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STATEMENT OF BASIS/ PROPOSED FINAL GROUNDWATER REMEDY DECISION SOLID  
WASTE MANAGEMENT UNIT 54 NAVAL ACTIVITY PUERTO RICO  
6/1/2012  
CH2MHILL

**STATEMENT OF BASIS /  
PROPOSED FINAL GROUNDWATER REMEDY DECISION**

**REGION 2  
ID# PR2170027203**

**NAVAL ACTIVITY PUERTO RICO (former Naval Station Roosevelt Roads)  
Ceiba, Puerto Rico  
(June 2012)**

**Facility/Unit Type: SWMU 54 TCE Area (former NEX repair/maintenance shop)**

**Contaminants:**

**Groundwater:** Trichloroethene (TCE)

**Proposed Final Remedy:**

Deep well installation and closure monitoring.

**FACILITY BACKGROUND**

SWMU 54 is the Former Naval Exchange Repair/Maintenance Shop (Building 1914), which was constructed in 1979. It has been demolished, but was located on approximately 1 acre of land in the Bundy Area of NAPR. An underground storage tank (UST) was present at the site and used to store fuel until its removal in December 1992. The date of installation and type of fuel stored is unknown, but is assumed to be gasoline. The building was used to perform maintenance on vehicles, including oil changes and lubrications. No wastes are known to have been disposed of at the unit and there are no known releases related to the unit (Baker, 2005).

According to the Corrective Measures Study (Baker, 2005), two areas of groundwater contamination were identified at SWMU 54: a TCE plume east of Bairoko Street and a benzene plume west of Bairoko Street (Figure 1). This statement of basis focuses only on the SWMU 54 TCE area. The benzene area is discussed in the SWMU 54 Benzene Plume Statement of Basis.

**PROPOSED REMEDY**

Based on the last groundwater sampling event, completed in November 2010, the groundwater at SWMU 54 complies with the corrective action objective (CAO). Therefore, the site is ready to begin closure monitoring in support of requesting no further action from the U. S. Environmental Protection Agency (EPA). One deep well will be installed to ensure the plume has been defined vertically.

Current land use controls (LUCs), including restricted access to the SWMU 54 area through security fencing and prohibited use of groundwater, will be maintained until the CAOs are achieved in both the TCE and the benzene areas. When corrective action is complete, LUCs must be maintained including:

- No permanent residences may be installed on the property.
- No groundwater extraction wells may be installed by the deed grantee.

- Potential for vapor intrusion must be considered by the developer and addressed by the developer, as needed.
- The grantee may not interfere with any existing or future groundwater remedial systems.
- The grantee must complete annual inspections of the property to ensure all LUCs are being complied with and provide written certification of the inspection.
- The grantee must comply with the Resource Conservation Recovery Act (RCRA) Administrative Order on Consent for this property (provided to the Puerto Rico Local Redevelopment Authority (LRA) by the U.S. Navy).
- Release of environmental conditions and grantee covenants can be considered only with EPA concurrence.
- In order to develop, improve, use, or maintain the property in a manner inconsistent with the LUCs, the grantee must submit a written request seeking approval to the Director at the NAVFAC BRAC Program Management Office, Southeast.

**SUMMARY OF FACILITY RISKS**

Historical releases of TCE are expected to have been small and located near the former maintenance and adjacent surface runoff areas.

According to data collected during pilot-scale testing in 2009 and 2010 and the Corrective Measures Study (Baker, 2005), no soil contamination exists in the TCE area, although TCE was identified in groundwater.

The extent of the TCE plume has been defined and the rate of groundwater flow has been determined to be very slow at 0.003 feet per day, or about 1 foot per year. Thus, groundwater contaminated with TCE is not migrating outside the SWMU 54 area and no surface water discharge is expected from the TCE plume at SWMU 54. Also, there are no surface water bodies within or near to SWMU 54 that could be contaminated by groundwater from SWMU 54.

As a result of natural processes, including biological degradation and dispersion, and the pilot-scale testing, the TCE levels in groundwater have declined over time at SWMU 54 (AGVIQ-CH2M HILL, 2012).

In addition, the groundwater beneath SWMU 54 was demonstrated to be unusable as a potable water supply because of the brackish/saline nature of the area groundwater, with high levels of total dissolved solids and salinity, as detailed in the Groundwater Usability Assessment, Naval Activity Puerto Rico, Ceiba, Puer o Rico Technical Memorandum (Appendix C of the SWMU 54 Corrective Measures Implementation Plan [AGVIQ, CH2M HILL, 2012]).

Under current land use, no direct exposure to site groundwater is occurring. Additionally, the area downgradient of SWMU 54 is undeveloped and no potential for groundwater exposure exists in this area. However, indirect exposure pathway through volatilization of TCE to ambient air and indoor air could occur in the SWMU 54 TCE plume area. Therefore, this indirect exposure pathway was considered complete for deriving the cleanup criteria for the site groundwater.

The cleanup criteria were developed for industrial (indoor) worker and construction worker scenarios as presented in the Revised Corrective Action Objectives for Solid Waste Management Units 7&8, 54, and 55 Technical Memorandum ((Appendix B of the SWMU 54 Corrective Measures Implementation Plan [AGVIQ-CH2M HILL, 2012]).

### **SCOPE OF CORRECTIVE ACTION**

The corrective action for TCE in groundwater at SWMU 54 includes installation and sampling of one deep well to ensure the plume has been defined vertically and closure monitoring of all site wells on a quarterly basis to demonstrate groundwater complies with the cleanup criteria.

The location of the deep well was selected to correspond with the highest measured TCE concentrations and the greatest potential for downward migration of TCE (Figure 2).

### **SUMMARY OF ALTERNATIVES**

Based on the most current groundwater data, no groundwater exceeds the cleanup criteria for TCE at SWMU 54. However, cleanup criteria were first established in 2005 and TCE in groundwater did exceed cleanup criteria at that time. Therefore, based on the 2005 data, four clean up alternatives were evaluated in the CMS (Baker, 2005), including:

- Alternative 1 No Action
- Alternative 2 Monitored natural attenuation (MNA), including LUCs
- Alternative 3 Enhanced bioremediation and MNA, including LUCs

- Alternative 4 In situ chemical oxidation and MNA, including LUCs

Except for Alternative 1, each alternative addresses TCE in groundwater at SWMU 54. LUCs and MNA are components of each alternative except Alternative 1. Alternative 1 was evaluated due to the small probability of groundwater exposure at SWMU 54. Alternative 2 consists solely of LUCs and MNA. This alternative would provide an assessment of naturally occurring degradation processes as the TCE is monitored with time. In addition, LUCs in the form of a deed restriction on groundwater extractions would protect human health. Alternative 3 utilizes enhanced bioremediation with optional bioaugmentation and MNA to reduce contaminant concentrations in groundwater. Enhanced bioremediation options include the addition of a substrate to the TCE-contaminated groundwater to promote TCE degradation. Alternative 4 includes oxidation of contaminants through the use of an oxidizing agent such as permanganate or hydrogen peroxide. It was not expected that oxidation, alone, would reduce concentrations below clean up criteria.

### **EVALUATION OF THE PROPOSED REMEDY AND ALTERNATIVES**

To complete the CMS, a technical evaluation of the alternatives was completed and the alternatives were ranked based on technical merits, human health benefits, environmental benefits, and cost. The technical merits evaluated included performance, reliability, implementability, and safety of each alternative. Alternative 2 was ranked highest in most of the evaluation categories, including cost. However, this alternative did not meet the desired time frame to complete the corrective action and the next highest ranking was Alternative 3.

As prescribed in the CMS (Baker, 2005), AGVIQ-CH2M HILL performed an in situ bioremediation (ISB) pilot-scale test to evaluate the ability to reduce TCE concentrations in groundwater. Testing involved the installation of 5 injection wells and 13 monitoring wells to define the TCE plume and monitor the pilot-scale testing (AGVIQ-CH2M HILL, 2012).

The pilot-scale test was conducted between December 2009 and February 2010. Emulsified vegetable oil (EVO), a substrate, was injected into groundwater at SWMU 54. Test results showed a reasonable amount of groundwater could be impacted during the injection and significant TCE degradation was achieved in the targeted hot spot well. The injection area had minor increases in 1,2-dichloroethene (DCE) and vinyl chloride (VC), which are TCE degradation byproducts.

No substantial TCE rebound was observed during quarterly monitoring conducted after the injection work. This indicates that TCE degradation is proceeding to completion and full-scale ISB injection would have been an effective remedy for addressing the remaining TCE concentrations in groundwater at SWMU 54.

However, in May 2012, the cleanup criteria were revised and, after the pilot-scale testing, there are no wells where groundwater concentrations of TCE exceed the cleanup criteria.

Therefore, closure monitoring is the selected alternative.

### **PUBLIC PARTICIPATION**

Public review and comment on the proposed remedy for SWMU 54 will be implemented as part of the public comment period for the proposed Administrative Order on Consent between the Navy and EPA. A public notice of that public comment period will be published in both Spanish and English in select Puerto Rico newspapers.

### **NEXT STEPS**

Following completion of public review and comment on the proposed remedy, the EPA will advise of any required modifications based on the public comments, or its acceptability.

### **KEY DOCUMENTS**

AGVIQ-CH2M HILL. 2012. Corrective Measures Implementation Plan for SWMU 54 TCE Plume, Naval Activity Puerto Rico. June.

Baker Environmental, Inc. 2005. Final Corrective Measures Study Final Report for SWMUs 54 and 55.

U.S. Environmental Protection Agency (EPA). 2011. USEPA Regional Screening Levels Table and Users Guide. November.  
[http://www.epa.gov/reg3hwmd/risk/human/rb-concentration\\_table/usersguide.htm](http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/usersguide.htm).

### **FURTHER INFORMATION**

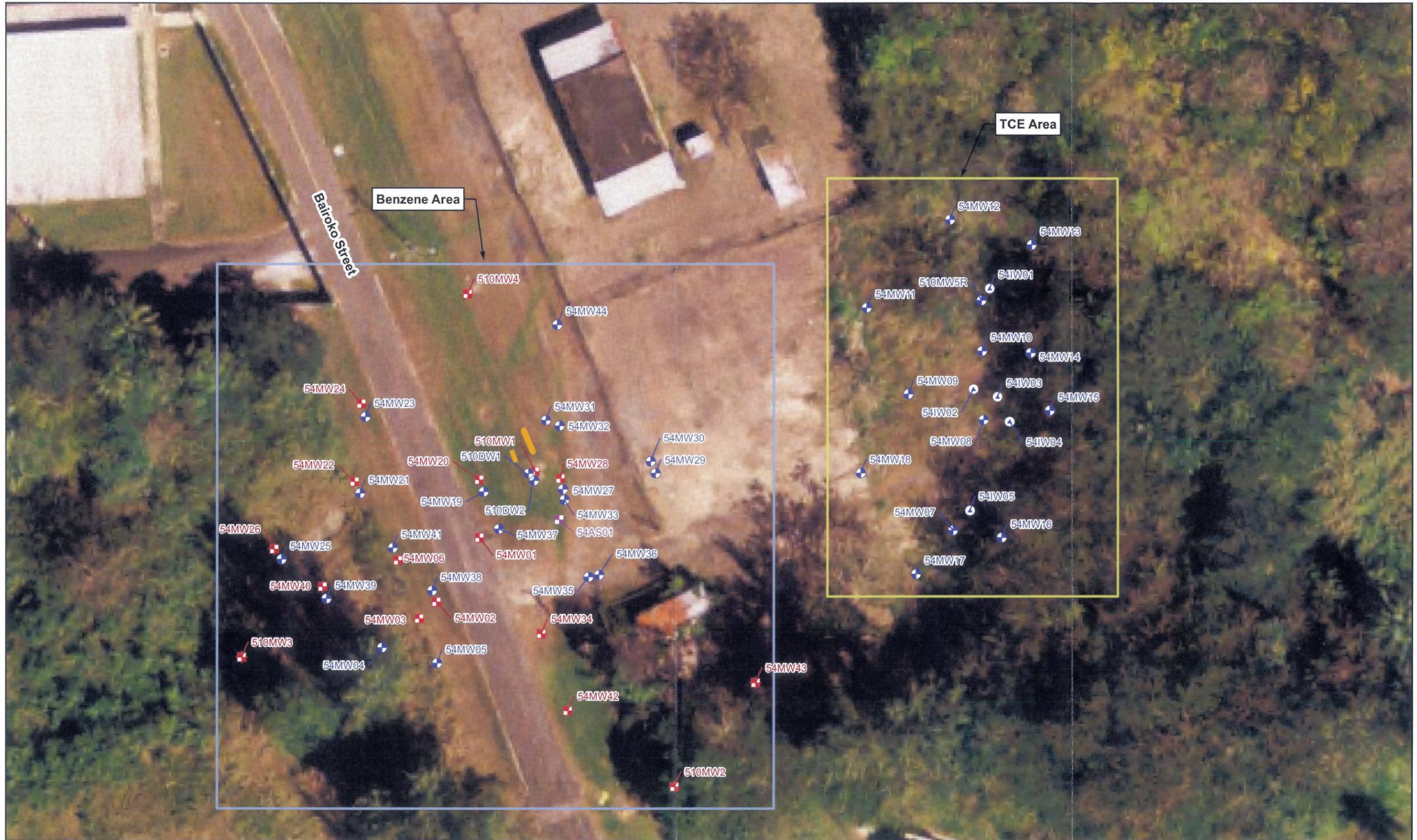
The key documents may be reviewed at:

U. S. Environmental Protection Agency  
Region 2  
RCRA File Room  
290 Broadway, 15<sup>th</sup> floor  
New York, NY 1007-1866  
Attn: Mr. David Abrines  
Phone: 212-637-3043

U. S. Environmental Protection Agency  
Caribbean Environmental Protection Division  
City View Plaza II – Suite 7000  
#48 RD. 165 km 1.2  
Guaynabo, PR 00968-8069  
Attn: Mr. Luis Negron  
Phone: 787-977-5870

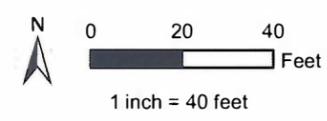
Puerto Rico Environmental Quality Board  
Oficina del Presidente – Piso 5  
Ave. Ponce de Leon #1308  
Carr Estatal 8838  
Sector El Cinco  
Rio Piedras, PR 00926  
Attn: Ms. Wilmarie Rivera  
Phone: 787- 767-8181 ext. 6141

Or at the following internet web page address:  
<http://nsrr-ir.org/>

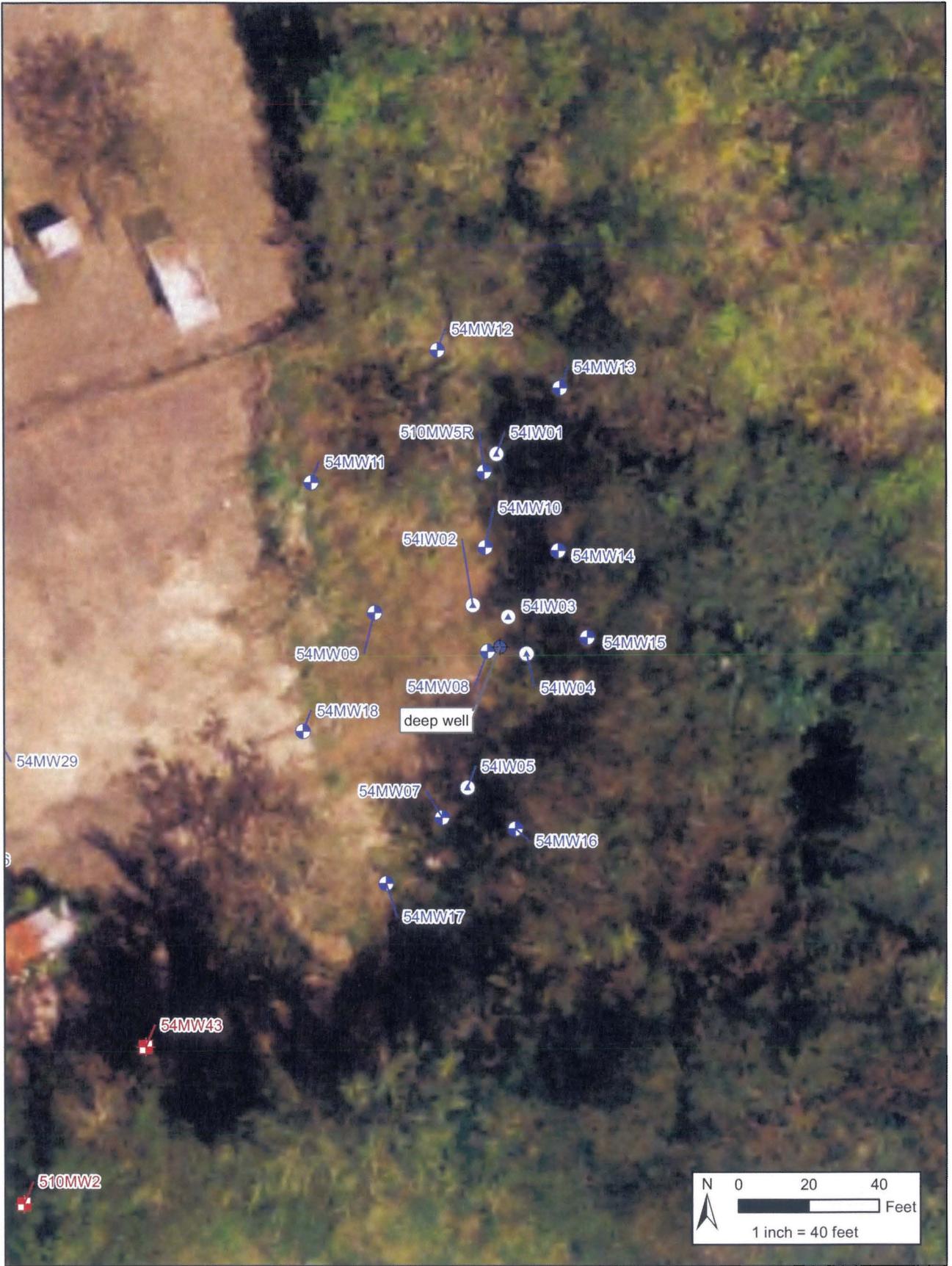


- Monitoring Well Screened Primarily Less than 15 ft bgs
- Monitoring Well Screened Primarily Greater than 15 ft bgs
- Injection Well Screened 17-27 ft bgs
- Air Sparge Injection Well
- Groundwater Flow

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**FIGURE 1**  
 Site Layout  
 SWMU 54  
 Naval Activity Puerto Rico



- Proposed Deep Well
- Monitoring Well Screened Primarily Less than 15 ft bgs
- ⊕ Monitoring Well Screened Primarily 15-25 ft bgs
- ⊙ Injection Well Screened 17-27 ft bgs

Note: CAO for TCE = 193 µg/L

**FIGURE 2**  
 Deep Well Installation Location  
 SWMU 54  
 Naval Activity Puerto Rico