TARGETED BROWNFIELDS ASSESSMENT
SAIPAN UXO PIT SITE
MARPI, SAIPAN,
COMMONWEALTH OF THE NORTHERN MARIANAS ISLANDS
TDD No. T05-09-06-11-001

Prepared For:
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Region IX
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November 30, 2007

Superfund Technical Assessment and Response Team

Saipan UXO Pit Site
Marpi, Saipan
Commonwealth of the Northern Marianas Islands

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December 1, 2007

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EXECUTIVE SUMMARY

Team 9's Superfund Technical Assessment and Response Team (START) conducted a Targeted Brownfields Assessment (TBA) at the Saipan Unexploded Ordnance (UXO) Pit Site located in Marpi, Saipan, Commonwealth of the Northern Marianas Islands (CNMI) under the United States Environmental Protection Agency (U.S. EPA) Brownfields program. The Saipan UXO Pit is an open burn/open detonation (OB/OD) pit used to destroy unserviceable and/or unexploded ordinance. This TBA included a geophysical (unexploded ordinance) survey, monitoring well installation, fence construction, groundwater sampling, and preparation of this TBA report, which evaluates whether contaminants of concern exist in groundwater at the perimeter of the site.

In preparation for field sampling activities, START contracted with AMPRO Ordinance and Explosives Consultants to perform an unexploded ordinance geophysical survey at the site's work areas. The goal of the geophysical survey was to safely locate unexploded ordinance and remove it from the site. AMPRO located several major pieces of ordinance, and safely removed it from work areas.

The scoping process for the Quality Sampling and Analysis Plan (QSAP) identified the need to investigate whether UXO OB/OD pit activities have impacted groundwater beneath the site. Potential chemical contamination in groundwater had to be assessed in order to meet this goal. Prior to this TBA, the concentrations of potential contaminants had not been evaluated. This investigation focused on the types of chemicals that were likely to be present at the site after military activities and UXO OB/OD pit activities.

To evaluate potential groundwater contamination at the site, START installed and sampled four monitoring wells at the perimeter of the site. Groundwater samples were analyzed for total petroleum hydrocarbons (TPH) in the gasoline, motor oil, and diesel ranges, explosives and energetics, semi-volatile organic compounds (SVOCs), volatile organic compounds (VOCs), polychlorinated biphenyls (PCBs), metals, cyanide, nitrate, nitrites, ammonia, phosphate, Kjeldahl nitrogen (TKN), perchlorates, nitro-cellulose, white phosphorus, and pesticides. The newly installed monitoring wells were surveyed for longitude, latitude, and elevation. Groundwater depths were measured and an approximate groundwater flow direction of northwest was determined. Groundwater also rose approximately 1 foot in well UXO-1, suggesting that tidal influence is occurring at the site.

Groundwater sample results indicated evidence of multiple constituents in groundwater. Detected compounds were compared to their respective maximum contaminant levels (MCLs) or U.S. EPA primary remediation goals (PRGs). The following baseline conditions were found in the groundwater at the site:

- TPH compounds were detected during this investigation in the gasoline, diesel, and motor oil ranges at all monitoring wells. Gasoline concentrations ranged from 26 μg/L (A2, C1, F1) to 120 μg/L (A2, F1, J Flag). Diesel concentrations range from 180 μg/L (A2, C1, F1 Flag) to 3,000 μg/L (F1-Flag). Motor oil concentrations range from 660 μg/L (A2, C1, F1 Flag) to 1,000 μg/L (F1 Flag).

- 1,3,5-Trinitrobenzene, 2,6 dinitrotoluene, HMX, and cyclotrimethylenetrinitramine were the only explosive compounds detected. However, all concentrations were well below their respective tap water PRGs.

- 1,4-Dioxane was the only SVOC detected above comparison criteria. However, 1,4-dioxane was determined to be a constituent of the drilling foam used. Bis(2-ethylhexyl) phthalate, di-n-butyl phthalate, and di-n-octyl phthalate were also detected but below their respective MCLs and PRGs. These detections are likely due to the polyethylene tubing used to collect samples.

- No PCBs were detected in any groundwater samples.

- No metals were detected above their MCLs or tap water PRGs except arsenic. Arsenic was detected at concentrations ranging from 0.63 μg/L (C1, J-Flag) to 3.5 μg/L, exceeding its tap water PRG of 0.007 μg/L but well below the MCL of 10 μg/L.

- Ammonia, Nitrate + Nitrite as N, TKN, and phosphorus were the only inorganic compounds detected during this sampling event. There are no specific comparison criteria for these compounds.

- Heptachlor epoxide was the only pesticide detected. It was detected in one sample (UXO-2) at a concentration of 0.075 μg/L which is above the tap water PRG of 0.0074 μg/L but below the MCL of 0.2 μg/L.

Based on the results of this TBA, the following conclusions can be made:

- Unexploded ordinance is still present at the site and further removal is warranted to ensure public safety.

- Groundwater beneath the site has been impacted with chemicals common in military munitions. It is unknown if these impacts are from previous military activities during World War II, UXO clearance activities after World War II, or current OB/OD UXO pit activities. Data collected during this TBA establish a baseline of contamination beneath the site. Further groundwater monitoring over time will be necessary to assess whether OB/OD UXO pit activities are impacting groundwater.

- Tidal influence could be affecting groundwater flow direction. Based on START field measurements, groundwater flow direction was determined to be to the northwest, towards Marpi Landfill, which contradicts the United States Geological Survey's measurement of east-north-east. Further measurements of depth-to-groundwater will be needed to assess a more definitive groundwater flow direction.

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ACRONYMS

CLPAS	Contract Laboratory Program Analytical Services
CNMI	Commonwealth of the Northern Marianas Islands
COPC	chemical of potential concern
DEQ	Division of Environmental Quality
DCL	Data Chem Laboratories
DPL	Department of Public Lands
DPS	Department of Public Safety
EOD	Explosive Ordinance Disposal Detachment
ERT	Explosives Response Team
µg/L	micrograms per liter
MCL	maximum contaminant level
mL/min	milliliters per minute
MPS	multiprobe system
msl	mean sea level
OB/OD	open burn/open detonation
PCB	polychlorinated biphenyl
PRG	preliminary remediation goal
PVC	polyvinyl chloride
QSAP	Quality Sampling and Analysis Plan
RCRA	Resource Conservation and Recovery Act
RDX	cyclotrimethylenetrinitramine
SAP	Sampling and Analysis Plan
START	Superfund Technical Assessment and Response Team
STL	Severn Trent Laboratory
SVOC	semi-volatile organic compound
TBA	Targeted Brownfields Assessment
TIC	tentatively identified compound
TKN	total Kjeldahl nitrogen
TPH	total petroleum hydrocarbons
U.S. EPA	United States Environmental Protection Agency
USGS	United States Geological Survey
USPS	United States Postal Service
UXO	unexploded ordnance
VOC	volatile organic compound

1.0 INTRODUCTION

The United States Environmental Protection Agency (U.S. EPA) Region IX directed the Team 9 Superfund Technical Assessment and Response Team (START) to conduct a Targeted Brownfields Assessment (TBA) on the Saipan Unexploded Ordnance (UXO) Open Burn/Open Detonation (OB/OD) Pit site (the site) located in Marpi, Saipan, Commonwealth of the Northern Marianas Islands (CNMI). U.S. EPA Region IX TBAs are intended to characterize conditions at Brownfield sites being considered for planned redevelopment or reuse. This TBA was performed in response to an application submitted by the CNMI Division of Environmental Quality (DEQ), who will also be referred to as the Brownfields Grant Applicant (applicant) for the purposes of this report.

UXO on the island of Saipan remaining from World War II is present in an area of the island proposed for homestead development. To allow for the development of 500 new homesteads, the previously undeveloped land will be cleared of UXO. When the UXO is cleared on Saipan, it is stored at the Marpi UXO Pit site in a cave until a maximum explosive weight is achieved and then detonated using plastic explosives cyclotrimethylenetrinitramine (RDX) and C4. Deformation occurs in an OB/OD pit, to eliminate the potential explosive hazard. The purpose of the OB/OD facility is to render unserviceable ordinance and other pyrotechnic devices harmless either by suppression of detonation or open burning. The CNMI DEQ has received a Brownfields grant to clear the proposed homestead area of UXO, to install monitoring wells, and perform a groundwater assessment in the vicinity of the UXO Pit.

In order to continue OB/OD operations, it is necessary to establish the current environmental baseline conditions for the underlying groundwater, and to determine whether offsite migration of contamination from historic operation of the UXO Pit has occurred. START installed monitoring wells along the perimeter of the site to generate baseline data and allow for ongoing monitoring of groundwater at the site perimeter by DEQ in the future. Groundwater monitoring will ensure that any release of hazardous waste or hazardous constituents from the OB/OD operations to the aquifer below the site is detected prior to offsite migration.

Field activities were conducted by START in accordance with the U.S. EPA approved Sampling and Analysis Plan (SAP) dated January 24, 2007. Tasks performed during this investigation included:

- UXO clearance survey in the proposed work areas;
- Installation of a fence on the site access road;
- Installation of four groundwater monitoring wells; and

- Sampling and analysis of groundwater from monitoring wells to establish baseline conditions.

2.0 RECORD REVIEW

Due to the location of the site on the island of Saipan, no environmental records were available for the site.

3.0 PROPERTY DESCRIPTION AND BACKGROUND

The following sections document the history of the site and describe the site setting.

3.1 PROPERTY LOCATION AND OWNERSHIP

The CNMI consists of a chain of 14 islands in the North Pacific Ocean. Saipan, the major inhabited island, lies at approximately 15° north latitude and 145° east longitude. The island is approximately 15 miles long and 5 miles wide at the widest point (48 square miles) (CNMI DEQ, 1995).

The geographic coordinates of the site are approximately 15 degrees, 16 minutes, 95 seconds north latitude, 145 degrees, 49 minutes, 19.24 seconds west longitude. The site has no physical address, but is located near the northern end of the island in an area known as Marpi. The site is situated approximately ½ mile from the Pacific Ocean (Figure 1). The site is currently owned by the CNMI Department of Public Lands (DPL). The Marianas Public Lands Authority parcel number for the site is 051-A-02.

3.2 PROPERTY DESCRIPTION

The site is comprised of a 5,000-square-meter area surrounding an existing UXO storage cave and an OB/OD Pit. The site is undeveloped land, with the exception of the UXO storage cave and the OB/OD pit. Bordering the site is Marpi Landfill approximately 800 feet to the northwest, a former Japanese railroad (currently a dirt access road) on the north and east sides, and cliffs around the south to west sides. Undeveloped land lies to the east of the former Japanese railroad.

3.3 PHYSICAL SETTING

The following paragraphs related to the physical setting of the site are summarized from United States Geological Survey (USGS) information and other supporting documentation.

3.3.1 Physiographic Conditions

The terrain in the area appears to be generally flat, with slight sloping to the northeast. The site elevation is approximately 50 to 60 meters above mean sea level (msl), based on the USGS 7.5-minute topographic map, Saipan quadrangle, dated 1983.

The climate in Saipan is characterized by temperatures ranging from 78 to 85 degrees Fahrenheit, relatively high humidity, and an average rainfall of 83.1 inches per year. Most of the rainfall occurs during the period from July through October, while the typical dry season occurs between January and April (CNMI DEQ, 1995).

3.3.2 Geologic Conditions

Saipan is characterized by limestone and calcareous sediments that cover approximately 90 percent of the island. Volcanic rock makes up the remaining 10 percent of the island's surface area, but exists beneath all the limestone formations at the island's core (CNMI DEQ, 1995).

The Mariana Islands are located to the west of the Mariana Trench, the subduction zone for the westward-moving Pacific Plate. As a result of their position with respect to regional plate tectonics, the Mariana Islands formed as part of a classic island arc chain. Uplifting forces related to the plate subduction result in the development of a chain of volcanoes. Due to the warm tropical waters, coral reefs develop along the shores of the volcanoes. Periodic changes in sea level and two separate periods of volcanic activity resulted in exposed limestone reef formations, while new reefs grew on the volcanic substrate brought closer to the surface of the water. The succession of raised reefs can be seen in the form of terraces that characterize Saipan (CNMI DEQ, 1995).

Upon conclusion of the initial active volcanic period, the first major limestone formation grew over Saipan. This formation is known as Takpochau Limestone, and it covers much of the interior of the island today. The major limestone formation that was formed after the second period of volcanic activity is referred to as the Mariana Limestone (CNMI DEQ, 1995).

Geologic logs from monitoring wells installed at the site documented shallow subsurface material as silty to sandy clay ranging in depth from 6 inches to 10 feet below ground surface (bgs) dependant on the location. Shallow material was underlain by limestone. Limestone on this part of the island is primarily composed of early Pleistocene age Mariana Limestone, which is mainly light-colored, coarsely porous, finely to coarsely fragmental limestone that contains abundant coral (USGS, 2003).

3.4 PROPERTY HISTORY

The following sections discuss the historical and current uses of the property.

3.4.1 Past Uses of the Property

Prior to being used as an OB/OD pit, the site has not been used since the formation of the CNMI in 1976. Prior to the formation of the CNMI, the site was vacant land and possibly used for military purposes by Japan and the United States during and after World War II. During Word War II, the U.S. Navy bombed areas of Saipan continuously for 48 hours, including the Marpi area. The area above the site, atop the cliffs, was used by Japanese military forces as an open revetment type ordnance storage area. After the battle for Saipan, American forces took over this area and converted it for ordnance storage use (AMPRO, 2005). The site also contained a Coastal Defense at the edge of the cliff line. Evidence of an old, narrow gauge railroad is also present on the site or near the site boundary, suggesting potential Japanese military use. At the end of Word War II, the U.S. Army initiated UXO cleanup in the Marpi area. Diesel fuel was used as a "weed killer" to clear the thick jungle and extract the UXO. This proved to be ineffective and the Army chose to remove small amounts of UXO by hand, stockpile them, and explode in place with C3 explosives. This disposal method was used numerous times throughout the Marpi area. This effort continued until July 1950, when U.S. forces were vacated from CNMI to fight in the Korean conflict. Aerial photographs showing the site circa 1945 are included in Appendix A.

3.4.2 Current Uses of the Property

The site currently serves as a UXO storage area and an OB/OD unit for the disposal of UXO discovered on the island. The site has been used for these operations for several years although the exact number of years could not be confirmed. The CNMI Department of Public Safety (DPS), in conjunction with the United States Navy Explosives Ordinance Disposal Detachment (Navy EOD), currently conducts OB/OD operations at the site.

3.5 PREVIOUS INVESTIGATIONS

No previous investigations have been conducted at the site.

3.6 ENVIRONMENTAL LIENS AND OTHER ENCUMBRANCES

Based on interviews with Jess Palacios, director of real estate for the CNMI DPL, and Abby Romolor, clerk at the Commonwealth Recorder's Office, no environmental liens or other encumbrances are present at the site.

3.7 REGULATORY INVOLVEMENT

OB/OD operations at the site have been occurring under the authority of the U.S. EPA. UXO storage and disposal has been conducted under Resource Conservation and Recovery Act (RCRA) emergency permits issued by the U.S. EPA. Each time a detonation is conducted, a new emergency permit is issued.

3.8 CURRENT AND PAST USES OF ADJOINING LAND

The following paragraphs related to the current and past adjoining land are summarized from previous environmental reports and observed conditions during field activities.

3.8.1 Current Uses of Adjoining Properties

The Marpi Landfill, which is located approximately 800 feet to the northwest, is currently the only developed area surrounding the site. Marpi Landfill is also a transfer station for residential and business recyclables to be recycled off-island. Other areas around the site remain undeveloped tangan-tangan jungle.

3.8.2 Past Adjoining Property Use

Historical reports show that the adjoining property surrounding the site was used primarily by the Japanese and American militaries into the 1950s. Land uses included coastal defense gun sites, ordinance storage facilities, ordinance detonation facilities, and an airfield. Evidence of an old narrow gauge railroad is also present, suggesting past Japanese military use. The 1945 Aerial Photographs included in Appendix A show undeveloped land to the north, south and east of the site. An ordinance storage facility is present to the west of the site on the cliffs above the UXO Pit. After the militaries abandoned the area at the end of Word War II, the surrounding lands were unused and allowed to return to jungle.

4.0 PHASE I FINDINGS

4.1 AERIAL PHOTOGRAPHS

Review of available aerial photographs from circa 1945 (AMPRO, 2005) show the site as undeveloped jungle. No other aerial photographs were available. Aerial photos are presented as Appendix A.

4.2 SANBORN MAPS

No Sanborn maps are available for the site.

4.3 TITLE SEARCH

No title search information is available for this site.

4.4 DATABASE SEARCHES

No standard environmental databases are available for the island of Saipan.

4.5 PROPERTY RECONNAISSANCE

In December 2006, START visited the site along with CNMI DEQ to inspect the area for the proposed groundwater monitoring wells. While on site, START witnessed the CNMI Explosive Response Team (ERT) and Navy EOD preparing and conducting a detonation in the OB/OD pit. No recognized environmental conditions were noted at the site other than the OB/OD operations.

4.6 INTERVIEWS AND FILE REVIEWS

No regulatory files were available for the site and interviews were not conducted for the site.

4.7 REGULATORY INVOLVEMENT, PREVIOUS STUDIES, AND CLEAN UP

Currently the CNMI DEQ, in cooperation with the CNMI ERT, oversees the site. No previous studies or clean up activities have occurred at the site beyond UXO removal and destruction.

5.0 PHASE II ASSESSMENT SUMMARY

Because the site is used as an OB/OD facility, the potential exists for a release of hazardous waste or hazardous constituents to groundwater from the OB/OD Pit. Therefore, it is necessary to document any releases from past and ongoing detonations and establish baseline conditions.

5.1 OBJECTIVES

The scoping process for the Quality Sampling and Analysis Plan (QSAP) identified the need to protect the groundwater resources of Saipan and ensure that groundwater contamination is not occurring as a result of OB/OD operations. Potential chemical contamination in groundwater at the perimeter of the site was assessed in order to meet this goal. Prior to this TBA, the concentrations of contaminants had not been evaluated. This investigation focused on the types of chemicals that were likely to be present at an OB/OD facility.

5.2 UXO SURVEY

In preparation for field sampling activities, START contracted AMPRO, to conduct a UXO survey in the areas proposed for land clearance and monitoring well installation. The goal of the UXO survey was to conduct a systematic surface and subsurface search to identify any UXO present in the work areas, and eliminate explosion hazards by removing any identified UXO. The field survey documented the presence of multiple UXO items in the work areas, including ten significant items which are documented in the attached report. All UXO items found containing explosive components were identified and removed from the work areas and turned over to the CNMI Explosive Response Team for disposal. The *AMPRO Unexploded Ordnance Support DPS Demo Site Test Wells Saipan, Final Report* (AMPRO Report) is provided in Appendix B.

5.3 INVESTIGATION AREAS

The investigation area was designated as the estimated down- to cross-gradient perimeter of the site, based on accessibility. Due to the presence of heavy vegetative growth surrounding the site perimeter, locations were determined based on accessibility and minimal impact to potential habitat for federally listed endangered species.

5.4 SAMPLING AND ANALYSIS PLAN

All sampling activities were performed in accordance with the *Sampling and Analysis Plan Targeted Brownfields Assessment Marpi UXO Pit, Saipan, CNMI*, dated January 24, 2007, with the following exceptions:

- All monitoring well borings were drilled with an 8-inch rotary bit instead of a 6-inch bit. Alexander Drilling (Alexander) did not have a 6-inch bit available. START determined that the increase in annular space from using a larger bit would not negatively affect the monitoring well installation or sample results.

- All monitoring wells were installed with 20 feet of screened well casing instead of 10 feet. Due to the difficulty of determining specific groundwater depth due to the foam rotary drilling method, a longer screened well casing was installed to ensure appropriate depth of the screened interval. This also allowed for tidal influence on groundwater depth in the screened interval.

5.5 MONITORING WELL INSTALLATION

All monitoring wells were installed using a Schramm T-660 Rotadrill drill rig supplied and operated by Alexander. The drilling methodology used was foam rotary drilling. All monitoring well locations were surveyed by Takai & Associates. Monitoring well locations are depicted on Figure 2.

An 8-inch-diameter boring was completed at each location to approximately 10 to 15 feet below first encountered groundwater. Monitoring wells were installed at depths ranging from 195 to 201 feet below ground surface (bgs) at the four locations.

A qualified START geologist completed lithologic logging on cuttings removed from the boring where possible. Boring logs for each of the wells are presented as Appendix C. At two of the borehole locations (UXO-1 and UXO-2), void spaces were encountered in the subsurface and cuttings did not flow to the surface. These void spaces were estimated to be approximately 4 feet thick in both borings. It is common for karst topography or caves to develop in limestone due to its solubility in dilute acidic groundwaters. Therefore, no lithologic data are available for the subsurface at these borings. However, based on the consistency of subsurface material at the surrounding wells and geologic data available for this area of Saipan, subsurface material in these wells can be assumed to be limestone.

When total depth was achieved, a 2-inch-diameter polyvinyl chloride (PVC) well casing with a 20-foot screen interval was installed. Monitoring wells were constructed in accordance with the completion details shown on the monitoring well diagram. Well completion diagrams are presented as Appendix D for each well.

Following completion, each monitoring well was developed using over-pumping in accordance with U.S. EPA Environmental Response Team standard operating procedures to remove fine materials and drilling fluids. Wells were initially purged using disposable bailers to remove excess coarse materials. Continuing well development purging was accomplished using polyethylene tubing and a 2-inch Grundfos™ submersible pump to remove excessive fine material and drilling fluids. Wells were then purged at a rate of 1 to 2.5 gallons per minute and periodically surged with the submersible pump. Pumping continued until groundwater turbidity was lowered and no drilling foam was observed in the purge water. Approximately 300 to 350 gallons of water were removed during development of each monitoring well. As stated in the SAP, purge water generated during development was discharged to the ground.

5.6 WATER SAMPLING

Water sampling from monitoring wells was completed using both the low-flow sampling methodology and standard well over purging procedures. Both sampling procedures were used at the site due to the malfunction of the Grundfos™ submersible pump prior to sampling monitoring wells UXO-1 and UXO-2. No replacement was readily available due to the remote location of the site. All water samples were placed into an ice filled coolers and shipped under chain-of-custody to analytical laboratories. Field sampling procedures are described below.

5.6.1 Low Flow Sampling

Low-flow sampling was used to collect groundwater samples from monitoring wells UXO-3 and UXO-4 on April 26, 2007. Low flow sampling ensures the sampling of undisturbed formation water and the accurate measurement of field parameters. The procedure involved the withdrawal of groundwater from the middle portion of the submerged well screen at low flows with a 2-inch Grundfos™ submersible pump. Water was removed from UXO-3 at 350 milliliters per minute (mL/min) and at 325 mL/min from UXO-4. Water was purged from the well until field-measured parameters (pH, conductivity, turbidity, temperature, redox potential, and dissolved oxygen), measured with a YSI 556 multiprobe system (MPS) meter, stabilized in accordance with U.S. EPA guidance criteria. After parameter stabilization, groundwater samples were transferred directly into sample containers from polyethylene tubing. Samples for metals analysis were field filtered with a 0.45-micron filter. Well sampling sheets are included in Appendix E.

5.6.2 Volume Purging

Samples from UXO-1 and UXO-2 were collected on May 11, 2007, using the over purging methodology due to mechanical issues with the 2-inch Grundfos™ pump. In accordance with U.S. EPA guidance, four well volumes were purged from each of the wells, using disposable polyethylene bailers. Field parameters (pH, conductivity, turbidity, temperature, redox potential, and dissolved oxygen) were recorded using a YSI 556 MPS meter after approximately each casing volume was removed. All parameters stabilized in accordance with U.S. EPA guidance criteria, with the exception of turbidity. Turbidity readings remained extremely high in both wells throughout purging. This was determined to be due to the disturbance of the water column caused by hand bailing activities. Field staff determined that purging of four casing volumes was sufficient to obtain a representative water sample in accordance with U.S. EPA protocols. Following purging of the well, grab samples were collected directly from the monitoring wells using a clean disposable polyethylene bailer. Samples for metals analysis were collected in polyethylene containers and then filtered at the DEQ laboratory with a 0.45-micron filter into a clean container. Well sampling sheets are included in Appendix E

6.0 PHASE II RESULTS

Groundwater samples were analyzed for the following:

- Total petroleum hydrocarbons (TPH) in the gasoline, motor oil, and diesel ranges by U.S. EPA Method 8015 – Modified
- Explosive and energetic compounds by U.S. EPA Method 8330
- Semi-volatile organic compounds (SVOCs) by Contract Laboratory Program Analytical Services (CLPAS) Method SOM01.1 SVOCs
- Volatile organic compounds (VOCs) by CLPAS Method SOM01.1 VOCs
- Polychlorinated biphenyls (PCBs) by CLPAS Method SOM01.1 PCBs
- Metals by U.S. EPA Method 200.7 and 245.1
- Cyanide by U.S. EPA Method 9010
- Nitrate by U.S. EPA Method 353.2
- Nitrite by U.S. EPA Method 353.2
- Ammonia by U.S. EPA Method 350.1
- Phosphate by U.S. EPA Method 365.4
- Total Kjeldahl nitrogen (TKN) by U.S. EPA Method 351.1
- Perchlorates by U.S. EPA Method 314.0
- Nitro-cellulose by U.S. EPA Method 353.2

- White phosphorus by U.S. EPA Method 7580
- Pesticides by CLPAS Method SOM01.1 pesticides.

A total of four primary water samples, one duplicate sample, one equipment blank and one field blank were submitted for laboratory analysis for the compounds listed above. The U.S. EPA Region IX Richmond laboratory analyzed samples for all of the compounds except explosive and energetic compounds by U.S. EPA Method 8330; nitro-cellulose by U.S. EPA Method 353.2; and white phosphorus by U.S. EPA Method 7580. Explosive and energetic compounds and nitrocellulose analyses were performed by Severn Trent Laboratory (STL) of Sacramento, California and white phosphorus was performed by Data Chem Laboratories (DCL) of Salt Lake City, Utah.

6.1 DATA QUALITY

The Region IX Richmond laboratory data were validated using a U.S. EPA Region IX Tier 1A data validation process by the Region IX Laboratory. A START chemist also performed a cursory review of this data. Analytical data from STL and Datachem were validated using a U.S. EPA Region IX Tier 1A data validation process by a qualified START chemist. All data were found to be acceptable and useable with qualification.

6.1.1 Severn Trent and Data Chem Laboratory Data

A START chemist performed a Tier 1A data validation of data from the START contract labs, following guidelines specified in the Draft EPA Region IX Quality Assurance Office Guidance, Region IX Superfund Data Evaluation/Validation Guidance (R9QA/006.1, dated December 2001). Water samples were analyzed for nitrocellulose by EPA Method 335.2 and data were acceptable for use without qualification (STL). Water samples were analyzed for white phosphorus by EPA 7580 and data were acceptable for use without qualification (DCL). Water samples were analyzed for nitroaromatics and nitroamines by EPA 8330 and data were acceptable for use with qualification (J) as estimated (STL). Samples UXO-3, UXO-4, UXO-1003, and UXO-3001 EB were extracted after the recommended holding time. The detected results were qualified as estimated (J) and the non-detected results were qualified as estimated (UJ). Sample UXO-2 was used for matrix spike and matrix spike duplicate. Recoveries of all analytes except RDX were within the control limits established by the laboratory. The detected RDX result in UXO-2 was qualified as estimated (J).

6.1.2 Region IX Laboratory Data

The Region IX Laboratory performed a Tier 1A data validation on water samples analyzed for TPH, SVOCs, VOCs, PCBs, Metals, and pesticides. No data were rejected, but some were accepted with the qualifications described below. Data were flagged with a "U" when the analytical result was below the method detection and reporting limits or when the constituent is present in the laboratory blank sample. Data were flagged with a "J" when the analytical result was between the method detection limit and the reporting limit, or based on laboratory quality assurance criteria where additional flags were added. Laboratory qualifications were added when samples were analyzed after expiration of their holding times, were delivered above recommended temperatures, and/or based on laboratory spike recovery or instrument calibration quality assurance. Samples received after recommended holding times were flagged with "A2," and samples out of holding times were flagged with "A3." Additional qualifiers based on internal laboratory quality assurance are defined on Table 2.

6.1.3 Sample Shipping

Samples were shipped on the same day they were collected via United States Postal Service (USPS). Because of Saipan's extremely remote location, USPS could offer delivery no faster than approximately 4 days to the continental United States. No other service on island was available to deliver sample packages faster. Prior to shipping, START packaged each shipment cooler with newly frozen Cold Ice Gel Refrigerant® packets, which maintain a freezing temperature longer than ice. Upon arrival at U.S. EPA Region IX Richmond laboratory, STL, and DCL, temperatures were recorded above 4 degrees Celsius in some coolers. Additionally, some of the analysis with short hold times (specifically perchlorate and phosphorus) were received outside of their recommended hold times due to extended shipping times. Analytical results for samples received above the recommended temperature range (A2 Flag) or after target hold times (A3 Flag) were qualified as shown on Table 2.

6.2 SITE ACTION LEVELS

As discussed in the SAP, the site action levels for chemicals of potential concern (COPCs) are their respective laboratory reporting limits. Although the site action level was the respective reporting limits of COPCs to determine presence or absence; concentrations were also compared to the U.S. EPA maximum containment levels (MCLs) for drinking water and the U.S. EPA preliminary remediation goals (PRGs) for tap water.

The U.S. EPA MCLs provide conservative regulatory comparison criteria for contaminants in groundwater used as a drinking water resource. The U.S. EPA tap water PRGs provide conservative comparison criteria and are intended to be used for residential tap water. A summary of sample results is provided in Table 2. A discussion of sample results is provided below.

6.3 WATER SAMPLES

The following section discusses the analytical results for the water samples collected during this TBA. Analytical results are presented on Table 2 and the laboratory analytical data package is included in Appendix F.

6.3.1 TPH

TPH as gasoline, diesel, and motor oil were detected in samples from all four wells. TPH in the gasoline range was detected at concentrations ranging from 26 micrograms per liter (μg/L) (A2, F1, J Flags) to 120 μg/L (A2, C1, F1 Flags). TPH in the diesel range was detected at concentrations ranging from 180 μg/L (A2, C1, F1 Flags) to 3,000 μg/L (F1 Flag). TPH as motor oil was detected at concentrations ranging from 660 μg/L (A2, C1, F1 Flags) to 1,000 μg/L (F1 Flag). All TPH detections were qualified as outside of the typical fuel ranges, indicating that the TPH has likely degraded over time. The detections of TPH are possibly from the use of diesel fuel as a "weed killer" during early UXO clearance and disposal activities in the 1950s. Gasoline, diesel, and motor oil are not used in standard operations for the OB/OD facility at the site. There are not U.S. EPA MCLs of tap water PRGs for any of the TPH compounds.

6.3.2 Explosive and Energetic Compounds

Five explosive and energetic compounds were detected in samples from the site; 1,3,5-trimethylbenzene, 2,6-dinitrotoluene, 3-nitrotoluene, HMX, and RDX. 1,3,5-Trinitrobenzene was detected in three samples (UXO-1, UXO-2 and UXO-3) with concentrations ranging from 0.035 μg/L (J Flag) to 0.085 μg/L. These concentrations are well below the conservative tap water PRG of 1,100 μg/L for this compound and there is no MCL value. 2,6-Dinitrotoluene was only detected in sample UXO-2 at a concentration of 0.087 μg/L (J Flag). This detection is well below the tap water PRG of 360 μg/L and there is no MCL. 3-Nitrotoluene was only detected in sample UXO-4 with a concentration of 0.15 μg/L (J Flag). There are no comparison criteria for 3-nitrotoluene and this concentration is between the MDL and RL. HMX was detected in two samples, at concentrations of 0.033 μg/L (J Flag) in UXO-2 and 0.049 μg/L (J Flag) in duplicate sample UXO-1003. Both of these detections are well below the tap water PRG of 1,800 μg/L. RDX was detected in sample UXO-2 at a concentration of 0.11 μg/L. RDX is used in the

OB/OD operations at the site. However, this detection is below the conservative tap water PRG of 0.60 µg/L and does not indicate a significant release to groundwater.

6.3.3 SVOCs

Four SVOCs were detected in samples from the site: 1,4 dioxane, bis(2-ethylhexyl) phthalate, di-n-butyl phthalate, and di-n-octyl phthalate. 1,4-Dioxane was detected in all of the wells, with concentrations ranging from 4 µg/L (A2, J Flags) to 44 µg/L. Concentrations in samples from three of the wells exceeded the 1,4-dioxane tap water PRG of 6.1 µg/L and there is no MCL for 1,4-dioxane. According to the manufacturer of the drilling foam used, Chemron Corporation, 1,4-dioxane can be a byproduct of alcohol-acid reactions during drilling foam production. However, as it is only present in the foam at low concentrations, it is not included on the Material Data Safety Sheet for the product.

Bis(2-ethylhexyl) phthalate was detected in samples from two of the wells, with concentrations ranging from 0.9 µg/L (C1, C3, J Flag) to 1.8 µg/L (A2, C1, J Flag). All bis(2-ethylhexyl) concentrations detected in samples are below the MCL of 6 µg/L and the tap water PRG of 4.8 µg/L. Di-n-butyl phthalate was detected in samples from two of the wells, at concentrations of 5.5 µg/L and 14 µg/L in samples UXO-1 and UXO-2, respectively. These concentrations are well below the tap water PRG of 3,600 µg/L and there is no MCL. Di-n-octyl phthalate was detected at a concentration of 0.5 µg/L (C3, J, Q3 Flag) in both UXO-1 and UXO-2. This concentration is well below the tap water PRG of 1,500 µg/L and there is no MCL. Phthalates compounds are traditionally used in the production of PVC and vinyl chloride resins, where they are added to plastics to make them flexible. In this case, START used polyethylene tubing during sampling activities that could have contributed to these phthalate detections. Twenty-eight SVOC tentatively identified compounds (TICs) were also identified during laboratory analysis and are noted on Table 2.

6.3.4 VOCs

Acetone and multiple TICs were the only VOCs detected in groundwater samples from the site. Acetone was detected in samples from all of the wells except UXO-4. It was also detected in the field blank. Concentrations in samples from the wells ranged from 390 µg/L (C1, J Flag) to 770 µg/L (A2, J, Q3 Flag). Acetone was detected in the field blank (UXO-2001 FP) at 3.6 µg/L. Acetone is not a COPC for this site, and is a common laboratory cleaner and contaminant. Additionally, none of these detections exceeded the tap water PRG of 5,500 µg/L and there is no MCL for this compound. Isopropyl alcohol was detected in samples from three wells as a TIC, with concentrations ranging from 5.8 µg/L (N, TIC, J Flag) to 13 µg/L (N, TIC, J Flag).

Isopropyl alcohol is a primary constituent of the drilling foam used. The detection is likely due to residual amounts of foam remaining after well development. Multiple other TICs were also detected in samples. However, as the constituents were only tentatively identified these results are not discussed.

6.3.5 PCBs

No PCBs were detected during this sampling event.

6.3.6 Metals

Fourteen metals were detected in groundwater samples during this sampling event. However, none of the concentrations exceeded either of the comparison criteria except for arsenic. Arsenic was detected at concentrations ranging from 0.63 μg/L to 3.5μg/L. These concentrations all exceeded the conservative tap water PRG of 0.007μg/L but were well below the MCL of 10μg/L.

6.3.7 Inorganic Compounds

Four inorganic compounds were detected in samples from site monitoring wells. However, there are no comparison criteria for the compounds detected. Ammonia as N was detected in four samples from all of the wells except UXO-4, with concentrations ranging from 170 μg/L (J, C1 Flag) to 870μg/L (A2, J Flag). Nitrate + nitrite as N was detected in samples from all of the wells, with concentrations ranging from 220 μg/L (C1, A2, J Flag) to 2,100 μg/L (Q4, J Flag). There are no direct comparison criteria for Nitrate + Nitrate as N. TKN was detected in samples from all of the wells, at concentrations ranging from 400 μg/L (A2, J Flag) to 1,000 μg/L (A2, J Flag). Phosphorus was detected in two samples, at concentrations of 1,200 μg/L in sample UXO-2 and 2,000 μg/L (J, Q4 Flag) in sample UXO-1.

6.3.8 Pesticides

Heptachlor epoxide was the only pesticide detected in samples from site monitoring wells. Heptachlor epoxide was only detected in sample UXO-2 at a concentration of 0.075 μg/L. This concentration of heptachlor epoxide is above the very conservative tap water PRG of 0.0075 μg/L but well below the MCL of 0.2 μg/L.

6.4 EQUIPMENT AND FIELD BLANK SUMMARY

6.4.1 Equipment Blank

Pentanol, methol as a TIC, and TKN were detected at concentrations of 2.5 μg/L (N, TIC, J Flag) and 290 μg/L (A2, A3, C1 Flag), respectively, in the equipment blank sample. Calcium was also detected at a concentration of 68 μg/L (C1, J Flag). However, as none of these compounds are COPCs, these detections should not affect sample data for the site.

6.4.2 Field Blank

Acetone was detected in the field blank sample, with a concentration of 3.6 μg/L (A2, J, Q3 Flag). Acetone is a common laboratory contaminant and was also detected in five other samples.

6.5 GROUNDWATER

Depth-to-groundwater was measured in all wells on May 11, 2007, and ranged from 1.65 to 2.42 feet above msl. START also observed a significant change in groundwater depths in well UXO-1, where depths rose approximately 1 foot over a 5 hour period when consecutive readings were collected. This change in groundwater elevation suggests that there is likely tidal influence to the onsite monitoring wells. Groundwater contours for the measured water levels on May 11, 2007 are shown on Figure 3. These contours indicate that the approximate groundwater flow direction is west northwest. However, based on the topography of the site and available groundwater data for this area of the Island, this does not appear representative. Further groundwater readings need to be collected at the site to accurately characterize groundwater flow directions; groundwater readings are included on Table 1.

7.0 PHASE II FINDINGS

Based on the results of the Phase II Baseline Investigation, START concludes the following:

7.1 GROUNDWATER SAMPLING FINDINGS

- TPH compounds were detected during this investigation in the gasoline, diesel, and motor oil ranges at all monitoring wells. Gasoline concentrations ranged from 26 μg/L (A2, C1, F1) to 120 μg/L (A2, F1, J Flag). Diesel concentrations range from 180 μg/L (A2, C1, F1 Flag) to 3,000 μg/L (F1-Flag). Motor oil concentrations range from 660 μg/L (A2, C1, F1 Flag) to 1,000 μg/L (F1 Flag).

- 1,3,5-Trinitrobenzene, 2,6 dinitrotoluene, HMX, and RDX were the only explosive compounds detected. However, all concentrations were well below their respective tap water PRGs.

- 1,4-Dioxane was the only SVOC detected above comparison criteria. However, 1,4-dioxane was determined to be a constituent of the drilling foam used. Bis(2-ethylhexyl) phthalate, di-n-butyl phthalate, and di-n-octyl phthalate were also detected but below their respective MCLs and PRGs. These detections are likely due to the polyethylene tubing used to collect sample.

- Acetone was the only VOC detected in groundwater not identified as a T. Acetone is a typical laboratory contaminant.

- No PCBs were detected in any groundwater samples.

- No metals were detected above their MCLs or tap water PRGs except arsenic. Arsenic was detected at concentrations ranging from 0.63 μg/L (C1, J-Flag) to 3.5 μg/L, exceeding its tap water PRG of 0.007 μg/L but well below the MCL of 10 μg/L.

- Ammonia, Nitrate + Nitrite as N, TKN, and phosphorus were the only inorganic compounds detected during this sampling event. There are no specific comparison criteria for these compounds.

- Heptachlor epoxide was the only pesticide detected. It was detected in one sample (UXO-2) at a concentration of 0.075 μg/L, which is above the tap water PRG of 0.0074 μg/L but below the MCL of 0.2 μg/L.

7.2 GROUNDWATER CONDITIONS

- Measurements collected on May 11, 2007 indicate an approximate groundwater flow direction to the west northwest.

- Groundwater appears to be tidally influenced based on the 1 foot elevation change in well UXO-1 over a five hour period.

- Additional groundwater measurements at site monitoring wells are required to accurately characterize groundwater flow direction at the site.

8.0 CONCLUSIONS

In order to evaluate potential subsurface contamination in groundwater at the site, START installed and sampled four groundwater monitoring wells. Groundwater sample laboratory results show detections of TPH compounds, SVOCs, VOCs, explosives and energetics, inorganic compounds, pesticides, and metals. However, although detections of some of these compounds exceeded the tap water PRGs, none of the concentrations exceeded the MCLs, which are a more appropriate criterion for comparison. Due to the history of Saipan during World War II (bombing by the American and Japanese militaries; historical ordinance storage and disposal activities), it is not possible to determine whether the low level detections in the samples collected are from past or current activities. Depth-to-groundwater following monitoring well installation indicates an approximate flow direction to the northwest. This is the opposite of the USGS measurement of east-north-east and further characterization is required. The closest developed property to the site is the Marpi Landfill to the northwest. Currently, groundwater beneath the site and Marpi Landfill is not planned to be a drinking water source. Therefore, based on the concentrations of contaminants detected and planned water use, no immediate groundwater remedial actions are warranted.

These groundwater sample concentrations establish a baseline for contaminants currently found in groundwater at the site. It is inconclusive to whether these detections are from previous or current property activities. START recommends CNMI DEQ perform further groundwater monitoring for detected chemicals on an annual basis to monitor the OB/OD pit's impact to groundwater beneath the site.

Upon approval of this TBA report, START will create a QSAP for the continuation of groundwater monitoring for the CNMI DEQ. This QSAP will include a sampling schedule, groundwater sampling and handling procedures, and a list of chemicals of concern.

9.0 REFERENCES

AMPRO, 2005. AMPRO's *Unexploded Ordnance Historical Research and UXO Assessment.* December.

CNMI DEQ, 1995. Commonwealth of the Northern Mariana Islands, Department of Environmental Quality (CNMI DEQ). *Final Report of the FY 1995 Isley and Kobler Well Study.*

USGS, 2003. Ground-Water Resources of Saipan, Commonwealth of the Northern Mariana Islands, Water-Resources Investigation Report 03-4178, Robert L. Carruth, Honolulu, Hawaii.

Table 1
Groundwater Depths
Saipan UXO Brownsfields
Saipan, CNMI

Monitoring Well	Top of Casing Elevation (ft)	Date of Measurement	Depth to Groundwater (ft)	Groundwater Elevation (ft)
UXO-1	191.079	5/11/2007	188.66	2.42
UXO-2	185.854	5/12/2007	183.53	2.32
UXO-3	189.107	5/13/2007	186.79	2.32
UXO-4	192.63	5/14/2007	190.98	1.65

Notes:

Elevations are referenced to feet above mean sea level (msl)

Table 2
Analytical Results
Saipan UXO Brownsfields
Saipan, CNMI

Parameter	USEPA MCLs* (ug/L)	USEPA Tap Water PRGs** (ug/L)	UXO-1	UXO-2	UXO-3	UXO-4	UXO-3001EB[1]	UXO-2001FB[2]	UXO-1003[3]
Volitile Organic Compounds (ug/L)									
1,1,1,2-Tetrachloroethane	n.v.	0.4	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 U
1,1,1-Trichloroethane	200	3,200	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 U
1,1,2,2-Tetrachloroethane	n.v.	0.1	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 U
1,1,2-Trichloro-1,2,2-trifluoroethane	5	59,000	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 U
1,1,2-Trichloroethane	n.v.	0.2	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 U
1,1-Dichloroethane	n.v.	2	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 U
1,1-Dichloroethene	7	340	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 U
1,1-Dichloropropene	n.v.	n.v.	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 U
1,2,3-Trichlorobenzene	n.v.	n.v.	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 U
1,2,3-Trichloropropane	n.v.	0.006	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 U
1,2,4-Trichlorobenzene	70	7.2	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 U
1,2,4-Trimethylbenzene	n.v.	12	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 U
1,2-Dibromo-3-chloropropane	0.2	n.v.	<2 A2, J, U	<2 U	<2 A2, J, U	<2 U	<2 A2, J, U	<2 A2, J, U	<2 U
1,2-Dibromoethane (EDB)	0.05	0.0056	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 U
1,2-Dichlorobenzene	600	370	<0.5 J, A2, U	<0.5 U	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 U
1,2-Dichloroethane	5	0.1	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 U
1,2-Dichloropropane	5	0.2	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 U
1,3,5-Trimethylbenzene	n.v.	12	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 U
1,3-Dichlorobenzene	n.v.	180	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 U
1,3-Dichloropropane	n.v.	120	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 U
1,4-Dichlorobenzene	75	0.5	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 U
2,2-Dichloropropane	n.v.	n.v.	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 U
2-Butanone (MEK)	n.v.	7,000	<4 A2, J, U	<4 U	<4 A2, J, Q3,	<4 U	<4 A2, J, U	<4 A2, J, U	<4 U
2-Chlorotoluene	n.v.	n.v.	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 U
4-Chlorotoluene	n.v.	n.v.	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 U
4-Methyl-2-pentanone (MIBK)	n.v.	2,000	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 A2, J, U	NA	NA	<0.5 A2, J, U	<0.5 A2, J, U
Acetone	n.v.	5,500	**630 A2, J, Q3**	**390 C1, J**	**770 A2, J, Q3,**	13 U	<4 A2, C4, J,	**3.6 A2, J, Q3**	**750**
Benzene	5	0.35	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 U
Bromobenzene	n.v.	20	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 U
Bromochloromethane	n.v.	n.v.	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 U
Bromodichloromethane	60	0.2	<0.5 J, A2, U	<0.5 U	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 U
Bromoform	n.v.	8.5	<0.5 A2, C3, J,	<0.5 U	<0.5 A2, C3, J,	<0.5 U	<0.5 A2, C3, J,	<0.5 A2, C3, J,	<0.5 U
Bromomethane	n.v.	8.7	<0.5 A2, J, U	<0.5 U	<0.5 A2, C4, J,	<0.5 U	<0.5 A2, J, Q6,	<0.5 A2, J, U	<0.5 U
Butylbenzene	n.v.	240	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 U
Carbon tetrachloride	5	0.17	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 U
Chlorobenzene	100	110	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 U
Chlorodibromomethane	n.v.	0.1	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 U	<0.5 J, A2, U	<0.5 A2, J, U	<0.5 U
Chloroethane	n.v.	4.6	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 U
Chloroform	n.v.	0.53	<0.5 A2, J, U	<0.5	<0.5 A2, J	<0.5 U	<0.5 A2, J, U	1.5 A2, J, U	<0.5 U
Chloromethane	n.v.	160	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 U
cis-1,2-Dichloroethene	70	n.v.	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 U
cis-1,3-Dichloropropene	n.v.	0.4	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 U
Dibromomethane	n.v.	61	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 C3, J, U	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 U
Dichlorodifluoromethane	n.v.	390	<0.5 A2, C3, J,	<0.5 C3, J, U	<0.5 A2, C3, J,	<0.5 U	<0.5 A2, C3, J,	<0.5 A2, C3, J,	<0.5 C3, J, U
Dichloromethane	5	n.v.	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 U
Ethylbenzene	700	1,300	<0.5 J, A2, U	<0.5 U	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 U
Hexachlorobutadiene	n.v.	0.86	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 N TIC, J	<0.5 J, A2, U	<0.5 A2, J, U	<0.5 U
Isopropylbenzene	n.v.	660	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 U
m&p-Xylene	10,000	210	<1 A2, J, U	<1 U	<1 A2, J, U	<1 U	<1 J, A2, U	<1 A2, J, U	<1 U
Naphthalene	n.v.	6.2	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 N TIC, J	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 U
o-Xylene	10,000	210	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 U
p-Isopropyltoluene	n.v.	n.v.	<0.5 J, A2, U	<0.5 U	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 U
Propylbenzene	n.v.	660	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 U
sec-Butylbenzene	n.v.	240	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 U
Styrene	100	1,600	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 U
tert-Butyl methyl ether (MTBE)	n.v.	11	<2 A2, J, U	<2 U	<2 A2, J, U	<2 U	<2 A2, J, U	<2 A2, J, U	<2 U
tert-Butylbenzene	n.v.	240	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 U
Tetrachloroethene	5	0.1	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 U
Toluene	1,000	720	<0.5	<0.5	0.3 A2, J, U	**0.4 N TIC, J**	<0.5	<0.5	0.3 U
trans-1,2-Dichloroethene	100	120	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, Q4,	<0.5 A2, J, U	<0.5 U
trans-1,3-Dichloropropene	n.v.	0.4	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 U
Trichloroethene	5	1.4	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 U
Trichlorofluoromethane	n.v.	1,300	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 N TIC, J	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 U
Vinyl chloride	2	0.02	<0.5 A2, J, U	<0.5 U	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 A2, J, U	<0.5 U
Isopropyl Alcohol	n.v.	n.v.	**12 N TIC, J**	**5.8 N TIC, J**	**12 U**	ND	ND	ND	**13 N TIC, J**
Nonanol	n.v.	n.v.	**5.1 U**	ND	ND	ND	ND	ND	ND
Total hydrocarbon	n.v.	240	**140 N TIC, J**	**2.8 U**	ND	ND	ND	ND	**3.6 N TIC, J**
unknown hydrocarbon	n.v.	240	**1.4 N TIC, J**	ND	ND	ND	ND	ND	ND
unknown hydrocarbon (01)	n.v.	n.v.	<0.50.5 N TIC, J	ND	ND	ND	ND	ND	**1.1 N TIC, J**
unknown hydrocarbon (02)	n.v.	n.v.	ND	ND	ND	ND	ND	ND	**2.7 N TIC, J**
unknown oxygenated (01)	n.v.	n.v.	**2.2 N TIC, J**	ND	ND	ND	ND	ND	ND
unknown oxygenated (02)	n.v.	n.v.	**1.1 U**	ND	ND	ND	ND	ND	ND

Table 2
Analytical Results
Saipan UXO Brownsfields
Saipan, CNMI

Parameter	USEPA MCLs* (ug/L)	USEPA Tap Water PRGs** (ug/L)	UXO-1	UXO-2	UXO-3	UXO-4	UXO-3001EB[1]	UXO-2001FB[2]	UXO-1003[3]
Semi-Volatile Organic Compounds (µg/L)									
1,2,4-Trichlorobenzene	70	7.2	<1 U	<1 U	<2 A2, J, U	<1 A2, J, U	<1 A2, J, U	NA	<0.9 A2, J, U
1,2-Dichlorobenzene	600	370	<1 U	<1 U	<2 A2, J, U	<1 A2, J, U	<1 A2, J, U	NA	<0.9 A2, J, U
1,3-Dichlorobenzene	n.v.	180	<1 U	<1 U	<2 A2, J, U	<1 A2, J, U	<1 A2, J, U	NA	<0.9 A2, J, U
1,4-Dichlorobenzene	75	0.5	<1 U	<1 U	<2 A2, J, U	<1 A2, J, U	<1 A2, J, U	NA	<0.9 A2, J, U
1,4-Dioxane	n.v.	6.1	**44**	**9.2**	**14 A2, J**	**4 A2, J**	<1 A2, J, U	NA	**33 A2, J**
2,2'-oxybis(1-Chloropropane)	n.v.	n.v.	<1 U	<1 U	<2 A2, J, U	<1 A2, J, U	<1 A2, J, U	NA	<0.9 A2, J, U
2,4,5-Trichlorophenol	n.v.	3,600	<5 U	<5 U	<10 A2, J, U	<5 A2, J, U	<5 A2, J, U	NA	<4.7 A2, J, U
2,4,6-Trichlorophenol	n.v.	1	<5 U	<5 U	<10 A2, J, U	<5 A2, J, U	<5 A2, J, U	NA	<4.7 A2, J, U
2,4-Dichlorophenol	n.v.	110	<5 U	<5 U	<10 A2, J, U	<5 A2, J, U	<5 A2, J, U	NA	<4.7 A2, J, U
2,4-Dimethylphenol	n.v.	730	<5 U	<5 U	<10 A2, J, U	<5 A2, J, U	<5 A2, J, U	NA	<4.7 A2, J, U
2,4-Dinitrophenol	n.v.	73	<5 U	<5 U	<10 A2, J, U	<5 A2, J, U	<5 A2, J, U	NA	<4.7 A2, J, U
2,4-Dinitrotoluene	n.v.	73	<1 U	<1 J, Q6, U	<2 A2, J, U	<1 A2, J, U	<1 A2, J, U	NA	<0.9 A2, J, U
2,6-Dinitrotoluene	n.v.	36	<1 U	<1 U	<2 A2, J, U	<1 A2, J, U	<1 A2, J, U	NA	<0.9 A2, J, U
2-Chloronaphthalene	n.v.	n.v.	<1 U	<1 U	<2 A2, J, U	<1 A2, J, U	<1 A2, J, U	NA	<0.9 A2, J, U
2-Chlorophenol	n.v.	30	<5 U	<5 U	<10 A2, J, U	<5 A2, J, U	<5 A2, J, U	NA	<4.7 A2, J, U
2-Methylnaphthalene	n.v.	n.v.	<1 U	<1 U	<2 A2, J, U	<1 A2, J, U	<1 A2, J, U	NA	<0.9 A2, J, U
2-Methylphenol	n.v.	1,800	<5 U	<5 U	<10 A2, J, U	<5 A2, J, U	<5 A2, J, U	NA	<4.7 A2, J, U
2-Nitroaniline	n.v.	110	<5 U	<5 U	<10 A2, J, U	<5 A2, J, U	<5 A2, J, U	NA	<4.7 A2, J, U
2-Nitrophenol	n.v.	n.v.	<5 U	<5 U	<10 A2, J, U	<5 A2, J, U	<5 A2, J, U	NA	<4.7 A2, J, U
3&4-Methylphenol	n.v.	180	<5 U	<5 U	<10 A2, J, U	<5 A2, J, U	<5 A2, J, U	NA	<4.7 A2, J, U
3,3'-Dichlorobenzidine	n.v.	0.15	<5 U	<5 J, Q4, U	<10 A2, J, U	<5 A2, J, U	<5 A2, J, U	NA	<4.7 A2, J, U
3-Nitroaniline	n.v.	3.2	<5 U	<5 U	<10 A2, J, U	<5 A2, J, U	<5 A2, J, U	NA	<4.7 A2, J, U
4,6-Dinitro-2-methylphenol	n.v.	n.v.	<5 U	<5 U	<10 A2, C3, Q2	<5 A2, C3, J,	<5 C3, A2, J,	NA	<4.7 A2, J, C3,
4-Bromophenyl phenyl ether	n.v.	n.v.	<1 U	<1 U	<2 A2, J, U	<1 J, A2, U	<1 A2, J, U	NA	<0.9 A2, J, U
4-Chloro-3-methylphenol	n.v.	n.v.	<5 U	<5 U	<10 A2, J, U	<5 J, A2, U	<5 A2, J, U	NA	<4.7 A2, J, U
4-Chloroaniline	n.v.	150	<5 C3, J, U	<5 C3, J, U	<10 A2, C3, J,	<5 J, A2, C3,	<5 C3, A2, J,	NA	<4.7 A2, J, C3,
4-Chlorophenyl phenyl ether	n.v.	n.v.	<1 U	<1 U	<2 A2, J, U	<1 J, A2, U	<1 A2, J, U	NA	<0.9 A2, J, U
4-Nitroaniline	n.v.	3.2	<5 U	<5 J, Q6, U	<10 A2, J, U	<5 J, A2, U	<5 A2, J, U	NA	<4.7 A2, J, U
4-Nitrophenol	n.v.	n.v.	<5 U	<5 U	<10 A2, J, U	<5 J, A2, U	<5 A2, J, U	NA	<4.7 A2, J, U
Acenaphthene	n.v.	370	<1 U	<1 U	<2 A2, J, U	<1 J, A2, U	<1 A2, J, U	NA	<0.9 A2, J, U
Acenaphthylene	n.v.	n.v.	<1 U	<1 U	<2 A2, J, U	<1 J, A2, U	<1 A2, J, U	NA	<0.9 A2, J, U
Anthracene	n.v.	1,800	<1 U	<1 U	<2 A2, J, U	<1 A2, J, U	<1 A2, J, U	NA	<0.9 A2, J, U
Benzo(a)anthracene	n.v.	0.1	<1 U	<1 U	<2 A2, J, U	<1 A2, J, U	<1 A2, J, U	NA	<0.9 A2, J, U
Benzo(a)pyrene	0.2	0.0092	<1 U	<1 U	<2 A2, J, U	<1 A2, J, U	<1 A2, J, U	NA	<0.9 A2, J, U
Benzo(b)fluoranthene	n.v.	0.1	<1 U	<1 U	<2 A2, J, U	<1 A2, J, U	<1 A2, J, U	NA	<0.9 A2, J, U
Benzo(g,h,i)perylene	n.v.	n.v.	<1 U	<1 U	<2 A2, J, U	<1 A2, J, U	<1 A2, J, U	NA	<0.9 A2, J, U
Benzo(k)fluoranthene	n.v.	0.1	<1 U	<1 U	<2 A2, J, U	<1 A2, J, U	<1 A2, J, U	NA	<0.9 A2, J, U
Benzyl alcohol	n.v.	11,000	<5 C4, J, U	<5 C4, J, U	<10 A2, C3, J,	<5 A2, C3, J,	<5 A2, C3, J,	NA	<4.7 A2, C3, J,
bis(2-Chloroethoxy)methane	n.v.	n.v.	<1 U	<1 U	<2 A2, J, U	<1 A2, J, U	<1 A2, J, U	NA	<0.9 A2, J, U
bis(2-Chloroethyl)ether	n.v.	0.01	<1 U	<1 U	<2 A2, J, U	<1 A2, J, U	<1 A2, J, U	NA	<0.9 A2, J, U
bis(2-Ethylhexyl) phthalate	6	4.8	<1 C3, J, U	**0.9 C1, C3, J**	**1.8 A2, C1, J**	<1 A2, J, U	<1 A2, J, U	NA	**0.9 A2, J**
Butyl benzyl phthalate	n.v.	7,300	<1 U	<1 U	<2 A2, J, U	<1 A2, J, U	<1 A2, J, U	NA	<0.9 A2, J, U
Carbazole	n.v.	3.4	<1 U	<1 U	<2 A2, J, U	<1 A2, J, U	<1 A2, J, U	NA	<0.9 A2, J, U
Chrysene	n.v.	0.6	<1 U	<1 U	<2 A2, J, U	<1 A2, J, U	<1 A2, J, U	NA	<0.9 A2, J, U
Dibenz(a,h)anthracene	n.v.	0.0092	<1 U	<1 U	<2 A2, J, U	<1 A2, J, U	<1 A2, J, U	NA	<0.9 A2, J, U
Dibenzofuran	n.v.	12	<1 U	<1 U	<2 A2, J, U	<1 A2, J, U	<1 A2, J, U	NA	<0.9 A2, J, U
Diethyl phthalate	n.v.	29,000	<1 U	<1 U	<2 A2, Q6, J,	<1 A2, J, U	<1 A2, J, U	NA	<0.9 A2, J, U
Dimethyl phthalate	n.v.	360,000	<1 U	<1 U	<2 A2, Q6, J,	<1 A2, J, U	<1 A2, J, U	NA	<0.9 A2, J, U
Di-n-butyl phthalate	n.v.	3,600	**5.5**	**14**	<2 A2, J, U	0.5 A2, C1, J	<1 A2, J, U	NA	<0.9 A2, J, U
Di-n-octyl phthalate	n.v.	1,500	**0.5 C3, J, Q3,**	**0.5 C3, J, Q3,**	<2 A2, C3, J,	<1 A2, C3, J,	<1 A2, C3, J,	NA	<0.9 A2, C3, J,
Diphenyl amine	n.v.	n.v.	<1 U	<1 U	<2 A2, J, U	<1 A2, J, U	<1 A2, J, U	NA	<0.9 A2, J, U
Fluoranthene	0.2	1,500	<1 U	<1 U	<2 A2, J, U	<1 A2, J, U	<1 A2, J, U	NA	<0.9 A2, J, U
Fluorene	0.2	240	<1 U	<1 U	<2 A2, J, U	<1 A2, J, U	<1 A2, J, U	NA	<0.9 A2, J, U
Hexachlorobenzene	1	0.042	<1 U	<1 U	<2 A2, J, U	<1 A2, J, U	<1 A2, J, U	NA	<0.9 A2, J, U
Hexachlorobutadiene	n.v.	0.9	<1 U	<1 U	<2 A2, J, U	<1 A2, J, U	<1 A2, J, U	NA	<0.9 A2, J, U
Hexachlorocyclopentadiene	50	220	<1 C4, J, U	<1 C4, J, U	<2 A2, J, U	<1 A2, J, U	<1 A2, J, U	NA	<0.9 A2, J, U
Hexachloroethane	n.v.	4.8	<1 U	<1 U	<2 A2, J, U	<1 A2, J, U	<1 A2, J, U	NA	<0.9 A2, J, U
Indeno(1,2,3-cd)pyrene	0.2	0.1	<1 U	<1 U	<2 A2, J, U	<1 A2, J, U	<1 A2, J, U	NA	<0.9 A2, J, U
Isophorone	n.v.	71	<1 U	<1 U	<2 A2, J, U	<1 A2, J, U	<1 A2, J, U	NA	<0.9 A2, J, U
Naphthalene	n.v.	6.2	<1 U	<1 U	<2 A2, J, U	<1 A2, J, U	<1 A2, J, U	NA	<0.9 A2, J, U
Nitrobenzene	n.v.	3.4	<1 U	<1 U	<2 A2, J, U	<1 A2, J, U	<1 A2, J, U	NA	<0.9 A2, J, U
N-Nitrosodipropylamine	n.v.	n.v.	<1 U	<1 U	<2 A2, J, U	<1 A2, J, U	<1 A2, J, U	NA	<0.9 A2, J, U
Pentachlorophenol	1	0.6	<5 U	<5 U	<10 A2, J, U	<5 A2, J, U	<5 A2, J, U	NA	<4.7 A2, J, U
Phenanthrene	n.v.	n.v.	<1 U	<1 U	<2 A2, J, U	<1 A2, J, U	<1 A2, J, U	NA	<0.9 A2, J, U
Phenol	n.v.	11,000	<5 U	<5 U	<10 A2, J, U	<5 A2, J, U	<5 A2, J, U	NA	<4.7 A2, J, U
Pyrene	n.v.	180	<1 U	<1 U	<2 A2, J, U	<1 A2, J, U	<1 A2, J, U	NA	<0.9 A2, J, U
15-Crown-5	n.v.	n.v.	ND	ND	**36 N TIC, J**	ND	ND	NA	ND
Caprolactam	n.v.	n.v.	**270 N TIC, J**	**730 N TIC, J**	ND	ND	ND	NA	ND
Cyclooctane,dimethyl-	n.v.	n.v.	ND	ND	**22 N TIC, J**	ND	ND	NA	ND
Decanoic acid, methyl	n.v.	n.v.	ND	ND	ND	ND	ND	NA	**30 N TIC, J**
Decanoic acid, methyl- (01)	n.v.	n.v.	ND	ND	**40 N TIC, J**	ND	ND	NA	ND
Decanoic acid, methyl- (02)	n.v.	n.v.	ND	ND	**40 N TIC, J**	ND	ND	NA	ND
n-Decanoic acid	n.v.	n.v.	**25 N TIC, J**	**93 N TIC, J**	ND	ND	ND	NA	ND
Dodecanoic acid	n.v.	n.v.	ND	**17 N TIC, J**	ND	ND	ND	NA	ND

Table 2
Analytical Results
Saipan UXO Brownsfields
Saipan, CNMI

Parameter	USEPA MCLs* (ug/L)	USEPA Tap Water PRGs** (ug/L)	UXO-1	UXO-2	UXO-3	UXO-4	UXO-3001EB[1]	UXO-2001FB[2]	UXO-1003[3]
Hexanoic acid, methyl	n.v.	n.v.	ND	ND	ND	ND	ND	NA	**16 N TIC, J**
Hexenol	n.v.	n.v.	ND	ND	**15 N TIC, J**	ND	ND	NA	ND
Phenol, tetramethylbuty	n.v.	n.v.	ND	ND	ND	**3.6 N TIC, J**	ND	NA	ND
Pentanol, methyl-	n.v.	n.v.	ND	ND	ND	ND	**2.5 N TIC, J**	NA	ND
Undecanoic acid	n.v.	n.v.	ND	**54 N TIC, J**	ND	ND	ND	NA	ND
unknown	n.v.	n.v.	ND	ND	ND	**4.6 N TIC, J**	ND	NA	ND
unknown (01)	n.v.	n.v.	**11 N TIC, J**	**35 N TIC, J**	ND	ND	ND	NA	ND
unknown (02)	n.v.	n.v.	**5.5 N TIC, J**	**11 N TIC, J**	ND	ND	ND	NA	ND
unknown (03)	n.v.	n.v.	**14 N TIC, J**	**9 N TIC, J**	ND	ND	ND	NA	ND
unknown (04)	n.v.	n.v.	**23 N TIC, J**	ND	ND	ND	ND	NA	ND
unknown (05)	n.v.	n.v.	**9.5 N TIC, J**	ND	ND	ND	ND	NA	ND
unknown acid (01)	n.v.	n.v.	**6.1 N TIC, J**	ND	ND	ND	ND	NA	ND
unknown acid (02)	n.v.	n.v.	**11 N TIC, J**	ND	ND	ND	ND	NA	ND
unknown acid (03)	n.v.	n.v.	**7.4 N TIC, J**	ND	ND	ND	ND	NA	ND
unknown fatty alcohol	n.v.	n.v.	ND	**8.9 N TIC, J**	ND	ND	ND	NA	ND
unknown hydrocarbon (01)	n.v.	n.v.	ND	**7.6 N TIC, J**	**22 N TIC, J**	ND	ND	NA	ND
unknown hydrocarbon (02)	n.v.	n.v.	ND	**5.9 N TIC, J**	ND	ND	ND	NA	ND
unknown, oxygenated (01)	n.v.	n.v.	ND	ND	**26 N TIC, J**	**2.6 N TIC, J**	ND	NA	**33 N TIC, J**
unknown, oxygenated (02)	n.v.	n.v.	ND	ND	**30 N TIC, J**	**5 N TIC, J**	ND	NA	**16 N TIC, J**
unknown, oxygenated (03)	n.v.	n.v.	ND	ND	**23 N TIC, J**	**9.8 N TIC, J**	ND	NA	**53 N TIC, J**
unknown, oxygenated (04)	n.v.	n.v.	ND	ND	**18 N TIC, J**	**12 N TIC, J**	ND	NA	**15 N TIC, J**
unknown, oxygenated (05)	n.v.	n.v.	ND	ND	ND	**6.4 N TIC, J**	ND	NA	**36 N TIC, J**
unknown, oxygenated (06)	n.v.	n.v.	ND	ND	ND	**11 N TIC, J**	ND	NA	**36 N TIC, J**
unknown, oxygenated (07)	n.v.	n.v.	ND	ND	ND	**8.1 N TIC, J**	ND	NA	**18 N TIC, J**
unknown, oxygenated (08)	n.v.	n.v.	ND	ND	ND	**3.9 N TIC, J**	ND	NA	**18 N TIC, J**
Polychlorinated Biphenyls (ug/L)									
Aroclor 1016	0.5	0.96	<1 U	<1 U	<1.99 A2, J, U	<1 A2, J, U	<1 J, A2, U	NA	<1.96 A2, J, U
Aroclor 1221	0.5	0.015	<2 U	<2 U	<3.98 A2, J, U	<2 A2, J, U	<2 J, A2, U	NA	<3.93 A2, J, U
Aroclor 1232	0.5	0.015	<1 U	<1 U	<1.99 A2, J, U	<1 A2, J, U	<1 J, A2, U	NA	<1.96 A2, J, U
Aroclor 1242	0.5	0.015	<1 U	<1.96 A2, J, U	<1.99 A2, J, U	<1 A2, J, U	<1 J, A2, U	NA	<1.96 A2, J, U
Aroclor 1248	0.5	0.015	<1 U	<1.96 A2, J, U	<1.99 A2, J, U	<1 A2, J, U	<1 A2, J, U	NA	<1.96 A2, J, U
Aroclor 1254	0.5	0.015	<1 U	<1 U	<1.99 A2, J, U	<1 A2, J, U	<1 A2, J, U	NA	<1.96 A2, J, U
Aroclor 1260	0.5	0.015	<1 U	<1 U	<1.99 A2, J, U	<1 A2, J, U	<1 A2, J, U	NA	<1.96 A2, J, U
Aroclor 1262	0.5	0.015	<1 U	<1 U	<1.99 A2, J, U	<1 A2, J, U	<1 A2, J, U	NA	<1.96 A2, J, U
Aroclor 1268	0.5	0.015	<1 U	<1 U	<1.99 A2, J, U	<1 A2, J, U	<1 A2, J, U	NA	<1.96 A2, J, U
Pesticides (ug/L)									
4,4'-DDD	n.v.	0.28	<0.1 U	<0.1 U	<0.199 A2, J, U	<0.1 A2, J, U	<0.1 A2, J, U	NA	<0.196 A2, J, U
4,4'-DDE	n.v.	0.2	<0.1 U	<0.1 U	<0.199 A2, J, U	<0.1 A2, J, U	<0.1 A2, J, U	NA	<0.196 A2, J, U
4,4'-DDT	n.v.	0.2	<0.1 U	<0.1 U	<0.199 A2, J, U	<0.1 A2, J, U	<0.1 J, A2, U	NA	<0.196 A2, J, U
Aldrin	n.v.	0.004	<0.05 U	<0.05 U	<0.099 A2, J, U	<0.05 A2, J, U	<0.05 J, A2, U	NA	<0.098 A2, J, U
alpha-BHC	n.v.	0.1	<0.05 U	<0.05 U	<0.099 A2, J, U	<0.05 A2, J, U	<0.05 A2, J, U	NA	<0.098 A2, J, U
alpha-Chlordane	2	n.v	<0.05 U	<0.05 U	<0.099 A2, J, U	<0.05 A2, J, U	<0.05 A2, J, U	NA	<0.098 A2, J, U
beta-BHC	n.v.	0.073	<0.05 U	<0.05 U	<0.099 A2, J, Q4,	<0.05 A2, J, U	<0.05 A2, J, U	NA	<0.098 A2, J, U
Chlordane (technical)	2	0.19	<5 U	<5 U	<9.94 A2, J, U	<5 A2, J, U	<5 A2, J, U	NA	<9.82 A2, J, U
delta-BHC	n.v.	n.v	<0.05 U	<0.05 U	<0.099 A2, J, Q2,	<0.05 A2, J, Q2,	<0.05 A2, J, Q2,	NA	<0.098 A2, J, Q2,
Dieldrin	n.v.	0.0042	<0.1 U	<0.1 U	<0.199 A2, J, U	<0.1 A2, J, U	<0.1 A2, J, U	NA	<0.196 A2, J, U
Endosulfan I	n.v.	220	<0.05 U	<0.05 U	<0.099 A2, J, U	<0.05 A2, J, U	<0.05 A2, J, U	NA	<0.098 A2, J, U
Endosulfan II	n.v.	220	<0.1 U	<0.1 U	<0.199 A2, J, U	<0.1 A2, J, U	<0.1 A2, J, U	NA	<0.196 A2, J, U
Endosulfan sulfate	n.v.	n.v	<0.1 U	<0.1 U	<0.199 A2, J, U	<0.1 A2, J, U	<0.1 A2, J, U	NA	<0.196 A2, J, U
Endrin	2	11	<0.1 U	<0.1 U	<0.199 A2, J, U	<0.1 A2, J, U	<0.1 A2, J, U	NA	<0.196 A2, J, U
Endrin aldehyde	n.v.	n.v	<0.1 U	<0.1 U	<0.199 A2, J, U	<0.1 A2, J, U	<0.1 J, A2, U	NA	<0.196 A2, J, U
Endrin ketone	0.2	n.v	<0.1 U	<0.1 U	<0.199 A2, J, U	<0.1 A2, J, U	<0.1 J, A2, U	NA	<0.196 A2, J, U
gamma-BHC (Lindane)	2	0.052	<0.05 U	<0.05 U	<0.099 A2, J, U	<0.05 A2, J, U	<0.05 A2, J, U	NA	<0.098 A2, J, U
gamma-Chlordane	2	n.v.	<0.05 U	<0.05 U	<0.099 A2, J, U	<0.05 A2, J, U	<0.05 A2, J, U	NA	<0.098 A2, J, U
Heptachlor	0.4	0.015	<0.05 U	<0.05 U	<0.099 A2, J, U	<0.05 A2, J, U	<0.05 J, A2, U	NA	<0.098 A2, J, U
Heptachlor epoxide	0.2	0.0074	<0.05 U	**0.075**	<0.099 A2, J, Q4,	<0.05 A2, J, U	<0.05 A2, J, U	NA	<0.098 A2, J, U
Methoxychlor	40	180	<0.5 U	<0.5 U	<0.994 A2, J, U	<0.5 A2, J, U	<0.5 J, A2, U	NA	<0.982 A2, J, U
Toxaphene	3	0.061	<5 U	<5 U	<9.94 A2, J, U	<5 A2, J, U	<5 A2, J, U	NA	<9.82 A2, J, U
Explosives and Energetics (ug/L)									
1,3,5-Trinitrobenzene	n.v.	1100	**0.085**	**0.069 J**	<0.11 UJ	**0.035 J**	<0.098 UJ	NA	<0.1 UJ
1,3-Dinitrobenzene	n.v.	3.6	<0.1 U	<0.099 U	<0.11 UJ	<0.11 UJ	<0.098 UJ	NA	<0.1 UJ
2,4,6-Trinitrotoluene	n.v.	2.2	<0.1 U	<0.099 U	<0.11 UJ	<0.11 UJ	<0.098 UJ	NA	<0.1 UJ
2,4-Dinitrotoluene	n.v.	730	<0.1 U	<0.099 U	<0.11 UJ	<0.11 UJ	<0.098 UJ	NA	<0.1 UJ
2,6-Dinitrotoluene	n.v.	360	<0.1 U	**0.087 J**	<0.11 UJ	<0.11 UJ	<0.098 UJ	NA	<0.1 UJ
2-Amino-4,6-dinitrotoluene	n.v.	n.v.	<0.2 U	<0.2 U	<0.22 UJ	<0.22 UJ	<0.2 UJ	NA	<0.2 UJ
2-Nitrotoluene	n.v.	n.v.	<0.5 U	<0.5 U	<0.55 UJ	<0.56 UJ	<0.49 UJ	NA	<0.5 UJ
3-Nitrotoluene	n.v.	n.v.	<0.5 U	<0.5 U	<0.55 UJ	**0.15 J**	<0.49 UJ	NA	<0.5 UJ
4-Amino-2,6-dinitrotoluene	n.v.	n.v.	<0.1 U	<0.099 U	<0.11 UJ	<0.11 UJ	<0.098 UJ	NA	<0.1 UJ
4-Nitrotoluene	n.v.	n.v.	<0.5 U	<0.5 U	<0.55 UJ	<0.56 UJ	<0.49 UJ	NA	<0.5 UJ
HMX	n.v.	1800	<0.1 U	**0.033 J**	<0.11 UJ	<0.11 UJ	<0.098 UJ	NA	**0.049 J**
Nitrobenzene	n.v.	3.4	<0.1 U	<0.099 U	<0.11 UJ	<0.11 UJ	<0.098 UJ	NA	<0.1 UJ
Nitrocellulose	n.v.	n.v.	<500 U	<500 U	<500 U	<500	<500 U	NA	<500 U
Nitroglycerin	n.v.	4.8	<0.65 U	<0.64 U	<0.72 UJ	<0.72 UJ	<0.64 UJ	NA	<0.66 UJ
RDX	n.v.	0.61	<0.1 U	**0.11**	<0.11 UJ	<0.11 UJ	<0.098 UJ	NA	<0.1 UJ
Tetryl	n.v.	n.v.	<0.1 U	<0.099 U	<0.11 UJ	<0.11 UJ	<0.098 UJ	NA	<0.1 UJ
White Phosphorus	n.v.	0.73	<0.0131	<0.0131	<0.0131	<0.0131	<0.0131	NA	<0.0131

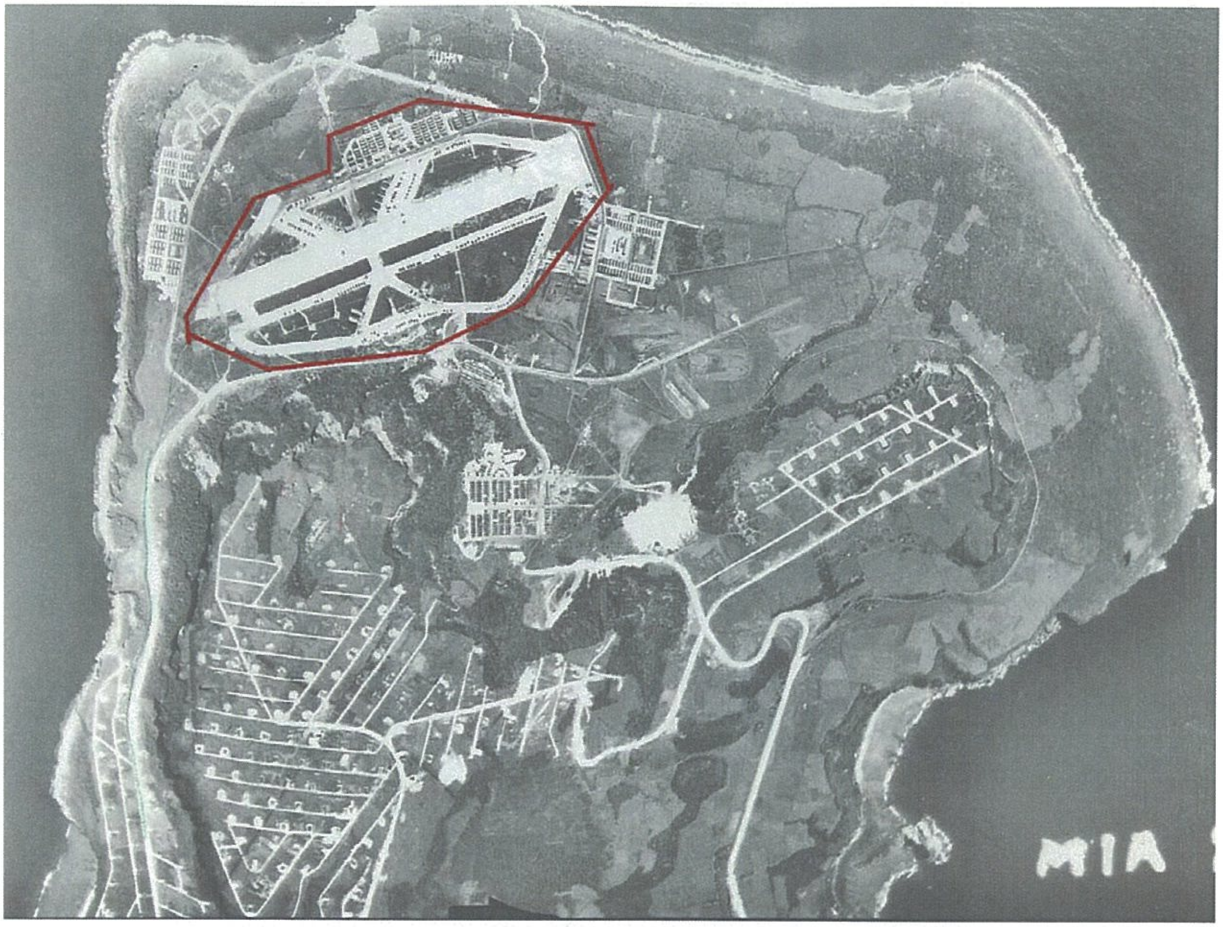
Table 2
Analytical Results
Saipan UXO Brownsfields
Saipan, CNMI

Parameter	USEPA MCLs* (ug/L)	USEPA Tap Water PRGs** (ug/L)	UXO-1	UXO-2	UXO-3	UXO-4	UXO-3001EB[1]	UXO-2001FB[2]	UXO-1003[3]
Inorganic Compounds									
Ammonia as N	n.v.	n.v.	**600**	**170 J, C1**	**870 A2, J**	<300 A2, J, U	<300 A2, J, U"	NA	**850 A2, J**
Cyanide (total)	200	730	<10 U	<10 U	<10 J, A2, U	<10 J, A2, U	<10 J, A2, U	NA	<10 J, A2, U
Nitrate+Nitrite as N	10,000 /1,000	10,000/1,000	**2100 Q4, J**	**300**	**220 C1, A2, J**	**400 J, A2**	<300 J, A2, U	NA	**220 C1, A2, J**
Nitrogen, Total Kjeldahl	n.v.	n.v.	**970**	**600**	**970 A2, J**	**400 A2, J**	**290 A2, A3, C1**	NA	**1000 A2, J**
Perchlorate	n.v.	3.6	<4 U	<10 U	<4 A2, A3, J,	<2 A2, A3, J,	<2 A2, A3, J,	NA	<4 A2, A3, J,
Phosphorus, Total	n.v.	n.v.	**2000 J, Q4**	**1200**	<300 A2, A3, J,	<300 A2, J, U	<300 A2, J, U	NA	<300 A2, J, U
Metals (ug/L)									
Aluminum	n.v.	36,000	**25 C1, J**	33 C1, J	<20 U	<20 U	<20 U	NA	<20 U
Antimony	6	15	<2 U	<2 U	<1 U	<1 U	<1 U	NA	<1 U
Arsenic	10	0.007	**1.9 C1, J**	**1.2 C1, J**	**3.5**	**0.63 C1, J**	<1 U	NA	**3.8**
Barium	2,000	2,600	**30**	**53**	**26**	**26**	<1 U	NA	**25**
Beryllium	4	73	<1 U	<1 U	<0.5 U	<0.5 U	<0.5 U	NA	<0.5 U
Boron	n.v.	7,300	**220**	**500**	**220**	**110**	<100	NA	**220**
Cadmium	5	18	<2 U	<2 U	<1 U	<1 U	<1 U	NA	<1 U
Calcium	n.v.	n.v.	**150000**	**160000**	**120000**	**120000**	**68 C1, J**	NA	**120000**
Chromium	100	n.v.	<2 U	<2 U	<1 U	<1	<1 U	NA	<1 U
Cobalt	n.v.	7,300	**1.5**	**4.1**	**4.3**	**0.67**	<0.5 U	NA	**3.8**
Copper	1,300	1,500	**5.1**	**9.3**	**1 C1, J**	<2 U	<2 U	NA	<2 U
Hardness, as CaCO3 (Calculated)	n.v.	n.v.	NA	NA	**540**	**410**	**1.2**	NA	**530**
Iron	n.v.	11,000	<100 U	<100 U	**960**	<100 U	<100 U	NA	**940**
Lead	15	n.v.	<4 U	<4 U	<2 U	<2 U	<2 U	NA	<2 U
Magnesium	n.v.	n.v.	**57000**	**120000**	**55000**	**28000**	<500	NA	**54000**
Manganese	n.v.	880	**120**	**500**	**600**	**42**	<2 U	NA	**580**
Mercury	2	11	<0.03 U	<0.03 U	<0.03 U	<0.03 U	<0.03 U	NA	<0.03 U
Molybdenum	n.v.	180	**5**	**6.5**	**17**	**2.4**	<0.5 U	NA	**17**
Nickel	n.v.	730	**10**	**12**	**11**	**6.9**	<1 U	NA	**11**
Potassium	n.v.	n.v.	**16000**	**43000**	**17000**	**6900**	<2000	NA	**17000**
Selenium	50	180	<2 U	2.4	<2 U	<2 U	<2 U	NA	<2 U
Silver	n.v.	180	<1 U	<1 U	<0.5 U	<0.5 U	<0.5 U	NA	<0.5 U
Sodium	n.v.	n.v.	**560,000**	**1,200,000**	**520,000**	**270000**	<500	NA	**510,000**
Thallium	2	2.4	<4 U	<4 U	<2 U	<2 U	<2 U	NA	<2 U
Vanadium	n.v.	36	<8 U	<8 U	<4 U	<4 U	<4 U	NA	<4 U
Zinc	n.v.	11,000	**7.4 C1, J**	**15**	<5 U	**2.8 C1, J**	<5 U	NA	**2.5 C1, J**
Total Petroleum Hydrocarbons (ug/L)									
TPH as Diesel	n.v.	n.v.	**1,200 F1**	**3,000 F1**	**860 A2, F1, J**	**180 A2, C1, F1**	<250 A2, J, U	NA	**860 A2, F1, J**
TPH as Gasoline	n.v.	n.v.	**85 F1**	**54 F1**	**120 A2, F1, J**	**26 A2, C1, F1**	<50 A2, J, U	NA	**120 A2, F1, J**
TPH as Motor Oil	n.v.	n.v.	**1,000 F1**	**790 C1, F1, J**	**750 A2, C1, F1**	**660 A2, C1, F1**	<1000 A2, J, U	NA	<2000 A2, J, U

* - United States Environmental Protection Agency Maximum Contaminant Level
** - United States Environmental Protection Agency Tap Water Preliminary Remediation Goal
1 - Equipment blank sample
2 - Field Blank
3 - Duplicate sample to UXO-3
BOLD- Analyte detected above laboratory
Shaded - Analyte concentration exceeds comparison criteria
n.v. - No value available
J - The reported result for this analyte should be considered an estimated value.
U - This analyte was not detected.
N TIC - Tentatively Idenitified Compound - This compound was identified only by match with mass spectral library. Identification and quantitation should be considered tentative and presumptive.
A2 - The sample was received above the recommended temperature range of 0 - 6 degrees C.
A3 - 'The sample was extracted/analyzed past the recommended holding time.
F1 - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.
C1 - The reported concentration for this analyte is below the quantitation limit.
C2 - The reported concentration for this analyte is above the calibration range of the instrument.
C3 - The initial calibration for this analyte did not meet calibration criteria.
C4 - The calibration verification check did not meet % difference criteria for this analyte.
Q2 - The laboratory control standard associated with this sample did not meet recovery criteria for this analyte.
Q3 - 'The quantitation limit standard did not meet recovery criteria for this analyte.
Q4 - The matrix spike and/or matrix spike duplicate associated with this sample did not meet recovery criteria for this analyte.
Q6 - Matrix spike/matrix spike duplicate precision criteria were not met for this analyte.

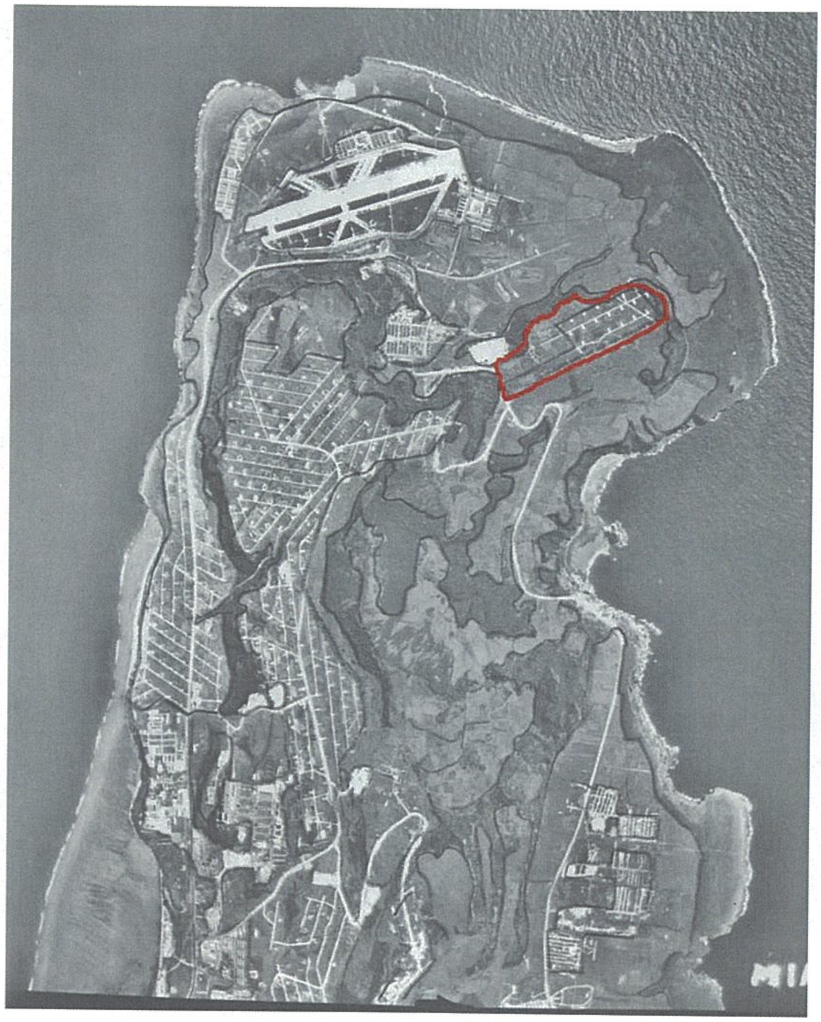
APPENDIX A

AERIAL PHOTOS



Marpi, Saipan, CNMI,

Aerial View 1945



Marpi, Saipan, CNMI,

Aerial View 1945

APPENDIX B

AMPRO REPORT

AMPRO

ORDNANCE AND EXPLOSIVES CONSULTANTS

UNEXPLODED ORDNANCE SUPPORT
DPS DEMO SITE TEST WELLS
SAIPAN

FINAL REPORT

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OVERVIEW

This report summarizes an Unexploded Ordnance (UXO) hazardous material remediation accomplished by Ampro, Inc. in support of the Saipan DPS Demo Site Monitoring Wells project. The report contents are:

~ Scope of Work requirements of the UXO Survey & Clearance
~ Summary of Events for the UXO Survey & Clearance
~ Identification of the type and quantities of ordnance discovered at the site along with other relevant artifacts of World War II military presence

BACKGROUND

Improvements to the Department of Public Safety Explosive Demolition site, located along the Laderan Laggun cliffline in Marpi, include 4 monitoring wells. These wells will be placed along the periphery of the demo site area to monitor contaminants which may leach into the groundwater layers as a result of explosive demolition operations at the site.

Installation of these wells will require stripping of surface vegetation within the immediate location of the wells and preparation of an access road to place well #4. As these actions may encounter Unexploded Ordnance (UXO) which may be present in the area, this proposal provides for ground clearance, monitoring and removal of any UXO within the working areas to prevent the possibility of an explosive accident or incident.

SCOPE OF WORK

AMPRO, Inc provided the following services in support of this project:

<u>Field Investigation, Monitoring and Clearance of Unexploded Ordnance (UXO)</u>

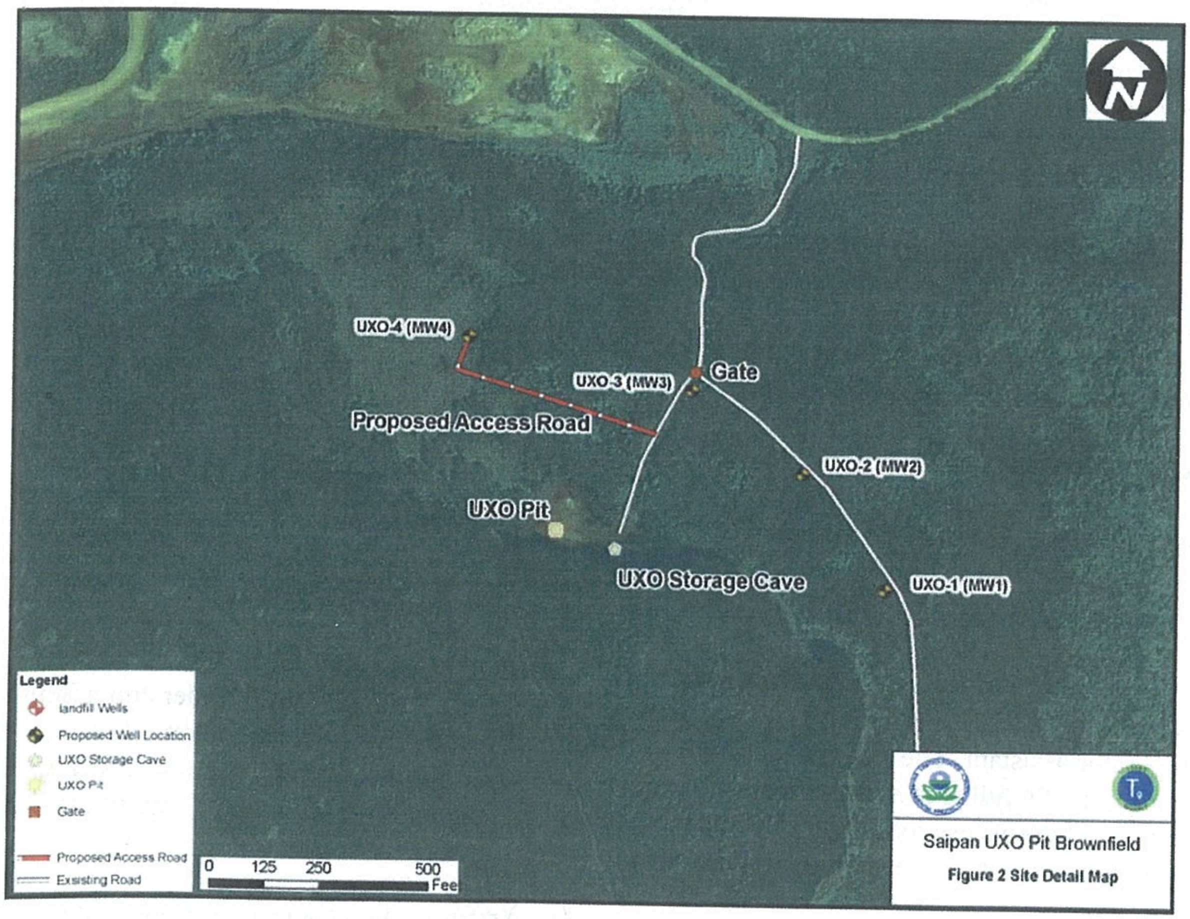
A systematic surface and subsurface search will be made by a two-man UXO Clearance team consisting of a US Army Corps of Engineers qualified UXO Specialist team leader and a Sensor Operator/assistant. The site clearance will be conducted with a flux-gate magnetometer and compose of a full area search across the areas to be cleared for installation of the monitoring wells and the access road. The clearance sweep will be conducted in advance of, and immediately after mucking of the vegetation at these sites.

Monitoring of drilling activity will be conducted by a UXO Technician to sweep the drill site immediately before drilling commences and to monitor a minimum of 2 meters depth of drill tailings for the presence of ordnance. Depths deeper than 2 meters will not require monitoring as it is considered too deep to have UXO present.

As appropriate to conditions & hazards of UXO found, these items will either be identified, explosive condition determined and removed from the site. If a significant hazard exists with non-ferrous components, commercial all-metal detectors will be used as a second scan to the magnetometer to locate non-ferrous components. Records will be kept and pictures taken of location, type, quantity and general condition of UXO items found.

All UXO items found containing explosive components will be identified and removed from the site and turned over to the CNMI Explosive Response Team (XRT)) for disposal.

SITE MAP



SUMMARY OF EVENTS

UXO MONITORING AND CLEARANCE SUPPORT

PROJECT COORDINATION MAY 30th

Ampro Senior UXO Supervisor (SUXOS) John Scott met with Roy Bueno of Alexander Drilling on Saipan. We went over the plan and coordinated for Ampro to provide a UXO tech commencing April 2-5 with the 6th as a backup date. Plans call for mucking the access road and the four drill pads during that time. Field support will also include monitoring down one meter on the intended drill shaft to clear the upper areas of any UXO prior to drilling commencing. Clarification was made to ensure earthmoving permits were completed and that the sites had been recently surveyed and marked to identify the test well sites and boundaries of the access road.

SITE SUPPORT APRIL 2-6

Ampro SUXOS John Scott and UXO Technician III JD Robinson met the earthmoving crew at the site Monday morning and provided a tailgate safety meeting regarding UXO identification, precautions and procedures if found. Communication signals were worked out with the heavy equipment operator and a site tour was conducted.

Operational support commenced with initial ground checks of the site prior to heavy equipment operations to clear any UXO from surface areas. Once vegetation was removed to near the surface, followup checks with Magnetometers were done to reveal metal contacts below the surface.

All metal contacts were marked and objects of high magnitude readings were excavated to 30 cm. UXO Technicians completed final hands-on excavation of any ordnance contacts and made condition inspections and field notes. All ordnance items located were photographed and explosive components removed from the site. Significant artifacts that provide evidence of World War II military occupation were also examined and noted.

Initial UXO checks of all four well sites and the access road at the Marpi UXO disposal facility were completed during this week. Numerous UXO related items, consisting primarily of fragmentation pieces,, burned out projectiles and 5 UXO items containing explosive components were recovered.

Status as of April 6: A typhoon watch, equipment problems and substantial rock encountered at the site pushed support requirements into another week. There was still a lot of rock and knocked down surface vegetation uncleared from the access road and drill sites, primarily in Site 4. We needed that out of the way before we can do a final subsurface check to complete UXO clearance. Final grading and mucking of the sites was planned for Monday, April 9 with final UXO checks scheduled for Tuesday, April 10.

SITE SUPPORT APRIL 9-10

One of our primary purposes of having a man onsite is to monitor for UXO being unearthed while the bulldozer is mucking the site. In view of the confirmed presence of UXO at the site, it's a strong possibility for the bulldozer to unearth something while clearing large rocks and the remaining surface vegetation. Accordingly, UXO monitoring support was provided for both Monday and Tuesday of the following week. Final checks at the site recovered several more live UXO items. Project support was completed on April 10th.

CLEARANCE RESULTS

We found ordnance and ordnance components on both the surface and within 30 cm of the surface using magnetometer detection equipment and manual excavation procedures. Significant UXO items removed from the site include:
Well site #1: no UXO items containing live components
Well site #2: 1 - US 75mm Armor Piercing projectile
Well site #3: 1 - US 105mm High Explosive projectile
Access road to well site #4: 3 US 105mm High Explosive Projectile,& 1 Japanese 50mm "knee mortar" round, two 81mm mortars
Well site #4: 1 - US 105mm High Explosive projectile, 2 US MK2 Hand Grenades, 1 US 75mm High Explosive projectile

All explosive containing items were removed from the site and turned over to Saipan DPS Explosive Response Team officers for future disposal. Examples of these ordnance items are contained in Appendix A

CURRENT STATUS

All work is complete. Appendix A provides photograph documentation of the significant ordnance items found at the site.

April 20, 2007

John L. Scott
President, AMPRO Inc.


Access Road Initial Mucking & Clearing


Drill Site Preparation – Note Extensive Rock

US MK2 Hand Grenades

81mm Mortar Rounds, 75mm & 105mm projectiles

US 75mm Projectile

US 105mm Projectile

US 90mm Armor Piercing Projectile

First Day Collection

APPENDIX C

GEOLOGIC BORING LOGS

UXO-1

DEPTH IN FEET	SAMPLING: TYPE OF SAMPLER	SAMPLING: RESISTANCE (blows per foot)	SAMPLING: PID READING (parts per million)	SAMPLES	SYMBOL	DESCRIPTION
0					CL	CLAY, dark reddish brown (5YR - 3/2) low plasticity, moist, some organics/roots and limestone fragments.
					LS	LIMESTONE, dark reddish brown (5YR 3/2) and very pale brown (10YR 8/2), moderately weathered.
5	S					
10						
20	S					LIMESTONE, very pale brown (10YR 8/2) and white (10YR 8/1), slightly to moderately weathered.
30	S					LIMESTONE, very pale brown (10YR 8/2) and white (10YR 8/1) and dark reddish brown (5YR 3/2), slightly to moderately weathered.
40	S					LIMESTONE, very pale brown (10YR 8/2) and white (10YR 8/1) and some pink, slightly weatehered.
45	S					
50	S					LIMESTONE, very pale brown (10YR 8/2) and white (10YR 8/1) and trace dark reddish brown slightly weathered.
60	S					Driller reports cavity at 58' bgs, foam circulation lost. No data Driller reports end of cavity at 62' bgs.
70	S					No data
80	S					No data
90	S					No data
100						

Continued Next Page

Job No: 36548284 Pt. ID: SAIPAN UXO.GPJ / UXO-1		**Log of Boring**
Date Completed: 4/27/07 Boring Depth: 195.0 ft.	Surface Elev: 187.565 Coordinates: 200823.1 N, 204268.6E	Location: Marpi, Saipan, CNMI

UXO-1

DEPTH IN FEET	SAMPLING: TYPE OF SAMPLER	SAMPLING: RESISTANCE (blows per foot)	SAMPLING: PID READING (parts per million)	SAMPLES	DESCRIPTION
100	S				No data
110	S				No data
120	S				No data
130	S				No data
	S				
140					No data
150					No data
160					No data
170	S				No data
180	S				No data
190					No data
200					End of boring @ 195' bgs.

UXO-2

DEPTH IN FEET	SAMPLING: TYPE OF SAMPLER	SAMPLING: RESISTANCE (blows per foot)	SAMPLING: PID READING (parts per million)	SAMPLES	SYMBOL	DESCRIPTION
0					CL	CLAY, dark reddish brown (5YR - 3/2) low plasticity, moist, some organics/roots and limestone fragments.
					LS	LIMESTONE
10	S					LIMESTONE, white (5YR 8/1) and pink (5YR 8/4) and trace dark reddish brown (5YR 3 slightly weathered.
20	S					LIMESTONE, yellowish brown (10YR 5/4) and some dark reddish brown (5YR 3/3), slig to moderately weathered.
30	S					LIMESTONE, white (10YR 8/1) and very pale brown (10YR 8/2), slightly weathered.
40	S					LIMESTONE, white (5YR 8/1) and pink (5YR 8/4), slightly weathered.
50	S					LIMESTONE, white (5YR 8/1) and pink (5YR 8/4) and some dark reddish brown (5YR slightly weathered.
60	S					LIMESTONE, very pale brown (10YR 8/2) and pink (5YR 3/3), slightly weathered.
70	S					LIMESTONE, very pale brown (10YR 8/2) and pink (5YR 8/4) and some dark reddish (5YR 3/5), slightly weathered.
80	S					LIMESTONE, pink (5YR 3/3) and very pale brown (10YR 8/2), moderately weathered
90	S					LIMESTONE, reddish yellow (5YR 6/6) and white (5YR 8/8), slightly to moderately weathered.
100						

Continued Next Page

Job No: 36548284 Pt. ID: SAIPAN UXO.GPJ / UXO-2		**Log of Borin**
Date Completed: 4/21/07 Boring Depth: 200.0 ft.	Surface Elev: 181.768 Coordinates: 201085.8 N, 204110.9E	Location: Marpi, Saipan, CNMI

UXO-2

DEPTH IN FEET	SAMPLING: TYPE OF SAMPLER	SAMPLING: RESISTANCE (blows per foot)	SAMPLING: PID READING (parts per million)	SAMPLES	SYMBOL	DESCRIPTION
100	S					LIMESTONE, reddish yellow (5YR 6/6) and very pale borwn (10YR 8/2), slightly to moderately weathered, calcite crystals 1/4" in length.
						Driller reports estimated 4'-thick cavity at 106' bgs, foam circulation lost
110	S					No data
120						No data
130	S					No data
	S					
140						No data
150						No data
160						No data
170	S					No data
180	S					No data Driller reports estimated 4'-thick cavity at 180' bgs
190	S					No data
200						

Continued Next Page

UXO-2

DEPTH IN FEET	SAMPLING: TYPE OF SAMPLER	SAMPLING: RESISTANCE (blows per foot)	SAMPLING: PID READING (parts per million)	SAMPLES	SYMBOL	DESCRIPTION
200						End of boring @ 200' bgs.
210						
220						
230						
240						
250						
260						
270						
280						
290						
300						

UXO-3

DEPTH IN FEET	SAMPLING: TYPE OF SAMPLER	RESISTANCE (blows per foot)	PID READING (parts per million)	SAMPLES	SYMBOL	DESCRIPTION
0					SC	SANDY CLAY, dark red (2.5YR 3/6), moist fine sands, low plasticity.
					LS	LIMESTONE, very pale brown (10YR 8/2), some hints of light pink.
10						
						LIMESTONE, very pale brown (10YR 8/2), pink tint on some.
20						LIMESTONE, pinkish gray (5YR 7/2).
30						LIMESTONE, pinkish gray (5YR 7/2) slightly weathered to dark red (2/5 YR 3.6), moderately weathered, trace fines on dark red weathered pieces.
40	S					LIMESTONE, pinkish gray (5YR 7/2) slightly weathered, less dark red limestone pieces.
50						LIMESTONE, pinkish gray (5YR 7/2), slightly weathered.
						SILTSTONE, dark reddish brown (2/5 YR 2.5/4), trace fine sands, trace limestone chips.
60						
						LIMESTONE, pinkish gray (5YR 7/2) slightly to moderately weathered.
70						
80	S					
	S					
90	S					
	S					LIMESTONE, pinkish gray (5YR 4/2) and very pale brown (10YR 8/2), trace reddish brown limestone, fresh to slightly weathered.
100						

Continued Next Page

Job No: 36548284 Pt. ID: SAIPAN UXO.GPJ / UXO-3		**Log of Boring**
Date Completed: 4/9/07 Boring Depth: 201.0 ft.	Surface Elev: 185.749 Coordinates: 201301.1 N, 203830.9E	Location: Marpi, Saipan, CNMI

UXO-3

DEPTH IN FEET	SAMPLING: TYPE OF SAMPLER	SAMPLING: RESISTANCE (blows per foot)	SAMPLING: PID READING (parts per million)	SAMPLES	SYMBOL	DESCRIPTION
100	S					
	S					LIMESTONE, pinkish gray (5YR 4/2) and very pale brown (10YR 8/2), trace reddish brown, fresh to slightly weathered.
110						
120	S					LIMESTONE, light red (10R 6/6), slightly weathered, trace white calcite crystals.
130						LIMESTONE, reddish brown (5YR 4/3) to dark reddish brown (5YR 3/3), slightly weathered, trace white limestone.
140	S					LIMESTONE, reddish brown (5YR 4/2) and reddish brown (5YR 4/3), slightly weathered.
						LIMESTONE, pinkish gray (5YR 4/2) and reddish brown (5YR 4/3), slighlty weathered.
150						LIMESTONE, pinkish gray (5YR 4/2) and reddish brown (5YR 4/3), slightly weathered.
	S					
160	S					LIMESTONE, pinkish gray (5YR 4/2) and reddish brown (5YR 4/3), slightly weathered.
	S					
170						LIMESTONE, pinkish gray (5YR 4/2) and pink (5YR 7/4), slightly weathered.
	S					
	S					LIMESTONE, pink (5YR 7/4), slightly weathered.
180	S					
						LIMESTONE, pink (5YR 7/4) and white (5YR 8/1), fresh to slightly weathered.
190						LIMESTONE, pink (5YR 7/4) and white (5YR 8/1), fresh to slightly weathered.
200						

Continued Next Page

UXO-3

DEPTH IN FEET	SAMPLING: TYPE OF SAMPLER	SAMPLING: RESISTANCE (blows per foot)	SAMPLING: PID READING (parts per million)	SAMPLES	SYMBOL	DESCRIPTION
200						LIMESTONE, pink (5YR 7/4) and pinkish gray (5YR 4/2)), fresh to slightly weathered.
						End of boring at 201' bgs.
210						
220						
230						
240						
250						
260						
270						
280						
290						
300						

UXO-4

Depth in Feet	Sampling: Type of Sampler	Sampling: Resistance (blows per foot)	Sampling: PID Reading (parts per million)	Samples	Symbol	Description
0					CL	SILTY CLAY, dark red (2.5 YR 2/6), moist, low plasticity. Organics in soil.
10	S				LS	Disseminations LIMESTONE, about 50% clay, 50% limestone, dark red soil (2.5YR 2/6) and pinkish gray (5 YR 4/2) limestones, slightly weathered.
20						LIMESTONE, white (5YR 8/1), slightly weathered, 1/8" pieces.
30	S					LIMESTONE, white (5YR 8/1) and pinkish gray (5YR 4/2), fresh to slightly weathered.
40	S S S					LIMESTONE, pink (5YR 7/3) and light reddish brown (5YR 6/3), fresh to slightly weathered.
50	S S					LIMESTONE, pink (5YP 7/3) and light reddish brown (5YR 6/5), fresh to slightly weathered.
60	S					LIMESTONE, very pale brown (10YR 8/3) and pink (5YR 8/3), fresh to slightly weathered.
70	S					LIMESTONE, very pale brown (10YR 8/3) and white (5YR 8/1), fresh to slightly weathered.
80	S S					LIMESTONE, very pale brown (10YR 8/3), and dark reddish brown (5YR 3/3), slghtly weathered.
90	S					LIMESTONE, very pale brown (10YR 8/3), slightly weathered.
100						

Continued Next Page

Job No: 36548284 Pt. ID: SAIPAN UXO.GPJ / UXO-4		**Log of Boring**
Date Completed: 4/16/07 Boring Depth: 200.0 ft.	Surface Elev: 189.382 Coordinates: 201482.5 N, 203372.3E	Location: Marpi, Saipan, CNMI

SAMPLING						

UXO-4

DEPTH IN FEET	TYPE OF SAMPLER	RESISTANCE (blows per foot)	PID READING (parts per million)	SAMPLES	SYMBOL	DESCRIPTION
100	S					LIMESTONE, very pale brown (10YR 8/3), slightly weathered.
110	S					LIMESTONE, very pale brown (10YR 8/3) and pink (5YR 7/3), slightly weathered.
120	S					LIMESTONE, very pale brown (10YR 8/3) and pink (5YR 7/3), slightly weathered.
130	S					LIMESTONE, very pale brown (10YR 8/3) and pink (5 YR 7/3), trace brown pieces, slightly weathered.
140	S					LIMESTONE, pink (5YR 7/3) and very pale brown (10YR 8/3), slightly weathered.
150	S					LIMESTONE, pink (5YR 7/3) and very pale brown (10YR 8.5) and trace brown (7.5YR 4/3), slightly weathered.
160	S					LIMESTONE, pink (5YR 7/5) and very pale brown (10YR 8/3), slightly weathered.
170	S					LIMESTONE, pink (5YR 7/5), slightly weathered, trace very pale brown.
180	S					LIMESTONE, pink (5YR 7/5) and very pale brown (10YR 8/2), slightly weathered, trace white pieces, trace clays.
190	S					LIMESTONE, pink (5YR 7/3) and very pael borwn (10YR 8/2), slighlty weathered.
	S					
200						

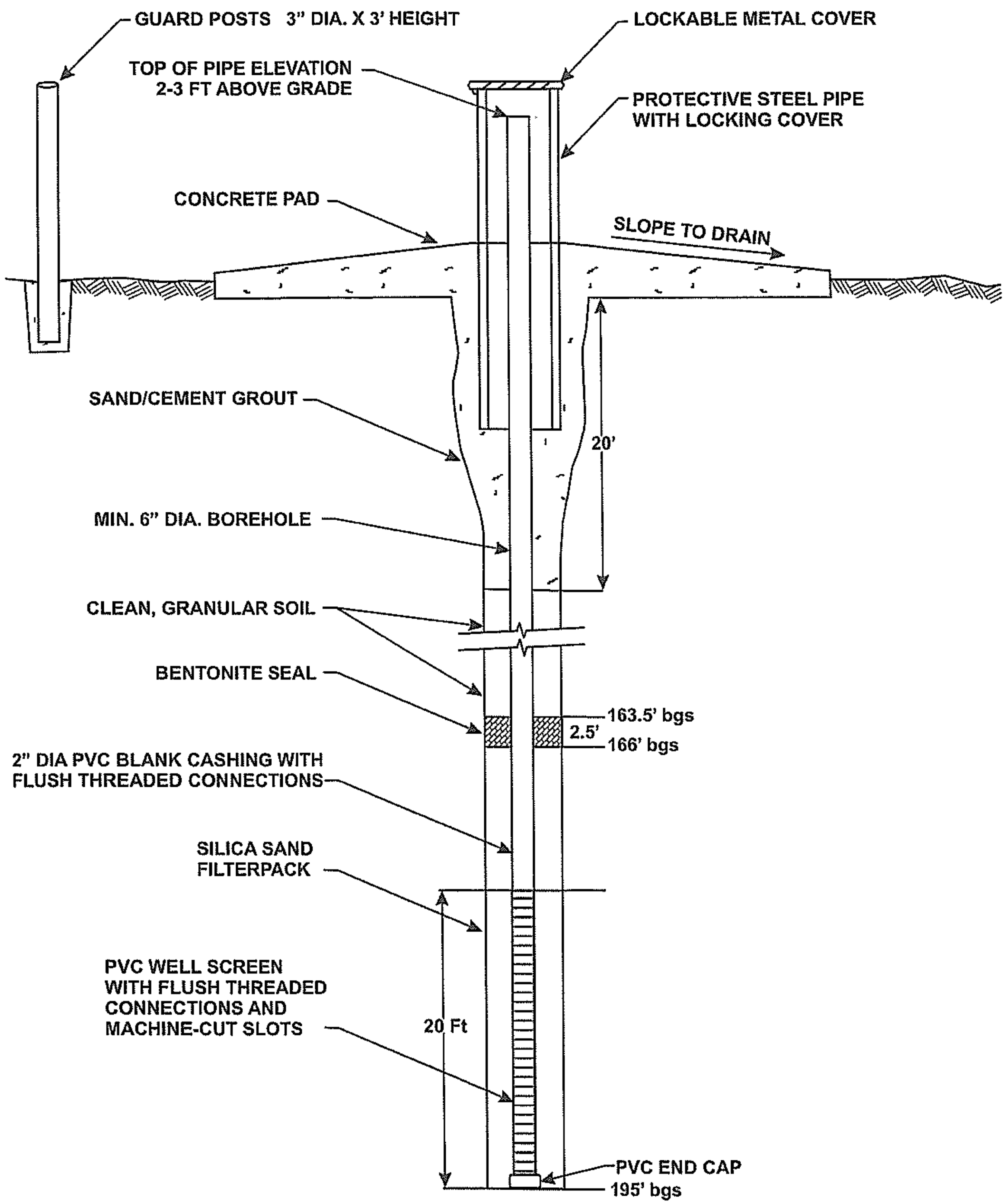
Continued Next Page

UXO-4

DEPTH IN FEET	SAMPLING: TYPE OF SAMPLER	SAMPLING: RESISTANCE (blows per foot)	SAMPLING: PID READING (parts per million)	SAMPLES	SYMBOL	DESCRIPTION
200						LIMESTONE, pink (5YR 7/3) and very pale brown (10YR 8/2), slightly weathered. End of boring at 200' bgs.
210						
220						
230						
240						
250						
260						
270						
280						
290						
300						

APPENDIX D

WELL COMPLETION LOGS



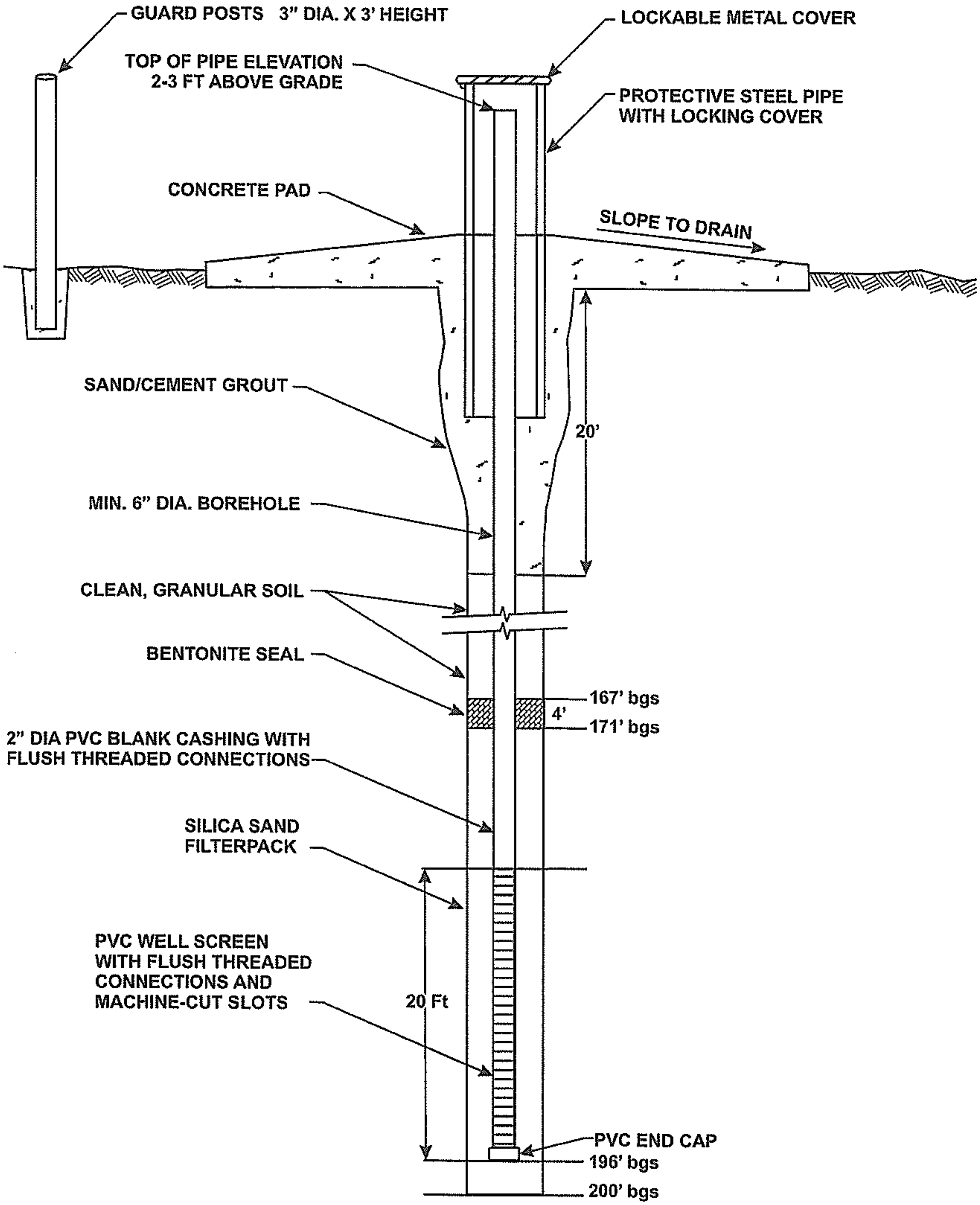
UXO-1 MONITORING WELL DIAGR

Saipan UXC

NOT TO SCALE

October 2007

10/4/07 rk..\V:\START\SITE FOLDERS\Saipan UXOPit\CAD Figures\UXO Figures\UXO-1.cdr



NOT TO SCALE

UXO-2 MONITORING WELL DIAGRAM

Saipan UXO Pit

October 2007

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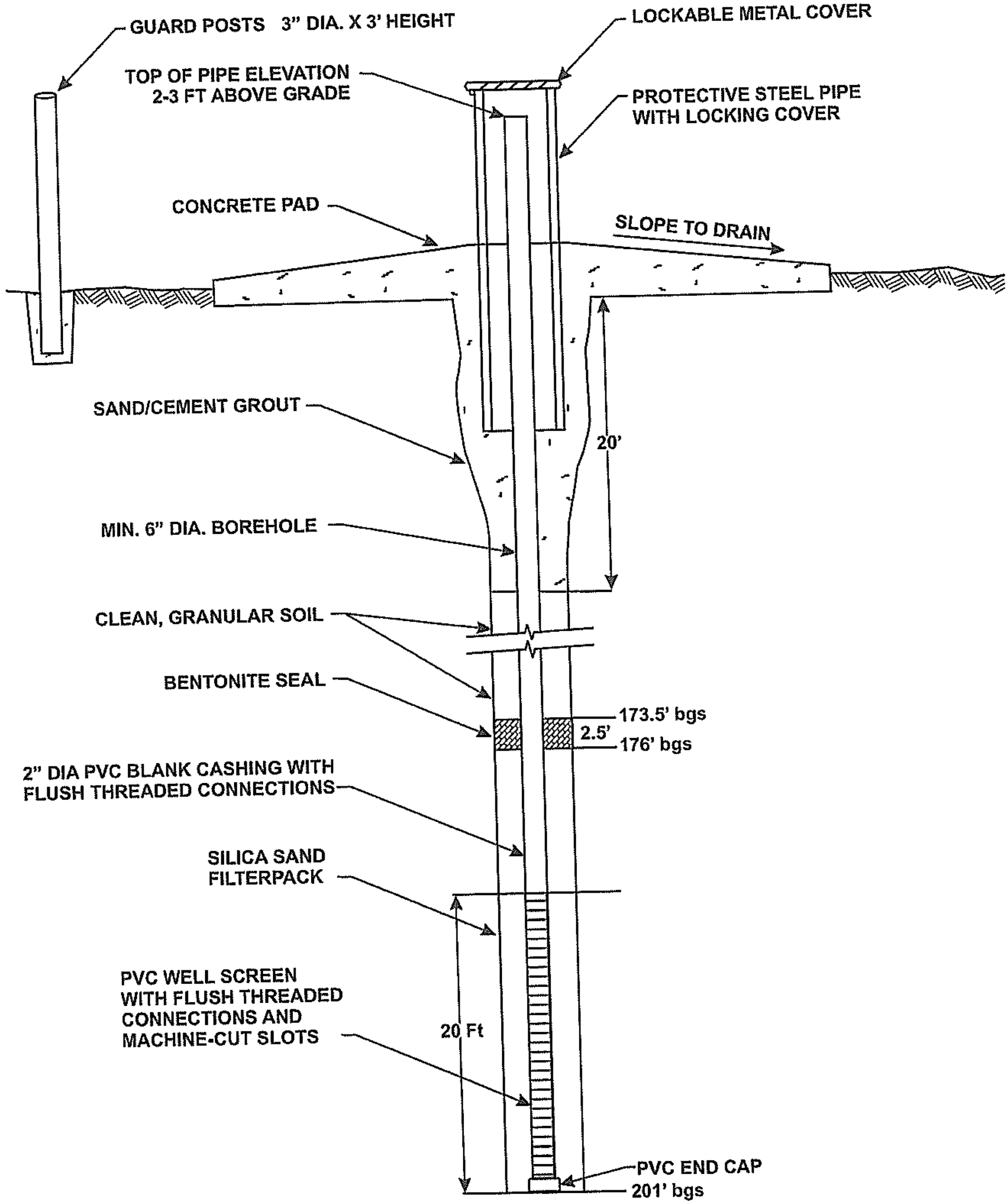

UXO-3 MONITORING WELL DIAGR

Saipan UXO

October 2007

NOT TO SCALE

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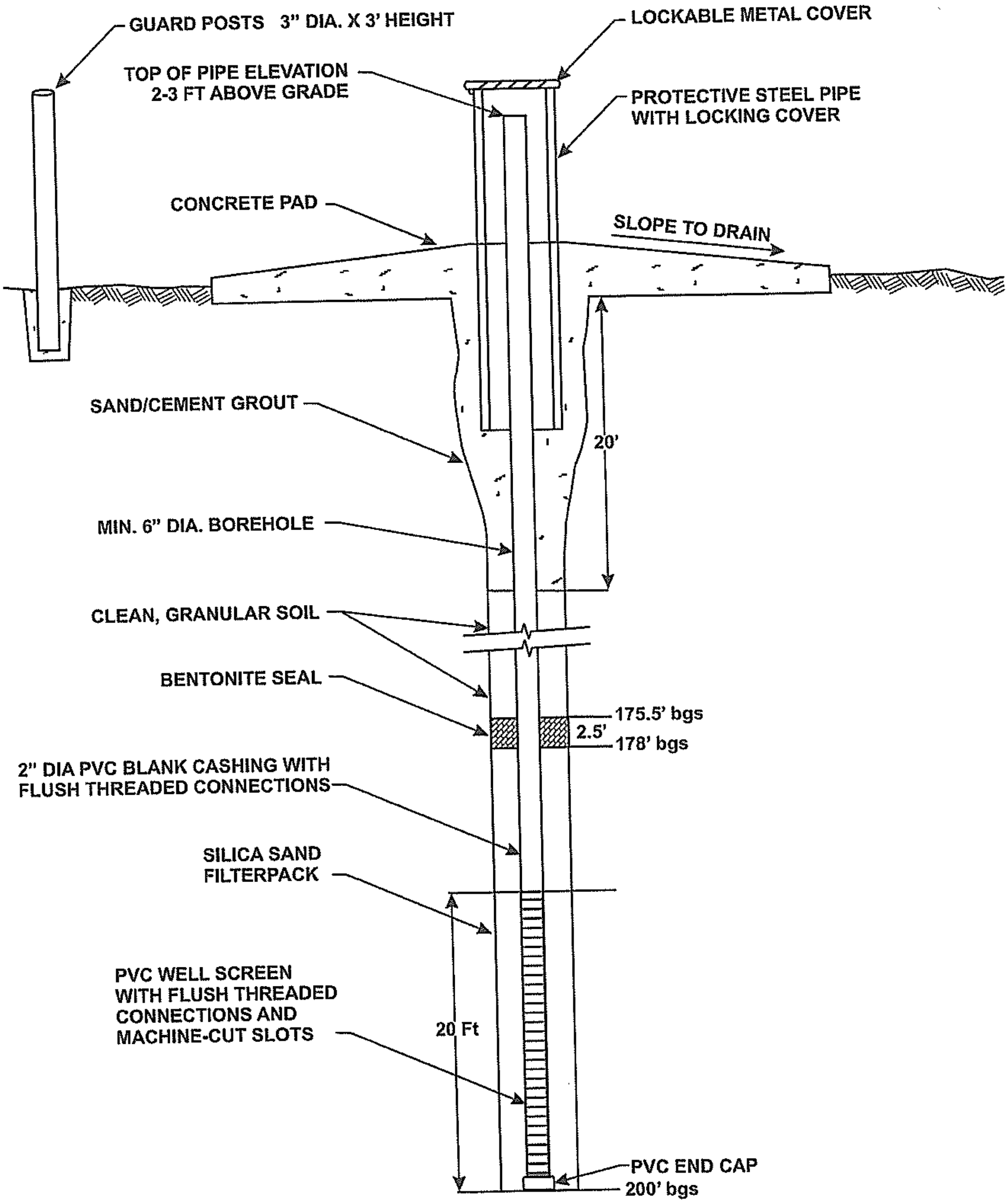

UXO-4 MONITORING WELL DIAGRAM

Saipan UXO Pit

NOT TO SCALE

October 2007

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APPENDIX E

WELL SAMPLING SHEETS

WELL SAMPLING RECORD

Project Name/Client UXO-SAIPAN Sample Location ______ Date 5-11-2007

Project Number ______ Samplers RB @ UXO-1

Well type MW (MW, EW, etc.)

SWL 198 (if above screen)

diameter 2"

equals__gal/ft. casing

175' Top of screen

SWL 188.71 (if in screen)

195 Bottom of screen

Measured T.D. 199

______ T.D. (as built)

Action	Time	Pump rate (gpm)	Water level
Start pump			
Stop			
Sampled			
Final water level			

Purge Calculation

0.17 gal/ft * 10.29 ft. = 1.75 x 3 5.25 gals.

T.D. -SWL one vol. Purge vol. (4 casings)

Purging apparatus / Sampling apparatus / Method

Hand Bail

Actual gallons purged ______

Actual Volumes purged ______

COC # ______

Sample I.D.	Analysis	Lab

Field observations / additional comments

1230 - 1st
1320 - 2nd
1330 - 3rd
1350 - 4th
@ 1420 - Samples Bailed

	Gallons purged	TEMP C / F (circle one)	EC (us/cm) / (ms/cm) (circle one)	pH	Turbidity (NTU)
1	2.5	27.59	3.536	10.79	911
2	4.0	27.73	3.660	7.20	Error
3	6.0	27.02	3.940	7.02	Error
4	8.0	27.12	4.054	7.04	Error
5					

approximately one set of parameters per casing volume

URS

221 Main Street, Suite 600
San Francisco, CA 94105
415.896.5858 Fax 415.882.9261

GROUNDWATER SAMPLING LOG

SITE NAME AND ADDRESS	JOB NUMBER	DATE	WELL #
Saipan UXO, Saipan CNMI		5/11/07	UXO-2

PERSONNEL CONDUCTING SAMPLING

Iain Baker and DeQ

WEATHER CONDITIONS

WEATHER	WIND SPEED	WIND DIRECTION

METER USED ☐ YSI6920 ☐ YSI3500 ☐ MP2 ☒ OTHER: YSI 556 MPS

WELL / WATER STATUS

PID READING: 0

DEPTH TO WATER (FROM TOP OF PVC): 183.53

WATER CONDITION (Color & Odor, Oil Sheen, Etc.): water very TurBid Due to ~~Bait~~ Hand Bail actions

REMARKS: (Weather/Area? Ground surface/Nearby activities/Etc.) cloudy Hot
Well volume = 1.95 gall 3 volumes = 5.85

FIELD READINGS

METHOD: ☐ LF ☒ STANDARD TOTAL PURGED (GAL) TOTAL PURGE TIME (MIN)

TIME	WATER LEVEL	PURGE RATE	VOLUME PURGED	TEMP. (C)	pH	CONDUCT. (25C)	TURBIDITY (NTU)	D.O. (mg/L)	REDOX POTENTIAL
1056		Hand Bail	2	28.19	7.08	6.58	841.0	27.6	264.0
1135			4	27.94	7.13	7.17	841.0	20.5	272.7
1150			6	27.84	7.05	8.83	841.0	30.4	265.1
1210			8	27.68	7.07	7.18	Err	28.9	257.3

SAMPLE

TIME SAMPLE TAKEN	ANALYSES REQUESTED
1220	
SAMPLE ID	

URS
221 Main Street, Suite 600
San Francisco, CA 94105
415.896.5858 Fax 415.882.9261

GROUNDWATER SAMPLING LOG

SITE NAME AND ADDRESS	JOB NUMBER	DATE	WELL #
Saipan UXO, Marpi Saipan		4/26/07	UXO-3

PERSONNEL CONDUCTING SAMPLING
Iain Baker / DEQ

WEATHER CONDITIONS
WEATHER Hot, Sunny
WIND SPEED
WIND DIRECTION

METER USED ☐ YSI6920 ☐ YSI3500 ☐ MP2 ☐ OTHER: YSI 556 MPS

WELL / WATER STATUS
PID READING
DEPTH TO WATER (FROM TOP OF PVC) 187.00
WATER CONDITION (Color & Odor, Oil Sheen, Etc.) Newly installed and Developed well
REMARKS: (Weather/Area? Ground surface/Nearby activities/Etc.)
Disolved O_2 is in %

FIELD READINGS
METHOD: ☒ LF ☐ STANDARD
TOTAL PURGED ~~(GAL)~~ mL 6300
TOTAL PURGE TIME (MIN) 18

TIME	WATER LEVEL	PURGE RATE	VOLUME PURGED	TEMP. (C)	pH	CONDUCT. (25C)	TURBIDITY (NTU)	D.O. (mg/L)	REDOX POTENTIAL
0841		350 mL	0	29.67	7.02	3.084	27.4	37.7	-298.1
0844			1050	29.58	6.95	3.079	20.5	28.7	-262.6
0847			2100	29.69	6.93	3.506	12.3	22.7	-246.8
0850			3150	32.9	6.94	3.516	8.47	22.5	-225.5
0853			4200	33.3	6.94	3.501	7.58	19.7	-228.3
0856			5250	33.32	6.93	3.508	6.41	18.7	-226.7
0859			6300	33.20	6.92	3.509	4.86	19.6	-216.2

8

SAMPLE
TIME SAMPLE TAKEN
ANALYSES REQUESTED
SAMPLE ID

URS
221 Main Street, Suite 600
San Francisco, CA 94105
415.896.5858 Fax 415.882.9261

GROUNDWATER SAMPLING LO

SITE NAME AND ADDRESS	JOB NUMBER	DATE	WELL #
Saipan UXO Marpi Saipan		4/26/07	UXO-4

PERSONNEL CONDUCTING SAMPLING

Jach Baker / DCQ

WEATHER CONDITIONS

WEATHER Hot Sunny | WIND SPEED 5 MPH | WIND DIRECTION South

METER USED ☐ YSI6920 ☐ YSI3500 ☐ MP2 ☐ OTHER: YSI 556 MPS

WELL / WATER STATUS

PID READING .0

DEPTH TO WATER (FROM TOP OF PVC) 191.28

WATER CONDITION (Color & Odor, Oil Sheen, Etc.)
Newly ~~D~~ Installed and Developed well

REMARKS: (Weather/Area? Ground surface/Nearby activities/Etc.)
~~No~~ water Sounder would not go Down well with pump and Tubing Inside
Dissolved oxygen is in percent.

FIELD READINGS

METHOD: ☒ LF ☐ STANDARD TOTAL PURGED ~~(GAL)~~ ML 9750 TOTAL PURGE TIME (MIN) 30

TIME	WATER LEVEL	PURGE RATE	VOLUME PURGED	TEMP. (C)	pH	CONDUCT. (25C)	TURBIDITY (NTU)	D.O. (mg/L)	REDOX POTENTIAL
1031		325 ML/min	0	30.51	7.24	2.310	101.0	62.7	-260.9
1034		↓	975 mL	30.42	7.12	2.277	71.6	57.3	-258.8
1037			1950 mL	30.34	7.14	2.294	117.0	57.0	-263.4
1040			2,925	30.39	7.11	2.257	108.0	56.5	-269.8
1043			3,900	32.78	7.09	2.303	54.4	50.3	-266.9
1047			5200	35.30	7.01	2.292	34.1	34.3	-265.4
1051			6500	34.52	7.04	2.278	33.9	37.0	-258.4
1055			7800 mL	33.24	7.00	2.267	28.4	34.6	-263.9
1058			8775	33.79	7.03	2.266	21.7	30.4	-259.9
1101			9750	36.06	7.01	2.240	16.3	33.5	-261.7

SAMPLE

TIME SAMPLE TAKEN	ANALYSES REQUESTED
1120	
SAMPLE ID	

APPENDIX F

PHOTO LOG

UXO Saipan Site Recon and Well Installation
UXO Pit, Marpi, Saipan, CNMI

PHOTOGRAPH 1:

The UXO storage locker with warning sign.

PHOTOGRAPH 2:

CNMI Police and Explosives Response Team members arranging UXO for destruction.

PHOTOGRAPH 3:

RDX and C4 Explosives being laid over the UXO

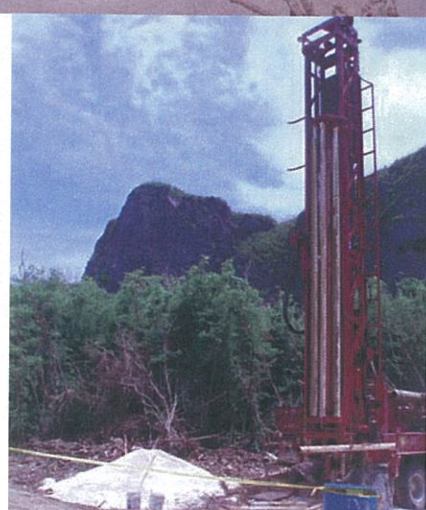
UXO Saipan Site Recon and Well Installation
UXO Pit, Marpi, Saipan, CNMI

PHOTOGRAPH 4:

Drill rig and support truck set up.

PHOTOGRAPH 5:

Rotary foam wash with cuttings. The drilling cuttings are suspended in the foam and forced to the surface with compressed air and more foam.



PHOTOGRAPH 6:

Drill rig mast with rotating carousel shown. Caution tape set up on roadside for public safety.

UXO Saipan Site Recon and Well Installation
UXO Pit, Marpi, Saipan, CNMI

PHOTOGRAPH 7:

START sampling foam to examine drill cuttings.

PHOTOGRAPH 8:

Drillers raising and installing well casing.

PHOTOGRAPH 9:

Installation of clean sand for the filter pack.

PHOTOGRAPH 10:

Installation of clean fill above filter pack and bentonite seal.

PHOTOGRAPH 11:

Above ground finish with concrete foundation and steel bollards.

PHOTOGRAPH 12:

Well development set up with Grunfos pump, and generator.

UXO Saipan Site Recon and Well Installation
UXO Pit, Marpi, Saipan, CNMI

PHOTOGRAPH 13:

START and DEQ groundwater sampling.

PHOTOGRAPH 14:

DEQ measuring groundwater sampling per ammeters.

APPENDIX G

LABORATORY ANALYSIS REPORTS