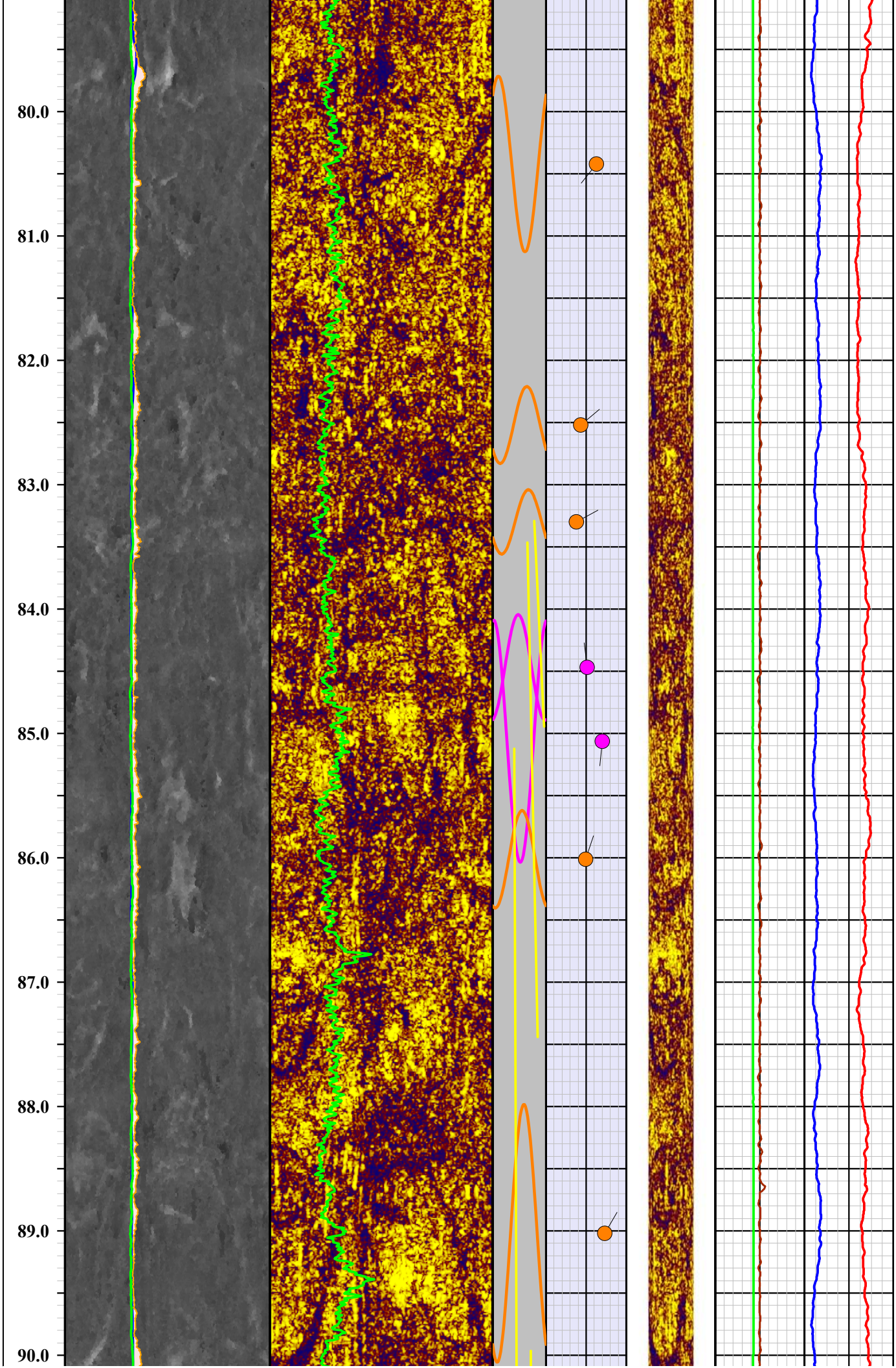
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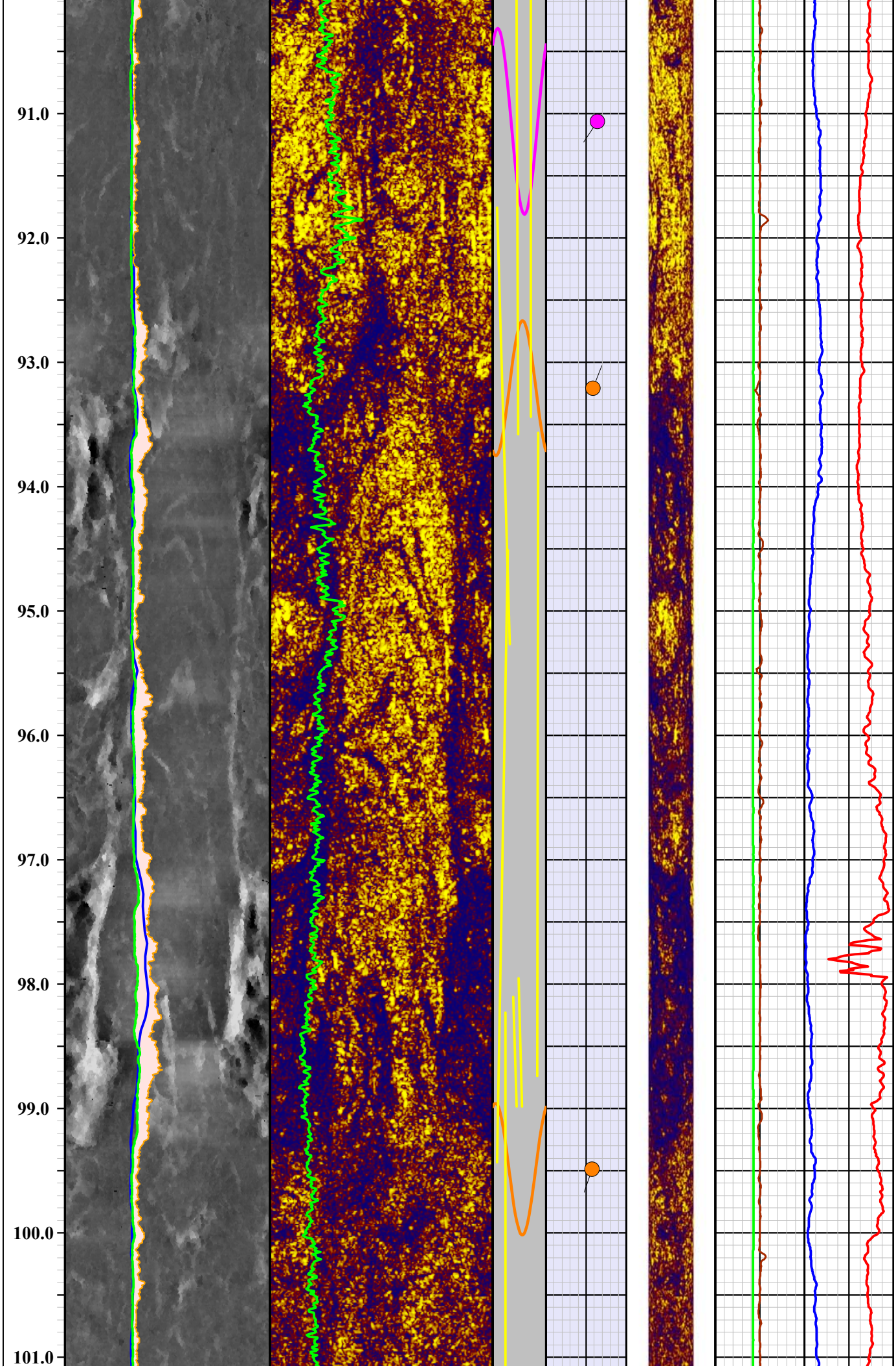
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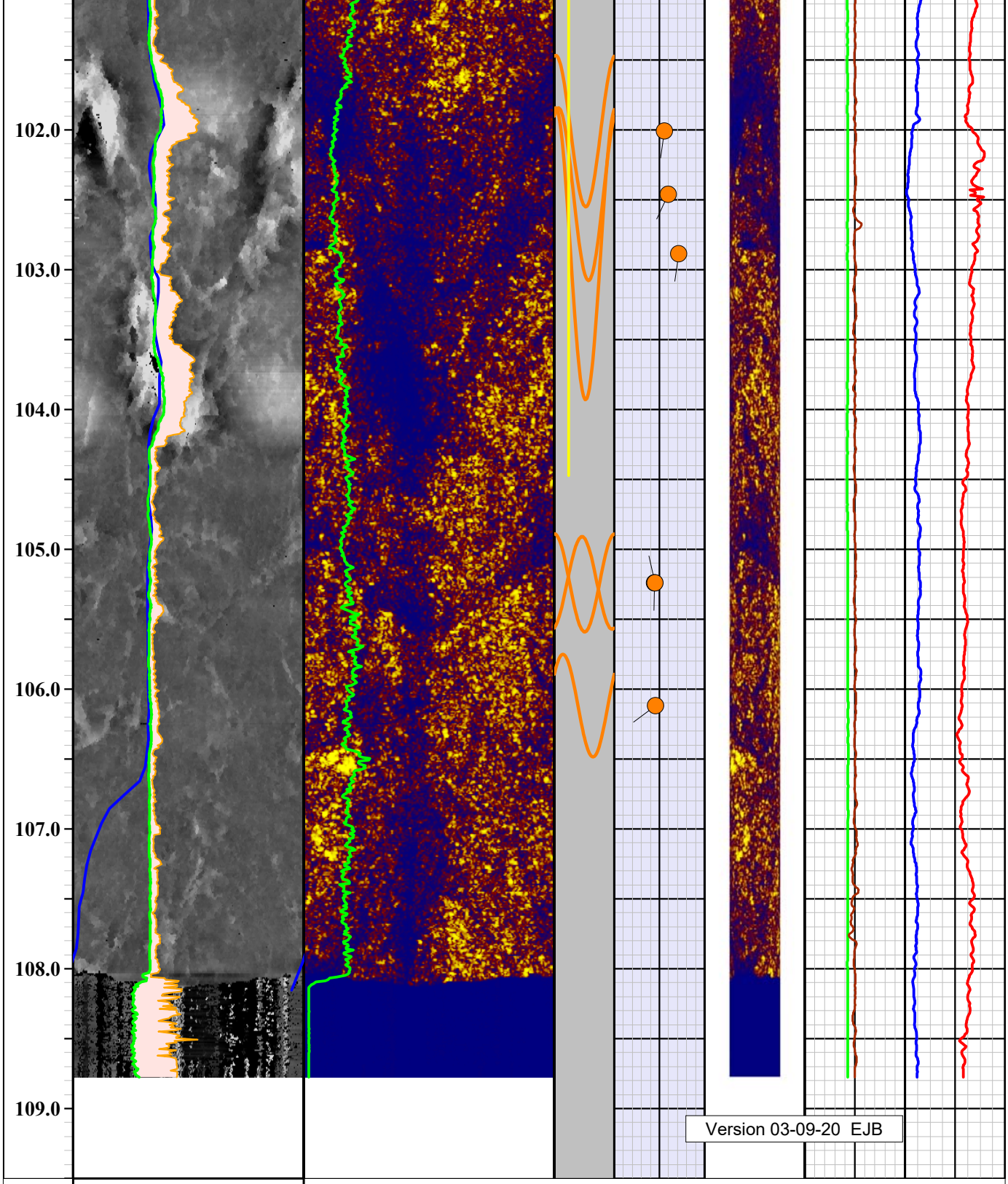


Enlargements

5 Inches 15
Ave-Acoustic Caliper

5 Inches 15
Max-Acoustic Caliper

5 Inches 15
3-Arm Caliper

0° 90° 180° 270° 0°
Oriented Mag North
Centralized TT

0 2000
ARI

0° 90° 180° 270° 0°
Oriented Mag North
Amplitude-Static

0° 90° 180° 270° 0°
Oriented Mag North
Amplitude-NM

Bx

NVJts

DIPA
Picks

0 100
DIPT
Tadpole

-0°
3-D View

0.8 g 1.2
Gravity

40 uT 60
Mag Field

0 360
Azimuth

0 Deg 8
Tilt

1in:1ft
Depth

TTU EX-5 Well ABI40 2G Summary ~68.8' to ~108.1'

Depth	

Legend

Mnemonics	Description
Centralized TT	2D plot of acoustic image travel time with probe position centralized. Oriented to magnetic north and plotted from left to right N-E-S-W-N.
3-Arm Caliper	3-arm mechanical caliper of hole diameter plotted from 5 to 15 inches (blue line).
Max-Acoustic Caliper	Maximum acoustic caliper of hole diameter calculated from Travel Time data and plotted as orange line from 5 to 15 inches.
Ave-Acoustic Caliper	Average acoustic caliper of hole diameter calculated from Travel Time data and plotted as bright green line from 5 to 15 inches.
Enlargements	Pink shaded zone between Ave-Acoustic Caliper and Max-Acoustic Caliper calculated from Travel Time data showing borehole enlargment.
Amplitude-NM	2D plot of unfiltered acoustic image amplitude oriented to magnetic north. Plotted from left to right N-E-S-W-N. Image toggled off.
Amplitude-Static	2D plot of acoustic image amplitude with Static normalization filter oriented to magnetic north. Plotted from left to right N-E-S-W-N. Image toggled on.
ARI	Acoustic Reflectance Index or relative rock hardness from ABI Amplitude log. Plotted 0 (soft) to 2000 (harder) as green line.
Picks	Planar strucutral features picked on acoustic borehole image shown as colored sinusoid (color designation shown on header) DIPA = dip apparent hole axis.
NVJts	Near Vertical (near parallel to hole axis) joint/fracture features picked on acoustic borehole image shown as colored sinusoid (color designation shown on header).
Bx	Apparent Breccia or Congomerate zones and Vugs/Vesicles/Cavities.
3-D View	3D cylindrical projection of ABI image using Centralized TT log for hole shape looking from North.
Tadpole	Tadpole plot of the ABI feature picks (fractures and bedding planes); plotted from 0 to 90 dip - see legend above. DIPT = True orientation; features corrected for hole deviation.
Mag Field	Total magnetic field strength as measured by fluxgate magnetometer in OBI or ABI deviation sensor - plotted 40-60 uT (green line).
Gravity	Total gravity (probe acceleration) as measured by 3-axis accelerometers in ABI deviation sensor - plotted 0.8-1.2 g (brown line).
Azimuth	Direction of tool tilt plotted 0 to 360 deg - represents borehole deviation direction (red line).

Tilt	Tool tilt (vertical = 0 and horizontal = 90) plotted 0 to 8 deg; represents borehole deviation tilt from vertical (blue line). Mnemonics prepared by Erika J Beam Version 03-09-20

QL ABI-40 2G Acoustic Borehole Imager

Probe Top = Depth Ref.

Tool SN: 143003, 143009 & 192302

Four Conductor MSI Probe Top

APS Probe Orientation Sensor
3-Axis Magnetometer
3-Axis Accellerometer

Probe Length = 1.62 m or 5.25 ft

Probe Weight = 6.7 kg or 14.7 lbs

Distance from Acoustic Image Window to Orientation Sensor = 0.92 m or 3 ft

Inclination Accuracy = +/- 0.5 deg
Azimuth Accuracy = +/- 1.2 deg

Beam Width = 1.5 mm

Frequency = 1.2 MHz

Temperature Range: 0 - 70 Deg C (32 - 158 Deg F)
Pressure Range: 0 - 200 bar (0 - 2900 psi)

Run Centralized with External Bow Spring Centralizers

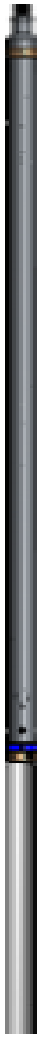
Can only be logged in fluid filled holes

ABI Imaging Window

1.6" or 40 mm Diameter

MSI Gamma-Caliper-Temperature-Fluid Resistivity

Probe Top = Depth Ref.



Single Conductor MSI Probe Top

Probe Length = 2.59 m or 8.5 ft
Probe Weight = 6.80 kg or 15.0 lbs

Natural Gamma and Caliper can only be collected logging up hole.

Fluid Temperature/Resistivity can only be collected logging down hole.

Temperature Rating: 70 Deg C (158 Deg F)
Presure Rating: 200 bar (2900 psi)

Natural Gamma Ray = 0.76 m (29.75 in)

NOTE: Lengths on a particular tool may vary from those listed on this document due to probe sizes and styles utilized

3-Arm Caliper = 1.44 m (56.75 in)

Distance from tool top: 2.20 m (86.5 in)

Available Arm Sizes: 3", 9", and 15"

TFR (Temperature/Fluid Resistivity) = 0.39 m (15.5 in)

1.375" or 34.9 mm Diameter

Southwest Exploration Services, LLC
borehole geophysics & video services

Company	GEOSYNTEC
Well	TTU EX-5
Field	TALLEY
County	MARICOPA
State	ARIZONA

Final Acoustic Televiewer Summary

Southwest Exploration Services, LLC

borehole geophysics & video services

COMPANY	GEOSYNTEC
WELL ID	TTU EX-5
FIELD	TALLEY
COUNTY	MARICOPA STATE ARIZONA

TYPE OF LOGS: GAMMA - CALIPER
MORE: TEMP / FLUID RES

LOCATION

SEC TWP RGE

OTHER SERVICES
ACOUSTIC TELEVIEWER
OPTICAL TELEVIEWER

PERMANENT DATUM		ELEVATION	K.B.
LOG MEAS. FROM	GROUND LEVEL	ABOVE PERM. DATUM	D.F.
DRILLING MEAS. FROM	GROUND LEVEL		G.L.

DATE	02-16-20	TYPE FLUID IN HOLE	FORMATION WATER
RUN No	2	MUD WEIGHT	N/A
TYPE LOG	GAMMA-CALIPER-TFR	VISCOSITY	N/A
DEPTH-DRILLER	110.0 FT	LEVEL	~70 FT
DEPTH-LOGGER	110.0 FT	MAX. REC. TEMP.	25.6 DEG C
BTM LOGGED INTERVAL	110.0 FT	IMAGE ORIENTED TO:	N/A
TOP LOGGED INTERVAL	SURFACE	SAMPLE INTERVAL	0.1 FT
DRILLER / RIG#	N/A	LOGGING TRUCK	TRUCK #310
RECORDED BY / Logging Eng.	E. BEAM / T. GODSEY	TOOL STRING/SN	MSI COMBO TOOL SN 5546
WITNESSED BY	FABRIZIO - GEOSYNTEC	LOG TIME:ON SITE/OFF SITE	7:00 AM

RUN	BOREHOLE RECORD			CASING RECORD			
NO.	BIT	FROM	TO	SIZE	WGT.	FROM	TO
1	?	SURFACE	20 FT	8.5 IN	STEEL	SURFACE	20 FT
2	8 IN	20 FT	TOTAL DEPTH				
3							

COMMENTS:

.

Tool Summary:

Date	02-16-20	**Date**	02-16-20	**Date**	02-16-20		
Run No.	1	**Run No.**	2	**Run No.**	3		
Tool Model	ALT QL OBI40 2G	**Tool Model**	MSI COMBO TOOL	**Tool Model**	ALT QL ABI40 2G		
Tool SN	170106	**Tool SN**	5446	**Tool SN**	192302		
From	SURFACE	**From**	SURFACE	**From**	69.0 FT		
To	109.0 FT	**To**	110.0 FT	**To**	109.0 FT		
Recorded By	E. BEAM	**Recorded By**	E. BEAM	**Recorded By**	E. BEAM		
Truck No	310	**Truck No**	310	**Truck No**	310		
Operation Check	01-30-20	**Operation Check**	02-16-20	**Operation Check**	02-14-20		
Calibration Check	N/A	**Calibration Check**	02-16-20	**Calibration Check**	N/A		
Time Logged	12:40 PM	**Time Logged**	1:05 PM	**Time Logged**	1:20 PM		
Date		**Date**		**Date**			
Run No.	4	**Run No.**	5	**Run No.**	6		
Tool Model		**Tool Model**		**Tool Model**			
Tool SN		**Tool SN**		**Tool SN**			
From		**From**		**From**			
To		**To**		**To**			
Recorded By		**Recorded By**		**Recorded By**			
Truck No		**Truck No**		**Truck No**			
Operation Check		**Operation Check**		**Operation Check**			
Calibration Check		**Calibration Check**		**Calibration Check**			
Time Logged		**Time Logged**		**Time Logged**			

Additional Comments:

Caliper Arms Used: 9" **Calibration Points:** 4" & 10"

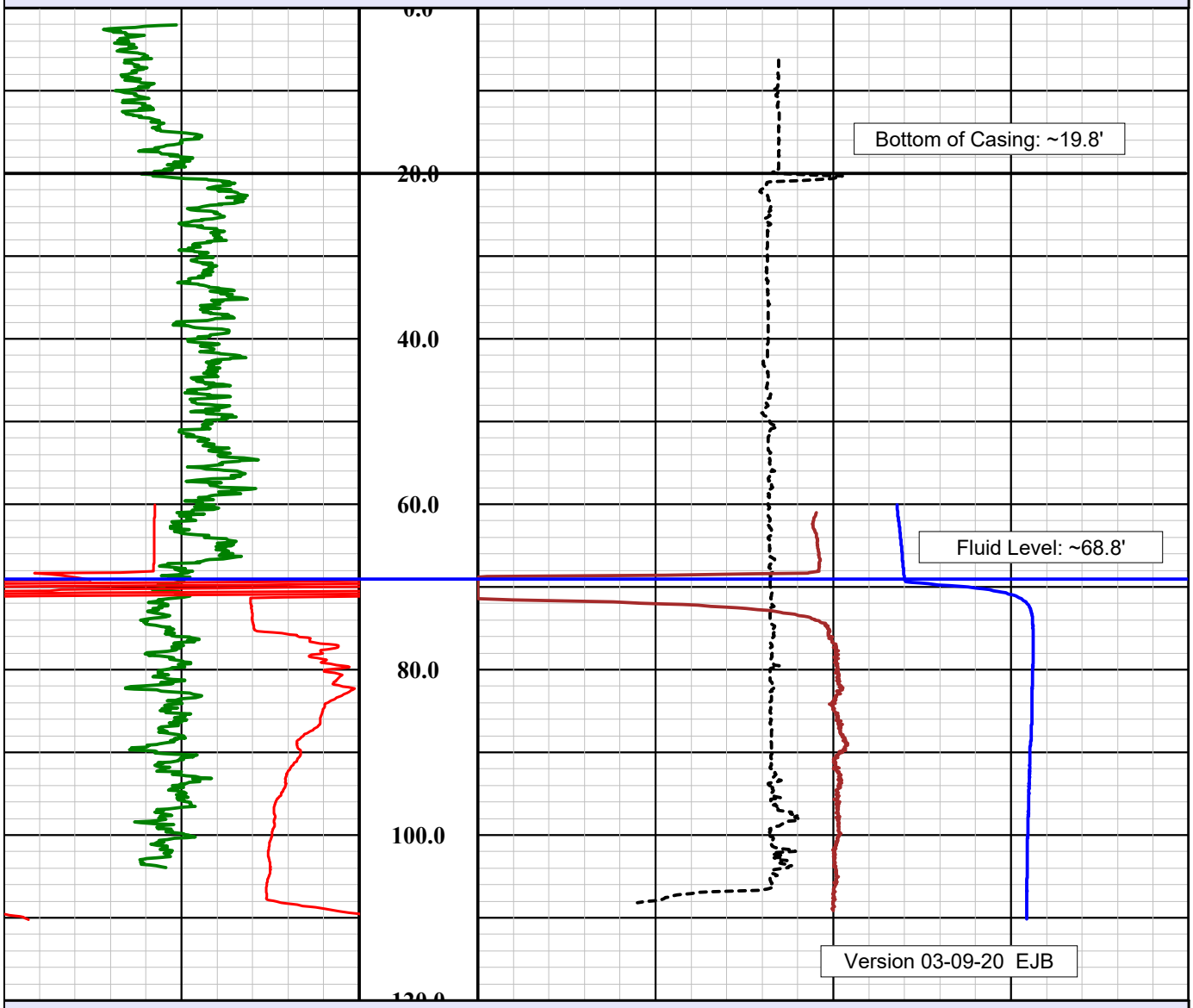
E-Log Calibration Range: N/A **Calibration Points:** N/A

Disclaimer:

All interpretations of log data are opinions based on inferences from electrical or other measurements. We do not guarantee the accuracy or correctness of any interpretations or recommendations and shall not be liable or responsible for any loss, costs, damages, or expenses incurred or sustained by anyone resulting from any interpretation made by any of our employees or agents. These interpretations are also subject to our general terms and conditions set out in our current Service Invoice.

Nat. Gamma	Depth	3-Arm Caliper
0 API 200	1in:20ft	0 Inches 20
Fluid Resistivity		**Temperature**
0 Ohm-m 20		10 Deg C 30
		2-Ft Diff. Temp.
		-1 Deg C 1

TTU EX-5 Well GCT Summary Surface to ~110.0'



TTU EX-5 Well GCT Summary Surface to ~110.0'

		-1 Deg C 1
		2-Ft Diff. Temp.
0 Ohm-m 20		10 Deg C 30

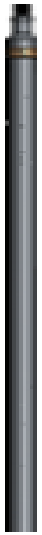
Fluid Resistivity		Temperature
0 API 200	1in:20ft	0 Inches 20
Nat. Gamma	Depth	3-Arm Caliper

Legend

Mnemonics	Description
Nat. Gamma	Natural gamma ray log plotted 0 to 200 API (green line).
Fluid Resistivity	Electrical resistivity of a borehole's fluid plotted from 0 to 20 ohm-m as red line.
3-Arm Caliper	3-arm mechanical caliper of hole diameter plotted from 0 to 20 inches (black dashed line).
Temperature	Borehole fluid temperature plotted from 10 to 30 degrees C (blue line).
2-Ft Diff. Temp.	Differential temperature over 2-ft spacing (brown line).
	Mnemonics prepared by Erika J. Beam Version 03-09-20

MSI Gamma-Caliper-Temperature-Fluid Resistivity

Probe Top = Depth Ref.



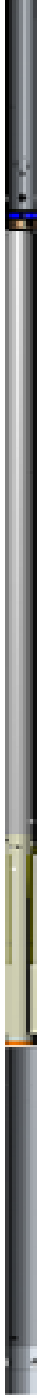
Single Conductor MSI Probe Top

Probe Length = 2.59 m or 8.5 ft
Probe Weight = 6.80 kg or 15.0 lbs

Natural Gamma and Caliper can only be collected logging up hole.

Fluid Temperature/Resistivity can only be collected logging down hole.

Temperature Rating: 70 Deg C (158 Deg F)
Presure Rating: 200 bar (2900 psi)



Natural Gamma Ray = 0.76 m (29.75 in)

NOTE: Lengths on a particular tool may vary from those listed on this document due to probe sizes and styles utilized

3-Arm Caliper = 1.44 m (56.75 in)

Distance from tool top: 2.20 m (86.5 in)

Available Arm Sizes: 3", 9", and 15"

TFR (Temperature/Fluid Resistivity) = 0.39 m (15.5 in)

1.375" or 34.9 mm Diameter

Southwest Exploration Services, LLC
borehole geophysics & video services

Company	GEOSYNTEC
Well	TTU EX-5
Field	TALLEY
County	MARICOPA
State	ARIZONA

Final GCT Summary

Southwest Exploration Services, LLC

borehole geophysics & video services

COMPANY	GEOSYNTEC
WELL ID	TTU EX-5
FIELD	TALLEY
COUNTY	MARICOPA STATE ARIZONA

TYPE OF LOGS: OPTICAL TELEVIEWER
MORE: GAMMA - CALIPER

LOCATION

SEC TWP RGE

OTHER SERVICES
ACOUSTIC TELEVIEWER
TEMP / FLUID RES

PERMANENT DATUM		ELEVATION	K.B.
LOG MEAS. FROM	GROUND LEVEL	ABOVE PERM. DATUM	D.F.
DRILLING MEAS. FROM	GROUND LEVEL		G.L.

DATE	02-16-20	TYPE FLUID IN HOLE	FORMATION WATER
RUN No	1	MUD WEIGHT	N/A
TYPE LOG	OPTICAL TELEVIEWER	VISCOSITY	N/A
DEPTH-DRILLER	110.0 FT	LEVEL	~70 FT
DEPTH-LOGGER	110.0 FT	MAX. REC. TEMP.	25.6 DEG C
BTM LOGGED INTERVAL	109.0 FT	IMAGE ORIENTED TO:	MAGNETIC NORTH
TOP LOGGED INTERVAL	SURFACE	SAMPLE INTERVAL	0.035 FT
DRILLER / RIG#	N/A	LOGGING TRUCK	TRUCK #310
RECORDED BY / Logging Eng.	E. BEAM / T. GODSEY	TOOL STRING/SN	ALT QL OBI40 2G SN 170106
WITNESSED BY	FABRIZIO - GEOSYNTEC	LOG TIME:ON SITE/OFF SITE	7:00 AM

RUN	BOREHOLE RECORD			CASING RECORD			
NO.	BIT	FROM	TO	SIZE	WGT.	FROM	TO
1	?	SURFACE	20 FT	8.5 IN	STEEL	SURFACE	20 FT
2	8 IN	20 FT	TOTAL DEPTH				
3							

COMMENTS:

.

Tool Summary:

Date	02-16-20	**Date**	02-16-20	**Date**	02-16-20		
Run No.	1	**Run No.**	2	**Run No.**	3		
Tool Model	ALT QL OBI40 2G	**Tool Model**	MSI COMBO TOOL	**Tool Model**	ALT QL ABI40 2G		
Tool SN	170106	**Tool SN**	5446	**Tool SN**	192302		
From	SURFACE	**From**	SURFACE	**From**	69.0 FT		
To	109.0 FT	**To**	110.0 FT	**To**	109.0 FT		
Recorded By	E. BEAM	**Recorded By**	E. BEAM	**Recorded By**	E. BEAM		
Truck No	310	**Truck No**	310	**Truck No**	310		
Operation Check	01-30-20	**Operation Check**	02-16-20	**Operation Check**	02-14-20		
Calibration Check	N/A	**Calibration Check**	02-16-20	**Calibration Check**	N/A		
Time Logged	12:40 PM	**Time Logged**	1:05 PM	**Time Logged**	1:20 PM		

Date		**Date**		**Date**			
Run No.	4	**Run No.**	5	**Run No.**	6		
Tool Model		**Tool Model**		**Tool Model**			
Tool SN		**Tool SN**		**Tool SN**			
From		**From**		**From**			
To		**To**		**To**			
Recorded By		**Recorded By**		**Recorded By**			
Truck No		**Truck No**		**Truck No**			
Operation Check		**Operation Check**		**Operation Check**			
Calibration Check		**Calibration Check**		**Calibration Check**			
Time Logged		**Time Logged**		**Time Logged**			

Additional Comments:

Caliper Arms Used: 9" **Calibration Points:** 4" & 10"

E-Log Calibration Range: N/A **Calibration Points:** N/A

Disclaimer:

All interpretations of log data are opinions based on inferences from electrical or other measurements. We do not guarantee the accuracy or correctness of any interpretations or recommendations and shall not be liable or responsible for any loss, costs, damages, or expenses incurred or sustained by anyone resulting from any interpretation made by any of our employees or agents. These interpretations are also subject to our general terms and conditions set out in our current Service Invoice.

Image Features Legend

- Btm of Casing
- Filled Fracture / Joint
- Bedding / Banding / Foliation / Veins
- Partially Open Joint / Fracture
- Minor Open Joint / Fracture
- OJ/Fx terminates at Fx intersection
- Unclassified
- Sulfide Vein
- Breakouts
- Major Open Joint / Fracture
- Fluid Level

Breakout Legend

- Broken Zone / Undifferentiated
- Major Breakout
- Minor Breakout
- Tensile Fracture
- Filled Near Vertical Joint/Fx
- Near Vertical Joint/Fx

Bx Legend

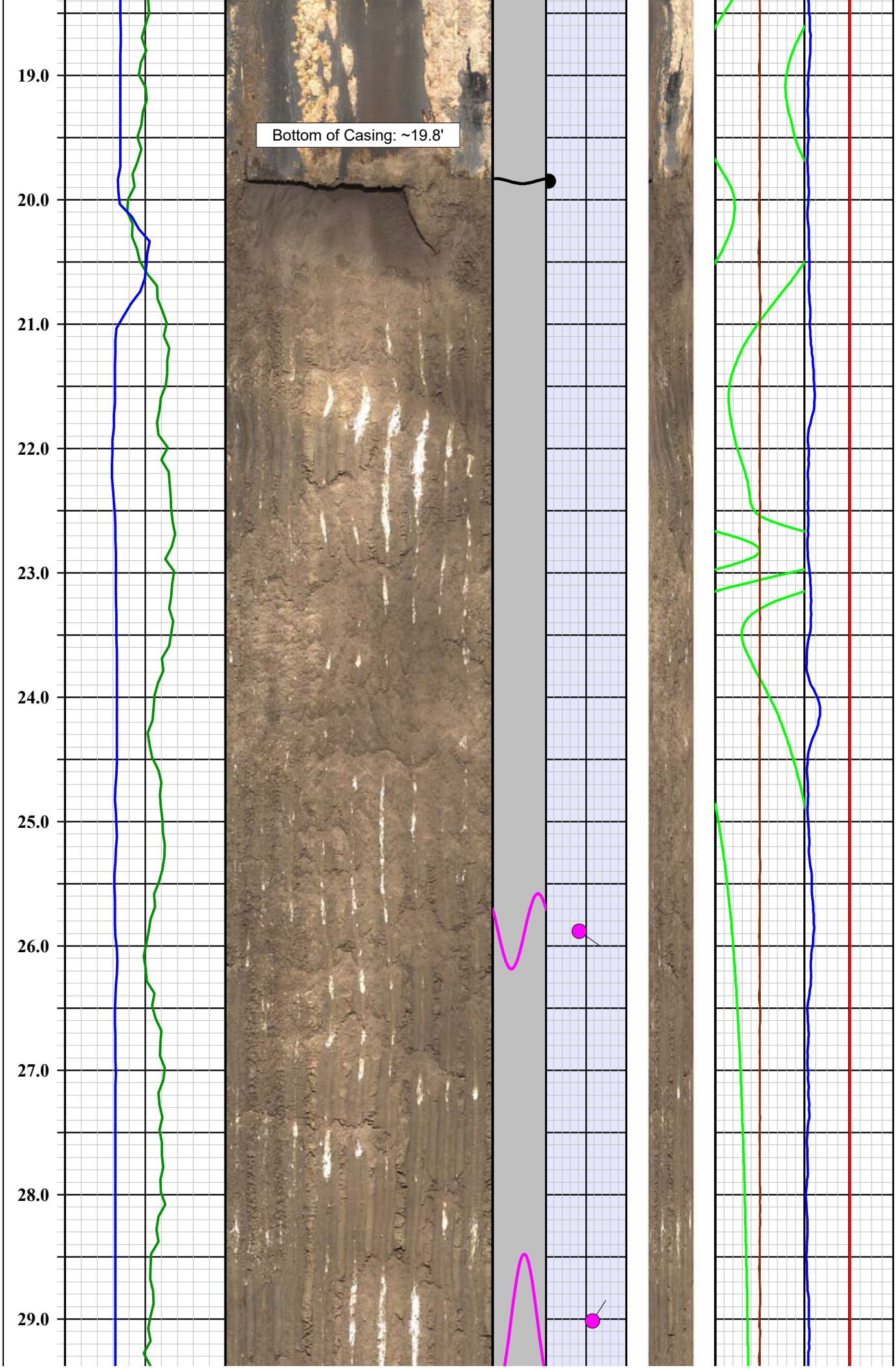
- Breccia or Conglomerate
- Large Vugs/Vesicles (> 6")
- Medium Vugs/Vesicles (2-6")
- Small Vugs/Vesicles (< 2")
- Conglomerate - sand matrix supported
- Conglomerate - mud matrix supported
- Conglomerate - clast supported

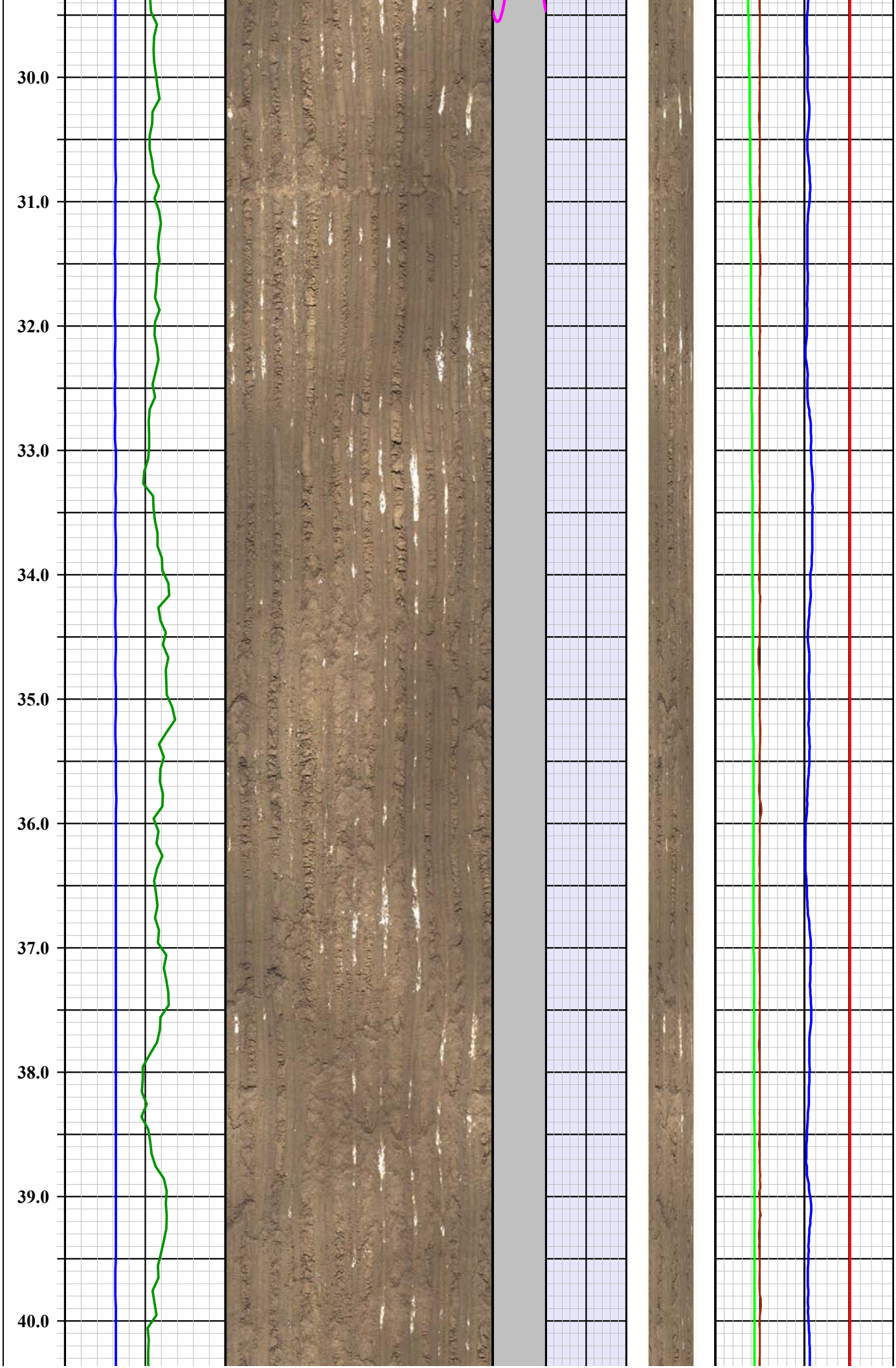
TTU EX-5 Well OBI40 2G Summary ~19.8' to ~108.7'

Depth 1in:1ft

Nat. Gamma	Image-NM	Picks	Tadpole	3-D View	Mag Field	Tilt
0 API 200	Oriented Mag North	DIPA	DIPT 0 100	-0°	40 uT 60	0 Deg 8
3-Arm Caliper	0° 90° 180° 270° 0°	NVJts			**Gravity**	**Azi-Edited**
5 Inches 15					0.8 g 1.2	0 360
	Image_18.0'-41.5' Non Oriented, Rot'd by 60.4 Deg	Bx				
	0° 90° 180° 270° 0°					

18.0


19.0
20.0
21.0
22.0
23.0
24.0
25.0
26.0
27.0
28.0
29.0
Bottom of Casing: ~19.8'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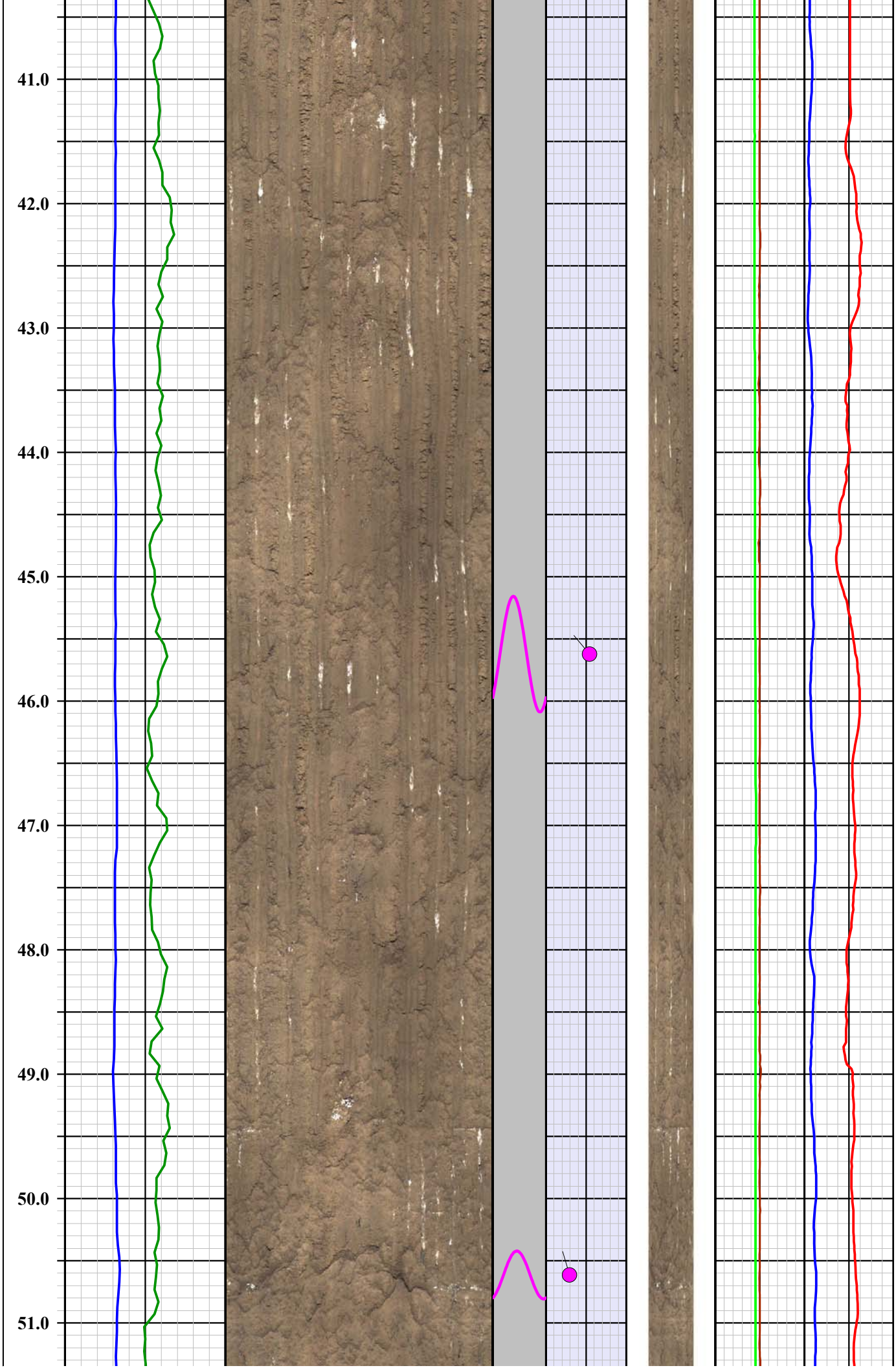
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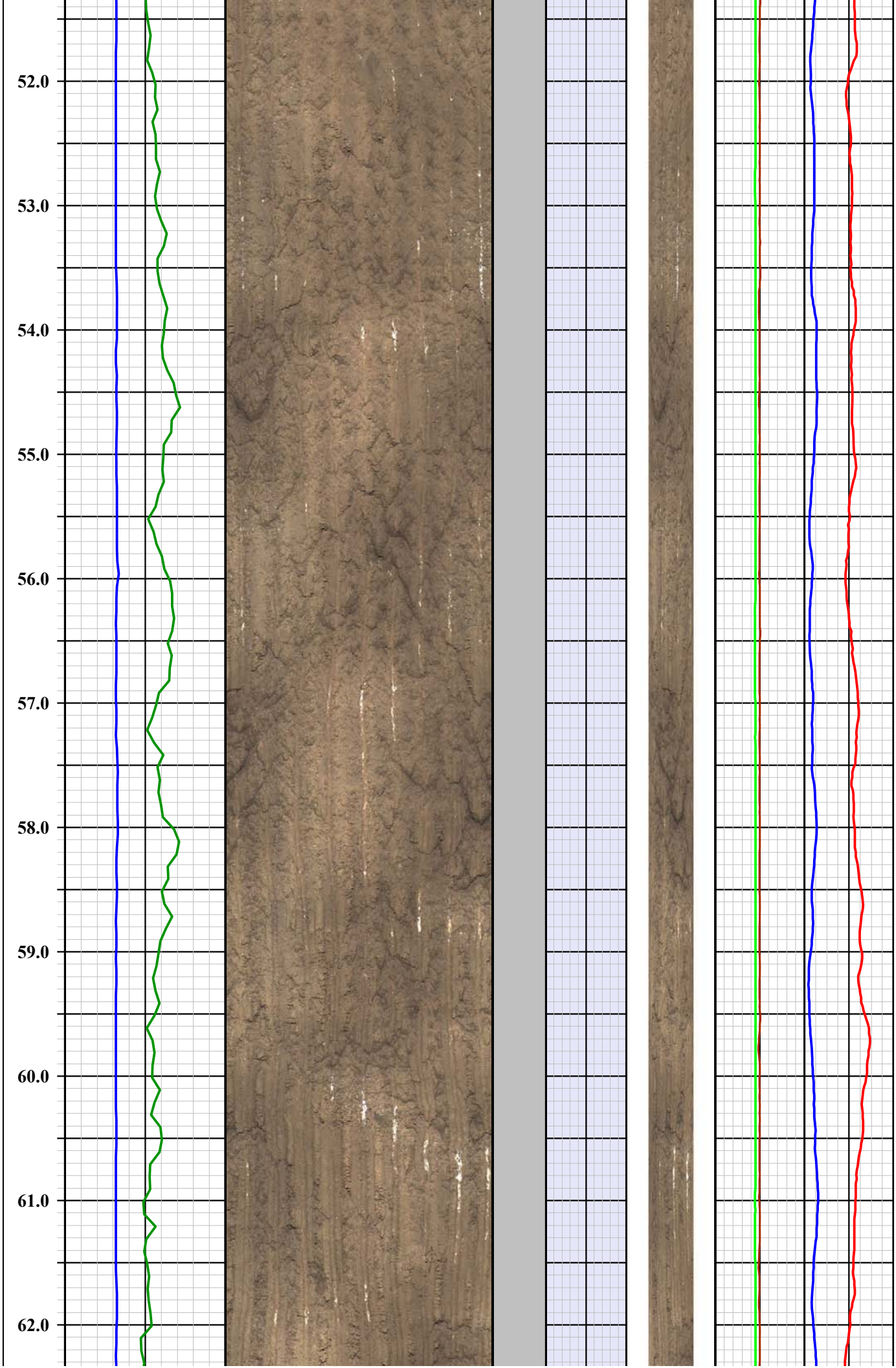
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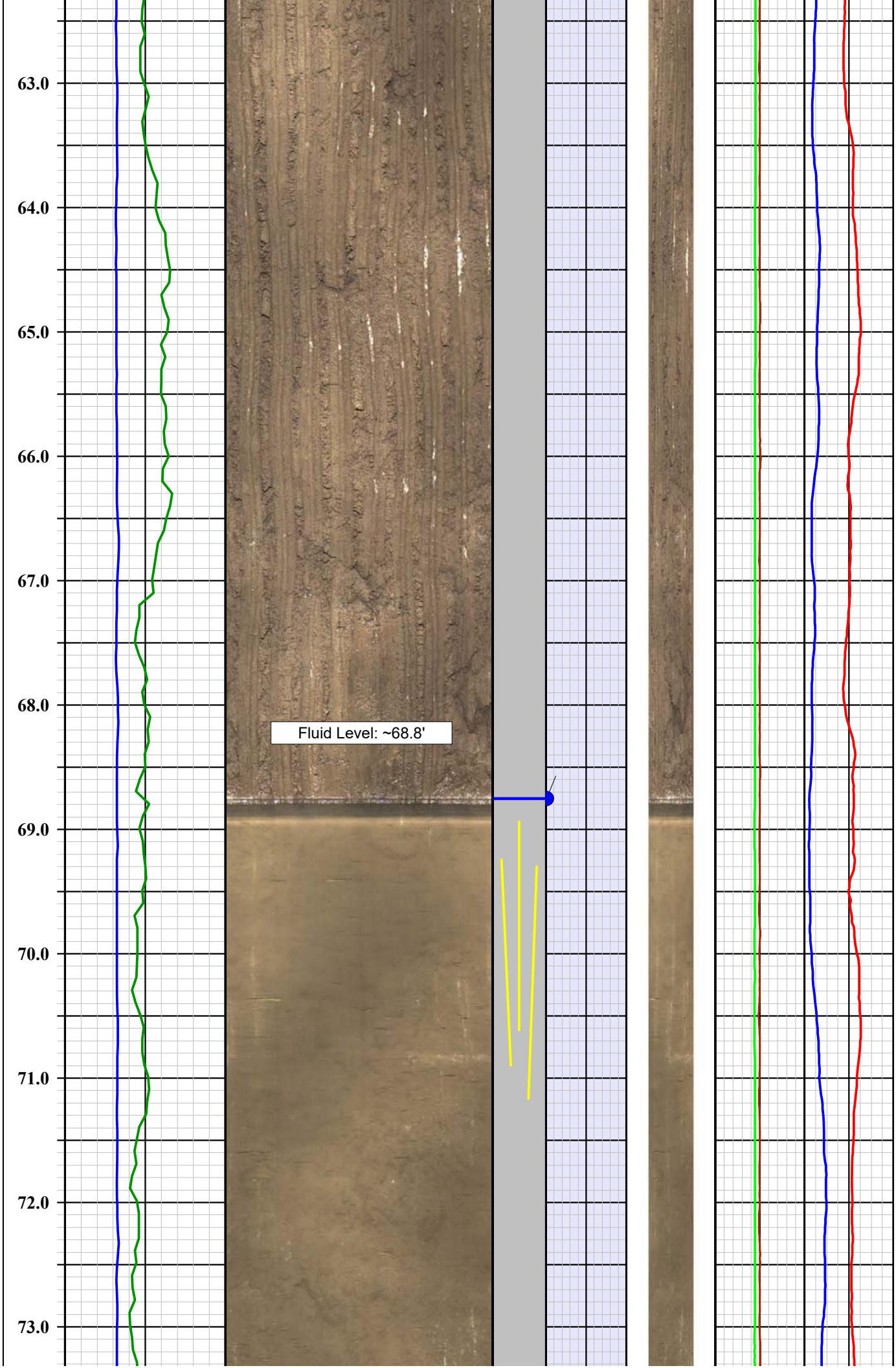
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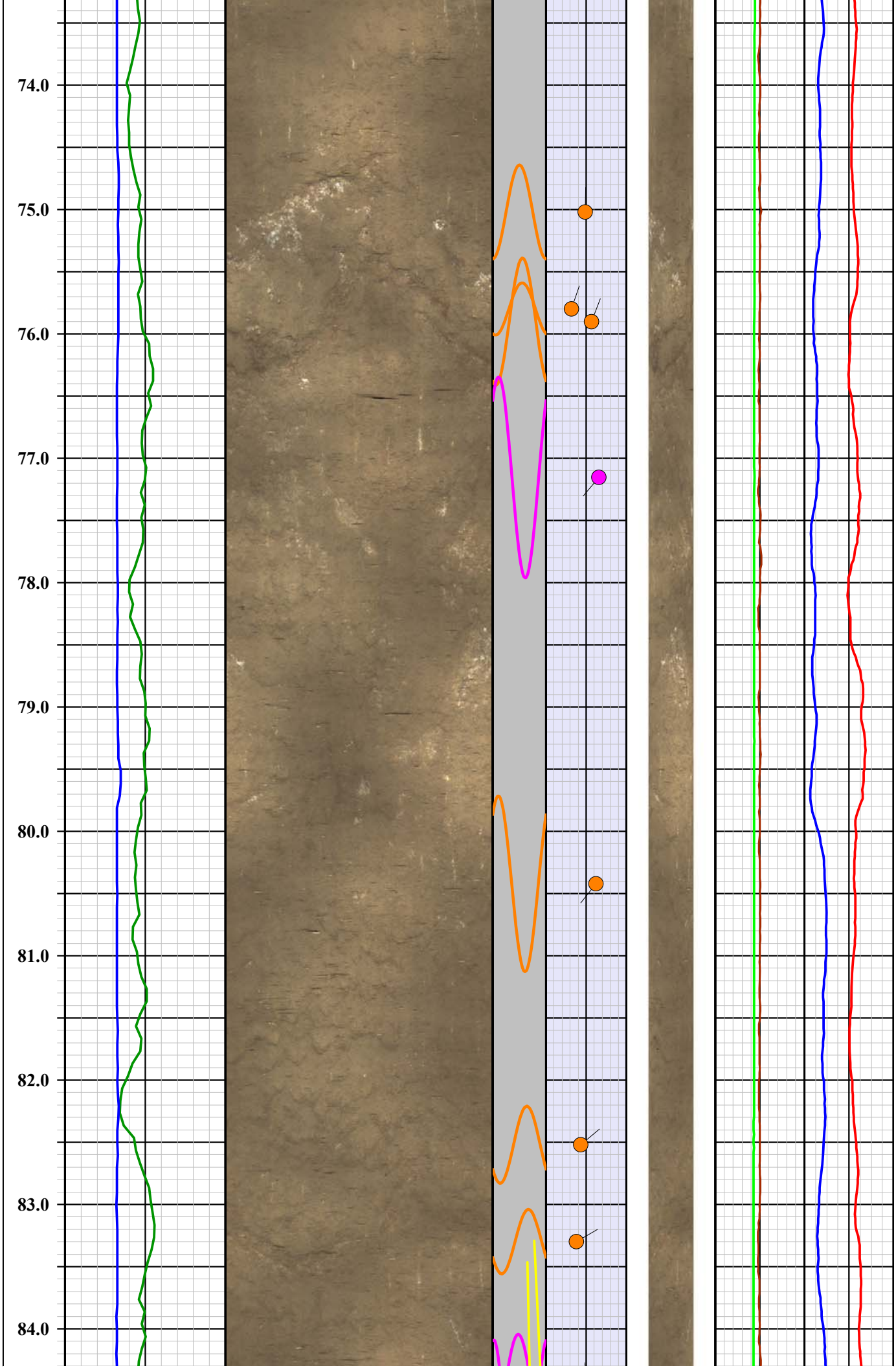
Fluid Level: ~68.8'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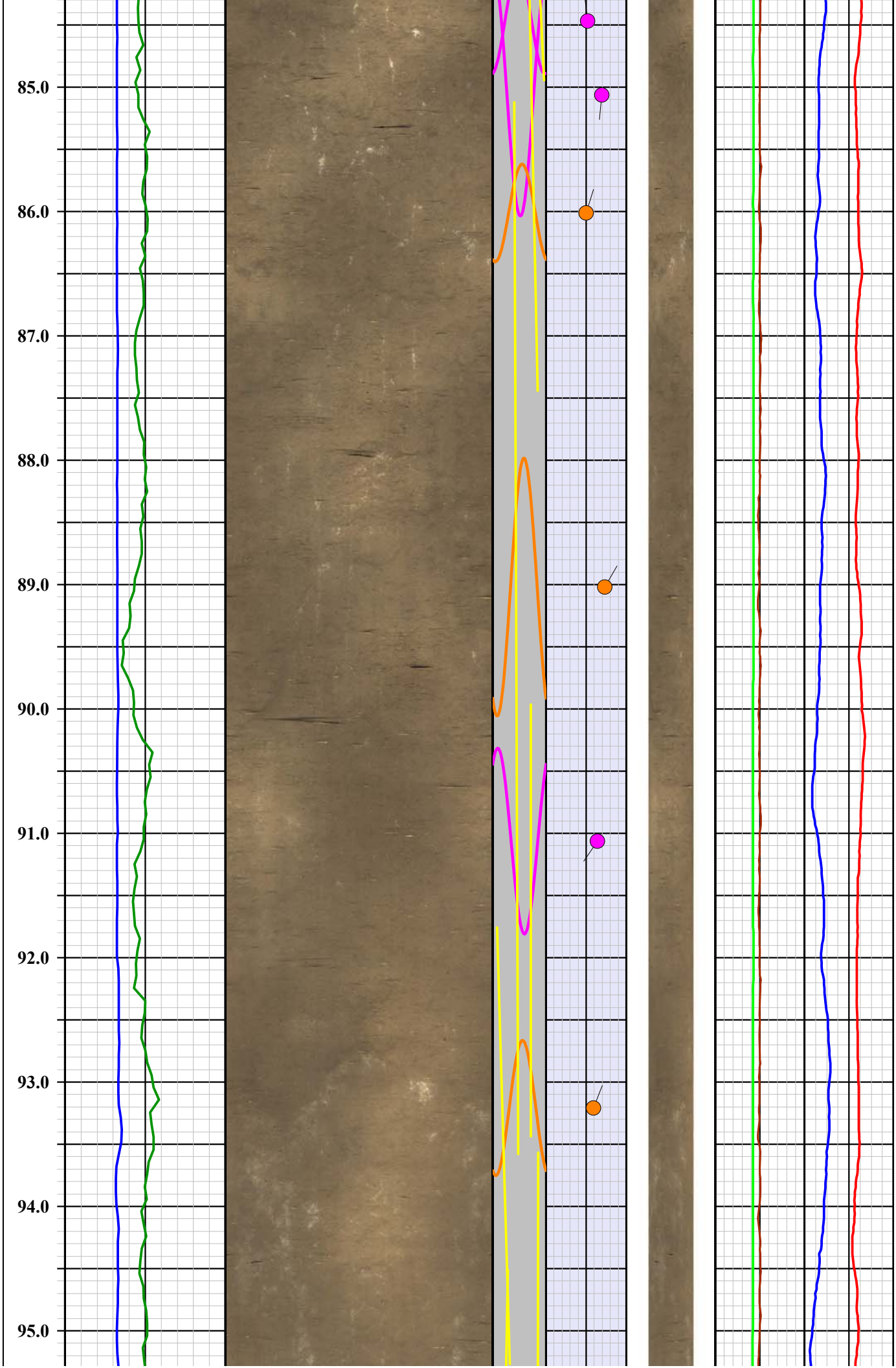
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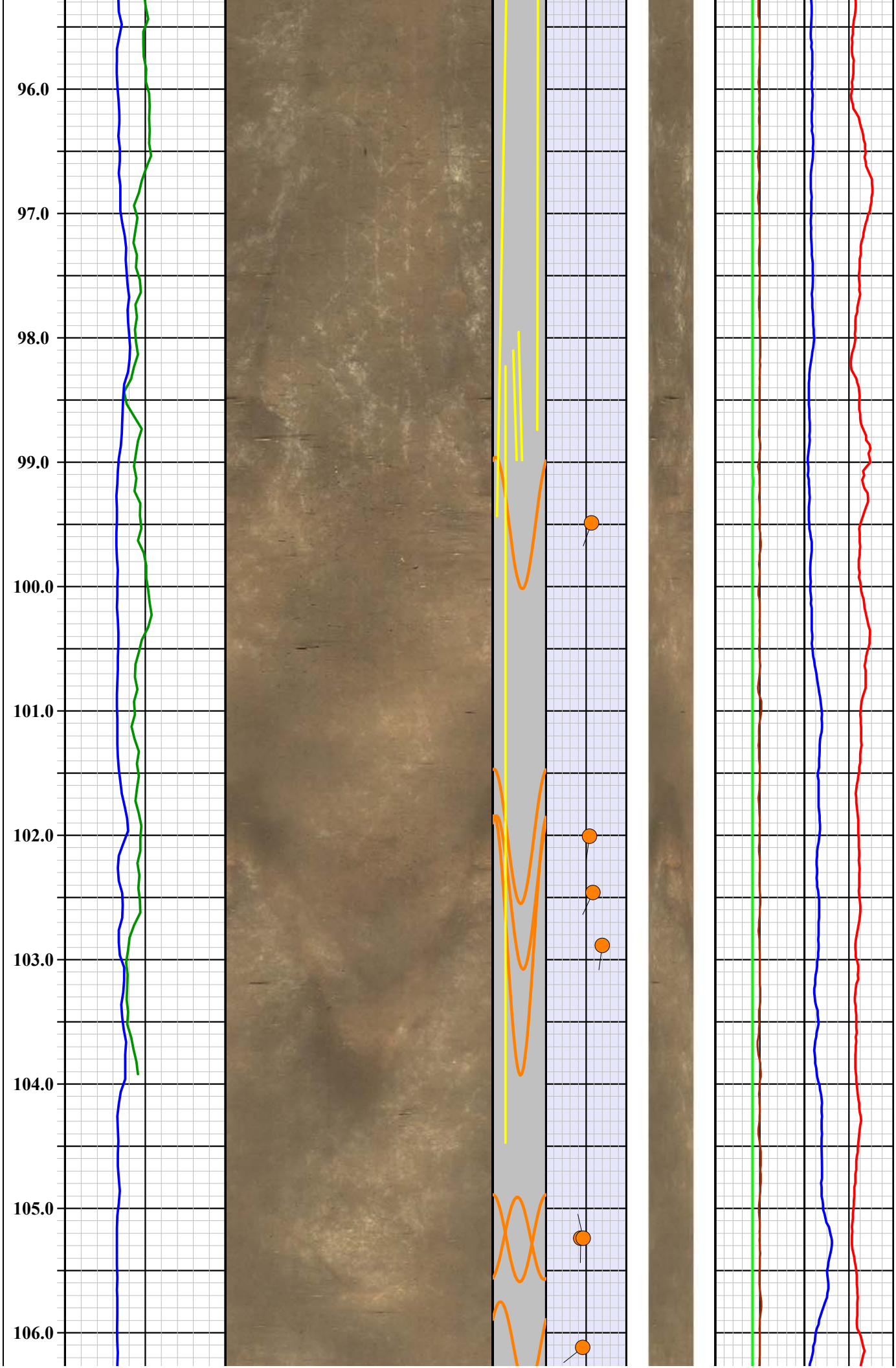
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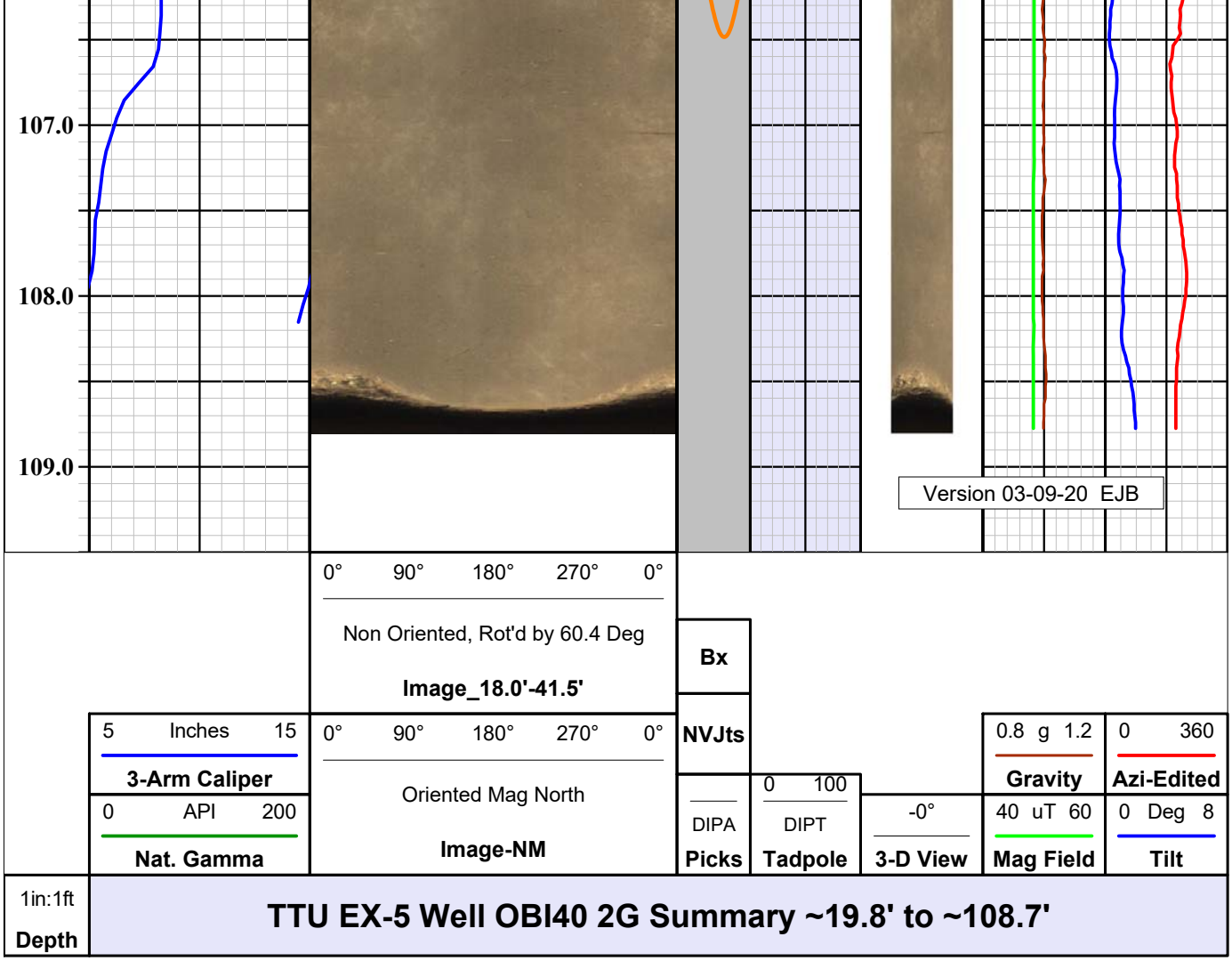


Legend

Mnemonics	Description
3-Arm Caliper	3-arm mechanical caliper of hole diameter plotted from 5 to 15 inches (blue line).
Nat. Gamma	Natural gamma ray log plotted from 0 to 200 API units (green line).
Image-NM	2D plot of optical image oriented to magnetic north. Plotted from left to right N-E-S-W-N.
Image_18.0'-41.5'	2D plot of optical image non-oriented and rotated by 60.4 deg to correct for magnetic affect in proximity of steel casing. Plotted from left to right N-E-S-W-N.
Picks	Planar strucutral features picked on optical borehole image shown as colored sinusoid (color designation shown on header) DIPA = dip apparent hole axis.
NVJts	Near Vertical (near parallel to hole axis) joint/fracture features picked on optical borehole image shown as colored sinusoid (color designation shown on header).
Bx	Apparent Breccia or Congomerate zones and Vugs/Vesicles/Cavities.
3-D View	3D cylindrical projection of OBI image viewed from north.

Tadpole	Tadpole plot of the OBI feature picks (fractures and bedding planes); plotted from 0 to 90 dip - see legend above. DIPT = True orientation; features corrected for hole deviation.
Mag Field	Total magnetic field strength as measured by fluxgate magnetometer in OBI or ABI deviation sensor - plotted 40-60 uT (green line).
Gravity	Total gravity (probe acceleration) as measured by 3-axis accelerometers in OBI deviation sensor - plotted 0.8-1.2 g (brown line).
Azi-Edited	Direction of tool tilt plotted 0 to 360 deg; edited for anomalous magnetic influence - represents borehole deviation direction (red line).
Tilt	Tool tilt (vertical = 0 and horizontal = 90) plotted 0 to 8 deg; represents borehole deviation tilt from vertical (blue line).
	Mnemonics prepared by Erika J Beam Version 03-09-20

QL OBI-40 2G Optical Borehole Imager

Probe Top = Depth Ref.

Tool SN: 145010, 152511 & 170106

Four Conductor MSI Probe Top

APS Probe Orientation Sensor
3-Axis Magnetometer
3-Axis Accellerometer

Probe Length = 1.66 m or 5.46 ft

Probe Weight = 5.3 kg or 11.7 lbs

Distance from Optical Image Window to Orientation Sensor = 0.9 m or 3 ft

Inclination Accuracy = +/- 0.5 deg
Azimuth Accuracy = +/- 1.0 deg

Temperature Range: 0 - 70 Deg C (32 - 158 Deg F)
Pressure Range: 0 - 200 bar (0 - 2900 psi)

External Bow Spring Centralizers

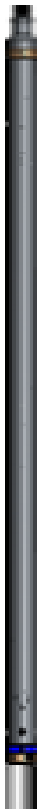
Operates in dry or clear water conditions.

OBI Imaging Window

1.6" or 40 mm Diameter

MSI Gamma-Caliper-Temperature-Fluid Resistivity

Probe Top = Depth Ref.



Single Conductor MSI Probe Top

Probe Length = 2.59 m or 8.5 ft
Probe Weight = 6.80 kg or 15.0 lbs

Natural Gamma and Caliper can only be collected logging up hole.

Fluid Temperature/Resistivity can only be collected logging down hole.

Temperature Rating: 70 Deg C (158 Deg F)
Presure Rating: 200 bar (2900 psi)

Natural Gamma Ray = 0.76 m (29.75 in)

*NOTE: Lengths on a particular tool may vary from those listed on

this document due to probe sizes and styles utilized*

3-Arm Caliper = 1.44 m (56.75 in)

Distance from tool top: 2.20 m (86.5 in)

Available Arm Sizes: 3", 9", and 15"

TFR (Temperature/Fluid Resistivity) = 0.39 m (15.5 in)

1.375" or 34.9 mm Diameter

Southwest Exploration Services, LLC
borehole geophysics & video services

Company	GEOSYNTEC
Well	TTU EX-5
Field	TALLEY
County	MARICOPA
State	ARIZONA

Final **Optical Televiewer Summary**

Drill Hole: TTU-16 March 10, 2020, EJB

Geophysical Logs were collected by SwExp on February 16, 2020.
Features oriented to Magnetic North and corrected for borehole deviation to true orientation
Features picked/ranked by EJB Prior to March 10, 2020.

Ranking Scheme:

100 = Black = Bottom of Casing
104 = White = In-filled Joint/Fracture - mineralogy not determined
106 = Green = Bedding/banding/foliation
109 = Orange = Partially open Joint/Fracture
110 = Pink = Thin and/or discontinuous around circumference Joint/Fracture
111 = Yellow = Apparent Joint/Fracture terminates at fracture intersection
112 = Light Blue = Unclassified planar feature
305 = Red = Wide major Joint/Fracture
307 = Blue = Fluid Level

VFx = 2 Near vertical Joints/Fractures
VFx-W = 2 Wide Near vertical Joints/fractures
33 = >2 near vertical Joint/fractures
IFx = Possible drilling induced near vertical tensile fractures
Bx = Breccia/Collapse Breccia
Lg V = Large Vug/ Vugs/ or Vesicles (> 6" diameter)
MV = Medium Vug/ Vugs/ or Vesicles (2-6" diameter)
CNG = Small Vug/ Vugs/ or Vesicles (< 2" diameter)
Vein = infilled near vertical joint/fracture

Continuity
C1 Discontinuous - < 50%
C2 Slightly continuous - 50-75%
C3 Moderately continuous 75-100%
C4 High continuous – thin
C5 Very continuous – wide

Condition
0 – Smooth
1 – Rough
2 – Weathered
3 - Brec / Crushed
4 – Offset

Form
0 – Undulating/curved
1 – Planar
2 – Stepped
3 – Parting
4 – Styolitic

Remark
Open
Partially Open
Tight
Cemented/Filled
Partially Cemented

Filling (OBI)
No apparent filling
White soft
White
Dark soft
Dark
Sulfide/metallic
Stained Black
Stained Brown

Filling (ABI)
No apparent filling
Hard

Note: Some partially open features on the ABI image may be filled with soft material and may not be potential fluid pathways.

Image log was obtained in 2 pieces:
OBI from 20.0' to 95.4'
ABI from 80.0' to 95.2'

The OBI/ABI combined image from 20.0' to 95.4' is good throughout the logged interval.

*Depth for dipping fractures is midpoint depth; for near Vertical joints/fractures and Vugs it is Top Depth

Depth*	Btm Depth	Dip Dir	Tilt	Aperture	Classification	Continuity	Form	Condition	Filling	Remark
Ft	Ft	Deg	Deg	Inch/10						
20.01		327.0	1.40	0.00	100 - Bottom of Casing	C3 Moderately continuous 75-100%	1 - Planar	0 - Smooth		
28.65		76.8	17.87	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
30.59		14.6	57.99	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
31.46		196.6	54.88	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
34.20		193.6	35.78	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
35.03		255.8	9.17	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
37.98		82.5	5.45	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
39.72		194.3	67.75	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
40.84		319.4	40.68	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
46.49		199.6	65.21	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
49.30		279.8	18.63	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
52.67		329.1	36.62	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
54.83		213.6	72.55	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
57.50		207.4	66.55	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
57.86		194.1	70.35	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
63.27		53.9	36.05	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
64.09		188.6	73.45	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
70.15		23.7	4.41	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
71.82		13.8	51.25	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
76.97		10.7	17.56	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
79.98		258.0	71.81	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
80.07		303.9	0.90	0.00	307 - Fluid Level	C3 Moderately continuous 75-100%	1 - Planar	0 - Smooth		
82.82		192.5	60.88	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
83.81		84.5	13.68	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
85.71		186.8	77.33	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
88.09		164.6	76.07	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
88.57		174.9	73.03	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
88.97		326.5	47.48	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
90.46		319.3	73.97	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
91.01		119.8	42.25	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
93.30		153.1	21.77	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open
93.72		143.8	71.76	0.00	110 - Minor Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Tight
94.81		207.2	79.49	0.00	109 - Partially Open Joint/Fracture	C3 Moderately continuous 75-100%	1 - Planar	1 - Rough	No apparent filling	Partially Open

Vugs and Bx Features

VFx = 2 Near vertical Joints/Fractures
VFx-W = 2 Wide Near vertical Joints/fractures
33 = >2 near vertical Joint/fractures
IFx = Possible drilling induced near vertical tensile fractures
Bx = Breccia/Collapse Breccia
Lg V = Large Vug/ Vugs/ or Vesicles (> 6" diameter)
MV = Medium Vug/ Vugs/ or Vesicles (2-6" diameter)
CNG = Small Vug/ Vugs/ or Vesicles (< 2" diameter)
Vein = infilled near vertical joint/fracture
7 = Conglomerate - Sand matrix supported
8 = Conglomerate - Mud matrix supported
9 = Conglomerate - Clast supported

Breccia/Vugs/Vesicles Etc. on OBI/ABI combined image from 20.0' to 95.4'

Depth	Btm Depth				Ranking/Description
Ft	Ft				

Near Vertical (Near parallel to hole axis) Features

0 = Gray = Broken Zone/Undifferentiated
1 = Red = Major Breakout
2 = Orange = Minor Breakout
3 = Light Blue = Tensile Fracture
4 = Green = Filled Near Vertical Joint/Fx
5 = Yellow = Near Vertical Joint/Fx

OBI/ABI combined image from 20.0' to 95.4'

Depth* = mid-point of near vertical feature.
Tilt is referenced to hole axis - 0 Deg tilt is parallel to hole axis

Depth*	Azimuth	Tilt	Length	Opening	Classification
Ft	Deg	Deg	Ft	Deg	
30.40	36.9	19.63	0.96	0.00	Near Vertical Joint/Fx
79.04	40.9	-2.62	0.95	0.00	Near Vertical Joint/Fx
79.61	122.6	-4.41	1.84	0.00	Near Vertical Joint/Fx
81.33	124.6	-6.44	4.00	0.00	Near Vertical Joint/Fx
81.86	255.8	8.88	3.35	0.00	Near Vertical Joint/Fx
88.12	134.5	-2.49	3.26	0.00	Near Vertical Joint/Fx
90.16	286.8	10.74	3.14	0.00	Near Vertical Joint/Fx
90.70	80.4	11.82	1.91	0.00	Near Vertical Joint/Fx
90.87	162.2	-9.35	1.92	0.00	Near Vertical Joint/Fx
93.23	104.2	-10.02	0.86	0.00	Near Vertical Joint/Fx
93.47	156.9	-14.61	0.72	0.00	Near Vertical Joint/Fx
93.49	331.0	-11.64	0.84	0.00	Near Vertical Joint/Fx
93.78	234.7	3.71	1.14	0.00	Near Vertical Joint/Fx
93.93	316.5	-5.09	1.54	0.00	Near Vertical Joint/Fx
94.62	251.9	2.45	1.23	0.00	Near Vertical Joint/Fx

Southwest Exploration Services, LLC

borehole geophysics & video services

COMPANY	GEOSYNTEC
WELL ID	TTU-16
FIELD	TALLEY
COUNTY	MARICOPA STATE ARIZONA

TYPE OF LOGS: ACOUSTIC TELEVIEWER
MORE: CALIPER

LOCATION

SEC TWP RGE

OTHER SERVICES
GAMMA
TEMP / FLUID RES
OPTICAL TELEVIEWER

PERMANENT DATUM		ELEVATION	K.B.
LOG MEAS. FROM	GROUND LEVEL	ABOVE PERM. DATUM	D.F.
DRILLING MEAS. FROM	GROUND LEVEL		G.L.

DATE	02-16-20	TYPE FLUID IN HOLE	FORMATION WATER
RUN No	3	MUD WEIGHT	N/A
TYPE LOG	ACOUSTIC TELEVIEWER	VISCOSITY	N/A
DEPTH-DRILLER	98.0 FT	LEVEL	~80 FT
DEPTH-LOGGER	97.0 FT	MAX. REC. TEMP.	26.0 DEG C
BTM LOGGED INTERVAL	95.0 FT	IMAGE ORIENTED TO:	MAGNETIC NORTH
TOP LOGGED INTERVAL	79.0 FT	SAMPLE INTERVAL	0.010 FT
DRILLER / RIG#	N/A	LOGGING TRUCK	TRUCK #310
RECORDED BY / Logging Eng.	E. BEAM / T. GODSEY	TOOL STRING/SN	ALT QL ABI40 2G SN 192302
WITNESSED BY	FABRIZIO - GEOSYNTEC	LOG TIME:ON SITE/OFF SITE	7:00 AM

RUN	BOREHOLE RECORD			CASING RECORD			
NO.	BIT	FROM	TO	SIZE	WGT.	FROM	TO
1	?	SURFACE	20 FT	8.5 IN	STEEL	SURFACE	20 FT
2	8 IN	20 FT	TOTAL DEPTH				
3							

COMMENTS:

.

Tool Summary:

Date	02-16-20	**Date**	02-16-20	**Date**	02-16-20		
Run No.	1	**Run No.**	2	**Run No.**	3		
Tool Model	ALT QL OBI40 2G	**Tool Model**	MSI COMBO TOOL	**Tool Model**	ALT QL ABI40 2G		
Tool SN	170106	**Tool SN**	5446	**Tool SN**	192302		
From	SURFACE	**From**	SURFACE	**From**	79.0 FT		
To	95.0 FT	**To**	97.0 FT	**To**	95.0 FT		
Recorded By	E. BEAM	**Recorded By**	E. BEAM	**Recorded By**	E. BEAM		
Truck No	310	**Truck No**	310	**Truck No**	310		
Operation Check	01-30-20	**Operation Check**	02-16-20	**Operation Check**	02-14-20		
Calibration Check	N/A	**Calibration Check**	02-16-20	**Calibration Check**	N/A		
Time Logged	1:45 PM	**Time Logged**	2:10 PM	**Time Logged**	2:25 PM		
Date		**Date**		**Date**			
Run No.	4	**Run No.**	5	**Run No.**	6		
Tool Model		**Tool Model**		**Tool Model**			
Tool SN		**Tool SN**		**Tool SN**			
From		**From**		**From**			
To		**To**		**To**			
Recorded By		**Recorded By**		**Recorded By**			
Truck No		**Truck No**		**Truck No**			
Operation Check		**Operation Check**		**Operation Check**			
Calibration Check		**Calibration Check**		**Calibration Check**			
Time Logged		**Time Logged**		**Time Logged**			

Additional Comments:

Caliper Arms Used: 9" **Calibration Points:** 4" & 10"

E-Log Calibration Range: N/A **Calibration Points:** N/A

Disclaimer:

All interpretations of log data are opinions based on inferences from electrical or other measurements. We do not guarantee the accuracy or correctness of any interpretations or recommendations and shall not be liable or responsible for any loss, costs, damages, or expenses incurred or sustained by anyone resulting from any interpretation made by any of our employees or agents. These interpretations are also subject to our general terms and conditions set out in our current Service Invoice.

Image Features Legend

- Btm of Casing
- Filled Fracture / Joint
- Bedding / Banding / Foliation / Veins
- Partially Open Joint / Fracture
- Minor Open Joint / Fracture
- OJ/Fx terminates at Fx intersection
- Unclassified
- Sulfide Vein
- Breakouts
- Major Open Joint / Fracture
- Fluid Level

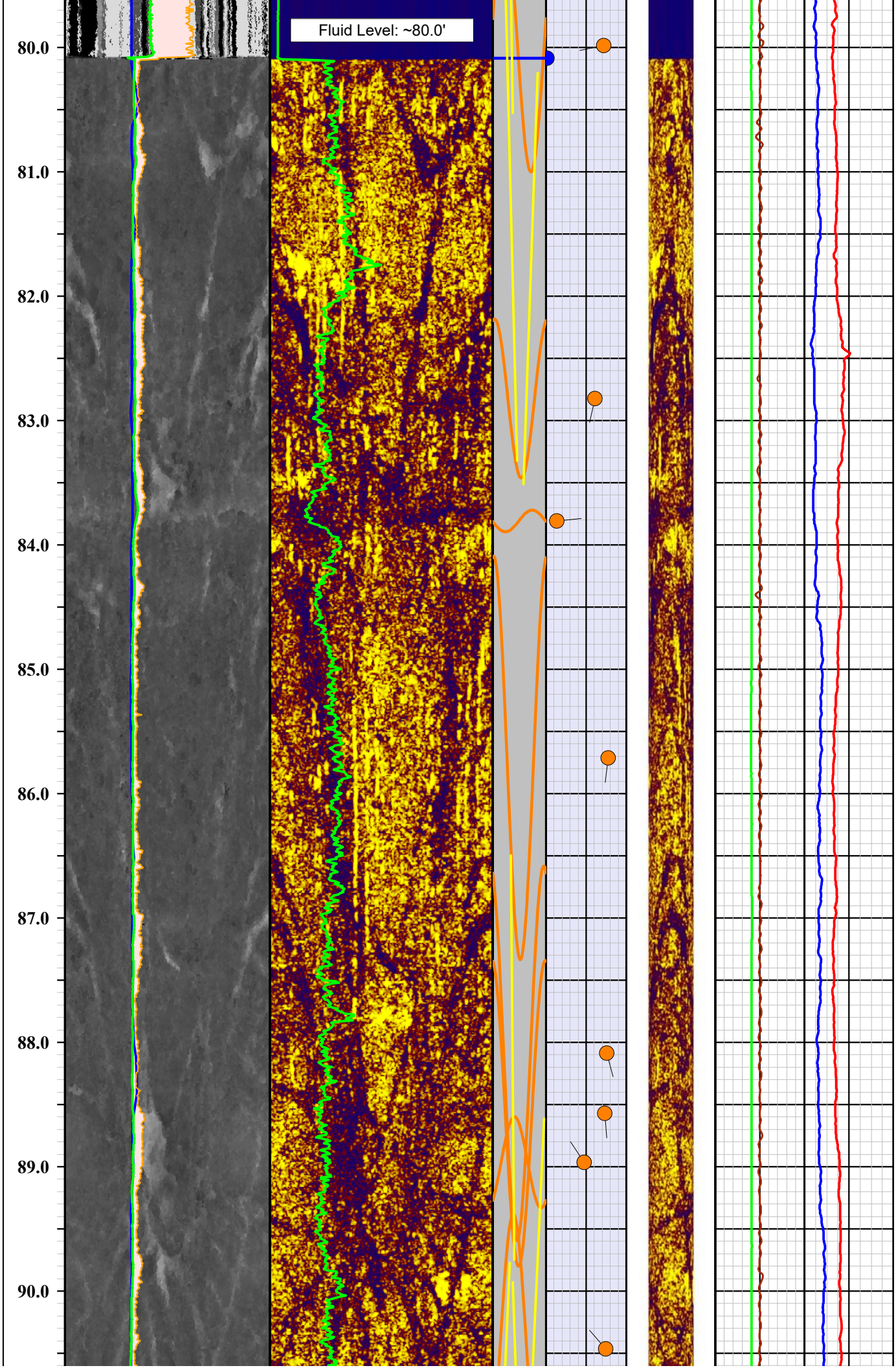
Breakout Legend

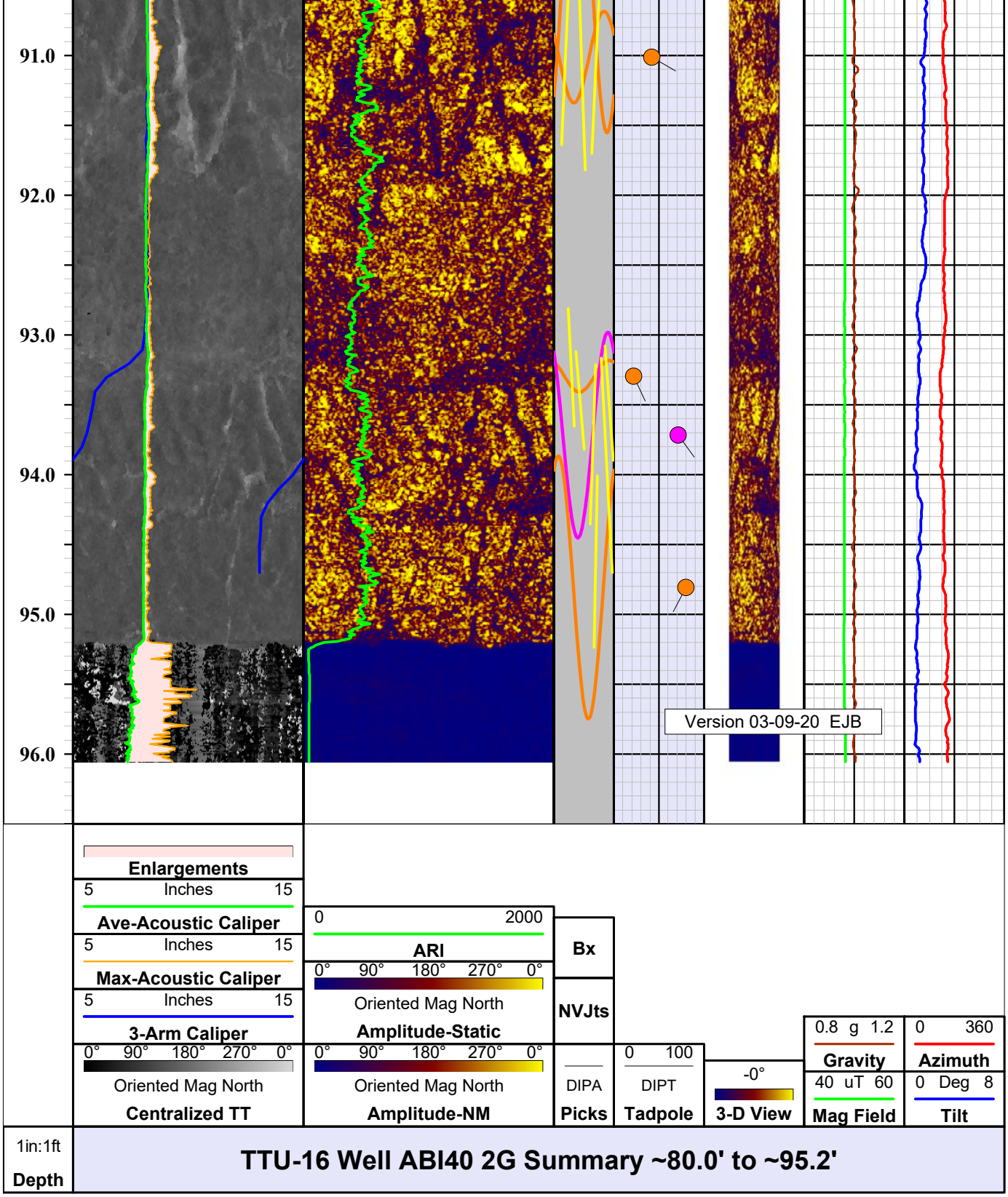
- Broken Zone / Undifferentiated
- Major Breakout
- Minor Breakout
- Tensile Fracture
- Filled Near Vertical Joint/Fx
- Near Vertical Joint/Fx

Bx Legend

- Breccia or Conglomerate
- Large Vugs/Vesicles (> 6")
- Medium Vugs/Vesicles (2-6")
- Small Vugs/Vesicles (< 2")
- Conglomerate - sand matrix supported
- Conglomerate - mud matrix supported
- Conglomerate - clast supported

Depth 1in:1ft	TTU-16 Well ABI40 2G Summary ~80.0' to ~95.2'						
	Centralized TT, Oriented Mag North (0° 90° 180° 270° 0°)	Amplitude-NM, Oriented Mag North (0° 90° 180° 270° 0°)	Picks: DIPA	Tadpole: DIPT (0 100)	3-D View (-0°)	Mag Field (40 uT 60)	Tilt (0 Deg 8)
	3-Arm Caliper (5 Inches 15)	Amplitude-Static, Oriented Mag North (0° 90° 180° 270° 0°)	NVJts			Gravity (0.8 g 1.2)	Azimuth (0 360)
	Max-Acoustic Caliper (5 Inches 15)	ARI (0 2000)	Bx				
	Ave-Acoustic Caliper (5 Inches 15)						
	Enlargements						


Fluid Level: ~80.0'
80.0
81.0
82.0
83.0
84.0
85.0
86.0
87.0
88.0
89.0
90.0



Legend

Mnemonics	Description
Centralized TT	2D plot of acoustic image travel time with probe position centralized. Oriented to magnetic north and plotted from left to right N-E-S-W-N.
3-Arm Caliper	3-arm mechanical caliper of hole diameter plotted from 5 to 15 inches (blue line).
Max-Acoustic	Maximum acoustic caliper of hole diameter calculated from Travel Time data and

Caliper	plotted as orange line from 5 to 15 inches.
Ave-Acoustic Caliper	Average acoustic caliper of hole diameter calculated from Travel Time data and plotted as bright green line from 5 to 15 inches.
Enlargements	Pink shaded zone between Ave-Acoustic Caliper and Max-Acoustic Caliper calculated from Travel Time data showing borehole enlargment.
Amplitude-NM	2D plot of unfiltered acoustic image amplitude oriented to magnetic north. Plotted from left to right N-E-S-W-N. Image toggled off.
Amplitude-Static	2D plot of acoustic image amplitude with Static normalization filter oriented to magnetic north. Plotted from left to right N-E-S-W-N. Image toggled on.
ARI	Acoustic Reflectance Index or relative rock hardness from ABI Amplitude log. Plotted 0 (soft) to 2000 (harder) as green line.
Picks	Planar strucutral features picked on acoustic borehole image shown as colored sinusoid (color designation shown on header) DIPA = dip apparent hole axis.
NVJts	Near Vertical (near parallel to hole axis) joint/fracture features picked on acoustic borehole image shown as colored sinusoid (color designation shown on header).
Bx	Apparent Breccia or Congomerate zones and Vugs/Vesicles/Cavities.
3-D View	3D cylindrical projection of ABI image using Centralized TT log for hole shape looking from North.
Tadpole	Tadpole plot of the ABI feature picks (fractures and bedding planes); plotted from 0 to 90 dip - see legend above. DIPT = True orientation; features corrected for hole deviation.
Mag Field	Total magnetic field strength as measured by fluxgate magnetometer in OBI or ABI deviation sensor - plotted 40-60 uT (green line).
Gravity	Total gravity (probe acceleration) as measured by 3-axis accelerometers in ABI deviation sensor - plotted 0.8-1.2 g (brown line).
Azimuth	Direction of tool tilt plotted 0 to 360 deg - represents borehole deviation direction (red line).
Tilt	Tool tilt (vertical = 0 and horizontal = 90) plotted 0 to 8 deg; represents borehole deviation tilt from vertical (blue line).

Mnemonics prepared by Erika J Beam
Version 03-09-20

QL ABI-40 2G Acoustic Borehole Imager

Probe Top = Depth Ref.

Tool SN: 143003, 143009 & 192302

Four Conductor MSI Probe Top

APS Probe Orientation Sensor
3-Axis Magnetometer
3-Axis Accellerometer

Probe Length = 1.62 m or 5.25 ft

Probe Weight = 6.7 kg or 14.7 lbs

Distance from Acoustic Image Window to Orientation Sensor = 0.92 m or 3 ft

Inclination Accuracy = +/- 0.5 deg
Azimuth Accuracy = +/- 1.2 deg

Beam Width = 1.5 mm

Frequency = 1.2 MHz

Temperature Range: 0 - 70 Deg C (32 - 158 Deg F)
Pressure Range: 0 - 200 bar (0 - 2900 psi)

Run Centralized with External Bow Spring Centralizers

Can only be logged in fluid filled holes

ABI Imaging Window

1.6" or 40 mm Diameter

MSI Gamma-Caliper-Temperature-Fluid Resistivity

Probe Top = Depth Ref.

Single Conductor MSI Probe Top

Probe Length = 2.59 m or 8.5 ft
Probe Weight = 6.80 kg or 15.0 lbs

Natural Gamma and Caliper can only be collected logging up hole.

Fluid Temperature/Resistivity can only be collected logging down hole.

Temperature Rating: 70 Deg C (158 Deg F)
Presure Rating: 200 bar (2900 psi)

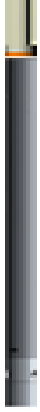
Natural Gamma Ray = 0.76 m (29.75 in)

NOTE: Lengths on a particular tool may vary from those listed on this document due to probe sizes and styles utilized

3-Arm Caliper = 1.44 m (56.75 in)

Distance from tool top: 2.20 m (86.5 in)

Available Arm Sizes: 3", 9", and 15"



1.375" or 34.9 mm Diameter

Southwest Exploration Services, LLC
borehole geophysics & video services

Company	GEOSYNTEC
Well	TTU-16
Field	TALLEY
County	MARICOPA
State	ARIZONA

Final Acoustic Televiewer Summary

Southwest Exploration Services, LLC

borehole geophysics & video services

COMPANY	GEOSYNTEC
WELL ID	TTU-16
FIELD	TALLEY
COUNTY	MARICOPA STATE ARIZONA

TYPE OF LOGS: GAMMA - CALIPER
MORE: TEMP / FLUID RES

LOCATION

SEC TWP RGE

OTHER SERVICES
ACOUSTIC TELEVIEWER
OPTICAL TELEVIEWER

PERMANENT DATUM		ELEVATION	K.B.
LOG MEAS. FROM	GROUND LEVEL	ABOVE PERM. DATUM	D.F.
DRILLING MEAS. FROM	GROUND LEVEL		G.L.

DATE	02-16-20	TYPE FLUID IN HOLE	FORMATION WATER
RUN No	2	MUD WEIGHT	N/A
TYPE LOG	GAMMA-CALIPER-TFR	VISCOSITY	N/A
DEPTH-DRILLER	98.0 FT	LEVEL	~80 FT
DEPTH-LOGGER	97.0 FT	MAX. REC. TEMP.	26.0 DEG C
BTM LOGGED INTERVAL	97.0 FT	IMAGE ORIENTED TO:	N/A
TOP LOGGED INTERVAL	SURFACE	SAMPLE INTERVAL	0.1 FT
DRILLER / RIG#	N/A	LOGGING TRUCK	TRUCK #310
RECORDED BY / Logging Eng.	E. BEAM / T. GODSEY	TOOL STRING/SN	MSI COMBO TOOL SN 5546
WITNESSED BY	FABRIZIO - GEOSYNTEC	LOG TIME:ON SITE/OFF SITE	7:00 AM

RUN	BOREHOLE RECORD			CASING RECORD			
NO.	BIT	FROM	TO	SIZE	WGT.	FROM	TO
1	?	SURFACE	20 FT	8.5 IN	STEEL	SURFACE	20 FT
2	8 IN	20 FT	TOTAL DEPTH				
3							

COMMENTS:

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Tool Summary:

Date	02-16-20	02-16-20	02-16-20
Run No.	1	2	3
Tool Model	ALT QL OBI40 2G	MSI COMBO TOOL	ALT QL ABI40 2G
Tool SN	170106	5446	192302
From	SURFACE	SURFACE	79.0 FT
To	95.0 FT	97.0 FT	95.0 FT
Recorded By	E. BEAM	E. BEAM	E. BEAM
Truck No	310	310	310
Operation Check	01-30-20	02-16-20	02-14-20
Calibration Check	N/A	02-16-20	N/A
Time Logged	1:45 PM	2:10 PM	2:25 PM

Date			
Run No.	4	5	6
Tool Model			
Tool SN			
From			
To			
Recorded By			
Truck No			
Operation Check			
Calibration Check			
Time Logged			

Additional Comments:

Caliper Arms Used: 9" **Calibration Points:** 4" & 10"

E-Log Calibration Range: N/A **Calibration Points:** N/A

Disclaimer:

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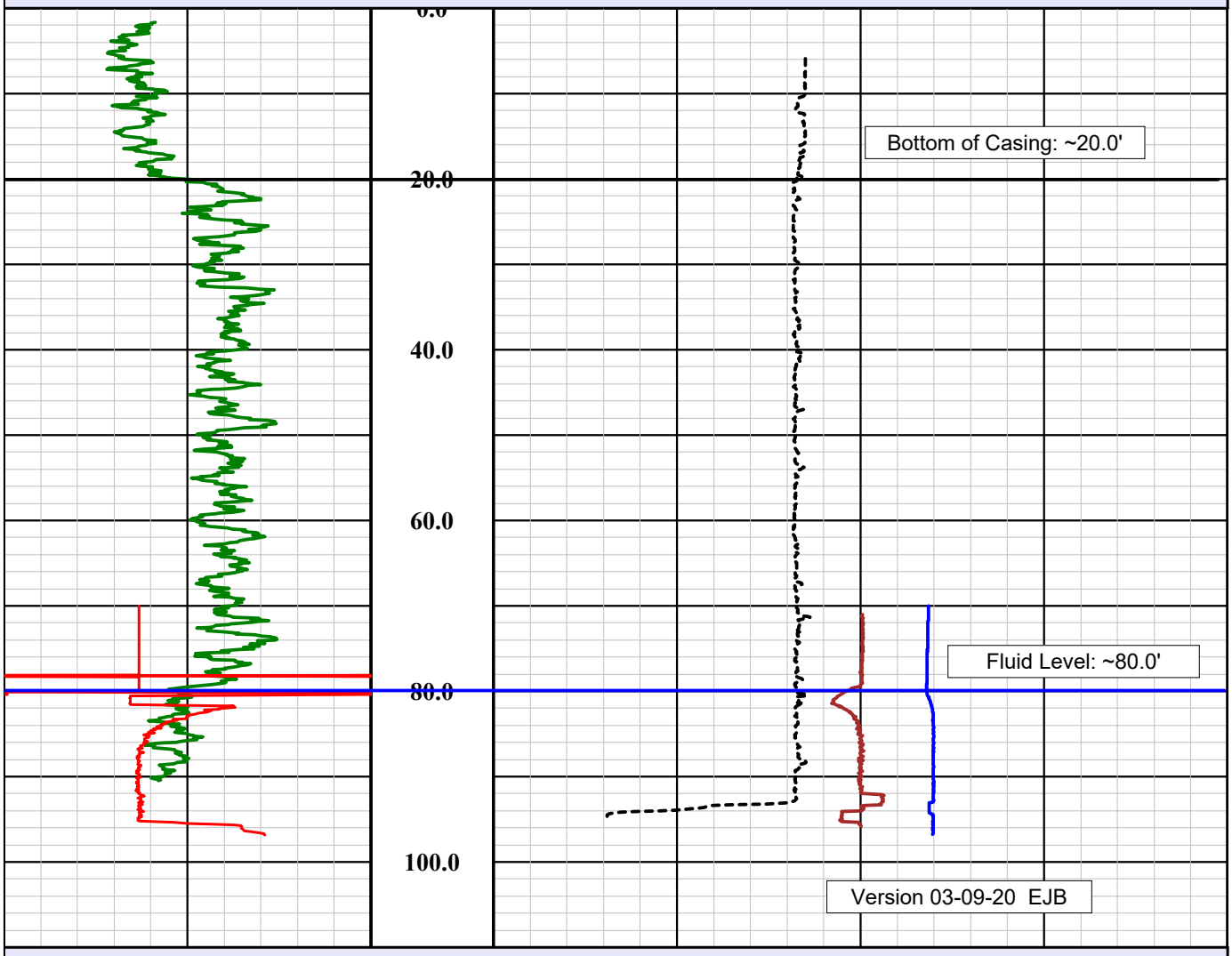
Nat. Gamma	Depth	3-Arm Caliper
0 API 200	1in:20ft	0 Inches 20
Fluid Resistivity		**Temperature**
0 Ohm-m 20		20 Deg C 30
		2-Ft Diff. Temp.
		-1 Deg C 1

TTU-16 Well GCT Summary Surface to ~97.0'



TTU-16 Well GCT Summary Surface to ~97.0'

		-1 Deg C 1
		2-Ft Diff. Temp.
0 Ohm-m 20		20 Deg C 30
Fluid Resistivity		**Temperature**
0 API 200	1in:20ft	0 Inches 20

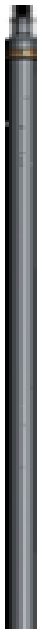
Nat. Gamma	Depth	3-Arm Caliper

Legend

Mnemonics	Description
Nat. Gamma	Natural gamma ray log plotted 0 to 200 API (green line).
Fluid Resistivity	Electrical resistivity of a borehole's fluid plotted from 0 to 20 ohm-m as red line.
3-Arm Caliper	3-arm mechanical caliper of hole diameter plotted from 0 to 20 inches (black dashed line).
Temperature	Borehole fluid temperature plotted from 20 to 30 degrees C (blue line).
2-Ft Diff. Temp.	Differential temperature over 2-ft spacing (brown line).
	Mnemonics prepared by Erika J. Beam Version 03-09-20

MSI Gamma-Caliper-Temperature-Fluid Resistivity

Probe Top = Depth Ref.



Single Conductor MSI Probe Top

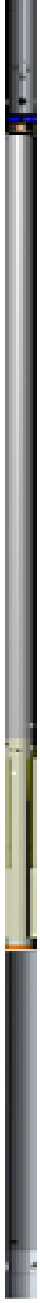
Probe Length = 2.59 m or 8.5 ft
Probe Weight = 6.80 kg or 15.0 lbs

Natural Gamma and Caliper can only be collected logging up hole.

Fluid Temperature/Resistivity can only be collected logging down hole.

Temperature Rating: 70 Deg C (158 Deg F)
Presure Rating: 200 bar (2900 psi)

Natural Gamma Ray = 0.76 m (29.75 in)



NOTE: Lengths on a particular tool may vary from those listed on this document due to probe sizes and styles utilized

3-Arm Caliper = 1.44 m (56.75 in)

Distance from tool top: 2.20 m (86.5 in)

Available Arm Sizes: 3", 9", and 15"

TFR (Temperature/Fluid Resistivity) = 0.39 m (15.5 in)

1.375" or 34.9 mm Diameter

Southwest Exploration Services, LLC
borehole geophysics & video services

Company	GEOSYNTEC
Well	TTU-16
Field	TALLEY
County	MARICOPA
State	ARIZONA

Final GCT Summary

Southwest Exploration Services, LLC

borehole geophysics & video services

COMPANY	GEOSYNTEC
WELL ID	TTU-16
FIELD	TALLEY
COUNTY	MARICOPA STATE ARIZONA

TYPE OF LOGS: OPTICAL TELEVIEWER
MORE: GAMMA - CALIPER

LOCATION

SEC TWP RGE

OTHER SERVICES
ACOUSTIC TELEVIEWER
TEMP / FLUID RES

PERMANENT DATUM		ELEVATION	K.B.
LOG MEAS. FROM	GROUND LEVEL	ABOVE PERM. DATUM	D.F.
DRILLING MEAS. FROM	GROUND LEVEL		G.L.

DATE	02-16-20	TYPE FLUID IN HOLE	FORMATION WATER
RUN No	1	MUD WEIGHT	N/A
TYPE LOG	OPTICAL TELEVIEWER	VISCOSITY	N/A
DEPTH-DRILLER	98.0 FT	LEVEL	~80 FT
DEPTH-LOGGER	97.0 FT	MAX. REC. TEMP.	26.0 DEG C
BTM LOGGED INTERVAL	95.0 FT	IMAGE ORIENTED TO:	MAGNETIC NORTH
TOP LOGGED INTERVAL	SURFACE	SAMPLE INTERVAL	0.035 FT
DRILLER / RIG#	N/A	LOGGING TRUCK	TRUCK #310
RECORDED BY / Logging Eng.	E. BEAM / T. GODSEY	TOOL STRING/SN	ALT QL OBI40 2G SN 170106
WITNESSED BY	FABRIZIO - GEOSYNTEC	LOG TIME:ON SITE/OFF SITE	7:00 AM

RUN	BOREHOLE RECORD			CASING RECORD			
NO.	BIT	FROM	TO	SIZE	WGT.	FROM	TO
1	?	SURFACE	20 FT	8.5 IN	STEEL	SURFACE	20 FT
2	8 IN	20 FT	TOTAL DEPTH				
3							

COMMENTS:

.

Tool Summary:

Date	02-16-20	**Date**	02-16-20	**Date**	02-16-20		
Run No.	1	**Run No.**	2	**Run No.**	3		
Tool Model	ALT QL OBI40 2G	**Tool Model**	MSI COMBO TOOL	**Tool Model**	ALT QL ABI40 2G		
Tool SN	170106	**Tool SN**	5446	**Tool SN**	192302		
From	SURFACE	**From**	SURFACE	**From**	79.0 FT		
To	95.0 FT	**To**	97.0 FT	**To**	95.0 FT		
Recorded By	E. BEAM	**Recorded By**	E. BEAM	**Recorded By**	E. BEAM		
Truck No	310	**Truck No**	310	**Truck No**	310		
Operation Check	01-30-20	**Operation Check**	02-16-20	**Operation Check**	02-14-20		
Calibration Check	N/A	**Calibration Check**	02-16-20	**Calibration Check**	N/A		
Time Logged	1:45 PM	**Time Logged**	2:10 PM	**Time Logged**	2:25 PM		

Date		**Date**		**Date**			
Run No.	4	**Run No.**	5	**Run No.**	6		
Tool Model		**Tool Model**		**Tool Model**			
Tool SN		**Tool SN**		**Tool SN**			
From		**From**		**From**			
To		**To**		**To**			
Recorded By		**Recorded By**		**Recorded By**			
Truck No		**Truck No**		**Truck No**			
Operation Check		**Operation Check**		**Operation Check**			
Calibration Check		**Calibration Check**		**Calibration Check**			
Time Logged		**Time Logged**		**Time Logged**			

Additional Comments:

Caliper Arms Used: 9" **Calibration Points:** 4" & 10"

E-Log Calibration Range: N/A **Calibration Points:** N/A

Disclaimer:

All interpretations of log data are opinions based on inferences from electrical or other measurements. We do not guarantee the accuracy or correctness of any interpretations or recommendations and shall not be liable or responsible for any loss, costs, damages, or expenses incurred or sustained by anyone resulting from any interpretation made by any of our employees or agents. These interpretations are also subject to our general terms and conditions set out in our current Service Invoice.

Image Features Legend

- Btm of Casing
- Filled Fracture / Joint
- Bedding / Banding / Foliation / Veins
- Partially Open Joint / Fracture
- Minor Open Joint / Fracture
- OJ/Fx terminates at Fx intersection
- Unclassified
- Sulfide Vein
- Breakouts
- Major Open Joint / Fracture
- Fluid Level

Breakout Legend

- Broken Zone / Undifferentiated
- Major Breakout
- Minor Breakout
- Tensile Fracture
- Filled Near Vertical Joint/Fx
- Near Vertical Joint/Fx

Bx Legend

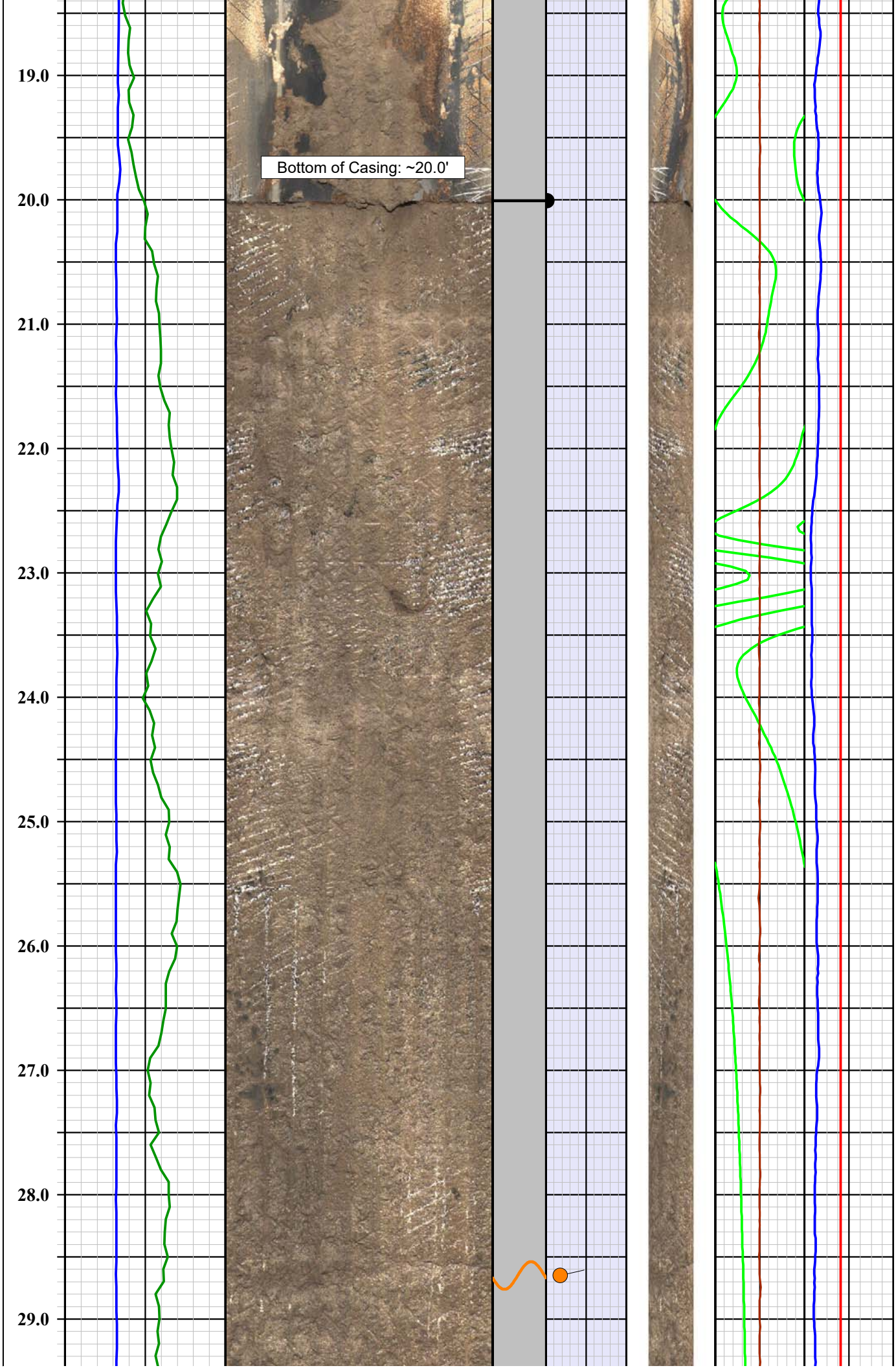
- Breccia or Conglomerate
- Large Vugs/Vesicles (> 6")
- Medium Vugs/Vesicles (2-6")
- Small Vugs/Vesicles (< 2")
- Conglomerate - sand matrix supported
- Conglomerate - mud matrix supported
- Conglomerate - clast supported

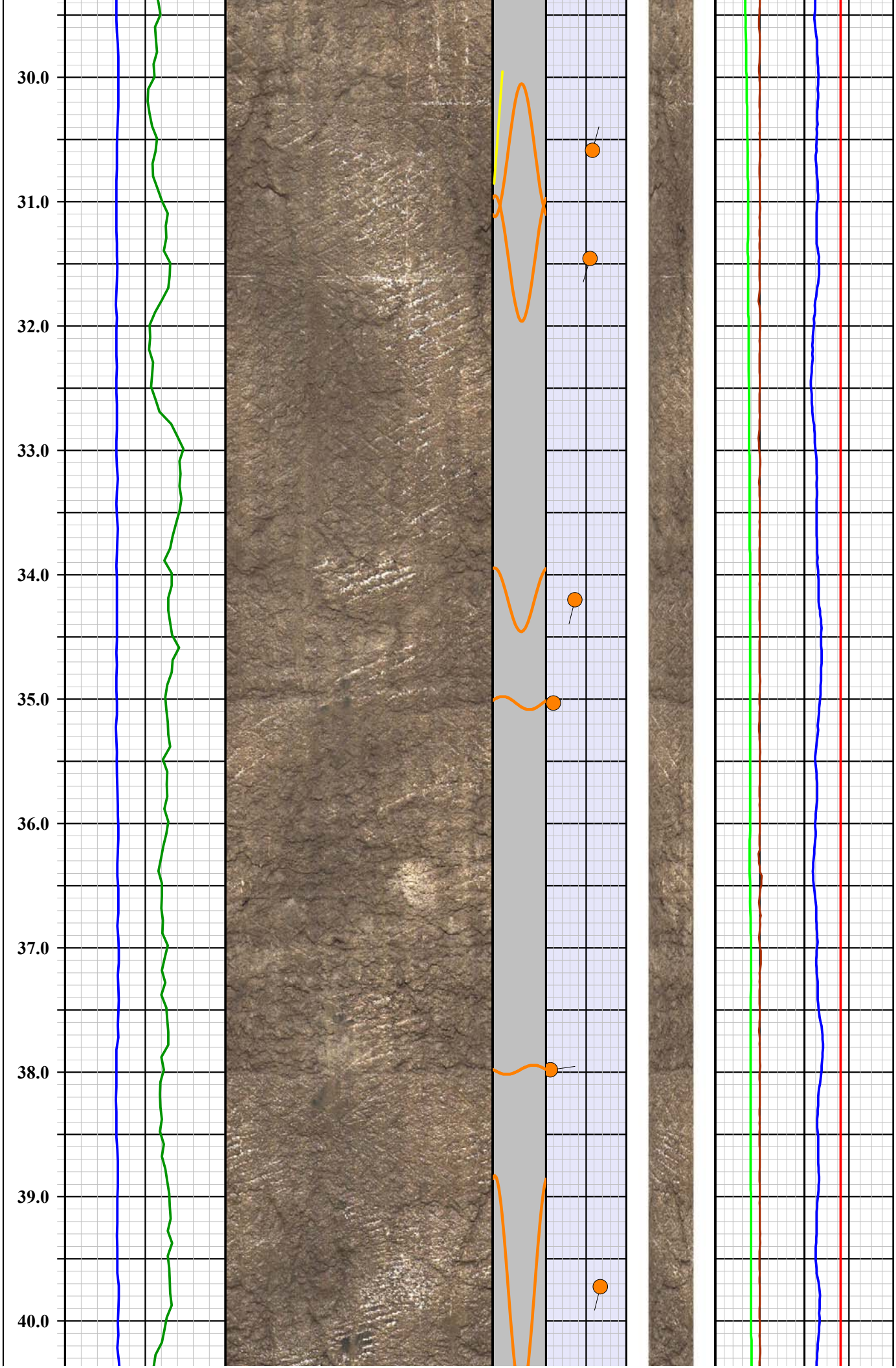
TTU-16 Well OBI40 2G Summary ~20.0' to ~95.4'

Depth 1in:1ft

Nat. Gamma	Image-NM	Picks	Tadpole	3-D View	Mag Field	Tilt
0 API 200	Oriented Mag North	DIPA	DIPT 0 100	-0°	40 uT 60	0 Deg 8
3-Arm Caliper	0° 90° 180° 270° 0°	NVJts			**Gravity**	**Azi-Edited**
5 Inches 15					0.8 g 1.2	0 360
	Image_18.0'-43.0'	Bx				
	Non Oriented, Rot'd by 32.0 Deg					
	0° 90° 180° 270° 0°					

18.0


19.0
20.0
21.0
22.0
23.0
24.0
25.0
26.0
27.0
28.0
29.0
Bottom of Casing: ~20.0'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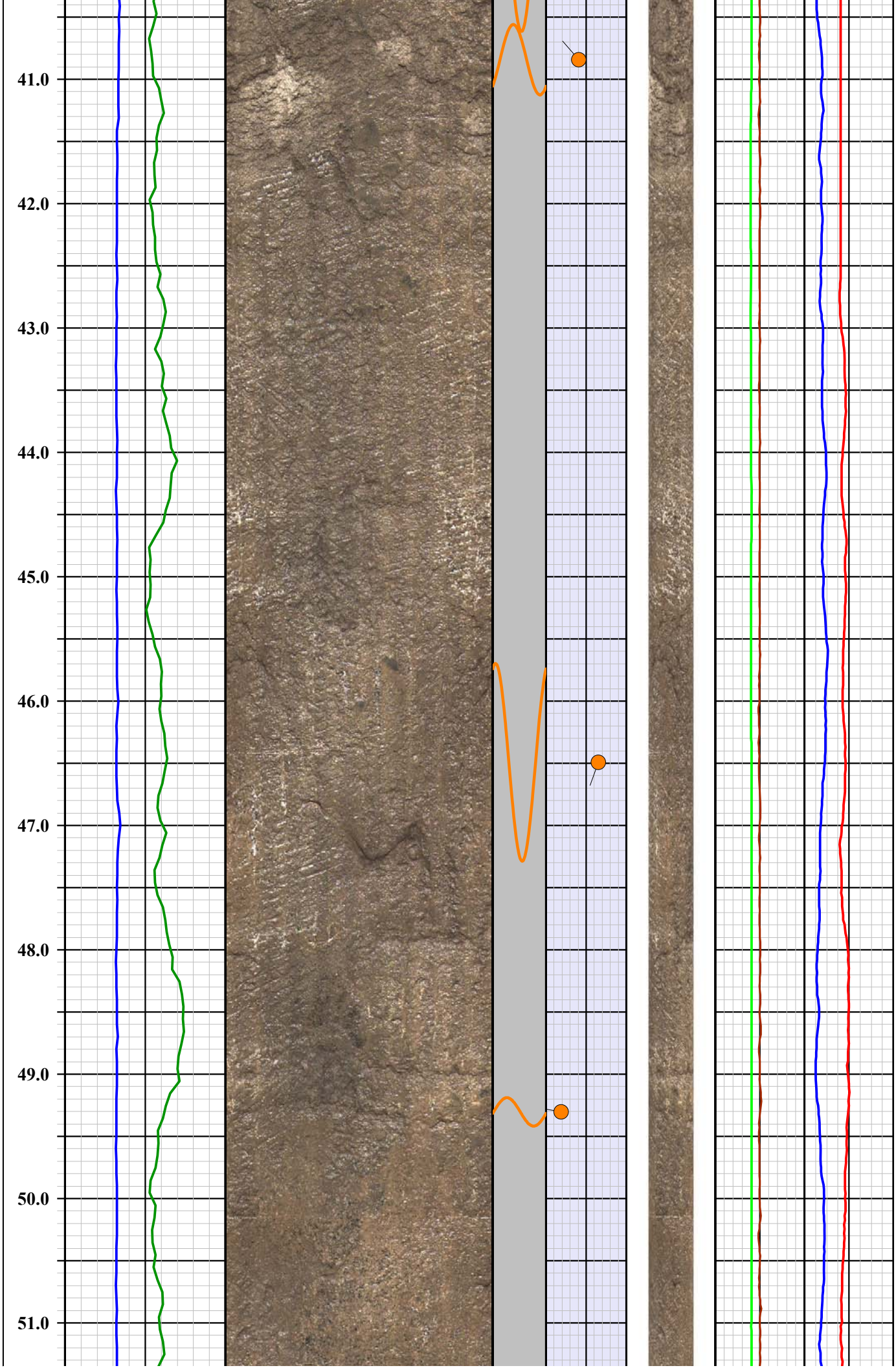
40.0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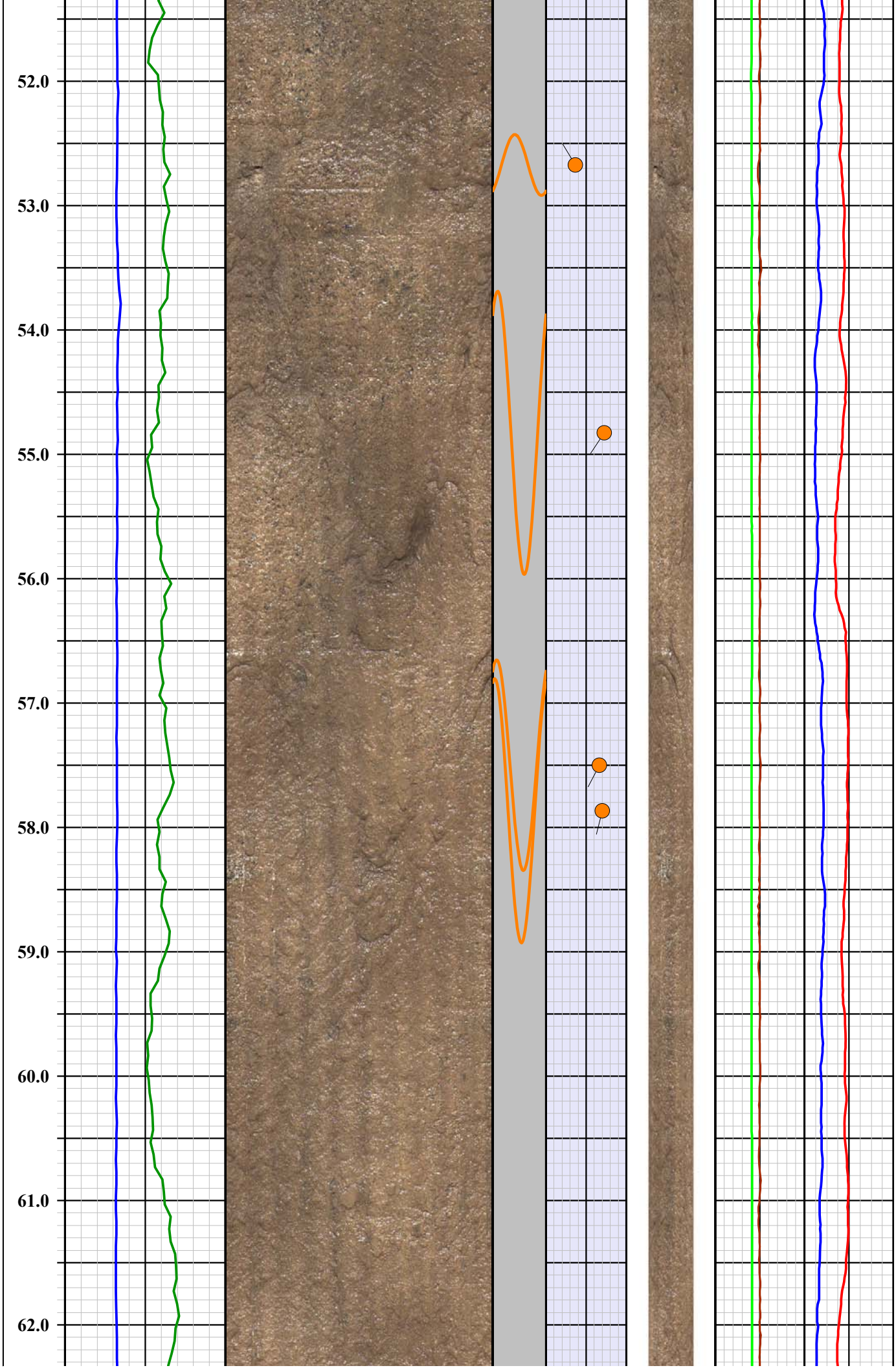
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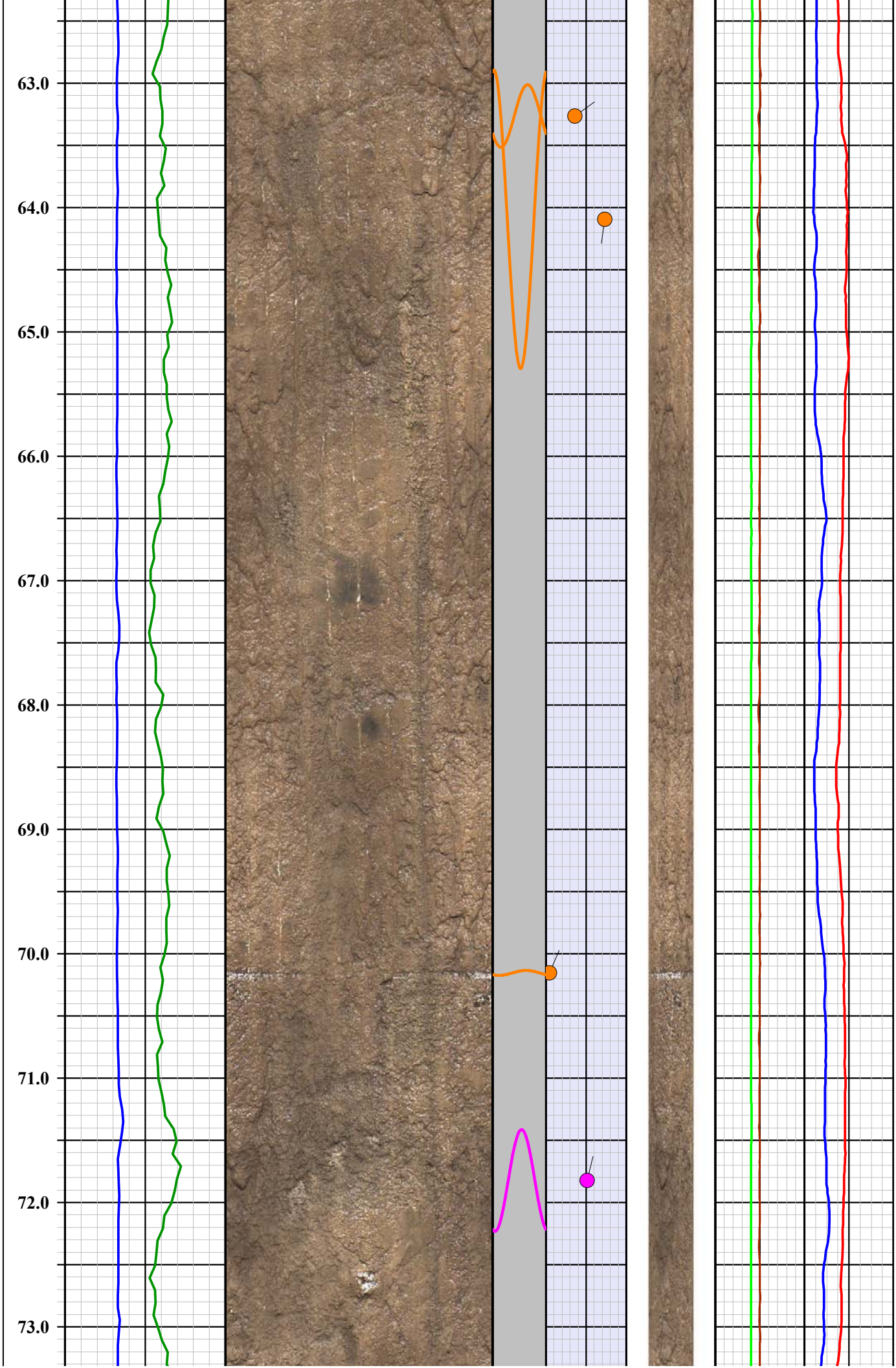
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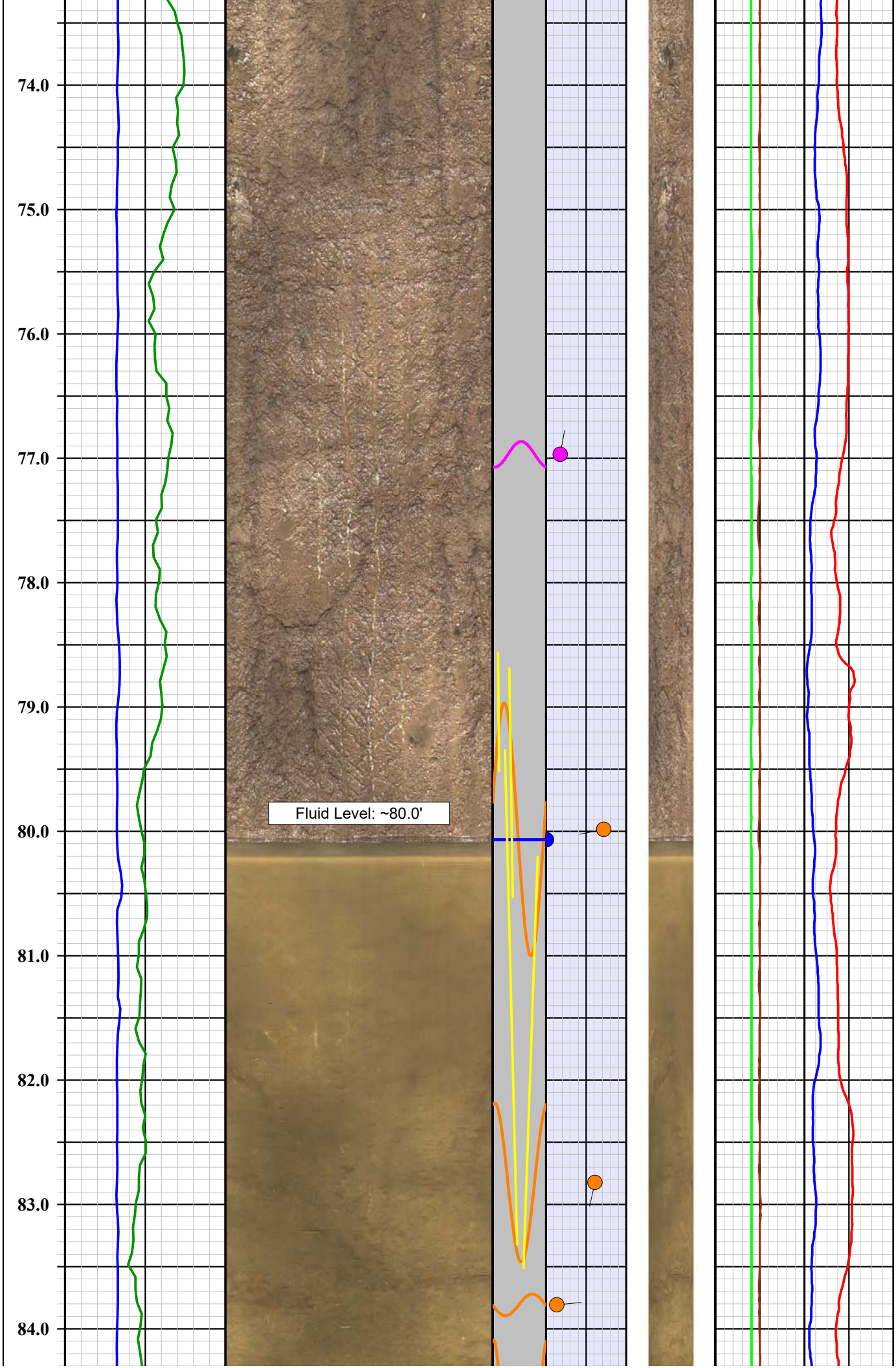
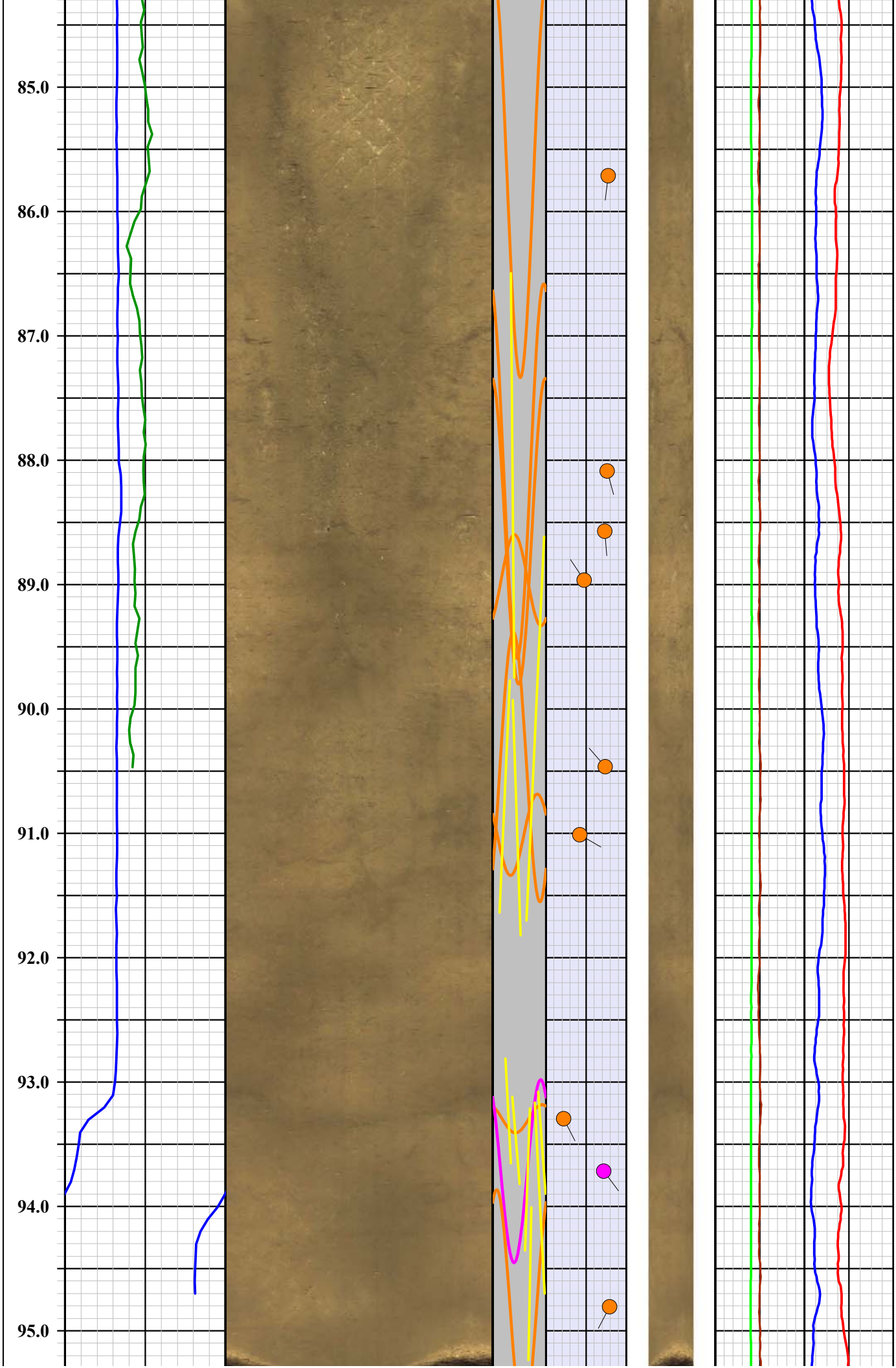
73.0


74.0
75.0
76.0
77.0
78.0
79.0
80.0
81.0
82.0
83.0
84.0
Fluid Level: ~80.0'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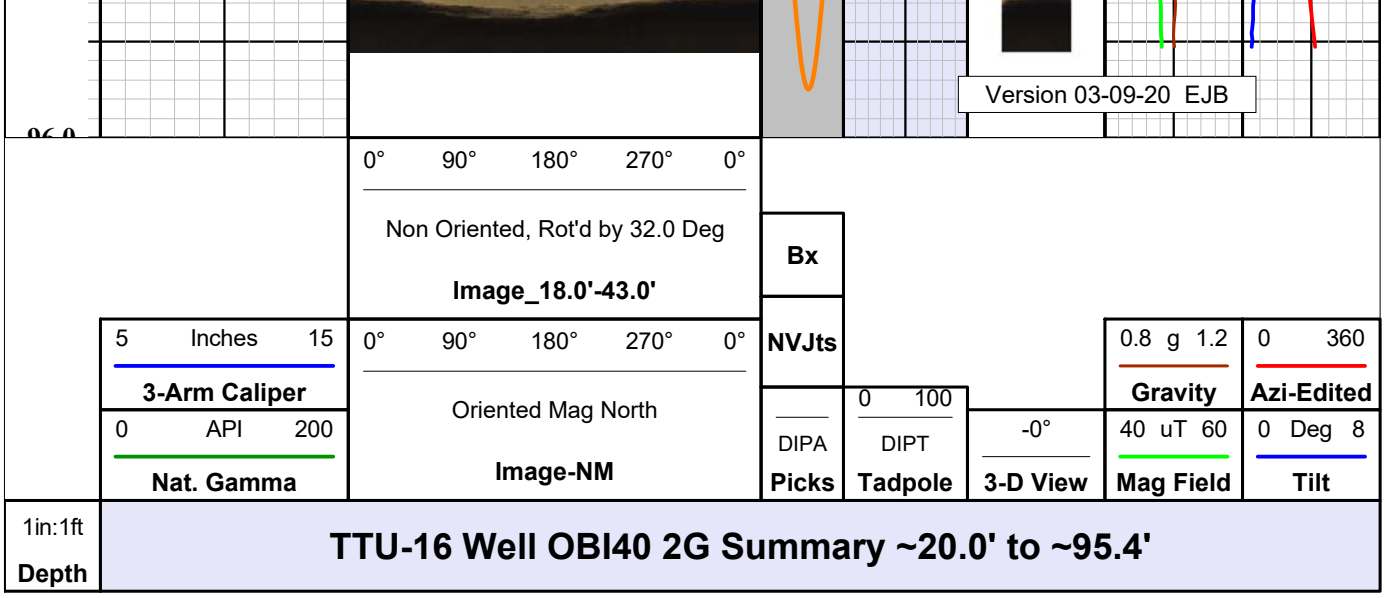


Legend

Mnemonics	Description
3-Arm Caliper	3-arm mechanical caliper of hole diameter plotted from 5 to 15 inches (blue line).
Nat. Gamma	Natural gamma ray log plotted from 0 to 200 API units (green line).
Image-NM	2D plot of optical image oriented to magnetic north. Plotted from left to right N-E-S-W-N.
Image_18.0'-43.0'	2D plot of optical image non-oriented and rotated by 32.0 deg to correct for magnetic affect in proximity of steel casing. Plotted from left to right N-E-S-W-N.
Picks	Planar strucutral features picked on optical borehole image shown as colored sinusoid (color designation shown on header) DIPA = dip apparent hole axis.
NVJts	Near Vertical (near parallel to hole axis) joint/fracture features picked on optical borehole image shown as colored sinusoid (color designation shown on header).
Bx	Apparent Breccia or Congomerate zones and Vugs/Vesicles/Cavities.
3-D View	3D cylindrical projection of OBI image viewed from north.
Tadpole	Tadpole plot of the OBI feature picks (fractures and bedding planes); plotted from 0 to 90 dip - see legend above. DIPT = True orientation; features corrected for hole deviation.
Mag Field	Total magnetic field strength as measured by fluxgate magnetometer in OBI or ABI deviation sensor - plotted 40-60 uT (green line).
Gravity	Total gravity (probe acceleration) as measured by 3-axis accelerometers in OBI deviation sensor - plotted 0.8-1.2 g (brown line).
Azi-Edited	Direction of tool tilt plotted 0 to 360 deg; edited for anomalous magnetic influence - represents borehole deviation direction (red line).

Tilt	Tool tilt (vertical = 0 and horizontal = 90) plotted 0 to 8 deg; represents borehole deviation tilt from vertical (blue line). Mnemonics prepared by Erika J Beam Version 03-09-20

QL OBI-40 2G Optical Borehole Imager

Probe Top = Depth Ref.

Tool SN: 145010, 152511 & 170106

Four Conductor MSI Probe Top

APS Probe Orientation Sensor
3-Axis Magnetometer
3-Axis Accellerometer

Probe Length = 1.66 m or 5.46 ft

Probe Weight = 5.3 kg or 11.7 lbs

Distance from Optical Image Window to Orientation Sensor = 0.9 m or 3 ft

Inclination Accuracy = +/- 0.5 deg
Azimuth Accuracy = +/- 1.0 deg

Temperature Range: 0 - 70 Deg C (32 - 158 Deg F)
Pressure Range: 0 - 200 bar (0 - 2900 psi)

External Bow Spring Centralizers

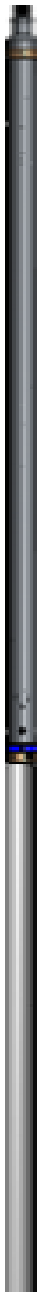
Operates in dry or clear water conditions.

OBI Imaging Window

1.6" or 40 mm Diameter

MSI Gamma-Caliper-Temperature-Fluid Resistivity

Probe Top = Depth Ref.



Single Conductor MSI Probe Top

Probe Length = 2.59 m or 8.5 ft
Probe Weight = 6.80 kg or 15.0 lbs

Natural Gamma and Caliper can only be collected logging up hole.

Fluid Temperature/Resistivity can only be collected logging down hole.

Temperature Rating: 70 Deg C (158 Deg F)
Presure Rating: 200 bar (2900 psi)

Natural Gamma Ray = 0.76 m (29.75 in)

NOTE: Lengths on a particular tool may vary from those listed on this document due to probe sizes and styles utilized

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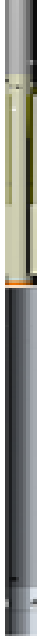
Distance from tool top: 2.20 m (86.5 in)



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TFR (Temperature/Fluid Resistivity) = 0.39 m (15.5 in)

1.375" or 34.9 mm Diameter

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Final Optical Televiewr Summary