PROPOSED PLAN
TANAPAG VILLAGE, SAIPAIN
UNITED STATES ARMY CORPS OF ENGINEERS
HONOLULU ENGINEER DISTRICT

INTRODUCTION

This Proposed Plan (Plan) identifies ten alternatives, including the preferred alternative, for reducing polychlorinated biphenyls (PCB) in stockpiled soil located at the Tanapag Village, Island of Saipan, Commonwealth of the Northern Mariana Islands (CNMI) (Figure1). The PCB contaminated soil was removed during the Phase III Removal Action. In addition, the Plan includes summaries of the other contaminant stabilization and reduction alternatives considered for this site. This document is issued by the United States Army Corps of Engineers, Honolulu District (Corps). The Corps will act as the lead agency for the project and the executive agent for the United States Department of Defense (DOD). The Corps and the United States Environmental Protection Agency (USEPA) will select a final remedy for the site. No decision will be made until after full consideration of any comments received from the Commonwealth of the Northern Mariana Islands (CNMI) Department of Environmental Quality (DEQ) and members of the public. Therefore, the public is encouraged to review and comment on all the alternatives presented in this Plan.

The Corps is required to issue the Plan to fulfill public participation requirements under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Section 117(a) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), Section 300.430(f)(2). The Plan summarizes the information contained within the Focused Feasibility Study (FFS; June 14, 2001) to address possible PCB remedial actions with regards to the stockpiled soils. This Plan highlights key information from the FFS, which considered ten remedial alternatives. The Corps encourages the public to review these documents to gain a more comprehensive understanding of the site and activities that have been conducted at the site.

Dates to Remember:

The Corps will accept written comments on the Plan until August 3, 2001. Comments may be submitted to :
Charles W. Adams
Project Manager (ATTN: CEPOH-PP-E)
U.S. Army Engineer District, Honolulu, Bldg. 230
Fort Shafter, HI 96858-5440
(808) 438-3242
(808) 438-7801 (Fax)
e-mail: charles.w.adams@usace.army.mil

Public Comment Period: July 3, 2001 – August 3, 2001

The Corps will hold a public meeting to explain the Plan and all of the alternatives presented in the FFS. Oral and written comments will also be accepted at the meeting. The meeting will be held at the Tanapag Elementary School, Tanapag Village, Saipan at 7:00 PM

Public Meeting: July 11, 2001

For More Information: The Corps will place copies of the Administrative Record for the cleanup project at the following locations not later than July 11:

1. Joeten-Kiyu Library, Susupe, Saipan
2. CNMI DEQ, Morgan Building 3rd Floor, San Jose, Saipan

SITE BACKGROUND

Between 1968 and 1974, an unknown number of electrical capacitors were transported from Public Works Yard (PWY) to Tanapag Village to be used as a perimeter around the Village ballpark/community hall area. Some of the electrical capacitors were also used for a barricade against vehicles entering the Village through Tanapag Beach Park. While the exact year that the capacitors were placed in Tanapag Village is not known, several older residents recall their arrival after Typhoon Jean hit the island in 1968-69. Individuals who were involved in transporting and placing the capacitors in Tanapag Village recall that the capacitors were brought into the Village in 1972. As a result of a typhoon that struck Saipan in the late 1970s, the capacitors became scattered throughout the Village.

DEQ was notified of the presence of numerous cylindrical electrical components in Tanapag Village in December 1988. Upon notification, DEQ field technicians conducted an investigation by collecting samples of the liquid contained within the cylinders. These samples were analyzed, and reported that approximately 60 percent of the samples had concentrations of the PCB Aroclor 1254 that exceed the federal action level.

In 1988, a USEPA Technical Assistance Team proceeded to remove the capacitors from Tanapag Village, bringing them to the PWY for storage in 55-gallon drums to await proper disposal. The drums were stored outside under a tarp. A total of 53 capacitors were removed in 1988; another two were removed from the Village by DEQ in 1991. The capacitors are cylindrical ceramic vessels containing phenolic windings soaked in PCBs and are approximately 4 feet long with an 18-inch diameter.

SITE CHARACTERISTICS

The U.S. Army began a preliminary assessment of Tanapag Village and initiated removal of the capacitors from Saipan in 1990. In August 1992, The Corps initiated Phase I soil removal from Tanapag Village at Site locations identified during preliminary assessment sampling activities, including the Lower Base Yard Excavation. Off-site disposal of 180 tons of PCB-contaminated soils mixed with capacitor debris was completed during Phase I.

In March 1994, the Corps began Phase II of the response action and removed an additional 1,730 tons of contaminated soil from Tanapag Village and Main Cemetery. This soil was treated on-site using a thermal oxidation process. Remediated sites were backfilled with clean quarry-supplied crushed, coral fill, or the treated soil. Approximately 4,000 cubic yards of contaminated soil was left in place at Main Cemetery and covered by a layer of crushed coral. Five hundred and forty nine tons of

soil (approximately 25% to 30% of the Main Cemetery material) was disposed of on the United States mainland. Twenty Sites were identified during Phase II.

USEPA collected additional soil samples identifying new areas of PCB contamination in May 2000. The Corps performed a Time Critical Removal Action, based on the Action Memorandum signed by Commander of the U.S. Army Corps of Engineers, Pacific Ocean Division, on 21 July 2000 for removal of the remaining contaminated soils at Tanapag Cemetery and various locations in and around Saipan Village as Phase III. Phase III included excavation of all identified PCB-contaminated soils and stockpiling of the material from approximately 23 Sites identified during Phase III removal activities. The volume of contaminated soil stockpiled and awaiting treatment and/or disposal is approximately 20,000 tons.

The Contaminants of Concern (COCs) are defined as the chemicals that represent a threat to human health and the environment, and are selected based on their mobility, persistence, toxicity, location and concentration distribution at the site. The chemical driving this Removal Action is the PCB Aroclor 1254. The dielectric fluid used by the capacitor manufacturer consisted of pure Aroclor 1254. Therefore, the PCB Aroclor 1254 is the only chemical considered as a COC, and the only chemical for which samples are tested to characterize the sites. PCB is a suspected carcinogen and bio-accumulates in animal species towards the top of the food chain. PCBs are insoluble and are heavier than water.

WHAT ARE THE "CONTAMINANTS OF CONCERN"?

The Contaminant of Concern at Tanapag Village is the polychlorinated biphenyl (PCB) Aroclor1254. Aroclor 1254 was detected in stockpiled soils at concentrations between 65.7 ppm and 0.449 ppm.

What are PCBs: PCB is a chlorinated organic compound of which 209 "species" exist. PCBs were widely used as a fire preventative and insulator in the manufacture of transformers and capacitors because of their ability to withstand exceptionally high temperatures.

How can PCBs affect my health: People exposed to PCBs in the air for a long time have experienced irritation of the nose and lungs, and skin irritations, such as acne and rashes. It is not known whether PCBs cause birth defects or reproductive problems in people. Some studies have shown that babies born to women who consumed PCB-contaminated fish had problems with their nervous systems at birth. However, it is not known whether these problems were definitely due to PCBs or other chemicals.

How likely are PCBs to cause cancer: It is not known whether PCBs cause cancer in people. In a long-term (365 days or longer) study, PCBs caused cancer of the liver in rats that ate certain PCB mixtures. The Department of Health and Human Services (DHHS) has determined that PCBs may reasonably be anticipated to be carcinogens.

The contaminated stockpile soils are not considered to be "principal threat wastes" because the COCs are not found at concentrations that pose a significant risk. The target level for remediation is based on an assumed residential exposure scenario using a target risk of $1x10^{-5}$ and a cancer slope factor of 7.7 $(ppm\text{-}d)^{-1}$. However, it is emphasized that existing stockpile soils are covered, and are not available for exposure. Workers implementing future soil remediation processes to reduce PCB contamination will be required to wear specialized personal protective clothing to protect potential exposure pathways.

SCOPE AND ROLE

This action, referred to as Remediation of Tanapag Village PCB Contamination, will be the final remedial action at the site. The purpose of this Remedial Action is to reduce PCB concentrations in stockpiled soils to the treatment objective of 1.0 ppm, as specified in *the RCRA Section 7003 Unilateral Administrative Order to the Department of Defense/Department of the Army to Clean Up Polychlorinated Biphenyl Contamination in Tanapag Village, Saipan* (Final Administrative Order) issued by the USEPA on December 20, 2000. The material has been previously identified in the Phase III Removal Action, and is currently stockpiled in the Tanapag Village storage cells.

SUMMARY OF SITE RISKS

Pursuant to the USEPA Region IX preliminary remediation goal (PRG) for PCBs in soil ranges from 0.22 ppm to 1.1 ppm, the Corps adopted a cleanup level of 1.0 ppm of PCBs in soils for the Phase III Removal Action, in lieu of performing a health risk analysis. The USEPA ratified and ordered the Corps to meet the cleanup level of 1.0 ppm in the Final Administrative Order, issued December 20, 2000.

The treatment, storage and disposal of PCBs are regulated under the Toxic Substance Control Act (TSCA), as implemented in Title 40 of the Code of Federal Regulations (CFR) Part 761 (revised 7/1/99). TSCA requirements are applicable to materials that contain PCBs in concentrations equal to or greater than 50 ppm. For impacted soils located in "high occupancy areas" (average of 6.7 hours or more of occupancy per week by an individual not wearing protection equipment), a target level for remediation of 1 ppm for surface soils is recommended. The definition of "high occupancy" could be interpreted to include both residential and industrial/commercial land use setting.

Human Health Risks

From the standpoint of human health concerns, soil PCB concentrations less than 1.0 ppm may be considered relatively low in terms of toxicity. A soil PCB concentration of 1.0 ppm may have adverse effects on human health only if the receptor is exposed to the contaminated soil for a relatively long (several years) period of time, on a chronic basis. The long-term (or chronic) exposure to relatively low levels of PCBs may increase the probability (or risk) of developing cancer or being subject to other non-cancer health effects. Note that the average overall cancer mortality in the U.S. is about 0.33. That means one person out of three will probably develop and die of cancer. The increase of cancer risk due to chronic exposure to low-level contaminants can be quantified using the standard risk assessment methodology recommended by the USEPA. This methodology is based on equations that account for the chemical, physical, and toxicological properties of the chemical of concern, the site environmental settings and land uses, and the behavioral patterns and intake parameters of the receptor populations that may come in contact with the contaminated media. In general, the regulatory agencies allow an increase of estimated cancer risk due to chemical exposure that is much lower than the average overall risk of about 0.33. The USEPA recommends using an increase of the

"target" cancer risk between $1x10^{-4}$(corresponding to a one-in-one-hundred-thousand increase) and $1x10^{-6}$ (corresponding to a one-in-a-million increase). The target risk from chemical exposure is several orders of magnitude lower than the inevitable risk to develop and die of cancer in one's lifetime. The reasons for this apparent inconsistency is based upon many factors including the fact that this risk is not, in general, a risk consciously accepted by the individual (for instance the risk of driving the freeways or drinking alcoholic beverages is not imposed).

The USEPA Region IX PRG for PCBs in soil ranges from 0.22 ppm for residential exposure scenario to 1.1 ppm for commercial-industrial exposure scenario. The PRGs are based on a residential (adults and children) or a commercial/industrial worker scenario, and account for exposure to soil via outdoor inhalation of particulate and vapor emissions (if applicable), and direct contact with soil (that include incidental ingestion and dermal contact). The PRGs correspond to a target risk of one-in-a-million or a hazard quotient of a unit (one) for non-carcinogenic chemicals. According to the USEPA Region IX PRGs, a soil concentration of 0.22 ppm corresponds to a risk of one-in-a-million to develop cancer during a lifetime if the receptor is exposed to the soil for 6 years as a child, 24 years as an adult, spending 24 hours per day, 350 days per year at the site, inhaling 20 cubic meter of air per day, incidentally ingesting 100 mg/day of soil as an adult and 200 mg/day as a child, and experiencing dermal contact with soil over a significant portion of the body. The PRG models estimate that such an exposure scenario corresponds to an excess cancer risk of one-in-a-million. Since concentration and risk are proportional, based on the PRG models the target level for remediation of 1.0 ppm corresponds to less than five-in-a-million excess cancer risk.

Ecological Risks

A screening ecological risk assessment was not performed. Based on the concentration of treated soils that are to remain on-site, and the level of containment of the treated soils, there is little potential for wildlife to have significant exposure.

REMEDIAL ACTION OBJECTIVES

The Remedial Action Objectives are to:

- Reduce PCBs in Stockpiles to 1.0 ppm for materials to be released back to unrestricted areas on the Island and;
- Comply with the EPA Order issued December 20, 2000.

The proposed action will reduce the excess human health risks associated with exposure to PCB contaminated soils to less than one in one million. This will be achieved by reducing the concentrations of PCB in soils to 1.0 ppm or less.

SUMMARY OF REMEDIAL ALTERNATIVES

Remedial alternatives for the Removal Action are presented below. The alternatives are numbered to correspond with the numbers in the FFS.

Common Elements: A majority of the remedies considered in the FFS require thermal treatment to reduce PCB concentrations in the contaminated soil to less than 1.0 ppm. The residual materials from these thermal processes contain the recovered PCBs in a concentrated form and may be disposed of either off the Island or further treated on-site to destroy the recovered PCBs

The criteria used in evaluating the remedial alternatives include the following:

- Overall protection of human health and the environment
- Compliance with ARARs
- Long-term effectiveness and permanence
- Reduction of toxicity, mobility, or volume
- Short-term effectiveness
- Implementability
- Cost

CERCLA and the NCP mandate that these criteria be used as the basis for a proposed remedial action decision. The selected alternative must meet the first two threshold criteria and the other five criteria are balancing criteria used to determine the best alternative under all the circumstances. The final two criteria of CNMI and public acceptance will be evaluated through review of the comments received from the CNMI DEQ and the public in response to this proposed plan.

The following ten remedial alternatives, organized into three groups and the No Action alternative, were evaluated for the Phase III Tanapag Village Remedial Action:

REMEDIAL ALTERNATIVES

Alternative 1: No Action

Estimated Capital Costs: $1,039,500
Estimated Annual Operations and Maintenance Costs (O&M): None
Estimated Present Worth: $1,039,500
Estimated Time Frame: Immediate
Estimated Time to Achieve Remedial Action Objectives: Immediate

A typical No Action alternative would specify no remedial action and have no capitol cost. It would involve no activity at the stockpiles. The No Action alternative is required by the NCP in order to establish a baseline for comparison. Strictly speaking, the No Action alternative would be to leave the stockpiles in place as they are.

Pursuant to the July 21, 2000 Time Critical Removal Action, the Corps has excavated 20,000 tons of contaminated soil and stockpiled this material on the site. In these circumstances, the No Action response would implement no remedial technology or process to reduce or minimize the volume, toxicity or mobility of the PCBs in the soil. However, it may include environmental monitoring and/or institutional controls. It may include the covering the 11 existing soil stockpiles at their present location with additional high-density polyethylene (HDPE) and a 6-inch layer of crushed coral, and maintaining them at this location indefinitely. The stockpiles would require a minimum degree of maintenance for the life of the alternative. Such maintenance could include

repairs of the plastic containment system and control of surface water and erosion. The designated stockpile area would need to be secured by fencing to prevent the public from entering the area.

Alternative 2A: Off-Site Disposal

Estimated Capital Costs: $18,456,900
Estimated Annual Operations and Maintenance Costs (O&M): None
Estimated Present Worth: $18,456,900
Estimated Time Frame: 10 months
Estimated Time to Achieve Remedial Action Objectives: 6 months

Alternative 2A consists of off-site disposal to a licensed treatment, storage, and disposal facility (TSDF), of the stockpiled soils that have been excavated from areas where PCBs detected in soils exceeded 1.0 ppm. The excavated areas were backfilled with clean, imported soil. In this alternative, the contaminated soil would be packaged in Department-of-Transportation (DOT)-rated containers or sacks, typically with a rated capacity of 1-1½ cubic yards. The individual sacks would be loaded into 20-foot shipping containers and transported by ocean carrier to the United States mainland for disposal at an appropriate disposal facility.

Alternative 2B: Off-Site Encapsulation with Stabilization

Estimated Capital Costs: $4,460,000
Estimated Annual Operations and Maintenance Costs (O&M): $5,000
Estimated Present Worth: $4,460,000
Estimated Time Frame: 4 months
Estimated Time to Achieve Remedial Action Objectives: 10 to 24 months

The waste management unit would be designed to permanently store PCB soils. The base of the waste management unit would be designed with a primary and secondary flexible membrane liner (FML) system consisting of 60-mil high density polyethylene (HDPE), and leachate collection and leak detection and removal systems. Contaminated soils would be stabilized to immobilize the PCBs prior to disposal in the waste management unit. This process would be implemented on PCB impacted soils to reduce the potential for leaching, and thereby reducing mobility and bioavailability.

The disposal cell cover would be designed with a cover system would consist of a single layer of 60-mil HDPE, surface water collection and removal system, and a four-foot thick vegetative cover soil layer. The thickness of the vegetative cover is related to the severity of storms that pass through the area. Alternatively, the vegetative cover could be replaced with a reinforced concrete cover to provide additional protection.

Alternative 3A: On-Site Treatment by Thermal Blanket and Thermal Oxidation

Estimated Capital Costs: $18,564,800
Estimated Annual Operations and Maintenance Costs (O&M): None
Estimated Present Worth: $18,564,800
Estimated Time Frame: 4 months
Estimated Time to Remedial Action Objectives: 10 months

The thermal blanket process has been used previously in the United States. This technology was also used for the Phase II Removal Action in 1998-99. The ex-situ thermal desorption system is modular and consists of 32 thermal panels, a vapor treatment system (VTS), power trailer, and control trailer. The power supplied to heating elements below the soil raises the temperature of the soil to a target temperature of 750°F, and is maintained for a minimum of 24 hours, the time expected for the PCBs to be completely volatilized from the soil.

Contaminant vapors are withdrawn from the soil by a vacuum system that feeds a trailer-mounted VTS to oxidize residual PCBs, discharging carbon dioxide and water vapor into the atmosphere. The VTS consists of a flameless thermal oxidizer and a GAC filter. The GAC adsorbs the vaporized contaminants not destroyed by oxidation.

Alternative 3B: On-Site Treatment by Incineration

Estimated Capital Costs: $7,830,700
Estimated Annual Operations and Maintenance Costs (O&M): None
Estimated Present Worth: $7,830,700
Estimated Time Frame: 6 months
Estimated Time to Remedial Action Objectives: 10 months

In this alternative, soil treatment is accomplished by incineration, which is a technique that utilizes high temperatures to volatilize and thermodynamically break down contaminants to non-hazardous components. The incineration process typically proceeds in two stages. First, the contaminated soil is introduced into a directly fired rotary kiln, operating at 1000 F, which partially destroys the PCBs and other organic materials. Vapors from the kiln are then introduced into a secondary combustion chamber at approximately 2000 F for complete destruction of the PCBs and other organic materials. The incineration phase oxidizes the hazardous waste to non-hazardous compounds, principally water and carbon dioxide. Often, this phase produces some acid gas, which is scrubbed or removed by other means.

The incineration system is portable and can be set up at remote sites. It primarily requires only fuel, water, and power for operation. The incinerator can be configured to meet the required treatment standards for the site (1-ppm PCBs in soil). However, incinerators are required to meet stringent emission standards for offgas treatment. This generally results in high mobilization costs associated with the demonstration of compliance with regulatory emission standards.

Alternative 4A: On-Site Treatment by Indirect Thermal Desorption and PCB Destruction by Fenton's Reaction

Estimated Capital Costs: $6,895,700
Estimated Annual Operations and Maintenance Costs (O&M): None
Estimated Present Worth: $6,895,700
Estimated Time Frame: 6 to 8 months
Estimated Time to Achieve Remedial Action Objectives: 12 months

This alternative involves the process of indirect thermal desorption (ITD) as the method of soil treatment, followed by the Fenton's Reaction for destruction of PCBs from the

resulting residue (see Figure 2). ITD has been successfully utilized for 15 years for effectively extracting from soil a variety of wastes, including PCBs. ITD by itself is a separation process intended to concentrate wastes for further treatment by other processes. The ITD is a continuous process that uses a thermally efficient rotary dryer that effectively removes the PCBs from the contaminated soil.

The contaminated soil and debris are crushed and screened to minus 2 inches and passed through the dryer. The feeder is operated with a variable-speed drive and allows plant operators to vary the feed rate. A heat source (fuel oil-fired burner) transfers heat through a metal shell to the soil as it contacts the metal. Material is processed in a triple dryer that is indirectly heated with a flame source. The material can be heated to temperatures as high as 1000°F, which completely volatizes the PCBs. The rotary dryer treats the soil rapidly (usually in 30 minutes).

The PCB contaminant residue from the ITD can be treated by the Fenton's Reaction to destroy the PCBs. Fenton's Reaction occurs in a water slurry mixture of contaminants and solids. The batch process undergoes a pH adjustment in one vessel followed by iron and peroxide addition in another. All reactions are done in a water slurry mixture at about 110°F. The residual peroxide is consumed in chemical oxidation of the waste and decomposed to water and oxygen. The effectiveness of this process has not been proven on actual ITD residuals from Tanapag. Laboratory and pilot scale testing must be done to demonstrate destruction of the PCBs contained in the ITD residuals to less than 1.0 ppm before this process can be used.

Alternative 4B: On-Site Treatment by ITD and PCB Destruction by Solvated Electron Technology

Estimated Capital Costs: $7,632,700
Estimated Annual Operations and Maintenance Costs (O&M): None
Estimated Present Worth: $7,632,700
Estimated Time Frame: 6 to 8 months
Estimated Time to Achieve Remedial Action Objectives: 12 months

Alternative 4B begins with initial treatment and separation by ITD (Alternative 4A). In this alternative post-treatment of the ITD residuals is PCB destruction by Solvated Electron Technology (SET^{TM}). To couple the two processes, a low temperature dryer unit would also be required prior to treatment by the SET^{TM} unit. This additional effort is thus required for filtration, sludge and GAC treatment of the aqueous liquid before the carry-over solids are processed.

The treatment process begins by placing the contaminated material into the reactor vessel. When the conductivity in the vessel drops to a certain level, feed is stopped. The destruction is very fast and is essentially diffusion controlled. The feed rate is typically less than a ton of material per day. The treated material is discharged to a waste storage vessel and then adding a solution of ammonia and metallic sodium, calcium, potassium, or lithium. At this point, the treated material may be removed; pH adjusted, and disposed as non-hazardous material. After the reaction in the reactor vessel is complete, the solution is transferred to the separator tank using the natural pressure of the ammonia as the motive force. In the separator vessel, the ammonia is heated to approximately 125°F, and is pumped in vapor form to a condenser for recycling.

The effectiveness of this process has not been proven on actual ITD residuals from Tanapag. Laboratory and pilot scale testing must be done to demonstrate destruction of the PCBs contained in the ITD residuals to less than 1.0 ppm before this process can be used.

Alternative 4C: On-Site Treatment by ITD and PCB Destruction by Gas-Phase Chemical Reduction

Estimated Capital Costs: $9,480,700
Estimated Annual Operations and Maintenance Costs (O&M): None
Estimated Present Worth: $9,480,700
Estimated Time Frame: 6 to 8 months
Estimated Time to Achieve Remedial Action Objectives: 12 months

This alternative is coupled initially with treatment and separation by ITD. The PCBs in the condensate from the ITD component are destroyed by the Gas Phase Chemical Reduction (GPCR) process. The GPCR unit has a front-end batch ITD unit to vaporize the PCBs before destruction by the GPCR process (see Figure 4). To couple the two processes, a low temperature dryer will drive off the soil moisture before GPCR treatment.

The contaminant separation is done in a batch processor where the organic compounds are desorbed before being fed into the reactor where steam is used in the reactor for heat transfer. Organic compounds are ultimately reduced by hydrogen at high temperatures into methane, hydrogen chloride, and minor amounts of hydrocarbons.

Gas leaving the process reactor unit is scrubbed to remove acids, water, fine particulate matter, aromatic compounds, and carbon dioxide. Some of the cooled and scrubbed product gas is reheated and circulated back into the reactor. The excess gas is removed from the system, compressed, and stored. The stored gas is continually analyzed and subsequently used as fuel to heat the boiler or burnt off.

The effectiveness of this process has not been proven on actual ITD residuals from Tanapag. Laboratory and pilot scale testing must be done to demonstrate destruction of the PCBs contained in the ITD residuals to less than 1.0 ppm before this process can be used.

Alternative 4D: On-Site Treatment by ITD and PCB Destruction by Base-Catalyzed Dechloronation

Estimated Capital Costs: $10,184,700
Estimated Annual Operations and Maintenance Costs (O&M): None
Estimated Present Worth: $10,184,700
Estimated Time Frame: 12 to 18 months
Estimated Time to Achieve Remedial Action Objectives: 24 months

The treatment method for this alternative is composed of the continuous-feed ITD technology, followed by Base-Catalyzed Dechloronation (BCD). The BCD batch process is coupled to the ITD; the PCBs concentrated in the condensate and solids by the ITD are destroyed in the BCD unit (see Figure 5). A strong base material (typically sodium hydroxide with a pH less than 7) is blended with a catalyst and organic waste and heated under pressure for a few minutes, which causes chlorine to be replaced with hydrogen. The end product is an organic oil material that contains no PCBs.

Since the ITD uses a condenser to capture the organic waste, the condensate is a mixture of water, contaminants, and particulate matter. In removing the water, the waste is typically bound to the solids. Sacrificial oil such as nonane or bunker oil is mixed with the solids at ratio of 15 % oil to solids, and the slurry is fed into the batch BCD reactor for treatment. The resultant is an asphalt mixture with generally low concentrations of PCBs.

The effectiveness of this process has not been proven on actual ITD residuals from Tanapag. Laboratory and pilot scale testing must be done to demonstrate destruction of the PCBs contained in the ITD residuals to less than 1.0 ppm before this process can be used.

Alternative 4E: On-Site Treatment by ITD and Off-Site Disposal

Estimated Capital Costs: $6,764,100
Estimated Annual Operations and Maintenance Costs (O&M): None
Estimated Present Worth: $6,764,100
Estimated Time Frame: 5 months
Estimated Time to Achieve Remedial Action Objectives: 9 months

This alternative uses Indirect Thermal Desorption of approximately 20,000 tons of PCB contaminated soils. Approximately 200 tons of PCB contaminated residuals from the ITD process will be shipped off the island. In this alternative, the contaminated residuals would be packaged in DOT-rated containers or sacks, typically with a rated capacity of 1-1½ cubic yards. The individual sacks would be loaded into 20-foot shipping containers and transported by ocean carrier to the U.S. mainland for disposal in an appropriate disposal facility. Approximately 19,800 tons of ITD treated soils containing less than 1.0 ppm PCBs will be used for fill material on Saipan.

EVALUATION OF ALTERNATIVES

Ten remedial alternatives were evaluated for suitability for the Phase III Tanapag Village Removal Action. These ten remedial alternatives were individually compared with each of the nine evaluation criteria to determine which of the alternatives met all nine of the criteria.

The alternatives, which satisfy the nine criteria, are compared to evaluate the relative merits and deficiencies of each alternative relative to one another so that they can be ranked in terms of the various evaluation criteria. The detailed discussion and analysis concerning the alternatives are in the FFS.

EVALUATION CRITERIA FOR REMEDIAL ALTERNATIVES
Overall Protection of Human Health and the Environment determines whether an alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, or treatment.
Compliance with ARARs evaluates whether the alternative meets Federal and State environmental statues and regulations that pertain to the site, or whether a waiver is justified. The ARAR designated for this site is: ***Toxic Substances Control Act (TSCA) (15 United States Code (USC) Section 2605), & 40 Code of Federal Regulations (CFR) Section 761.61-PCB Remediation Waste and other***

appropriate sections.
Long-term Effectiveness and Performance considers the ability of an alternative to maintain protection of human health and the environment over time.
Reduction of Toxicity, Mobility, or Volume evaluates an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.
Short-term Effectiveness considers the length of time needed to implement al alternative and the risks the alternative poses to workers, residents, and the environment during implementation.
Implementability considers the technical and administrative feasibility of implementing the alternative, including factors such as the relative availability of goods and services.
Costs include estimated capital and annual operations and maintenance costs, as well as present worth cost. Present worth cost is the total cost of an alternative over time in terms of today's dollar value. Costs estimates are expected to be accurate within the range of +50 to –30 percent.
CNMI Acceptance considers the comments of the CNMI on the Corps' analyses and recommendations, as described in the FFS and Proposed Plan.
Community Acceptance considers comments of the local community and any other members of the public on the Corps' analyses and preferred alternative. Comments received on the Proposed Plan are an important indicator of community acceptance.

The FFS evaluated each of the ten alternatives against the first seven of the nine criteria described in this section. The first two criteria are categorized as "Threshold Criteria" that each alternative must meet to be eligible for further evaluation. The third through seventh criteria are used to develop the proposed plan. The final decision on the selection of the remedy will be made only after full consideration of the final two criteria, through review and response to the CNMI DEQ and all public comments received on the proposed plan. The results of the evaluation against the first seven criteria are summarized here.

Alternative 1: No Action

This alternative was retained for comparative analysis as required by the National Contingency Plan (NCP). However this alternative does not meet the threshold criteria, overall protection of human health and the environment. This alternative fails to meet the criteria because the PCB contaminated soils would remain in temporary storage. The temporary cells are not engineered containment systems, thereby presenting a long-term threat to human health and the environment. The PCB contaminated soils were placed in temporary storage cells pending future treatment and disposal. While the temporary storage cells are adequate for the immediate future they do not meet the standards that a permanent TSCA-approved disposal facility is required to meet.

Alternative 2A: Off-Site Disposal

This alternative meets all seven of the criteria evaluated to date and was retained for comparative analysis.

Alternative 2B: Off-Site Encapsulation

This alternative meets all seven of the criteria evaluated to date and was retained for comparative analysis.

Alternative 3A: On-Site Treatment by Thermal Blanket

This alternative has been utilized in the past in Tanapag. Past experience with this alternative suggests that the process may have a difficult time meeting the 1.0 ppm treatment standard imposed by EPA, without the need to retreat soils. Excessive re-treatment of soils has the potential to dramatically increase the time required to complete remediation of the stockpiled soils. This alternative was not retained for comparative analysis because it may not satisfy the criteria to reduce toxicity and may not meet the criteria for short-term effectiveness because of the time required to complete the project if multiple treatment of the soils is required.

Alternative 3B: On-Site Treatment by Incineration

This alternative meets all seven of the criteria evaluated to date and was retained for comparative analysis.

Alternative 4A: On-Site Treatment by Indirect Thermal Desorption and PCB Destruction by Fenton's Reaction

Article VIII, Section 1.B, of the Final Administrative Order, dated December 20, 2000, specifies that the treatment methodology proposed in this alternative must comply with relevant regulatory requirements and be approved by USEPA. USEPA approval will be contingent upon a testing and demonstration phase for the thermal desorption process to confirm that the thermal desorption unit meets all relevant regulatory requirements. This Article further requires that USACE perform laboratory-scale investigations of the feasibility and practicability of using Fenton's Reaction. Bench tests of the Fenton's Reaction process are being performed on site materials to verify the implementability of the process and process rates; however, to date this process has not been demonstrated to be capable of achieving the 1.0 ppm treatment standard for the subject contaminant residue.

The implementability of the second phase of this two step process has not been demonstrated. Therefore this alternative was not retained for comparative analysis because it does not meet the implementability criteria.
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Alternative 4B: On-Site Treatment by Indirect Thermal Desorption and PCB Destruction by Solvated Electron Technology

Article VIII, Section 1.B of the Final Administrative Order, dated December 20, 2000, specifies that the treatment methodology proposed in this alternative must comply with relevant regulatory requirements and be approved by USEPA. USEPA approval is

contingent upon field pilot testing that demonstrates that the treatment method is capable of destroying PCBs to less than 1.0 ppm.

The implementability of the second phase of this two step process has not been demonstrated. This alternative was not retained for comparative analysis because it does not meet the implementability criteria.

Alternative 4C: On-Site Treatment by Indirect Thermal Desorption and PCB Destruction by Gas-Phase Chemical Reduction

Article VIII, Section 1.B of the Final Administrative Order, dated December 20, 2000, specifies that the treatment methodology proposed in this alternative must comply with relevant regulatory requirements and be approved by USEPA. USEPA approval is contingent upon field pilot testing that demonstrates that the treatment method is capable of destroying PCBs to less than 1.0 ppm. The second phase of this two-phase process has only been demonstrated to be effective on PCB dielectric fluids. This alternative was not retained for comparative analysis because it does not meet the implementability criteria.

Alternative 4D: On-Site Treatment by ITD and PCB Destruction by Base-Catalyzed Dechloronation

This alternative is not protective of human health and the environment since the Base-Catalyzed Dechloronation process is not capable of destroying PCBs in the ITD residue to meet 1.0-ppm treatment standard.

Article VIII, Section 1.B of the Final Administrative Order, dated December 20, 2000, requires that the excavated soils and contaminated debris be treated by a USEPA-approved methodology that is capable of removing PCBs to less than 1.0 ppm. This process is not capable of destroying PCBs to the level specified in the Final Administrative Order.

This alternative was not retained because it does not meet the protection of human health and the environment criteria and it does not meet the implementability criteria.

Alternative 4E: On-Site Treatment by ITD and Off-Site Disposal
This alternative meets all of the seven criteria evaluated to date and was retained for comparative analysis.

COMPARATIVE ANALYSIS OF RETAINED ALTERNATIVES

Overall Protection of Human Health and the Environment

Alternative 1 (No Action) does not meet the threshold criterion of being protective of human health environment. Alternatives 2A (Off-Site Disposal), 2B (Off-Site Encapsulation), 3B (On-Site Incineration), and 4E (On-Site ITD/ Off-Site Disposal) meet this threshold criterion. Consistent with USEPA (1988) guidance, further assessment of the alternatives on the basis of this criterion is reserved for the more detailed analyses covered under other evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs.

Compliance with ARARs

All of the alternatives comply with the threshold criterion of meeting the ARARs. Alternative 1 does not meet the requirements of the EPA Order, which specifies that soils left in unrestricted areas must not contain PCBs in excess of 1.0 ppm.

Long-term Effectiveness and Permanence

Alternative 1 (No Action) retains PCB contaminated soil in temporary stockpiles for an indefinite period of time. Long-term storage under temporary storage conditions presents a long-term threat to human health and the environment in Tanapag. Alternative 2A (Off-Site Disposal) permanently removes PCBs from Tanapag. Alternative 2B (Off-Site Encapsulation) will permanently contain the PCBs. Alternative 4E (On-Site ITD/ Off-Site Disposal) is not a destruction remedy, however the PCBs are effectively and permanently removed from Tanapag. Alternative 3B (On-Site Incineration) destroys PCBs (see discussion under Reduction of Toxicity, Mobility, or Volume criterion), thus making this alternative rank very high under this criterion.

Reduction of Toxicity, Mobility, or Volume

Alternative 1 (No Action) does not meet this criteria. Alternative 3B (On-Site Incineration) permanently destroys PCBs and achieves all 3 of these goals. Alternative 2A (Off-Site Disposal) only meets the goal of reduction of mobility by placing the contaminated soil in a controlled disposal facility. Alternative 4E (On-Site ITD/ Off-Site Disposal) effectively reduces the mobility and volume of the contaminated soil, but not its toxicity. Alternative 2B (Off-Site Encapsulation) only reduces mobility. If the contents within the waste management unit are solidified or stabilized, the volume will increase by 5 to 10 percent.

Short-term Effectiveness

Alternatives 1 (No Action) is most protective for site workers and eliminates the risks to the community related to implementing an alternative that involves moving the contaminated materials or using heavy equipment. Alternatives 2A (Off –Site Disposal), 2B (Off-Site Encapsulation) Alternative 3B (On-Site Incineration) and 4E (On-Site ITD/Off-Site Disposal) are essentially equally protective of site workers and the community. The hazards associated with moving, treating and loading contaminated soils are manageable through the application of appropriate work plan controls and monitoring.

Alternative 1 (No Action) is immediately effective because it has been completed. Alternative 2A (Off-Site Disposal) will require 10 months to be effective. The 10 months is the estimated time necessary to ship 1000 containers of contaminated soil to Guam for eventual shipment to the United States. Alternative 2B (Off-Site Encapsulation) can be effective within 2 to 3 months if a suitable site can be located on site where no permit is required from the CNMI. If a permit is required, the time for Alternative 2B (Off-Site Encapsulation) to be effective will be 2 years or more. Alternative 3B (On-Site Incineration) will require 10 months to be effective. Alternative 4E (On-Site ITD/ Off-

Site Disposal) can be effective in 9 months, depending on shipping schedules for the 200 tons of ITD residuals that will be shipped off of Saipan.

Implementability

Alternative 1 (No Action) is the most easily implementable alternative because it is essentially complete.

Alternative 2A (Off-Site Disposal) is technically implementable and effective, subject to shipping constraints that decrease the overall implementability rating. In evaluating the implementability of this alternative, it was assumed that 4 containers per day could be loaded. Containers are shipped by barge from Saipan to Guam at the rate of 24 per week. The rate at which containers can be shipped from Saipan to Guam is limited by barge capacity and potentially by the number of seaworthy containers available in Saipan. Cargo ship service to the West Coast of the United States is monthly. The ships in transit from Guam to the United States should be able to carry 100 + containers per month. Given these assumptions 10 months would be required to complete this alternative.

Alternative 2B (Off-Site Encapsulation) is technically implementable and effective subject to the location of a suitable site for the encapsulation cell on the site where a permit from the CNMI would not be required. Potential permit requirements would reduce the implementability rating. The use of a standard design for the waste management unit shortens the design and specification phase of this alternative. The HDPE liner is readily available, but will require a skilled installation team from the mainland construct. All other aspects of the construction are available on Saipan.

Alternative 4E (On-Site ITD/Off-Site Disposal) is technically implementable and effective. ITD is a proven technology that is capable of treating the soils in Tanapag. Because the ITD process is continuous, the duration of the soil processing with this unit is anticipated to be relatively brief. The unit proposed for use at Tanapag is a modular unit designed for containerized transportation aboard ship.

Alternative 3B (On-Site Incineration) is also implementable and effective. The incineration can be completed in less than a year if a suitable incineration unit is available off the shelf. If a custom designed incinerator is required, the design construction and performance testing of the unit would be time consuming and render this alternative less implementable.

Cost

The most cost-effective alternatives are Alternative 1 (No Action). Alternative 2B (Off-Site Encapsulation) at $1,039,500 and $1,499,300 respectively.

Alternative 3B (On-Site Incineration) and Alternative 4E (On-Site ITD/Off-Site Disposal) have costs in the mid-range at $7,830,680 and $6,764,120, respectively.

The most costly is Alternative 2A (Off-site Disposal) at $18,456,900.

CNMI Acceptance

CNMI acceptance will be addressed in the Record of Decision following comments on the FFS report and the Proposed Plan.

COMMUNITY Acceptance

Community acceptance will be addressed in the Record of Decision following comments on the FFS report and the Proposed Plan.

SUMMARY OF THE PREFERRED ALTERNTIVE

The Corps preferred remedial alternative for this project, as selected in the FFS process, is Alternative 4E: On-site Treatment by ITD combined with Off-site Disposal of the residuals. This alternative satisfies the threshold criteria of being protective of human health and the environment and complying with ARARs, as well as ranking high in the comparative analysis using the other evaluation criteria. This alternative will meet the Treatment Objectives of reducing PCBs in stockpiles to 1.0 ppm and compliance with the EPA order. The ITD/Off-site alternative is the most cost-effective treatment alternative when schedule is considered. ITD is a proven technology and has been successfully used at many sites. The ITD process is continuous and efficient; the unit considered is expected to treat the soil at a rate of 7 to 10 tons per hour.

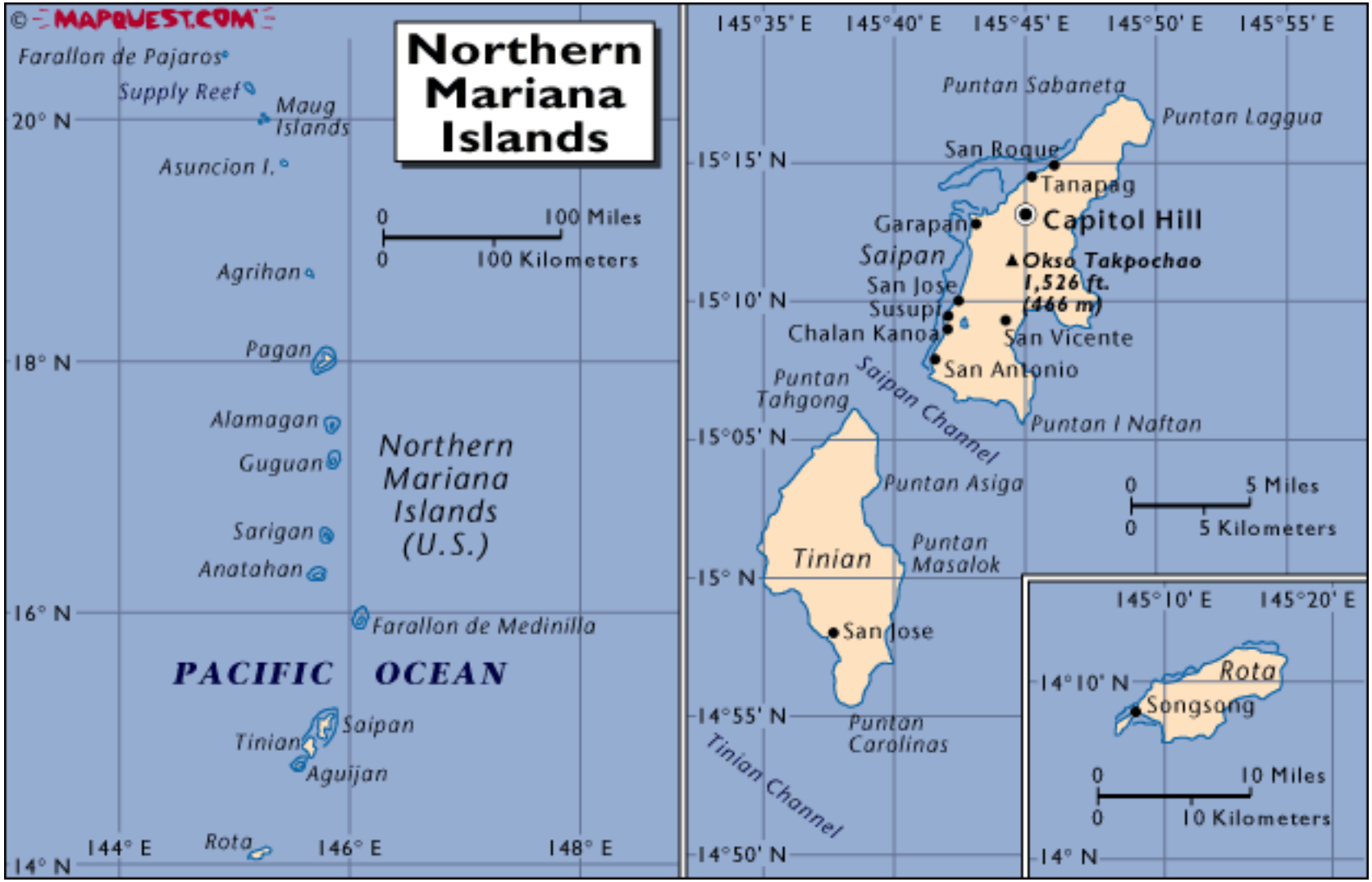
COMMUNITY PARTICIPATION

The Corps is providing information regarding the cleanup of the Tanapag Village to the public through a public meeting, publication of this Proposed Plan, and announcements published in the local newspapers. The Corps will place the Administrative Record for this cleanup at the DEQ and Joeten-Kiyu library prior to the public meeting. The Corps encourages the public to gain a more comprehensive understanding of the site and the clean-up activities that have been conducted at the site, and ask interested members of the public to provide their written comments on the proposed plan in order to allow officials of the Corps and the USEPA to review these comments before making a decision on the final remedial action for the PCB contaminated stockpiles. Responses to comments received from the DEQ and the public will be included in the final Record of Decision (ROD).

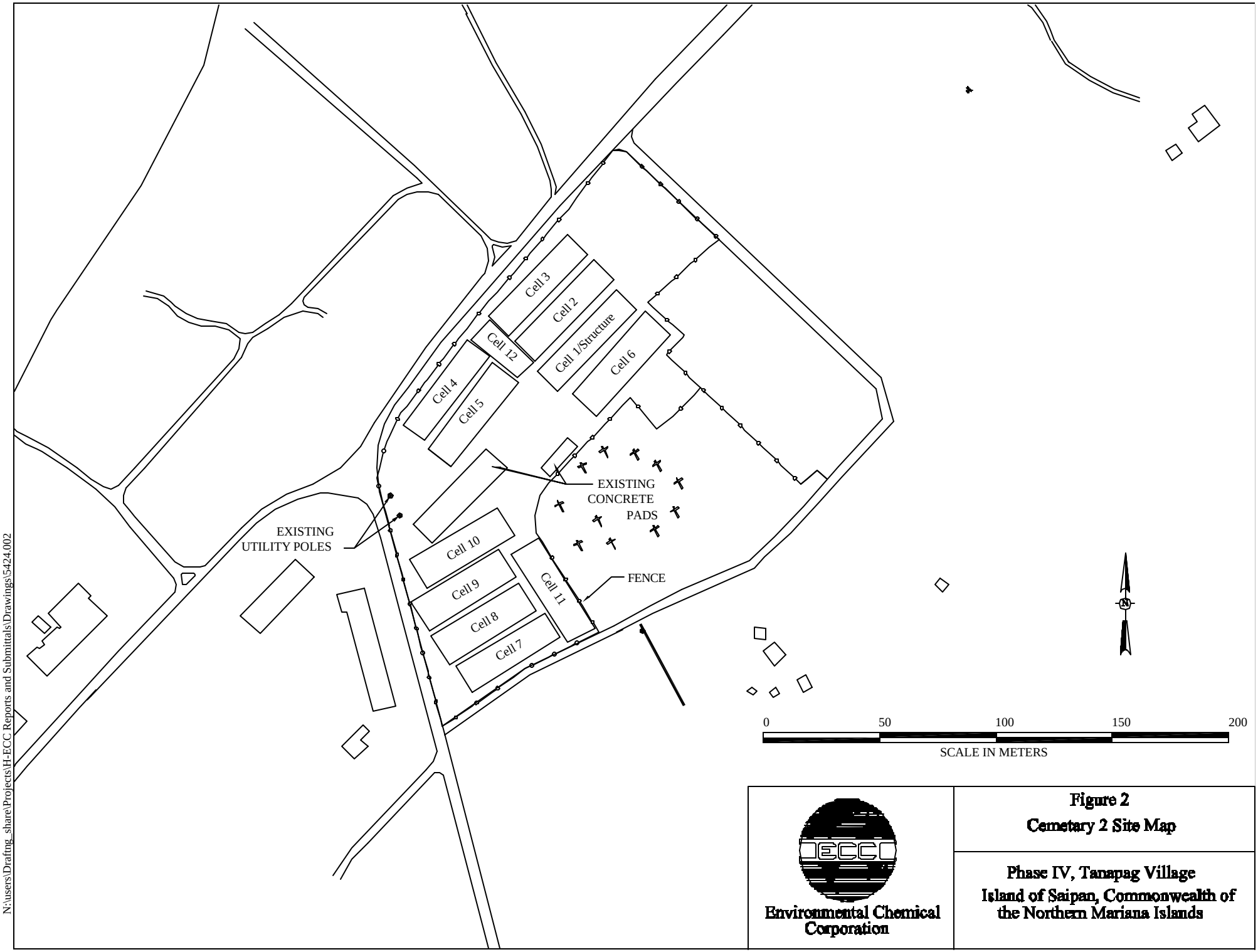
The dates for the public comment period, and the date, location and time for the public meeting, are provided on the front page of this Proposed Plan.

For More Information on the Tanapag Village Site, Please Contact:

Programs and Project Management Division,
Environmental and Special Projects Branch
Attn: Mr. Charles Adams, PE, Project Manager
Telephone (808) 438-3242
Facsimile (808) 438-7801
Email: charles.w.adams@usace.army.mil
United States Army Corps of Engineers, Honolulu District
Building 230, Fort Shafter, Hawaii 9685805440



ENVIRONMENTAL CHEMICAL CORPORATION URS	LOCATION OF PHASE III TANAPAG VILLAGE SITES Project No. 51-00170007.00	PHASE III REMOVAL ACTION TANAPAG VILLAGE, ISLAND OF SAIPAN COMMONWEALTH OF THE NORTHERN MARIANA ISLANDS	FIGURE 1



Environmental Chemical Corporation

Figure 2

Cemetary 2 Site Map

Phase IV, Tanapag Village

Island of Saipan, Commonwealth of the Northern Mariana Islands

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