

**Final Supplemental
Environmental Impact Statement
For the Siting of a Municipal
Solid Waste Landfill Facility, Guam**

Prepared for
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Government of Guam
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<http://www.guamlandfill.org>

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LIST OF ACRONYMS AND ABBREVIATIONS

APCA	Air Pollution Control Act
ATSDR	Agency for Toxic Substances and Disease Registry
BDT	Best Demonstrated Technology
BG	Block Group
BLS	Below Land Surface
BMP	Best Management Practice
CAA	Clean Air Act
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CFU	Colony Forming Units
CH ₄	Methane
cm	Centimeter(s)
cm/sec	Centimeter(s) Per Second
CMP	Coastal Management Plan
CNMI	Commonwealth of Northern Mariana Islands
CO ₂	Carbon Dioxide
CPD	Coastal Programs Division
CWA	Clean Water Act
CY	Cubic Yard(s)
CZMA	Coastal Zone Management Act
D&A	Duenas & Associates, Inc.
DAWR	Division of Aquatic and Wildlife Resources
dBA	Decibels
DO	Dissolved Oxygen
DOI	Department of the Interior
ECP	Erosion Control Plan
EIS	Environmental Impact Statement
ESA	Endangered Species Act
FAA	Federal Aviation Administration
Fe	Iron
FML	Flexible Membrane Liner
ft	Foot or Feet
ft/day	Feet Per Day
ft/min	Feet Per Minute
ft ² /day	Square Feet Per Day
GCA	Guam Code Annotated
GCMP	Guam Coastal Management Program

GDA	Guam Department of Agriculture
GDP	Gross Domestic Product
GDPW	Guam Department of Public Works
GEPA	Guam Environmental Protection Agency
GHURA	Guam Housing and Urban Renewal Authority
GIA	Guam International Airport
GLUZR	Guam Land Use Zoning Regulations
GPA	Guam Power Authority
gpm	Gallon(s) Per Minute
gpm/ft	Gallon(s) Per Minute Per Foot
GWA	Guam Waterworks Authority
GTA	Guam Telephone Authority
GWQS	Guam Water Quality Standards
HDPE	High Density Polyethylene
in.	Inch(es)
in./yr	Inch(es) Per Year
km	Kilometer(s)
km ²	Square Kilometer(s)
LF	Linear Foot or Linear Feet
LOS	Level of Service
LPR	Leo Palace Resort
LS	Lump Sum
LSET	Landfill Site Evaluation Team
m	Meter(s)
mg	Milligram(s)
Mg	Megagram(s)
mg/L	Milligram(s) Per Liter
Mg/yr	Megagram(s) Per Year
mgd	Million Gallon(s) Per Day
mi	Mile(s)
mi ²	Square Mile(s)
ml	Milliliter(s)
mph	Mile(s) Per Hour
MSL	Mean Sea Level
MSW	Municipal Solid Waste
MSWLF	Municipal Solid Waste Landfill Facility
NAAQS	National Ambient Air Quality Standards
NASA	National Aeronautics and Space Administration
ND	North District
NEPA	National Environmental Policy Act

NHPA	National Historic Preservation Act
NMOC	Non-Methane Organic Compound
NO ₃ -N	Nitrate-Nitrogen
NOAA	National Oceanic and Atmospheric Administration
NPC	Noise Pollution Clearinghouse
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
NSPS	New Source Performance Standards
NTU	Nephelometric Turbidity Units
OCRM	Office of Ocean and Coastal Resource Management
P	Phosphorus
P-tot	Phosphorus Level
PAB	Private Activity Bond
PAL	Preliminary Area List
PDD	Planned Development District
PEM1C	Palustrine, Emergent, Persistent, Seasonal
PEM1F	Palustrine, Emergent, Persistent, Semipermanent
PFO3C	Palustrine, Forested, Broad-Leafed Evergreen, Seasonal
PM _{2.5}	Particulate Matter Greater Than 2.5 Microns
PM ₁₀	Particulate Matter Greater Than 10 Microns
POTW	Publicly Owned Treatment Works
POWF	Palustrine Open-Water Semipermanent Wetlands
PSSR	Preliminary Site Selection Report
PWC	Public Works Center
RCRA	Resource Conservation Recovery Act
ROD	Record of Decision
RTE	Rare, Threatened, and Endangered
SARS	Severe Acute Respiratory Syndrome
SF	Square Foot or Square Feet
SIP	State Implementation Plan
SPPP	Stormwater Pollution Prevention Plan
STP	Sewage Treatment Plant
TSCA	Toxic Substances Control Act
USACE	United States Army Corps of Engineers
USC	United States Code
USDA	United States Department of Agriculture
USDOI	United States Department of the Interior
USDOJ	United States Department of Justice
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service

USGS United States Geological Survey
WQC Water Quality Certification
WERI Water and Environmental Research Institute of the Western Pacific
WHPP Well Head Protection Program
WTF Wastewater Treatment Facility

EXECUTIVE SUMMARY

The Government of Guam (GovGuam), through the Guam Department of Public Works and Guam Environmental Protection Agency, is proposing to construct a Municipal Solid Waste Landfill Facility (MSWLF) in Inarajan, Guam to manage Guam's solid waste generated by the island community. The landfill site selected by GovGuam is located in the Layon area of Dandan, Inarajan. Within the landfill parcel, the proposed landfill footprint has been identified and is approximately 126 acres in area. In this Supplemental EIS (SEIS) Dandan refers to the parcel and the name Layon is used to refer to the smaller landfill footprint within the Dandan parcel. This SEIS evaluates three conceptual alternatives for the site layout and development of a MSWLF at Layon, as well as the no action alternative. The document also prescribes mitigation for potentially significant impacts from the preferred conceptual alternative.

GovGuam is required to prepare an Environmental Impact Statement (EIS) on potential new landfill sites, and initiate and complete the construction of a fully compliant Resource Conservation Recovery Act (RCRA) Subtitle D MSWLF and to close Ordot Dump. These tasks are among the terms of the Ordot Consent Decree (U.S. District Court, Territory of Guam, Civil Case No. 02-00022), an agreement that was entered into on February 11, 2004 between U.S. Environmental Protection Agency and U.S. Department of Justice and GovGuam to resolve issues related to the unauthorized discharge of pollutants from the Ordot Dump to the Lonfit River.

GovGuam conducted a preliminary site suitability screening study, and summarized its findings in the *Preliminary Landfill Site Suitability Report* (PLSSR) published in March 2004. Applying the MSWLF Location Restrictions specified in the Guam Solid Waste Disposal Rules and Regulations (GCA Title 22, Division 4, Chapter 23), and using other screening criteria, GovGuam identified three candidate landfill locations: Dandan, Sabanan Batea, and Lonfit. A *Preliminary Site Selection Report* (PSSR) was prepared to further characterize these three potential landfill sites (alternatives). GovGuam selected a site (Dandan) based on the PSSR and formally announced its selection on January 31, 2005. This final site selection process is documented in the *Municipal Solid Waste Landfill (Guam) Site Evaluation Report* dated January 28, 2005. USEPA accepted the selection of Dandan as the preferred site in a letter dated February 14, 2005. The PSSR became final and was published on March 14, 2005 as the *Final Site Selection Report/EIS*.

Layon is located in the higher badland areas on the west side of the Dandan parcel, southwest of the former National Aeronautics and Space Administration (NASA) tracking station. The Dandan parcel (Lot B-3-REM) in which the Layon footprint is located is approximately 2,800 acres of undeveloped, privately-owned land. The existing land use on the 126-acre Layon footprint is a mixture of agricultural and recreational. The Layon footprint contains four vegetation communities -- savanna grassland, ravine forest, disturbed vegetation/badlands, and wetlands. Approximately 2.4 acres of wetlands are present within the footprint. A total of two mammals, eight birds, one reptile, four amphibians, and two mollusks were found at Layon during the pedestrian and bird count surveys. No threatened or endangered species were observed during the surveys, although wetlands at the site may provide suitable habitat for the endangered Mariana common moorhen. An archaeological inventory survey within the proposed Layon footprint identified ten isolated occurrences. The finds represent Prehistoric and Historic Period activities but the find locations lack the complexity and integrity normally associated with

formal archaeological site designations. No such formal archaeological sites were identified during the survey.

Design and landfill operating features for the landfill alternatives would be in compliance with RCRA and the Rules and Regulations for GEPA Solid Waste Disposal Title 22, Division 4 Chapter 23, Guam Code. An additional 30 acres for site access control, office facilities, stormwater runoff control, etc. and 4.6 acres for an access road and utilities would be needed beyond the conceptual landfill footprint regardless of the alternative. During development and operation of the landfill, approximately 10 acres would conceptually be developed at any time. Within this ten-acre area, only a 0.5-acre area would actively receive waste. The landfill is envisioned as a mounded landfill. The top elevation of the landfill would be approximately elevation 435 ft above mean sea level (MSL). The landfill cells would be excavated approximately 15 ft below existing grade or deeper to provide cover soils; this depth would be adjusted based on local variability of surface contours and depth to groundwater. These cells would be progressively opened and closed from the north to the south. This would reduce active landfill areas and spread capital costs over the lifetime of the facility.

Access to the site would be from Route No. 4 via Dandan Road. Support facilities, including an entrance control structure, scale and scale house, administration facility, leachate storage and treatment facility, and equipment and maintenance storage facilities, would be located within the footprint or buffer area of the landfill. The stormwater detention pond is sized for a 25-year, 24-hour storm event for the area of two cells, one cell undergoing closure and one new operating cell. The detention pond would conceptually be located to the east of the landfill site in the surrounding buffer area. The treated stormwater from the pond would be discharged to the wetlands to the east of the landfill. The drainage facility layout is conceptual; the final design will address drainage to appropriately distribute stormwater runoff so as to maintain hydrology to the wetlands.

The three layout alternatives provide various conceptual configurations of the landfill cells and support facilities. Alternative 1 would be divided into 12 cells, each approximately 10.5 acres in size. An area of about 9.6 acres would be required for the detention pond. This alternative would fill approximately 2.41 acres of wetlands in the footprint, and 1.14 acres of wetlands within the buffer area to accommodate waste cells and support facilities. Layout Alternative 2 is configured to avoid wetland areas that fall within the Layon footprint and buffer area. Alternative 2 would be divided into nine cells, each approximately 14 acres in size. The landfill footprint would be extended approximately 400 ft south, which would increase the overall landfill land requirement by approximately 15 acres. An area of about 13 acres would be required for the detention pond.

Layout Alternative 3 is a revised version of Layout Alternative 2. Alternative 3 was designed to allow more distance between the wetlands and the support facilities. Alternative 3 would be divided into nine cells, each approximately 14 acres in size. As with Alternative 2, the landfill footprint of Alternative 3 would be extended approximately 400 ft south of Alternative 1 to avoid wetland impacts. This would increase the overall landfill land requirement by approximately 15 acres. The configuration of Cell 1 to avoid wetlands remains as in Alternative 2. The support facilities would be relocated directly outside of the buffer area to the northeast of

the footprint. As in Alternative 2, the support facilities for Alternative 3 are still adjacent to, but not within the wetland areas. Alternative 3 will require an additional 7 acres of land for the relocated support facilities. The detention pond is estimated to be 13 acres in size, lying to the east of the landfill site in the surrounding buffer area. As with Alternative 2, layout Alternative 3 avoids wetlands identified within the main footprint. Additionally, the wetlands within the buffer area would not be disturbed by the landfill construction and operation. The support facilities are positioned to minimize any potential impacts to wetlands by creating a larger distance/buffer between the wetlands and proposed development.

Under the No Action alternative, no new landfill site would be selected, and Guam would continue to use the existing Ordot Dump for disposal of solid wastes, which means that the dump would continue to impact the Lonfit and Pago Rivers in violation of the Clean Water Act. Leachate streams emanate from the Ordot Dump and discharge into the Lonfit River. This alternative is not considered viable since it would result in significant adverse impacts to the resources in the vicinity of the Ordot Dump as well as a major adverse financial responsibility in the form of penalties from USEPA.

Alternative 3 has emerged as the preferred layout alternative based on an evaluation of environmental effects. The main determining factors in choosing a site layout are impacts to hydrological features within the footprint (streams and wetlands), and aquatic ecology. All three alternatives would impact the headwaters of the Fensol River; however, Alternative 1 would also impact approximately 705 linear feet of the Fintasa River, and 3.55 acres of wetlands. Impacts to wetlands and streams would require federal permits and mitigation. Alternative 2 would be beneficial to wetlands, hydrology, and aquatic ecology; however, Alternative 3 appears to be slightly more beneficial to these resources by offering a larger buffer between hydrological features present in the northwest corner of the landfill footprint and the proposed location of the support facility structures. While some impact to the environment cannot be avoided, GovGuam has determined that Alternative 3 poses the least potential impact among the conceptual alternatives considered.

Proposed mitigation measures for potential impacts associated with the preferred footprint alternative at Layon are identified for seismic activity, water quality, wetlands, vegetation, community concerns, transportation, archaeological/historical resources, and landfill operations. The final detailed landfill design would have secondary containment for leachate storage and flexible piping connections for the leachate tank to avoid impacts from seismic activity to the leachate collection system. The conceptual stormwater detention pond is designed for temporary storage of runoff and controls peak discharge rates into receiving waters. A wet extended detention pond is recommended to be used as an alternative, which is designed to increase settling of pollutants with features such as a sediment forebay and a permanent wet pool with wetland vegetation that would increase benefits to water quality.

Impacts related to transportation would be addressed by the use of regional transfer stations as the destination for solid waste collection vehicles. The proposed new strategy of using transfer stations would allow consolidation of waste into larger hauling trucks to transport to the landfill. Landfill-bound traffic would be primarily restricted to large capacity trash/waste haulers with capacities ranging from 75 to 100 CY of compacted waste.

The preferred layout alternative would likely require a Section 404 permit from the US Army Corps of Engineers. The USACE and USEPA also require compensatory mitigation for unavoidable adverse impacts to waters of the US. If mitigation is required, a mitigation plan would be prepared that specifies how functions and values of the resource would be replaced. Even though the headwaters of the Fensol River would have to be filled for Alternative 3, wetlands would be entirely avoided, which protects this important resource. In addition to avoiding wetlands, Alternative 3 provides additional protection to the wetlands by minimizing the distance to wetlands by providing a larger buffer between hydrological features and support facility structures within the landfill footprint. The preferred alternative would rectify the impacts to vegetation by restoring the vegetation removed from the landfill site. At the closure of each cell, the exposed soils would be revegetated with grasses. BMPs (Environmental Protection Plan, Erosion Control Plan, and Stormwater Pollution Prevention Plan) would be used to prevent erosion and soil removal. Through revegetation, those areas that were barren and eroded would be enhanced to savanna grasslands to the maximum extent possible.

Any impacts to communities within the vicinity of Layon would be offset with mitigation measures that would focus on the host community. Possible mitigation measures to provide benefits to the host community may include, but not be limited to, providing the host community with a revenue stream as a percentage of the tipping fee, discounted waste disposal, preferential hiring in the waste management industry, special contingency funds, regular water tests and property value protection. Actions such as using landscaping for screening to preserve the viewshed of neighboring properties, performing construction and operational activities during times that would minimize noise disturbance and restricting waste transport to non-peak traffic hours would also mitigate against negative impacts associated with a landfill.

Impacts to archaeological and historic resources are negligible for the shared footprint area in the site layouts of all three alternatives. There is low potential for discovery of further historic properties that would be significant under National Register Criterion D. The preferred layout alternative would require additional archaeological survey within the 400-foot extension to the south of the present footprint. The findings within this area are expected to be similar to those within the present footprint; however, if historic properties are discovered and found to be significant according to National Register criteria, then a determination of No Adverse Effect would require mitigation in coordination with the Guam (State) Historic Preservation Officer (SHPO) under the National Historic Preservation Act.

The landfill would be operated in compliance with criteria in the Solid Waste Management Rules and Regulations, GCA Title 22, Chapter 23, as overseen and regulated by Guam Environmental Protection Agency. The landfill would also require compliance with other applicable local and federal laws and regulations.

1.0 BACKGROUND

The Government of Guam (GovGuam), through the Guam Department of Public Works and Guam Environmental Protection Agency, is proposing to construct a Municipal Solid Waste Landfill Facility (MSWLF) to manage Guam's solid waste generated by the island community.

The Ordot Dump has been a dumping ground for the Island of Guam since the 1940s, serving as Guam's primary receptacle for industrial and municipal waste. Proper landfill operation procedures, including the placement of daily cover material and proper waste compaction, have not been followed at the site. Guam Department of Public Works owns and operates the Ordot Dump and is primarily responsible for the Solid Waste Collection and Disposal System for Guam. The Ordot Dump is approximately 500 feet (ft) from the Lonfit River, and leachate streams emanate from the site to the river. The Governor of Guam designated Ordot Dump as Guam's highest priority site for Superfund cleanup. The site is being addressed through federal and territorial actions. In September 1988, the United States Environmental Protection Agency (USEPA) issued a Record of Decision (ROD) that deferred cleanup of the site from the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) to USEPA's Water Program.

The historical and continuing discharge of pollutants to the Lonfit River is a violation of the Federal Clean Water Act (CWA) (GEPA 2004a). On March 26, 1986, USEPA issued an Administrative Order under the Clean Water Act, 33 United States Code (USC) Section 1251 et seq., that requires the Guam Department of Public Works (GDPW) to cease discharge of leachate from the site to the Lonfit River (USEPA 2002). Due to the failure of the GDPW to comply with the Administrative Order, the United States Department of Justice (USDOJ), acting on behalf of USEPA, filed a lawsuit on August 7, 2002 to force the closure of Ordot Dump (USEPA 2002). A settlement agreement (The Ordot Consent Decree - U.S. District Court, Territory of Guam, Civil Case No. 02-00022) was entered into on February 11, 2004, between USEPA with USDOJ and GovGuam to resolve issues related to the unauthorized discharge of pollutants from the Ordot Dump to the Lonfit River.

In order to resolve the violation, the parties have agreed to specific terms under the Consent Decree for GovGuam to initiate and complete the construction of a fully compliant Resource Conservation Recovery Act (RCRA) Subtitle D MSWLF and to close Ordot Dump. Section IV.9. of the Consent Decree outlines a process of identifying, assessing, and finally selecting a suitable landfill site. A copy of the Consent Decree can be found in Appendix A. As part of the Ordot Consent Decree, GDPW has been directed to prepare an Environmental Impact Statement (EIS) on potential new landfill sites.

Requirements and Schedule

The Consent Decree outlines a timeline that GovGuam agreed to follow in completing specific tasks to correct the violation (Table 1-1). These tasks include the siting, design, and construction of a new MSWLF that is fully compliant with Subtitle D of the Federal

RCRA. The opening of the new landfill would coincide with the mandated regulated closure of Ordot Dump. GovGuam completed the first phase of the siting process by screening land parcels throughout the island based on various scientific criteria and placing the six most suitable landfill sites on a Preliminary Area List (PAL). From this list, the three highest-ranking potential landfill sites (Dandan, Sabanan Batea, and Lonfit) were selected by GovGuam for further analyses. This selection process for the three highest-ranking potential landfill sites and the ranking results are summarized in the *Preliminary Landfill Site Suitability Report* (GEPA 2004b) prepared in March 2004 by Guam Environmental Protection Agency (GEPA) in association with GDPW. As stated in Table 1-1 below, the Consent Decree requires that GDPW identify a minimum of three sites for the Site Selection EIS by March 12, 2004. This deadline was met by releasing the *Preliminary Landfill Site Suitability Report* in March 2004.

Table 1-1. Schedule of Critical Consent Decree-Related Requirements

Requirement	Elapsed Time	Date
• Identify a minimum of 3 sites for Site Selection EIS	30 days	3/12/04
• Develop a Financial Plan	120 days	6/10/04
• Final Site Selection EIS	300 days	12/7/04
• Draft Ordot Dump Closure Plan	300 days	12/7/04
• Draft New Landfill Design	540 days	08/4/05
• Final Ordot Dump Closure Plan	570 days	09/3/05
• Final New Landfill Design	845 days	06/5/06
• New Landfill Operation	1,320 days	9/23/07
• \$1 Million Hazardous Waste Diversion Project	4 years	2/11/08

The *Preliminary Landfill Site Suitability Report* can be found on the GEPA Web site (www.guamepa.govguam.net).

The Consent Decree also requires that GDPW complete a site selection EIS within 300 days of the entry date. This deadline (12/7/04) was not met due to a conflict with the right of entry for the Lonfit site. Without the right of entry consent by the owners, the field investigations could not be accomplished, which delayed the project and the identification of a site for the island's new MSWLF. USEPA fined GDPW \$7,250 for missing the required deadline. Right of entry to the Lonfit site was eventually resolved, which allowed access to the site and the field investigations were completed. The *Final Site Selection Report: Environmental Impact Statement for the Siting of a Municipal Solid Waste Landfill Facility, Guam* (GDPW 2005) documents the site selection process and evaluates the impacts associated with three potential landfill sites. GovGuam was then able to select a landfill site based on information in the EIS. USEPA recognized the selection of a site as meeting the obligation of Paragraph 9.a. under of the Consent Decree (USEPA letter to GDPW February 14, 2005). GDPW is no longer being fined by USEPA since they met the Consent Decree obligations. A detailed description of the site selection process leading to the selection of the Dandan site is provided below.

Site Selection Process

GovGuam has undertaken a comprehensive and multi-faceted site selection process to satisfy two primary objectives as follows:

1. Identify potential alternative landfill sites and recommend a selection criteria system and process. These steps allowed GovGuam to select a preferred site; and
2. Identify environmental impacts and prescribe appropriate mitigation of those impacts at the selected site to accommodate the construction and operation of an MSWLF.

The site selection process has included the following stages:

- Preliminary Landfill Site Suitability Report March 2004
- Scoping July 2004
- Preliminary Site Selection Report (PSSR)/EIS January 11, 2005
- Scoping January 2005
- Final Site Selection by GovGuam January 31, 2005
- USEPA Accepts Final Site Selection February 14, 2005
- Final Site Selection Report (FSSR)/EIS March 14, 2005

The remaining steps in the process are:

- Draft Supplemental EIS (SEIS) May 18, 2005
- Public Comment Period May 18, 2005 – June 16, 2005
- Public Meeting May 24, 2005
- Final Supplemental EIS July 16, 2005

Preliminary Landfill Site Suitability Report

GovGuam conducted a preliminary site suitability screening study. Applying the MSWLF Location Restrictions specified in the Guam Solid Waste Disposal Rules and Regulations (GCA Title 22, Division 4, Chapter 23), and using other screening criteria including engineering, hydrogeology, environmental and land use factors, GovGuam identified three candidate landfill locations. The screening study report entitled *Preliminary Landfill Site Suitability Report* was published in March 2004. The three candidate sites identified by the screening study were Dandan, Sabanan Batea, and Lonfit.

Scoping

The scoping process relies on input from stakeholders, government and non-government entities, and the general public to help identify issues and define the appropriate scope of analyses in the site selection process. Public involvement was most heavily concentrated in the scoping stage, when input was solicited on what criteria and considerations should

be examined during the process. An opportunity for public input was available after the release of the Preliminary Landfill Site Suitability Report in July 2004 and then again after the release of the Preliminary Site Selection Report in January 2005. The public participation process is discussed in more detail in Chapter 6.

Preliminary Site Selection Report and Environmental Impact Statement (PSSR/EIS)

The PSSR was prepared to further characterize the three potential landfill sites (alternatives) identified in the *Preliminary Landfill Site Suitability Report*. Information was collected on topics such as hydrology, geology, soils, flora, fauna, wetlands, land use, infrastructure, air quality, noise and cultural resources through background research and reconnaissance surveys of each candidate site. Input from the public and from local and federal government reviewers was also used to characterize the sites. The public had the opportunity to comment on the PSSR at public meetings held in January 2005.

Final Site Selection Report and Environmental Impact Statement (FSSR/EIS)

GovGuam selected a site (Dandan) based on the PSSR and formally announced its selection on January 31, 2005. This final site selection process is documented in the *Municipal Solid Waste Landfill (Guam) Site Evaluation Report* dated January 28, 2005 (Appendix B). The Landfill Site Evaluation Team (LSET) reviewed the PSSR and related information to evaluate the three candidate sites. LSET is a panel of seven members from GDPW and GEPA making up the Consent Decree project team. The LSET determined that the Dandan candidate site located in the Municipality of Inarajan is best suited for the development of a MSWLF. USEPA accepted the selection of Dandan as the preferred site in a letter dated February 14, 2005 (Appendix B). The PSSR became final and was published on March 14, 2005 as the FSSR/EIS.

Island-Wide Solid Waste Management Strategy

The current solid waste management systems on Guam are the Ordot Dump, three transfer stations, and a hardfill (a facility that accepts inert material, such as rocks, soil, concrete chunks, asphalt pavement chunks, etc.) in the Municipality of Inarajan. The hardfill site also acts as a transfer station for municipal waste, as well as a disposal area for clean construction/demolition debris, clean metallic waste, and other material that is not subject to Subtitle D restrictions. These facilities and other permitted private hardfills service the entire civilian community of Guam. Trash collection is provided by GDPW as well as by a number of private trash haulers (GDPW 1998).

The Navy Public Works Center (PWC) operates a landfill on the Naval Station (PWC Landfill). The United States Air Force operates a landfill on Andersen Air Force Base. Both the Navy and the Air Force operate their own collection systems (GDPW 1998).

The island-wide solid waste management strategy proposed for implementation by GovGuam targets a thorough restructuring of Guam's solid waste collection, diversion,

recycling, storage, transportation, and disposal practices and processes, and consists of the following elements/components:

- Mandatory separation and collection of recyclables at the source to include both commercial and residential generators;
- Development and operation of multi-purpose regional substations to which solid waste collection traffic will be directed for deposition of solid waste loads for further separation and processing;
- Processing of solid waste at the regional substations for additional capture of recyclables and compostables and for separation of hazardous/toxic waste materials that enter the waste stream;
- Development and operation of composting facilities at designated regional substations to effect the reduction of compostable wastes;
- Operation and maintenance of a well-designed, Subtitle D-approved limited-access sanitary landfill in a manner that is completely compliant with local and federal solid waste disposal regulations; and
- Transport of separated and sorted solid waste to the sanitary landfill in bulk, purpose-built trash haulers at times of day that will minimize impacts on highway traffic flow and safety.

The strategy will dictate the design, construction, operation, and maintenance of a limited-access sanitary landfill, which will minimize landfill-bound traffic flow.

Closure of Ordot Dump

Concurrent with the siting, design, and construction of the new landfill, GDPW must initiate significant and progressive improvements to the operation of the Ordot Dump and develop regulatory closure plans that coincide with the opening of the new landfill facility (GEPA 2004a).

1.1 LOCATION

The landfill site selected by GovGuam is located in Dandan, Inarajan (GEPA 2005). The selection of this site was based on exclusionary criteria derived from several guidelines, including the RCRA Subtitle D location restrictions and other requirements of the Guam Solid Waste Disposal Rules and Regulations (GCA Title 22, Div. 4, Chapter 23).

Figure 1-1 depicts the location of the Dandan landfill parcel. Within the landfill parcel, the proposed landfill footprint has been identified and is approximately 126 acres in area. The landfill footprint is referred to as Layon. Previous documents concerning GDPW's new MSWLF have referred to both the parcel and the footprint as Dandan. In this SEIS

Dandan refers to the parcel and the name Layon is used to refer to the smaller footprint within the Dandan parcel.

This Supplemental EIS (SEIS) evaluates three alternatives for the site layout and development of a municipal solid waste landfill facility at Layon, as well as the no action alternative.

1.2 PURPOSE AND NEED

The purpose of this project is to provide a site for a fully compliant RCRA Subtitle D MSWLF on the Island of Guam. The purpose of this SEIS is to analyze the potential environmental impacts of the proposed action and prescribe appropriate mitigation of those impacts. This project is needed because the current Ordot Dump is in violation of the Clean Water Act and the Ordot Consent Decree requires the GDPW to cease discharge of leachate from the Ordot Dump to the Lonfit River. This SEIS is needed because a detailed analysis of the impacts of alternatives for the Layon footprint was not included in the FSSR/EIS for Site Selection.

1.3 SCOPE OF THE SEIS

The Ordot Consent Decree mandates the preparation of an EIS for the siting of the new MSWLF. The completion of the EIS process precedes the issuance of a permit to GDPW by GEPA with concurrence from USEPA for the siting, construction, and operation of a new MSWLF on Guam. The EIS for the siting of a new MSWLF was completed in March 2005 (GDPW 2005).

This SEIS evaluates impacts of alternative site layouts at Layon, located within the selected Dandan parcel. This SEIS examines the consequences of a proposed action on the environment. The SEIS analyzes the temporary, long-term, permanent and cumulative effects of the proposed action, along with reasonable alternatives to the proposed action including the alternative of "no action." The SEIS assists decision-makers by comparing the proposed action with the alternatives and identifying mitigation measures that would minimize adverse effects.

1.4 ORGANIZATION OF THE SEIS

This Draft SEIS is composed of nine chapters. The format for the SEIS was based on guidance from:

- GEPA Environmental Impact Assessment Guidelines, September 1997 (Amended) November 1999; and
- Ordot Consent Decree.

Chapter 1 discusses the location of the project, purpose and need of the project, the scope of the SEIS, the site selection process (these topics were previously discussed in Sections

1.1 through 1.4), organization of the SEIS (current section being discussed), and applicable statutory and regulatory requirements (Section 1.5). Chapter 2 discusses the alternatives for site development at Layon, including the proposed action. Chapter 3 describes the affected environment. This chapter discusses existing conditions of natural, physical, socio-economic, and cultural resources in relation to the alternatives. Chapter 4 presents the environmental consequences for the alternatives to natural, physical, socio-economic, and cultural resources, and compares the impacts among the three alternatives to select a preferred alternative. Chapter 5 discusses mitigation and monitoring needed for the preferred alternative, cumulative impacts, and compliance with regulations. Chapter 6 documents agency consultation and coordination and public participation in the EIS process. The remaining chapters (7 through 9) include a list of preparers, references, and appendices (respectively).

1.5 APPLICABLE STATUTORY AND REGULATORY REQUIREMENTS

1.5.1 Guam Regulatory Design Requirements for Solid Waste Landfills

GovGuam has been delegated the authority for the planning and design of a new MSWLF conforming to the requirements of Subtitle D of the Federal RCRA by USEPA. GovGuam regulations to implement Subtitle D are set forth in *Rules and Regulations for the Guam Environmental Protection Agency (GEPA) Solid Waste Disposal* (GCA Title 22, Div. 4, Chapter 23). These regulations are no less stringent than the USEPA MSWLF standards. These requirements are common to all sites:

- Access Control
- Office and Maintenance Facilities
- Base Liner System
- Leachate Collection
- Stormwater Control
- Landfill Operation
- Landfill Closure/Post-Closure
- Landfill Gas Collection and Monitoring

These requirements, which govern the planning and design of a new MSWLF, are discussed in detail in Section 2.2. Table 1-2 lists the regulations that govern the planning and design of new MSWLFs set forth in Title 22, Div. 4, Chapter 23.

Table 1-2 Regulations that Govern the Planning and Design of New MSWLF

Resource or Topic	Section	Description
Design Criteria	23401	All MSWLF units must meet the minimum design criteria.
	23403	All MSWLF units must be below the legal maximum containment level for all chemicals.
Ground Water	23502	All MSWLF must have a ground-water monitoring system installed that consists of a sufficient number of wells to yield ground-water samples.

Resource or Topic	Section	Description
	23504	All MSWLF units must have a ground-water monitoring program which includes consistent sampling and analysis procedures.
	23505	All MSWLF must have a detection monitoring program at all ground-water monitoring wells.
	23506	All MSWLF must have an assessment monitoring program if an increase has been detected for one or more of the constituents listed in Appendix I in the <i>Rules and Regulations for the GEPA Solid Waste Disposal</i> .
Soil	23304	All MSWLF units must cover disposed solid waste with six inches of earthen material at the end at each operating day.
Air Quality	23306	All MSWLF must monitor the concentration of methane emitted.
	23307	All MSWLF units shall not violate any applicable requirements developed under a State Implementation Plan approved by the USEPA.
Surface Water	23309	All MSWLF units shall have a run-on and run-off control system.
	23310	All MSWLF units shall not cause a discharge of pollutants into streams, rivers, wetlands, etc., that violates any requirements of the Clean Water Act.
	23203	New MSWLF units shall not be located in wetlands.
Site Access	23308	All MSWLF units must control public access and prevent unauthorized vehicular traffic and illegal dumping.
Record Keeping	23312	All MSWLF units must record and retain near the facility an operating record.
Closure	23601	All MSWLF units must install a final cover system that is designed to minimize infiltration and erosion.
Post-Closure	23602	All MSWLF units must have post-closure care conducted for thirty years.

1.5.2. Relevant Federal Statutes

In evaluating environmental impacts of proposed actions, relevant laws, policies and regulations should be considered. In this section we describe the laws and Presidential executive orders that are applicable to this project. Table 1-3 lists the relevant Executive Orders.

Table 1-3. Relevant Executive Orders

Resource or Topic	Executive Order	Description
Floodplains	11988	All agencies shall reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains.
Pollution Control	12088	All agencies are responsible for ensuring that all necessary actions are taken for the prevention, control, and abatement of environmental protection.
Wetlands	11990	All agencies shall take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetland.
Cultural Resources	11593	All agencies are responsible in preserving, restoring and maintaining the historic and cultural environment of the Nation.

Resource or Topic	Executive Order	Description
Protection of Children	13045	All agencies shall make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children.
Environmental Quality	11514	All agencies are responsible in protecting and enhancing the quality of the Nation's environment to sustain and enrich human life.

The Resource Conservation and Recovery Act (RCRA)

RCRA established a system for managing non-hazardous and hazardous solid wastes in an environmentally sound manner. Specifically, it provides for the management of hazardous wastes from the point of origin to the point of final disposal (i.e., "cradle to grave"). RCRA also promotes resource recovery and waste minimization. The Act defines solid and hazardous waste, authorizes USEPA to set standards for facilities that generate or manage hazardous waste, and establishes a permit program for hazardous waste treatment, storage, and disposal facilities. In the Hazardous and Solid Waste Amendments of 1984 the federal government attempted to prevent future cleanup problems by prohibiting land disposal of untreated hazardous wastes, setting liner and leachate collection requirements for land disposal facilities, setting deadlines for closure of facilities not meeting standards, and establishing a corrective action program.

RCRA Subtitle D - Subtitle D of RCRA is titled *State or Regional Solid Waste Plans* and is implemented at 40 *CFR* 257 and 258:

- 40 *CFR* 257 focuses on state and local governments as the primary planning, regulating, and implementing entities for the management of non-hazardous solid waste (e.g., household and non-hazardous industrial wastes).
- 40 *CFR* 258 establishes minimum national criteria for all municipal solid waste landfill (MSWLF) units. It also addresses location restrictions (Subpart B), Operating Criteria (Subpart C), Design Criteria (Subpart D), Ground-Water Monitoring and Corrective Action (Subpart E), and Closure and Post-Closure Care (Subpart F) for municipal solid waste landfills.

USEPA regulations implementing RCRA (40 *CFR*) establish criteria for liners, leachate collection, groundwater monitoring, and corrective action at municipal landfills.

The Coastal Zone Management Act (CZMA) of 1972

CZMA establishes an extensive federal grant program within the Department of Commerce to encourage coastal states to develop and implement coastal zone management programs. Activities that affect coastal zones must be consistent with approved state programs. The Act also establishes a national estuarine reserve system.

The National Historic Preservation Act (NHPA) of 1966

NHPA (16 USC 470), as amended, established a nationwide historic preservation program. The NHPA requires federal agencies to integrate historic preservation into their programs. Section 106 of NHPA requires federal agencies to consider the effects of their actions on properties that are listed, or eligible for listing, on the National Register of Historic Places (NRHP). Section 110 of NHPA directs federal agencies to inventory and evaluate their properties and to provide stewardship over significant historic properties.

The Endangered Species Act (ESA) of 1973

ESA provides a program for the conservation of threatened and endangered plants and animals and the habitats in which they are found. The United States Fish and Wildlife Service (USFWS) of the Department of the Interior (DOI) maintains the list of 632 endangered species (326 are plants) and 190 threatened species (78 are plants).

The Clean Air Act (CAA) of 1970

CAA is the comprehensive federal law that regulates air emissions from area, stationary, and mobile sources. This law authorizes the USEPA to establish National Ambient Air Quality Standards (NAAQS) to protect public health and the environment. The setting of maximum pollutant standards was coupled with directing the states/territories to develop state implementation plans (SIPs) applicable to appropriate air emission sources in the state. The Act was amended in 1977 primarily to set new goals (dates) for achieving attainment of NAAQS. The 1990 amendments to the CAA in large part were intended to meet unaddressed or insufficiently addressed problems such as acid rain, ground-level ozone, stratospheric ozone depletion, and air toxics. The SIP for Guam has adopted ambient air quality standards that closely follow national ambient air quality standards.

The Air Pollution Control Act (APCA)

The APCA was enacted in its present form in 1997 by Public Law 24-40:2. It establishes the Air Pollution Control Permit Program and outlines other air pollution control efforts. The purpose of this act is to achieve and maintain the levels of air quality that would protect human health and safety and prevent injury to plant and animal life and property.

The Clean Water Act (CWA) of 1972

CWA, as amended, establishes the national goal of restoring and maintaining the chemical, physical, and biological integrity of the nation's surface waters so that they support "the protection and propagation of fish, shellfish, and wildlife and recreation in and on the water." The statute employs a variety of regulatory and non-regulatory tools to control pollutant discharges from municipal and industrial facilities, manage polluted stormwater runoff, and finance municipal wastewater treatment facilities. Among those tools is the National Pollutant Discharge Elimination System (NPDES) program, under

which USEPA and delegated states and territories issue permits to control discharges to the nation's surface waters.

The Safe Drinking Water Act of 1974

The Safe Drinking Water Act of 1974 was passed to protect public drinking water supplies from harmful contaminants. It is administered through regulatory programs that establish standards and treatment requirements for drinking water, control underground injection of wastes that may contaminate water supplies, and protect groundwater.

The Toxic Substances Control Act (TSCA)

TSCA was enacted to provide information about all chemicals and to control the production of new chemicals that might present an unreasonable risk of injury to health or the environment. TSCA authorizes USEPA to require testing of old and new chemical substances. TSCA also provides authority to regulate the manufacturing, processing, import, and use of chemicals. Because TSCA gives USEPA broad powers, the law covers virtually all manufactured and natural chemicals.

2.0 DESCRIPTION OF THE FOOTPRINT ALTERNATIVES FOR LAYON

Chapter 2.0 describes the three conceptual footprint layout alternatives for Layon, Dandan. The layout alternatives were developed to further reduce the environmental impacts of the landfill project at Layon. Design requirements for a MSWLF including operations, volume projections, components, and costing are also described in this chapter. The potential impacts of the preferred footprint alternative could change based on final design considerations. If design changes cause measurable changes to impacts, additional impact assessment may be required.

2.1 DESCRIPTION OF ALTERNATIVES

This section provides a description of the three proposed conceptual footprint layout alternatives developed for Layon. A description of the No Action Alternative is also included in this section. Layon is located in the higher badland areas on the west side of the Dandan parcel, southwest of the former National Aeronautics and Space Administration (NASA) tracking station (Figure 2-1). An additional 30 acres for site access control, office facilities, stormwater runoff control, etc. and 4.6 acres for an access road and utilities would be needed beyond the landfill footprint regardless of the alternative. During development and operation of the landfill, approximately 10 acres would be developed at any time. Within this ten-acre area, only a 0.5-acre area would actively receive waste.

The landfill is envisioned as a mounded landfill. The top elevation of the landfill would be approximately elevation 435 ft above mean sea level (MSL) (see Figure 2-2 for conceptual closure profile). The landfill would be excavated approximately 15 ft or deeper below existing grade to provide cover soils. Access to the site would be from Route 4 via Dandan Road.

The landfill footprint and shape would be more clearly defined during the design process in order to further reduce the amount of impact to the site based on refined geotechnical and hydro-geological surveys and analysis that is specific to the design.

A summary of the conceptual landfill alternatives is provided in Table 2-1.

Table 2-1. Summary of Conceptual Landfill Layout Alternative Characteristics

Characteristic	Alternative 1 (Acres)	Alternative 2 (Acres)	Alternative 3 (Acres)
Cells	12 cells (10.5 acres each)	9 cells (14 acres each)	9 cells (14 acres each)
Sub-total	126	126	126
Extend 400 ft	--	15	15
Total of Cells	126	141	141
Buffer	30	30	30
Footprint Total	156	171	171

Characteristic	Alternative 1 (Acres)	Alternative 2 (Acres)	Alternative 3 (Acres)
Pond (within buffer)	9.6	13	13
Support Facilities (within buffer)	5	5	12*
Access Road and Utilities	4.6	4.6	4.6

*Includes 7 acres of land that would be needed for support facilities outside the buffer.

2.1.1 Layout Alternative 1

Alternative 1 would be divided into 12 cells, each approximately 10.5 acres in size (Figure 2-3). These cells would be progressively opened generally from the north to the south. This would reduce active landfill areas and spread capital costs over the lifetime of the facility. Each cell would be excavated to a depth of approximately 15 ft below grade or deeper, which would be adjusted based on local variability of surface contours and depth to groundwater.

Support facilities, including an entrance control structure, scale and scale house, administration facility, leachate storage and treatment facility, and equipment and maintenance storage facilities, would be located adjacent to the access road in the buffer area in the northeast corner of the site. An area of 5 acres would be reserved for these facilities within the buffer area of the landfill.

The stormwater detention pond is sized for a 25-year, 24-hour storm event for the area of two cells, one cell undergoing closure and one new operating cell. The detention pond is estimated to be 9.6 acres in size, lying to the east of the landfill site in the surrounding buffer area. The treated stormwater from the pond would be discharged to the wetlands to the east of the landfill. The drainage facility layout is conceptual; the final design will address drainage to appropriately distribute stormwater runoff so as to maintain existing hydrology.

2.1.2 Layout Alternative 2

Layout Alternative 2 is a revised version of Layout Alternative 1. Alternative 2 was redesigned to avoid wetlands located within the cells and buffer area of the landfill. Alternative 2 would be divided into nine cells, each approximately 14 acres in size (Figure 2-4). These cells would be progressively opened and closed from the north to the south. This would reduce active landfill areas and spread capital costs over the lifetime of the facility. Each cell would be excavated to a depth of approximately 15 ft below grade or deeper, which would be adjusted based on local variability of surface contours and depth to groundwater.

The landfill footprint of Alternative 2 would be extended approximately 400 ft south of the footprint for Alternative 1 to avoid wetland impacts. This extension would provide equivalent landfill space without significantly increasing the height of the landfill to minimize visual impact. This would increase the overall landfill land requirement by

approximately 15 acres. Additionally, Cell 1 has been configured to avoid wetlands in the northeastern portion of the landfill.

The support facilities, including an entrance control structure, scale and scale house, administration facility, leachate storage and treatment facility, and equipment and maintenance storage facilities, would be relocated from the buffer area to the northwestern corner of the site (Cell 1 of Alternative 1). The support facilities are now adjacent to, but not within the wetland areas. This reduces the land acquisition requirements to the north (that were within the buffer area for Alternative 1).

The stormwater detention pond would be sized for a 25-year, 24-hour storm event for the area of two cells, one cell undergoing closure and one new operating cell. The detention pond is estimated to be 13 acres in size, lying to the east of the landfill site in the surrounding buffer area. The treated stormwater from the pond would be discharged to the wetlands to the east of the landfill. The drainage facility layout is conceptual; the final design will address drainage to appropriately distribute stormwater runoff so as to maintain existing hydrology.

Layout Alternative 2 avoids wetlands identified within the main footprint. Additionally, the wetlands within the buffer area would not be disturbed by the landfill construction and operation.

2.1.3 Layout Alternative 3

Layout Alternative 3 is a revised version of Layout Alternative 2. Alternative 3 was redesigned to allow more distance between the wetlands and the support facilities. Alternative 3 would be divided into nine cells, each approximately 14 acres in size (Figure 2-5). These cells would be progressively opened and closed from the north to the south. This would reduce active landfill areas and spread capital costs over the lifetime of the facility. Each cell would be excavated to a depth of approximately 15 ft below grade or deeper, which would be adjusted based on local variability of surface contours and depth to groundwater.

As with Alternative 2, the landfill footprint of Alternative 3 would be extended approximately 400 ft south of Alternative 1 to avoid wetland impacts. This would increase the overall landfill land requirement by approximately 15 acres. The configuration of Cell 1 to avoid wetlands remains as in Alternative 2.

The support facilities, including an entrance control structure, scale and scale house, administration facility, leachate storage and treatment facility, and equipment and maintenance storage facilities, would be relocated directly outside of the buffer area to the northeast of the footprint. As in Alternative 2, the support facilities for Alternative 3 are still adjacent to, but not within the wetland areas. Alternative 3 will require an additional 7 acres of land for the relocated support facilities.

The stormwater detention pond would be sized for a 25-year, 24-hour storm event for the area of two cells, one cell undergoing closure and one new operating cell. The detention pond is estimated to be 13 acres in size, lying to the east of the landfill site in the surrounding buffer area. The treated stormwater from the pond would be discharged to the wetlands to the east of the landfill. The drainage facility layout is conceptual; the final design will address drainage to appropriately distribute stormwater runoff so as to maintain existing hydrology.

As with Alternative 2, Layout Alternative 3 avoids wetlands identified within the main footprint. Additionally, the wetlands within the buffer area would not be disturbed by the landfill construction and operation. The support facilities were relocated in Alternative 3 to minimize any potential impacts to wetlands by creating a larger distance/buffer between the wetlands and proposed development.

2.1.4 The No Action Alternative

The No Action alternative is required to review and compare all feasible alternatives to existing baseline conditions. Under the No Action alternative, no new landfill site would be selected, and Guam would continue to use the existing Ordot Dump for disposal of solid wastes, which means that the dump would continue to impact the Lonfit and Pago rivers. Leachate streams emanate from the Ordot Dump and discharge into the Lonfit River. This alternative is not considered viable. It would be a continued violation of the Federal Clean Water Act and the settlement agreement (The Ordot Consent Decree) to resolve issues related to the unauthorized discharge of pollutants from the Ordot Dump to the Lonfit River. GovGuam has agreed to specific terms under the Consent Decree to initiate and complete the construction of a fully compliant RCRA Subtitle D MSWLF within a specific schedule. If this schedule is not met, USEPA would begin fining GovGuam for missing the required deadline. Therefore, the No Action Alternative would result in significant adverse impacts to the resources in the vicinity of the Ordot Dump as well as a major adverse financial responsibility.

2.2 DESIGN REQUIREMENTS FOR MUNICIPAL SOLID WASTE LANDFILLS

The following landfill design and operating features are common to all alternatives. Figures 2-6 through 2-9 provide generalized cross-sections of the landfill common to all alternatives. The cross-sections are in accordance with RCRA and the Rules and Regulations for GEPA Solid Waste Disposal Title 22, Division 4 Chapter 23, Guam Code. These cross-sections are applicable to all alternatives. The cross-sections are based on the following requirements.

2.2.1 Landfill Design and Operating Features

Landfill Access

The access corridor includes the access road and utility rights-of-way. The access to the facility would be controlled to prevent unauthorized disposal of restricted material, dumping, and scavenging in accordance with §23308. These facilities would include:

- Entrance control structure.
- Perimeter fencing and access gates
- Scale and scale house
- Interior access roads

Office and Maintenance Facilities

The MSWLF would include office and maintenance facilities to provide the supporting infrastructure and recordkeeping (rule §23312). For operation of the landfill this would include:

- Office facility for landfill operations, recordkeeping, conference room, training areas, employee lockers and changing facilities and sanitary facilities.
- Employee and visitor parking.
- Equipment maintenance and storage facilities.

Stormwater Run-Off Control

The MSWLF would include run-on and run-off control systems in accordance with §23309. These facilities would include:

- A run-on control system to prevent flow into the active portion of the landfill during peak discharge from a 25-year storm.
- A run-off control system to prevent flow from the active portion of the landfill, and to collect and control at least the volume resulting from a 24-hour, 25-year storm.
- Runoff from the active portions of the landfill unit must be handled in accordance with rule §233010 to meet the requirements of NPDES.

The conceptual stormwater detention pond is sized for the 25-year, 24-hour storm event for the area of two cells, one cell undergoing closure, and a new operating cell. The systems would be adjusted based on operating procedures during final design to appropriately distribute stormwater runoff so as to maintain existing hydrology.

Liner Requirements

The minimum liner system design (Figure 2-6) specified in rule §23401 is a composite liner consisting of the following:

- A minimum 30-mil (0.03-inch) thick flexible membrane liner (FML), unless the FML is high density polyethylene (HDPE) where the FML shall be a minimum 60 mil (0.06 inch) in thickness installed in direct and uniform contact with a minimum 2-ft layer of compacted soil with a hydraulic conductivity of no more than 1×10^{-7} centimeters per second (cm/sec).
- Alternative liner systems are permitted by the rules if the design ensures that the concentration values listed in §23403 are not exceeded in the uppermost aquifer at the relevant point of compliance.

The conceptual liner system for this landfill EIS is proposed to be in conformance with the first bulleted item.

Leachate Collection

The conceptual leachate collection system design (Figure 2-7) specified in rule §23401 shall be designed to maintain less than a 30-centimeter (cm), 12-inch (in.) depth of leachate over the liner. This system normally consists of a sloped drainage layer immediately above the liner system that drains to a series of perforated collection pipes and sumps. The leachate is pumped to storage tanks for onsite treatment or transport to an offsite treatment facility.

Closure System

The minimum closure system design to minimize infiltration and erosion specified in rule §23601 consists of the following:

An infiltration prevention system consisting of 18 inches of earthen material with a permeability equal to or less than the permeability of the bottom liner system, or permeability no greater than 1×10^{-5} cm/sec. Based on the use of a composite base liner system, a composite liner system would be assumed for the closure of all alternatives. An erosion layer consistency of a minimum of 6 in. of earthen material that is capable of sustaining native plant growth. This may be increased during design, but would be assumed similar for all alternatives.

Groundwater Monitoring Plan

A groundwater monitoring plan would include wells to monitor the uppermost aquifer below the landfill.

Leachate Transport and Treatment

Leachate would be collected from below the placed wastes and conveyed to a sump conceptually located in the corner of each cell. Leachate will be pumped to onsite storage facilities for onsite treatment and disposal, or transported offsite to a local Wastewater Treatment Facility.

Landfill Operation

The landfill operations would be performed in accordance with rule §23304 to include daily cover of all wastes. The daily cover is assumed to be 6 in. of soil placed at a ratio of 4:1 waste-to-soil cover for all conceptual alternatives. Cover soils for waste placement would be provided from initial and subsequent cell excavations. Soil would be stockpiled to meet daily needs near the active landfill areas or placed directly from excavations based on the final operating plan for the facility. A Draft Operation Plan outline is provided below in Table 2-2.

Table 2-2. Draft Operation Plan Outline

Draft Operation Plan Outline	
Introduction	
2.0	Staffing
3.0	Prevention of Receipt of Hazardous Wastes
3.1	Inspections
3.2	Handling Procedures
3.3	Contractual Agreements (for hauling offsite, if received)
4.0	Recyclables Acceptance, Storage, and Transfer
5.0	Disposal Method
5.1	Introduction
5.2	Filling Method and Procedure
5.2.1	Type of Facility
5.2.2	Typical Cell Construction
5.2.3	Excavation of Subgrade
5.2.4	Waste Spreading
5.2.5	Waste Compaction
5.2.6	Waste Cover
5.3	Special Provisions
5.3.1	Setback
5.3.2	Traffic Management
5.3.3	Final Grade Provision
6.0	Miscellaneous Operational Activities
6.1	Litter Control
6.2	Dust Control
6.3	Vector Control
6.4	Odor Control
6.5	Fire Control
6.6	Noise Control
6.7	Bird and Wildlife Control
6.8	Access Control
6.9	Drainage and Erosion Control
6.10	Leachate Collection and Handling
6.11	Equipment

Draft Operation Plan Outline	
6.12	Site Signs
7.0	Recordkeeping
8.0	Waste Characterization
8.1	Service Area
8.2	Wastes Accepted/Not Accepted
8.3	Waste Properties
8.4	Facilities Accepting Refused Wastes
8.5	Special Handling Procedures
9.0	Restricted Activities
9.1	Salvaging
9.2	Open Burning
9.3	Setbacks
10.0	Contingency Plan
10.1	Landfill Gas Migration
10.2	Traffic--Unusual Conditions
10.3	Fire
10.4	Personnel Safety
10.5	Facility Shutdown
10.6	Equipment Failure
10.7	Release of Hazardous or Toxic Wastes
10.8	Leachate Collection System
10.9	Leachate Treatment System
10.10	Emergency Coordination
10.11	Evacuation Plan
10.12	Emergency Preparedness and Response Plan
11.0	Closure Plan
11.1	Closure System Design
11.2	Phase Cell Closure System Description
11.3	Notification Requirements
12.0	Post-Closure Plan
12.1	Groundwater Monitoring Requirements
12.2	Landfill Gas Monitoring Requirements
12.3	Maintenance and Inspection Requirements
13.0	Groundwater Monitoring Plan
13.1	Monitoring Well Locations
13.2	Field Sampling Requirements
13.3	Laboratory Testing Requirements
13.4	Recordkeeping
13.5	Statistical Analysis Requirements

Landfill Closure

Final conceptual closure contours were assumed based on side slopes of 4 horizontal to 1 vertical to an approximate height of 55 ft above grade. The top of the landfill would be

sloped at approximately 5 percent to maintain drainage on the top of the landfill. The final landfill closure contours would depend on the proposed final land use plans for the area after closure of the landfill. Landfill post-closure care, in accordance with rule §23602, would be considered similar for all alternatives.

Gas Collection

The gas collection and monitoring requirements are specified in rule §23306. Conceptual gas collection would be by vertical wells (Figure 2-8). The gas would be passively dispersed or collected and flared or put to beneficial use. The flare, if necessary, would be located in the support facilities area. There is a potential for generation of electric power from methane generated during operation and closure of an MSWLF. The development of generation capacity would be evaluated during detailed design.

Water Quality Monitoring

Water quality monitoring would be performed at the landfill facility to detect any discharge of pollutants into surface waters of the United States in violation of the Clean Water Act requirements, as prohibited in rule §23306. A monitoring plan approved by Guam EPA would specify monitoring stations and sampling parameters.

A groundwater monitoring system would be installed in compliance with rule §23502 to §23506 to detect statistically significant levels of constituents that exceed groundwater standards. A typical monitoring well section is provided on Figure 2-9. The number of wells, locations and depths for groundwater sampling, and sampling and analytical methods would be specified in a monitoring plan.

Corrective Action

As specified in rule §23507 to §23509, implementation of a corrective action groundwater program is required when groundwater standards have been exceeded for one or more constituents. The assessment of corrective measures involves several considerations, including community concerns and long-term reliability of engineering and institutional controls. The assessment and implementation of an approved remedy must be performed in a timely manner.

Financial Assurance

Article 7 of the Guam Solid Waste Management Regulations (Title 23, GCA) provides extensive financial criteria that must be satisfied by the owner and operator of the new landfill facility. Financial assurance requirements cover closure and post-closure activities of the landfill as well as actions to correct defects in the performance of in-place landfill systems and to comply with the regulations. Financial assurance may be provided through a variety of optional mechanisms as defined by the regulations and subject to the approval of the GEPA Administrator.

2.2.2 Landfill Volume Projections

Development of the new landfill must be preceded by a reasonable estimation of the volume of municipal solid waste that is intended for disposal at the landfill facility over a minimum period of 30 years. The following waste generation and waste stream processing scenario shows the range of possible and reasonable target 30-year cumulative volumes for use in sizing the proposed MSWLF:

- Nominal source reduction at 2 percent.
- Generation rate based on 20 percent over the national average, or 5.28 pcd.
- 30-year cumulative volume = 14,019,081 cubic yards.

The solid waste landfill volume calculations are based on industry-accepted solid waste management waste conversion factors, a reasonable range of generation rates, and current population projections. The population forecast report can be found in Appendix E of the *Final Site Selection Report* (GDPW 2005).

This scenario provides the most conservative order of magnitude solid waste volume generation estimate. Thus, the volume of 14 million cubic yards would be used to size the proposed landfill for the 30-year design period. If the proposed diversion and recycling components of new solid waste management strategy are effective, the estimated life of the landfill will exceed the 30-year design capacity.

2.2.3 Landfill Components

The landfill would require the following general components. The quantities would vary based on the final site-specific design of the facility based on the final waste stream. Items 1 through 8 are support facilities that would be developed initially and would support the entire landfill development. The remaining items would be performed as each cell is developed.

Table 2-3. Landfill Component List

	Component	Item	Units	Quantity	Comments
1.	Access Road	Site Clearing	Acre	Site Specific	Asphalt Paved Two Lane
		Excavation	CY	Site Specific	
		Fill	CY	Site Specific	
		Paving	LF	Site Specific	
		Culverts	Each	Site Specific	
2.	Access Control	Access Control Building	Each	1	
		Fencing	LF	Site Specific	Perimeter of each cell, Maintenance office area and runoff pond
		Vehicle Gates	Each	Site Specific	
		Interior Roads	LF	Site Specific	Around each cell, two lane gravel/limerock surfacing
3.	Fire Protection	Storage Tank	Each	Site Specific	

	Component	Item	Units	Quantity	Comments
		Piping	LF	Site Specific	
		Pumps	Each	Site Specific	
		Hydrants	Each	Site Specific	
4.	Utilities	Water supply piping	LF	Site Specific	
		Power distribution line and transformer	LF	Site Specific	
		Telephone	LF	Site Specific	
		Sewage piping	LF	Site Specific	
		Septic tank and leaching field	Each	1	
5.	Maintenance/ Office Area	Site Clearing			
		Office Building	Each	1	Office personnel, records storage, locker rooms, showers, bathrooms
		Equipment Maintenance Building	Each	1	Typhoon protection for mobile equipment, vehicle maintenance, equipment spares storage
		Lighting	LS	Site Specific	
		Pavement/Parking Area	Acre	2	Aggregate surfacing
6.	Mobile Equipment	Water Truck 2,000 gallons	Each	1	
		Compactor S26	Each	1	
		Dozer D8	Each	1	
		Loader 980G	Each	1	
		Maintenance Truck	Each	1	
7.	Scale	Truck Scale	Each	1	
		Computer Control System	Each	1	
		Scale House	Each	1	
8.	Leachate Treatment	Treatment Plant	LS	Site Specific	Not needed if local Wastewater Treatment Facility available
		Leachate tank	LS	50,000 gallons	
		Pipeline to POTW	LF	Site Specific	
9.	Stormwater Collection	Stormwater Collection Pond 24-hour storm			
		Site clearing	Acre	Site Specific	Area Pond
		Excavation	CY	Site Specific	Area Pond
		Liner System	SF	Site Specific	Area pond
		Geotextile	SF	Site Specific	Area pond
		Collection Ditches	LF	Site Specific	
10.	Landfill Cells				Per Cell
	Site Preparation	Site Clearing	Acre	Site Specific	Area of cells
		Site excavation	CY	Site Specific	
		Site Fill	CY	Site Specific	
		Containment Berms	LF	Site Specific	Around perimeter of each cell, 4 ft high

	Component	Item	Units	Quantity	Comments
	Liner System	Composite Liner			
		60-mil HDPE	SF	Site Specific	Area base of landfill
		24-in. compacted clay	SF	Site Specific	Area base of landfill
	Leachate Collection System	Geotextile	SF	Site Specific	Twice Area base of landfill
		Leachate Collection Piping	LF	Site Specific	100 ft on center across cell
		12-in. Granular Collection Material	SF	Site Specific	Area base of landfill
		Leachate Sumps	Each	Site Specific	one per cell
		Leachate pumps	Each	Site Specific	one per cell
		Leachate Collection Pipe Cleanouts	Each	Site Specific	One per run of pipe
		Cover Soils	CY	25% of Waste	
	Protective Soil Cover	Soil Cover 12-24 in.	SF	Site Specific	Area base of landfill
11.	Monitoring Wells		Each	Site Specific	Two per cell
12.	Closure	Composite Liner			
		60-mil HDPE	SF	Site Specific	Area top of landfill
		18-in. compacted clay	SF	Site Specific	Area top of landfill
		Infiltration Drainage System			
		Geotextile	SF	Site Specific	Area top of landfill
		Drainage Layer	SF	Site Specific	Area top of landfill
		Protective Soil Cover 12-18 in.	SF	Site Specific	Area top of landfill
		Topsoil 6 in.	SF	Site Specific	Area top of landfill
		Gas Collection Well	each	Site Specific	2/acre at 50 ft deep
		Gas collection piping	LF	Site Specific	
		Flare	Each	1	Per landfill
13.	Run-On Diversion Ditch	Excavation	CY	Site Specific	Divert surrounding area run-off around landfill
		Culverts	Each	Site Specific	
		Erosion Control			
		Riprap	CY	Site Specific	
		Concrete pavement	SF	Site Specific	
14.	Wetland Mitigation	Create new wetlands	Acre	Site specific	
15.	Landscaping	Trees	LS	Site specific	
		Shrubs	LS	Site specific	
16.	Signage		LS	Site Specific	
17.	Land Acquisition	Footprint, pond, maintenance and buffer areas	Acres		
18.	Engineering	Landfill Design	LS		
		Operations Manual	LS		
		Closure design	LS		
		Post-Closure Plan	LS		
		Groundwater Monitoring	LS		
		Gas Monitoring	LS		

	Component	Item	Units	Quantity	Comments
		Financial Assurance	LS		
		Construction Quality Assurance Plan	LS		

Notes:

- CY – Cubic Yard(s)
- LF – Linear Foot or Linear Feet
- LS – Lump Sum
- SF – Square Foot or Square Feet

2.2.4 Landfill Costing

The following information on landfill costing included in this section was taken from the *Landfill Financial Plan* prepared by Duenas & Associates, Inc. and Ernst & Young, LLP for GDPW (GDPW 2004c). Currently, DPW funds the operations of the Division of Solid Waste Management through a special or “proprietary” fund derived from the collection of tipping and user fees as authorized by Public Laws 24-139 and 24-272. The intent of the Solid Waste Management Fund (SWMF or the “fund”) was to provide for the complete cost of solid waste operations. Data for the SWMF is maintained by the Bureau of Budget and Management Resources (BBMR). Information from both DPW and BBMR was used in the development of this cost analysis. Where necessary for the purposes of projecting revenues and expenses that are based on solid waste generation rates, DPW has relied on generation data developed for the preparation of the *Guam Integrated Solid Waste Management Plan* (GEPA 2000).

2.2.4.1 Status of Solid Waste Operating Fund

Currently funding is provided by the following fee structure for tipping fees per cubic yard (cy):

1. \$4/cy un-compacted
2. \$16/cy compacted (based on a 4:1 compaction ratio)
3. \$2/ pickup (for self drops)
4. \$4/cy for self drops in excess of 3 cy

2.2.4.2 Program Costs for the Construction of a New MSWLF

Capital costs to construct the new MSWLF are estimated at \$25.7 per ton which is based on initial startup costs for landfill development, equipment, and two landfill cells. Each cell has a capacity of 500,000 tons and a life of 3 years. Operating and maintenance costs are estimated at \$20 per ton. Using projected waste generated annually from the ISWMP and assuming that 98% of the waste is landfilled, the total volume of waste landfilled during the first 6 years of operation is approximately 900,000 tons, with an average per year of 150,000 tons.

Total Development Program Cost for the first 2 cells is estimated at:
\$25.7 million [\$25.7 per ton x 2 cells x 500,000 tons] for capital costs and
\$3,000,000 [\$20 per ton x 150,000 tons per year] for annual O&M costs.

2.2.4.3 Construction Management Services for New MSWLF

Capital costs for construction management services are estimated at \$50,000 per month for the life of the construction contract for the new MSWLF. The Consent Decree requires that the new landfill be completed 12 months after award of the contract.

Total Programming Cost is estimated at \$600,000 [\$50,000/month x 12 months].

2.2.4.4 Training of Engineering Staff

This program element consists of training the Solid Waste Division staff to allow for the effective management and monitoring of the landfill operations, landfill closure and post-closure requirements. The costs associated with the program element include annual salary and benefits, as well as annual training. Total Programming Cost is estimated at \$283,000 per year.

2.2.4.5 Land Acquisition for New MSWLF

Capital cost for the acquisition of raw land in the southern half of Guam is estimated at \$40,000 per acre. It is estimated that approximately 150 acres of land would need to be acquired for the new MSWLF, not including off-site improvements.

Total Program Cost is estimated at \$6 million [\$40,000 per acre x 150 acres].

2.2.4.6 Off-Site Infrastructure for New MSWLF

The aerial map of the Dandan area was reviewed to determine the necessity for off-site infrastructure improvements. Based on the likely location of the landfill within the Dandan parcel, distance to the nearest access road was estimated. It is assumed that existing access roads would be improved as necessary under the Federal Highways Fund and infrastructure improvements such as power and water were available along the nearest access road with residential and commercial land use.

The following table describes the conceptual engineering cost estimates for land acquisition, and road and infrastructure improvements.

Table 2-4. Conceptual Engineering Cost Estimates for Off-Site Infrastructure Improvements

Location & Item	Description	Unit	Qty	Unit Cost	Total Capital Cost
Land	Acquisition of land for 40-foot right-of-way	AC	4.6	\$ 40,000	\$ 184,000.00
Road	36ft Wide, 2-1/2" paved road system with shoulder & drainage	LF	5000	\$ 284	\$ 1,420,000.00
Power	45ft Concrete Poles with Guy Wires and Primary Lines every 180ft	EA	28	\$ 3,500	\$ 98,000.00
Water	10" Diameter Ductile Iron, Mechanical Joints	LF	5000	\$ 42	\$ 210,000.00
				TOTAL	\$ 1,912,000.00

2.2.4.7 Summary of Costs

As summarized in the table below (Table 2-5), costs associated with the construction of the new MSWLF are projected to be approximately \$58 million. Currently, GovGuam has identified a total of \$2,430,000 in available funding. Accordingly, it would be expected that \$57 million in private activity bonds (PABs) would be used for funding of this project.

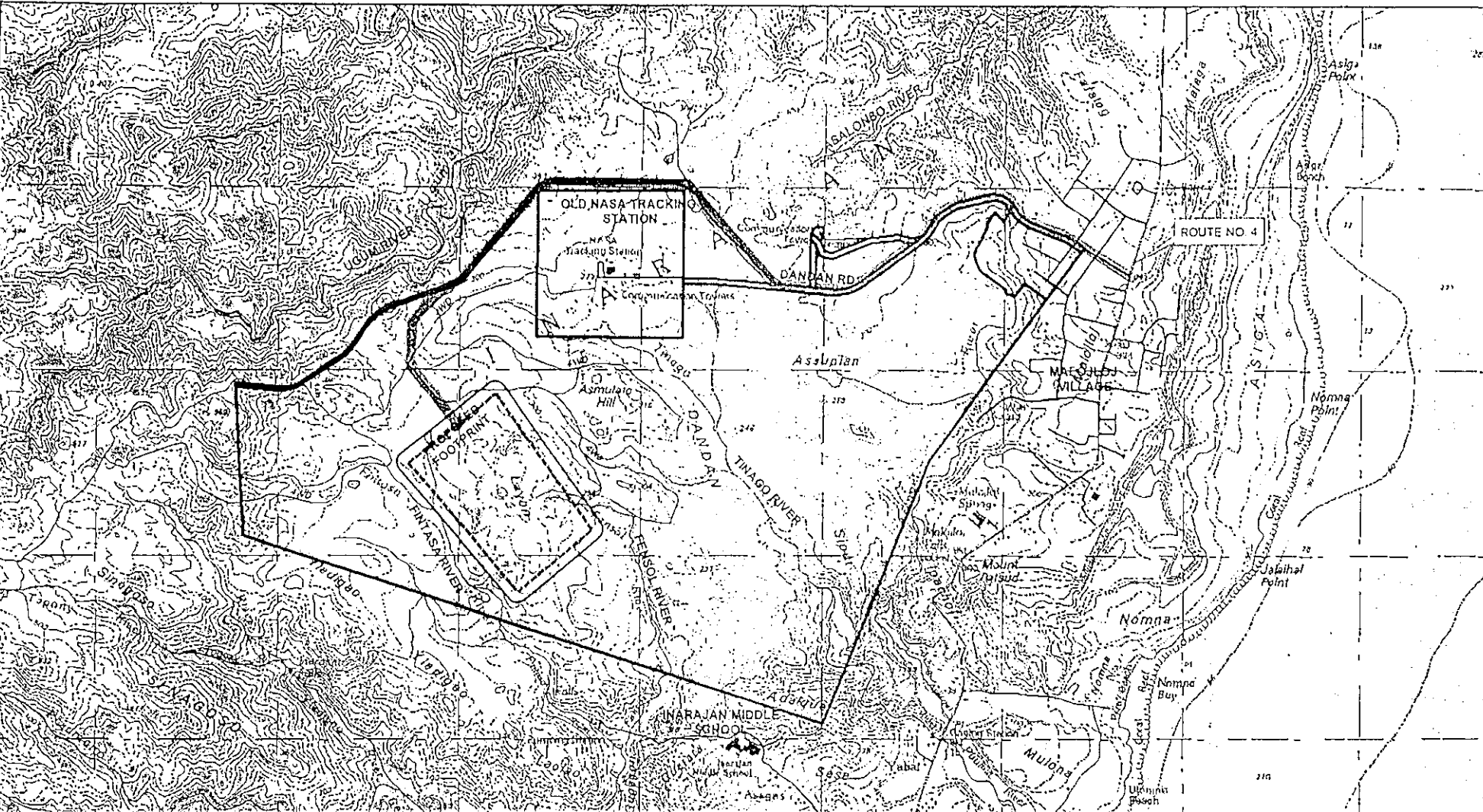
Table 2-5. Program Costs Associated with the New MSWLF

Description	Funding Status	Preferred Funding Alternative	Capital Costs (\$1,000)	O & M Costs (\$1,000)	Total Costs (\$1,000)
EIS and Site Selection	Allocated	SWMF	\$1,100	---	\$1,100
Final Design Plans and 90% Wetland Mitigation Plan	Partially Funded	SWMF, DBOT	\$2,818	---	\$2,818
Advertise, Award & Construct	Unfunded	DBOT	\$25,700	\$18,000	\$43,700
Construction Management Services	Partially Funded	Grants, Loans, Bonds	\$600	---	\$600
Training of Engineering Staff	Partially Funded	Grants, Loans, Bonds	---	\$1,698	\$1,698
Land Acquisition	Unfunded	DBOT, Gov't Exchange	\$6,000	---	\$6,000
Off-site Land Acquisition and Infrastructure	Unfunded	DBOT	\$1,912	---	\$1,912
Wetland Mitigation Construction	Unfunded	Grants, Loans, Bonds	\$750	---	\$750

Description	Funding Status	Preferred Funding Alternative	Capital Costs (\$1,000)	O & M Costs (\$1,000)	Total Costs (\$1,000)
Total Estimated Funding Required	---	---	---	---	\$58,578
Available Funding	---	---	---	---	\$2,430

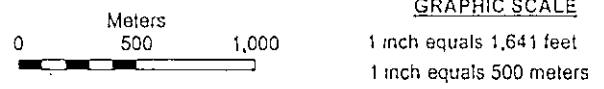
Funding of approximately \$37.8 million would be required by 2007 for costs associated with the opening of the first cell of the new facility. An additional \$20.8 million would be required by 2010 for opening of the second cell at the sanitary landfill. As the Internal Revenue Code requires, the funds from the issuance of a PAB must be used within 2 years of the bond issuance. It was assumed in the financial plan that a PAB of approximately \$37 million would be issued in 2005 and an additional bond of approximately \$20 million would be issued in 2008. Interest rates for the 2005 bond issue are based on the October 27, 2003 rates plus 75 basis points. For this analysis the interest rates for the 2008 bond issue are assumed to increase another 100 basis points.

It has been estimated that the operating and management costs for the new sanitary landfill would be \$20 per ton in 2007 adjusted annually by an average inflation factor of 3.5%. Assuming the Design, Build, Operate and Transfer (DBOT) option is pursued, a profit margin should be included for the private contractor. While this would be subject to negotiation between GovGuam and the private contractor, for purposes of this financial plan a 10% profit margin is assumed. Accordingly, the operating and management costs, inclusive of a 10% margin would be expected to equal \$22 per ton in 2007.



KEY TO FEATURES

- PARCEL
- PROSPECTIVE LANDFILL FOOTPRINT
- PROPOSED 200-FOOT BUFFER
- UTILITY ROUTE



DATUM: UNIVERSAL TRANSVERSE MERCATOR ZONE 55N
 SPHERIOD: WGS84
 BASEMAP: 2002 USGS TOPOGRAPHIC QUADRANGLE

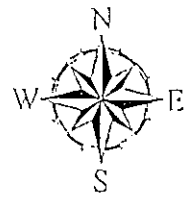
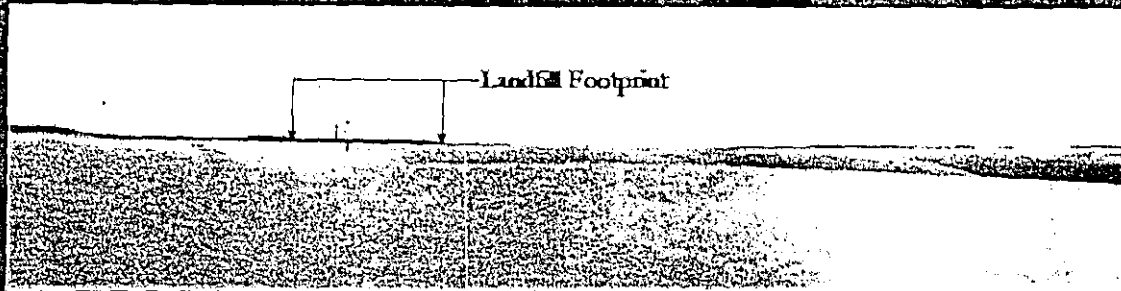


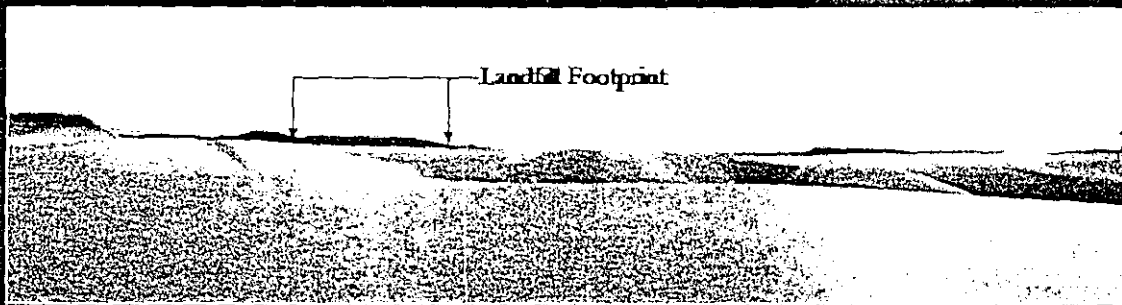
FIGURE 2-1
LOCATION OF THE PROPOSED
LAYON FOOTPRINT

DUEÑAS &
ASSOCIATES
 Inc.

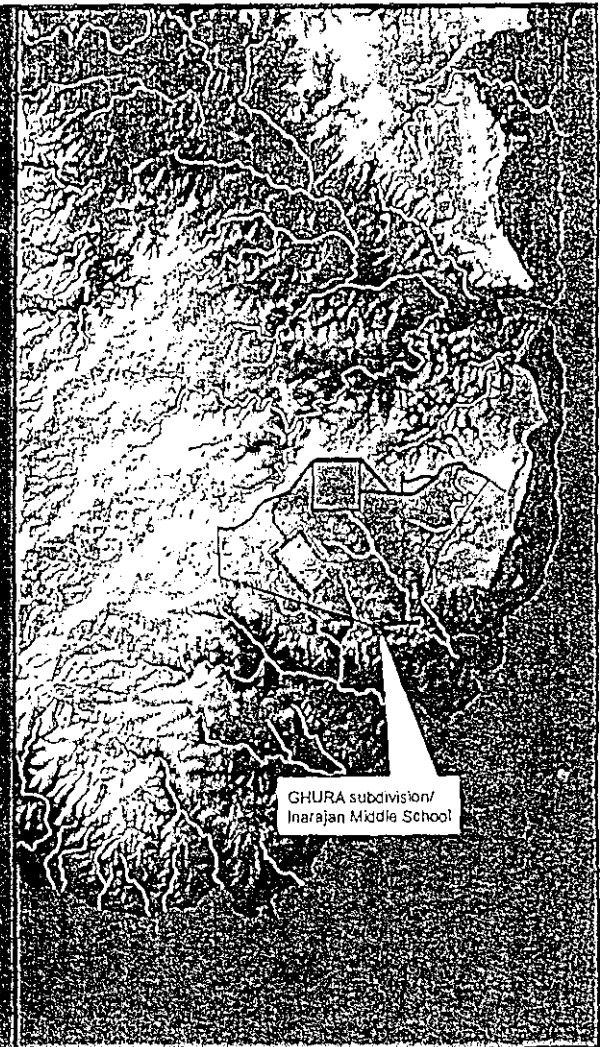
Layon, Inarajan Landfill Site



Normal ground level view facing northwest towards the Layon Footprint from the vicinity of the Inarajan Middle School/GHURA Subdivision. Note: Contour elevations are at a 1:1 (normal view) ratio.



Exaggerated ground level view facing northwest towards the Layon Footprint from the vicinity of the Inarajan Middle School/GHURA Subdivision. Note: Contour elevations are presented at a 2:1 ratio (two feet of vertical distance for every foot of horizontal distance).



KEY TO FEATURES (Inset Map Only)

- RIVERS
- DANDAN PARCEL
- LAYON LANDFILL FOOTPRINT
- PROPOSED UTILITY ROUTE

Meters
0 2,000 4,000



GRAPHIC SCALE for Inset map

1 inch equals 6,563 feet

1 inch equals 2,000 meters

DATUM: UNIVERSAL TRANSVERSE MERCATOR ZONE 55N
SPHERIOD: WGS84
BASEMAP: GUAM DIGITAL ELEVATION MODEL

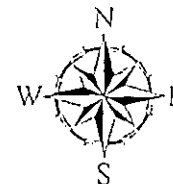
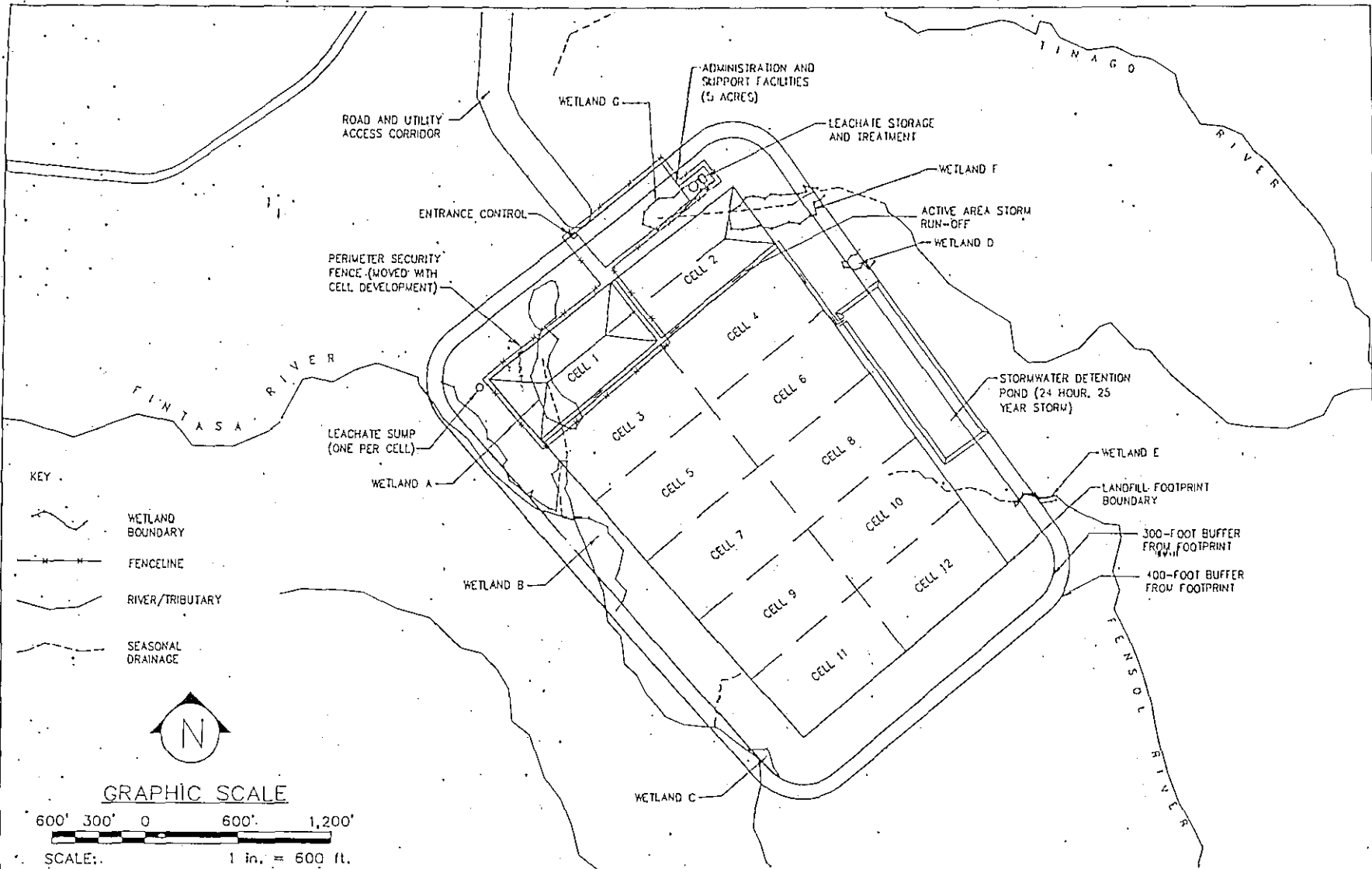


FIGURE 2-2
LANDFILL CLOSURE PROFILE

**DUENAS &
ASSOCIATES**
Inc.



- KEY
- WETLAND BOUNDARY
 - FENCELINE
 - RIVER/TRIBUTARY
 - SEASONAL DRAINAGE



GRAPHIC SCALE



SCALE: 1 in. = 600 ft.

DATE	REVISION OR ISSUE	NO.	BY

DUEÑAS & ASSOCIATES
INC.

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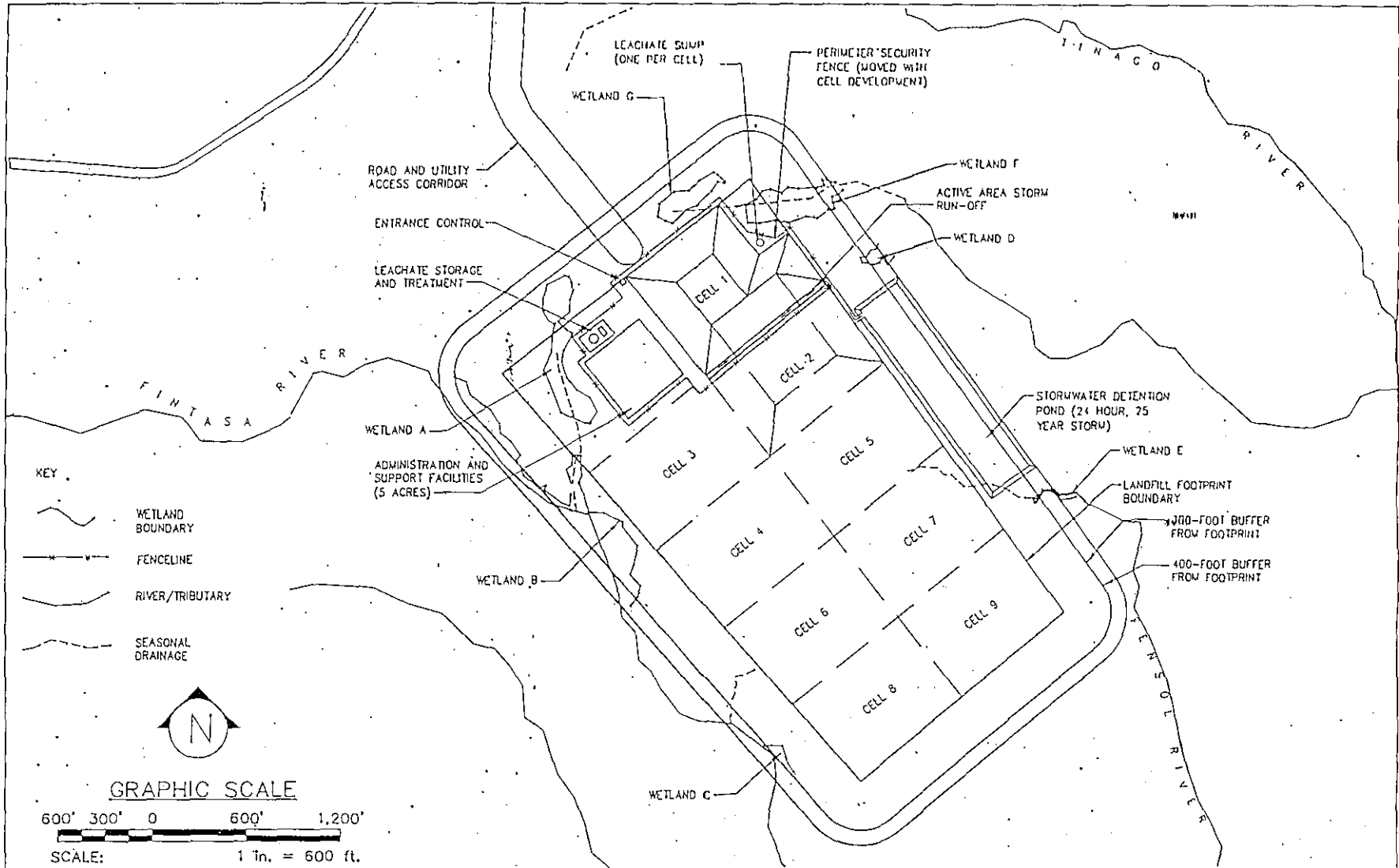


PROJECT
41316

GUAM MSL EIS

CONCEPTUAL LAYOUT
OF ALTERNATIVE 1

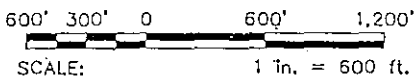
FIGURE 2-3



- KEY
- WETLAND BOUNDARY
 - FENCELINE
 - RIVER/TRIBUTARY
 - SEASONAL DRAINAGE



GRAPHIC SCALE



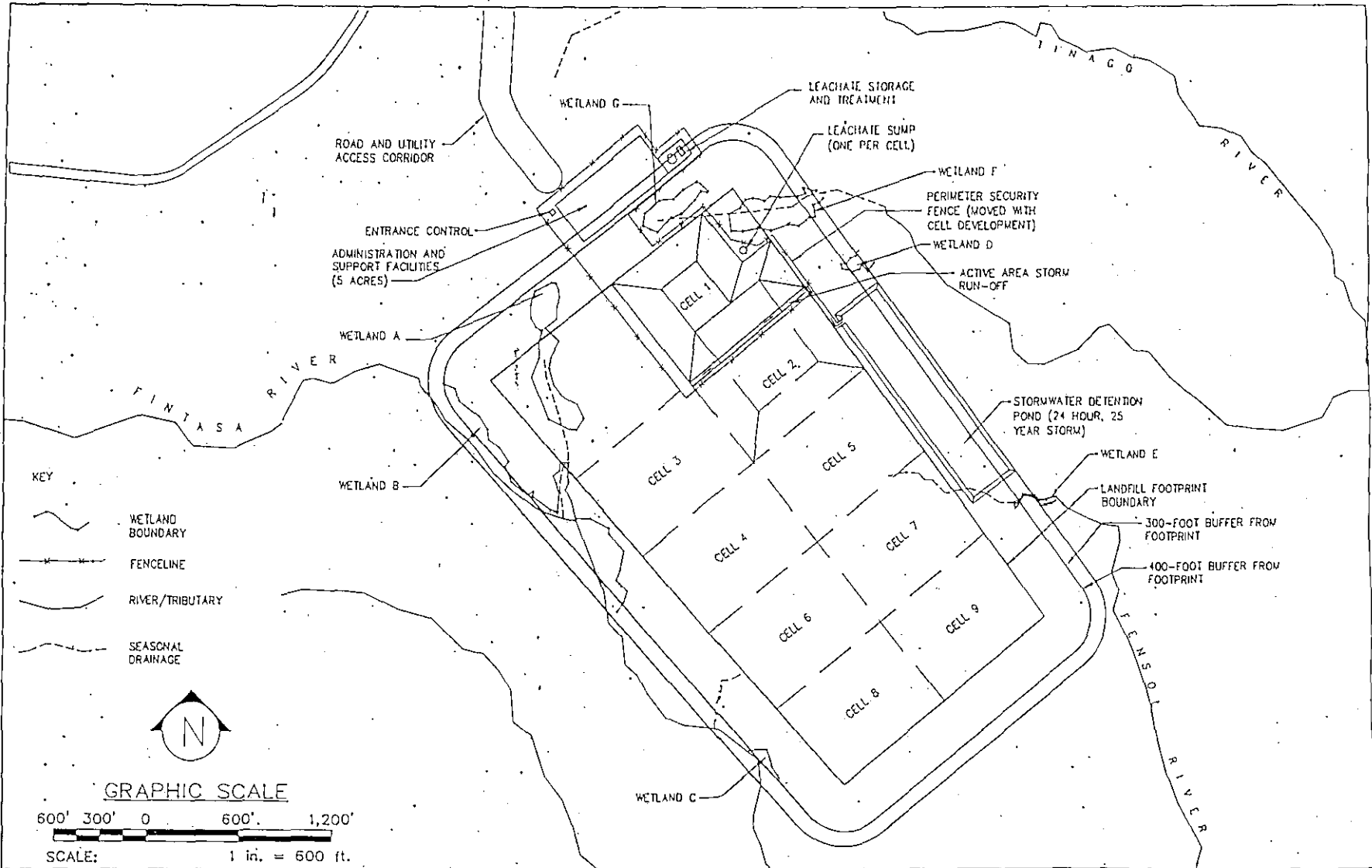
DATE	REVISION OR ISSUE	NO.	BY

DUEÑAS & ASSOCIATES
Inc.

BLACK & VEATCH
PROJECT
41316

GUAM MSWL EIS
CONCEPTUAL LAYOUT
OF ALTERNATIVE 2

FIGURE 2-4



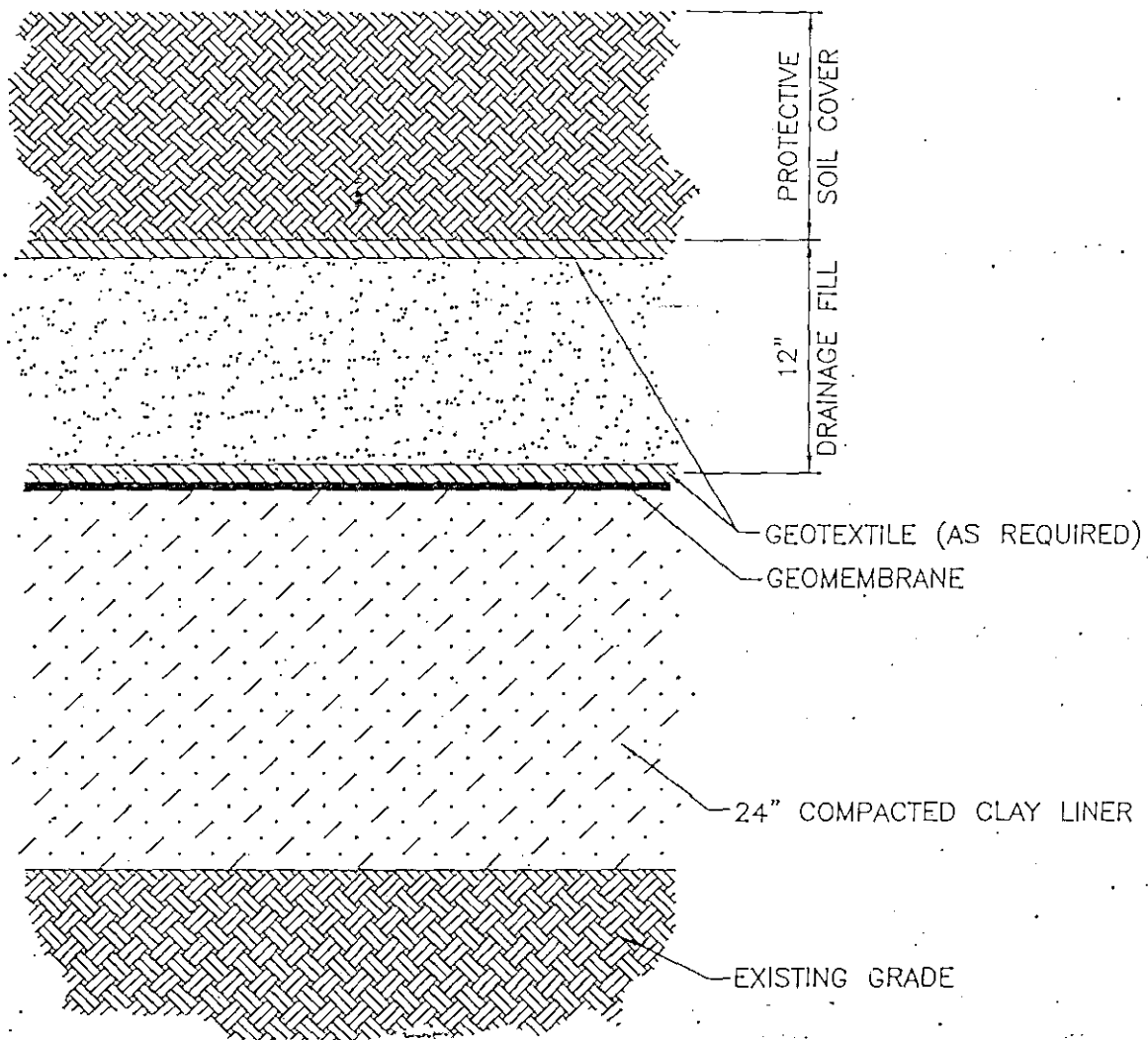
DATE	REVISION OR ISSUE	NO.	BY

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PROJECT 41316

GUAM MSWL EIS
CONCEPTUAL LAYOUT OF ALTERNATIVE 3

FIGURE 2-5.



* A GEOSYNTHETIC CLAY LINER (GCL) MAY BE USED INSTEAD OF THE COMPACTED CLAY LINER.

NEW LANDFILL LINER TYPICAL CROSS-SECTION

SCALE: NTS

BLACK & VEATCH

GUAM MSWL EIS

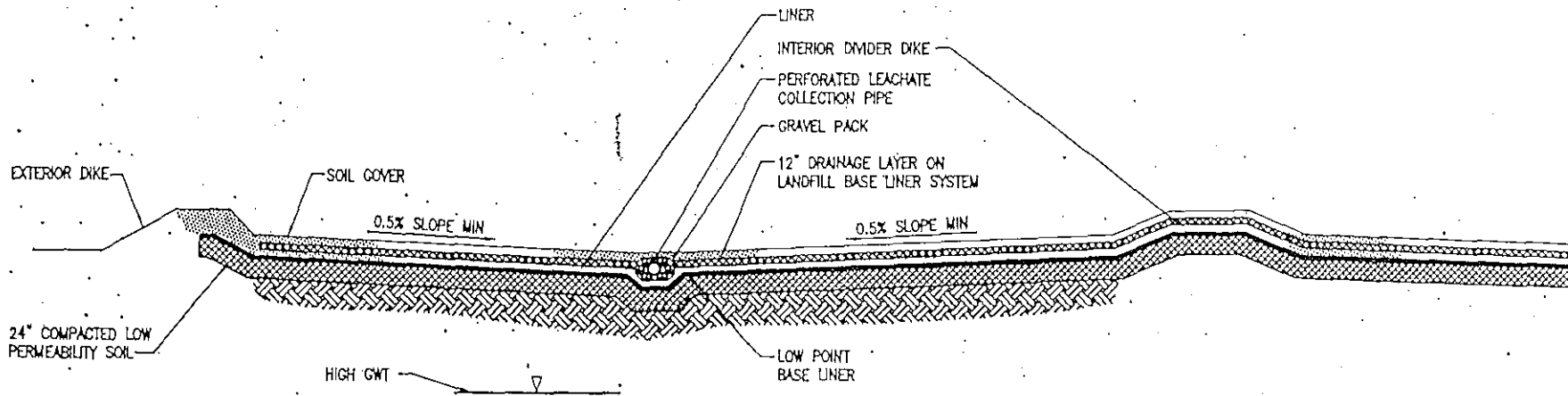
DATE



PROJECT
41316

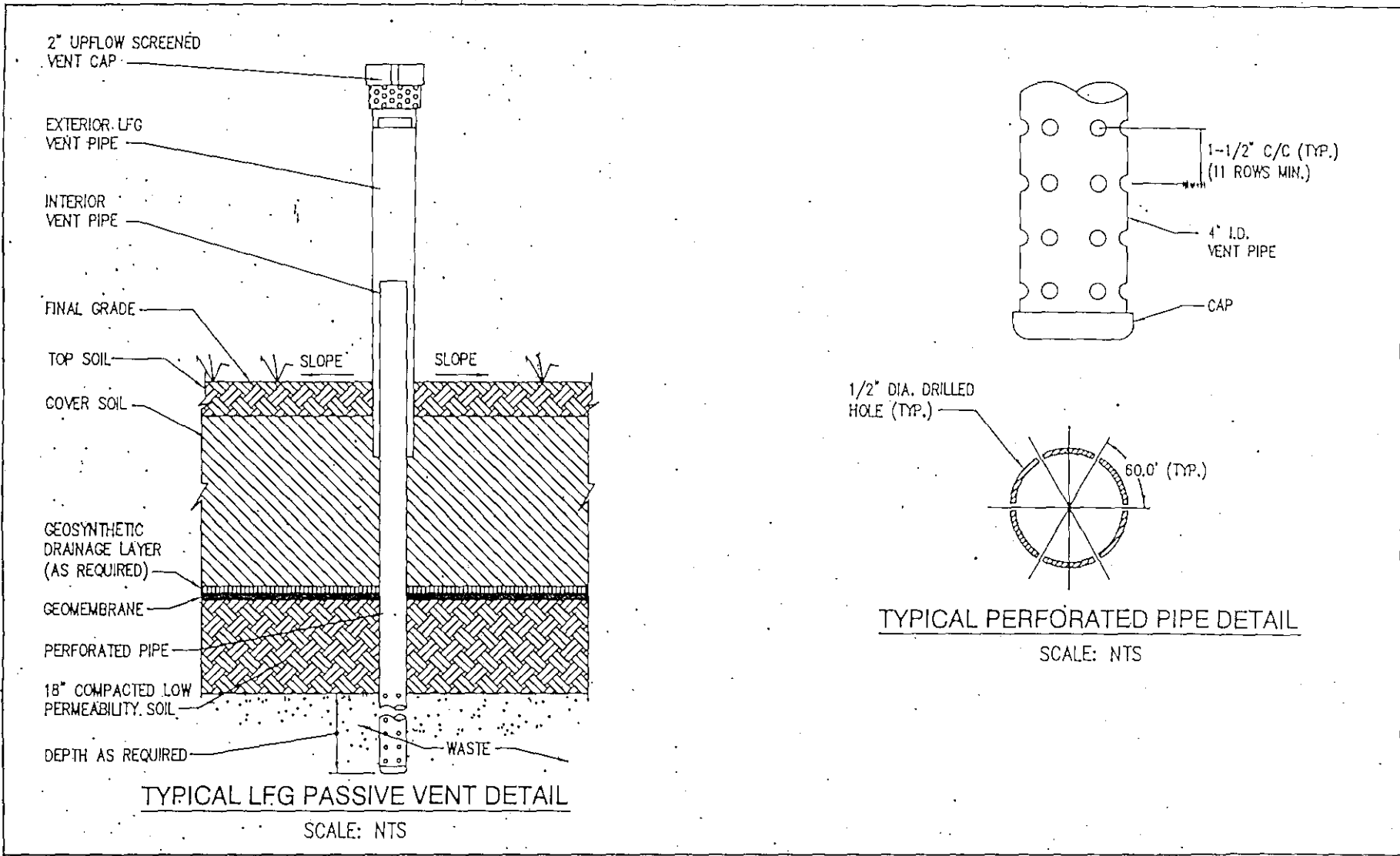
NEW LANDFILL LINER
TYPICAL CROSS-SECTION


FIGURE 2-6

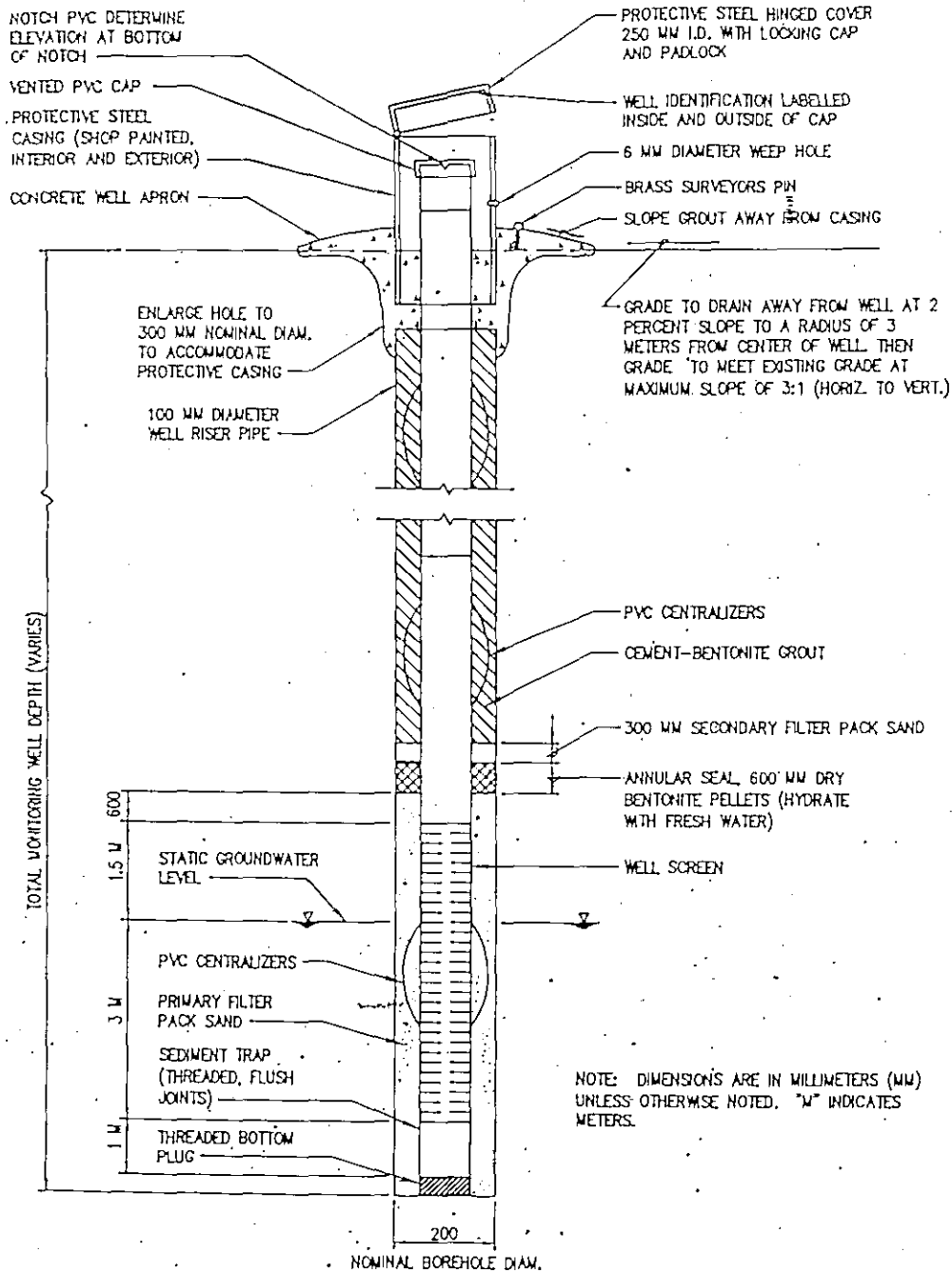


LEACHATE COLLECTION SYSTEM TYPICAL SECTION
SCALE: NTS


				BLACK & VEATCH	GUAM MSWL EIS	FIGURE 2-7
				PROJECT 41316	LEACHATE COLLECTION SYSTEM TYPICAL SECTION	
DATE	REVISION OR ISSUE	NO.	BY			



BLACK & VEATCH PROJECT  41316	GUAM MSWL EIS	DATE
	SOLID WASTE MANAGEMENT FACILITY CLOSURE AND TYPICAL LFG PASSIVE VENT	FIGURE 2-8



TYPICAL MONITORING WELL SECTION
SCALE: NTS

BLACK & VEATCH	GUAM MSWL EIS.	DATE
 PROJECT 41316	SOLID WASTE MANAGEMENT FACILITY TYP GROUNDWATER MONITORING WELL	FIGURE 2-9

3.0 AFFECTED ENVIRONMENT

3.1 CHAPTER OVERVIEW

Chapter 3.0 describes the existing environmental resources of the areas that would be affected if the proposed footprint alternatives were implemented. The descriptions, data, and analyses focus on the specific conditions or consequences that may result from implementing the alternatives. This chapter should not be considered a comprehensive description of all aspects of the environment within or surrounding the site.

A description of existing environmental conditions follows for a better understanding of planning issues and to establish a benchmark by which the magnitude of environmental effects of the footprint alternatives can be compared. Most of the information used to describe the existing environmental resources in this chapter was taken from the *Final Site Selection Report* (GDPW 2005) unless otherwise stated. The information in Chapter 3.0 is organized by the same environmental topics used to organize the impact analysis in Chapter 4.0. Section 3.1.1 briefly explains why certain topics have been retained for detailed discussions in Chapters 3.0 and 4.0, and why some topics have been eliminated from this point forward in the document.

The proposed alternatives include the landfill footprint, buffer area, access roads, and utilities, all of which comprise the limit of disturbance. The zone of influence is defined as the landfill site, and any adjacent areas, regions, and even Island-wide if reasonably affected by the alternatives. Because resources vary in function and relation to environmental factors, the zone of influence was defined independently for each environmental resource (see environmental topic sections under Sections 3.2 and 3.3).

3.1.1 Screening of Resources Affected

Resource Topics Evaluated in Detail

The following resources have the potential to be affected by or affect the proposed action and are evaluated in detail in this SEIS:

- | | |
|-------------------------------|---|
| Geology | Geologic features are a factor in siting a landfill, including the presence of fault areas, seismic impact zones and unstable areas. |
| Seismic Impact Zones | The entire island of Guam is within a Seismic Impact Zone. |
| Hydrogeology | The potential for groundwater/aquifer impacts exist at the site. |
| Soils & Topography | The excavation of soils and the use of soils as waste cover at the proposed landfill, as well as re-grading and altering the elevation of the site would alter these resources. |

Air Quality	During the short-term construction phases of the project, the operation of construction equipment would generate some criteria pollutant emissions, including carbon monoxide and particulate matter. There is a potential for impacts to air quality due to a projected increase in vehicular traffic to and from the site.
Noise	The construction phase of this project is expected to create minor and temporary noise impacts at the site. A potential increase in noise is expected due to increases in truck traffic to Layon.
Surface Water	Hydrological features, including wetlands and rivers, are located within the vicinity of Layon, as well as the potential for impacts to the overall drainage and water quality within the river basins. Layon is also located within the coastal zone.
Terrestrial Ecology	Terrestrial vegetation, wildlife, and habitat occur at Layon.
Aquatic Ecology	The aquatic ecosystems occurring in nearby streams and wetlands would have the potential to be impacted due to stormwater runoff.
Socioeconomic Conditions	There is potential for impacts to occur to land use, zoning, demographics, economics, and sensitive receptors in the region surrounding Layon.
Infrastructure	The infrastructure on Guam, including utilities and roadways, would need to be upgraded or expanded to accommodate a new landfill. Energy use would increase for an updated solid waste management system, which includes transfer stations, the main landfill, and haul routes to be used. Airport safety is also evaluated due to landfill hazards that can affect aviation activities in the vicinity.
Public Health and Safety	Public health and safety issues are a major concern in the planning and design of a landfill. Factors that relate to public health and safety include considering proximity to drinking water sources and sensitive receptors, highway safety and containment of wastes, and air and water quality. Employee health and safety is also a concern during construction and operation of a landfill.
Aesthetics	Aesthetic concerns of surrounding property owners and recreational users of the land are a factor when siting a landfill.
Cultural Resources	Archaeological and historic resources exist within the vicinity of Layon.

Topics Dismissed From Further Analysis

The following topics would not result in impacts and are not relevant factors to the selection of the footprint alternatives considered in this SEIS; therefore, these topics have been eliminated from the detailed analysis presented in Chapter 4:

Fault Areas	Modern day faulting is not evident at Layon.
Unstable Areas	Karst terrain is not present in the volcanic geology underlying Layon, and the observed soils are not collapsible.
Climate	With the exception of wind patterns on the island of Guam, climate would not be affected by the proposed action. Prevailing wind patterns are addressed under the Air Quality and Aesthetics sections.
Floodplains	Layon is not contained within mapped floodplains; therefore, no impacts are expected for placement of a landfill at Layon.
Rare, Threatened & Endangered Species	No RTE species were observed during wildlife surveys conducted at Layon, including the federally-listed endangered Mariana common moorhen.
Prime and Unique Farmlands	None of the soil map units at Layon meet the soil requirements to qualify as prime farmland; therefore, there would be no impacts to prime and unique farmlands (United States Department of Agriculture [USDA] 1975).
Designated Natural Areas	The only designated natural areas on Guam are the Guam National Wildlife Refuge and the War in the Pacific National Historic Park. These natural areas are not located in the vicinity of Layon, so there would be no impacts to designated natural areas.
Housing	There would be no displacement of residences, farms, or businesses; therefore, there would be no impacts to housing in the region surrounding Layon. New employment opportunities created at the landfill would not create a large demand for housing in the area. Vacant housing units available in the area would accommodate any additional housing needs.

3.2 NATURAL ENVIRONMENT

The topics are organized by the natural and human environment. The natural environment includes physical features: soil, topography, surface water, groundwater, terrestrial and aquatic ecology, and rare, threatened, and endangered (RTE) species. The human environment includes socioeconomics, existing infrastructure, public health and safety, aesthetics, and archaeological/historical resources.

3.2.1 Physical Features

This section discusses the physical environment at Layon, including geology, hydrogeology, soils/topography, air quality, and noise.

3.2.1.1 Geology

Guam is the largest and southern-most island within the Mariana Islands archipelago – an active volcanic region formed approximately 70 million years ago as a result of the subduction and underthrusting of the Pacific tectonic plate beneath the Philippine tectonic plate along the Mariana Trench.

The island of Guam can be roughly divided into two geologic regions (north and south) by a northwest/southeast trending fault (the Adelup-Pago fault) that runs from Asan on the west coast easterly to Pago Bay on the east coast. The northern part of Guam is an uplifted limestone plateau comprised of molluscan, detrital, reef, and foraminiferal facies, rising from 150 to 600 ft above sea level, with steep coastal cliffs and narrow coastal plains, consisting primarily of thick limestone deposits covered with thin soil. Fissures, cracks, and sinkholes characterize the limestone plateau, and there are no permanent rivers or streams because of the high permeability of the limestone. The southern portion of the island is a mountainous volcanic region with a number of peaks that are over 1,000 ft in elevation. Layon is located within the southern portion of Guam, and is underlain by volcanic deposits.

Volcanic and volcanically derived sedimentary rocks (e.g. tuffs, breccias, pyroclastics, and siltstones, sandstones and conglomerates) form the foundation of the entire island of Guam, and volcanics are exposed at the surface over approximately 35 percent of the island's surface (Gingerich 2003), predominantly in southern Guam. The oldest exposed rocks on Guam are volcanic rocks of Eocene/Oligocene age (58 to 22.5 million years old). Approximately 60 percent of the exposed rocks on Guam are Neogene age (22.5 to 2 million years old) limestones, which are predominately exposed in northern Guam. The remaining 5 percent of the surface cover of Guam consists of Holocene (11,000 years ago to present) riverine alluvial deposits and coastal beach and reef deposits. Faults transect the entire island; however, modern day faulting is not evident at Layon.

Bedrock

The rocks underlying Layon consist of the Bolanos pyroclastic member of the Miocene Umatac Formation (Stark 1963; Tracey et al. 1964). The basal portion of the Bolanos

pyroclastic member is reworked tuff breccia and volcanic conglomerate (Tracey et al., 1964). Clasts within the tuff breccia are composed of basalt and andesite, with recrystallized fragments of the Maemong limestone member of the Umatac Formation. Remnants of the Layon lava flow member are found in scattered patches and individual large boulders and range in composition from island arc theolitic basalt to andesite (Stark, 1963). The Layon flow member is separated from the underlying Bolanos pyroclastic member by a flow breccia (Tracey et al., 1964).

Virtually all of the moderately sloping area in the Tinago basin is underlain by fine grain tuff that weathers easily and is readily eroded by wind and overland flow from rainfall. This results in the "badland" topography of barren hills and depressions on which most vegetation has difficulty in taking root. Only the toughest plants, like swordgrass, can thrive in weathered tuff soils. The contrasting verdure of the ravines and wetlands indicates the proximity of the groundwater table beneath the ground surface in these areas.

Within the landfill parcel, the best outcrops are in the badland hills that form the northwestern boundary and in the Asmulato Hill area in the south. Fine grain thinly layered weathered red tuffaceous siltstones outcrop in the lower portion of the hill, while the upper part of the hill is capped by approximately 6 ft. of highly weathered red tuff breccia. The clasts within this breccia layer are relatively uniform in size and generally less than an inch across. The matrix material between the clasts is composed of fine weathered ash that appears lateritic. These units dip gently to the east. The sequence at this location is saprolitic in nature.

The submarine volcanism that deposited the lithologic sequence underlying Layon results in a tightly packed rock with very low permeability. Additionally, diagenetic alteration of primary minerals to montmorillonite and kaolinite clays has further reduced permeability. Clay mineral identification was performed using x-ray diffraction techniques by the U.S. Department of Agriculture on samples collected from on-site boreholes by Guam EPA personnel. Therefore, the geological formations at Layon are not likely to support aquifers from which groundwater can be easily extracted.

The layered tuffaceous siltstones, which underlie the tuff breccia, could be used for the landfill covering material. Fine-grained and thinly layered alluvial sediments are present east of the badland hills. These well-sorted alluvial soils could also be used for landfill cover material.

Just north of the small wetland depression shown on the quadrangle map (See Figure 2-1) is an outcrop of an explosive pyroclastic lithic tuff deposit containing numerous large angular blocks of slightly weathered basalt (up to 0.5 ft. across) and broken accidental inclusions of recrystallized limestone. Tracey et al. (1964) concluded that the presence of recrystallized limestone found in the tuff breccias and volcanic conglomerate of the Bolanos pyroclastic member originated from the Maemong limestone, which may sporadically underlie the Bolanos pyroclastics. Outcrops of the Maemong limestone are not mapped in the Layon area (Tracey et al., 1964), therefore the presence of

recrystallized limestone so far inland could indicate that there are limestone deposits at depth.

Seismic Impact Zone

The entire island of Guam is within a Seismic Impact Zone, and Guam is considered an active seismic area where small earthquakes are common. Guam has an extensive history of earthquakes, although destructive earthquakes are infrequent. The most recent destructive earthquake in Guam (magnitude 8.1) occurred on August 8, 1993.

3.2.1.2 Hydrogeology and Groundwater

Groundwater supplies 80 percent of the drinking water on Guam, and groundwater flow is generally from the interior regions to the coast.

Northern Guam contains a fresh groundwater lens system that is the sole source aquifer, providing approximately 70 percent of Guam's potable water supply. In northern Guam, the highly permeable Barrigada limestone constitutes the majority of the aquifer. The high permeability of the surface limestone allows almost all of the rainfall to infiltrate. The freshwater lens floats on salt water and is separated from the salt water by a transition zone of brackish water. The freshwater lens system is recharged by direct infiltration of rainfall and by inflow from perched groundwater. Discharge from the freshwater lens system in northern Guam is by diffuse seepage near the coast and to subaerial and submarine coastal springs. Nearly 180 wells withdraw about 35 million gallons per day (mgd) of water from the aquifer, with chloride concentrations ranging from 6 to 585 milligrams per liter (mg/L) (Gingerich 2003). In 1978, GEPA declared most of the northern half of the island where the freshwater lens is located a "Principal Source Aquifer." A "Groundwater Protection Zone" has been developed as a land use management overlay, which includes much of the land surface above Guam's Principal Source Aquifer, as well as drinking water production wells and their respective wellhead protection zones (GEPA 2001).

In southern Guam, the low permeability volcanic rocks allow much less rainfall infiltration and slower groundwater flow. On Guam, the major rivers and streams are located in the southern portion of the island. Here, low permeability volcanic deposits allow only slow infiltration of rainfall, and streams are recharged mainly by surface runoff with secondary discharge from groundwater.

Groundwater within Guam falls into one of two classifications: G-1 (Resource Zone) and G-2 (Recharge Zone). The G-1 category includes all groundwater extending 20 ft above the water table to depth and must be protected to drinking water quality standards (GEPA 2001). Groundwater beneath Layon falls within the G-1 classification.

Aquifers

The geological formation at Layon does not support aquifers from which groundwater can be easily extracted. The volcanic tuffs and basalts are tightly packed, low permeable rocks. The weathered Bolanos pyroclastic member tuffaceous siltstone, tuff breccias, and associated reworked alluvial material, including the well-sorted soils, create a low permeability substrate. Although faults and fissures within the volcanic substrates may harbor a potentially exploitable aquifer, the yield from deep wells is likely too small to justify development. A single test well was drilled into the volcanics at Layon (United States Geological Survey [USGS] Well 1845-50) in 1971. The well was bailed dry without pumping, an indication of its very low permeability.

Groundwater recovery tests were performed in the test pits in the surficial water table encountered below the landfill site. The measured permeability ranged from 3×10^{-4} to 5×10^{-3} cm/sec (5.9×10^{-4} to 9.8×10^{-3} ft per minute [ft/min]), with an average of 1.7×10^{-3} cm/sec (3.3×10^{-3} ft/min). These relatively high permeabilities are restricted to the relatively thin surficial unconsolidated alluvial and residual soil deposits. The more consolidated volcanics of the underlying bedrock have much lower permeabilities. The shallow depth of these soils and the lower permeability in the underlying bedrock do not provide favorable conditions for the development of a groundwater source.

Groundwater

A total of 16 test pits and 3 deep borings were placed at Layon. The test pits were excavated to a depth of 10 ft or greater (Table 3-1). Borings were drilled to depths of 58 to 72 ft. Water levels were measured in all test pits. No borings were drilled in the higher elevation badlands to confirm water table elevations.

Table 3-1. Water Table Depths and Elevations at Layon

Test Pit/Boring Number	Depth to Groundwater Below Land Surface (BLS) (ft)	Surface Elevation MSL (ft)	Groundwater Surface Elevation MSL (ft)
TP-1	7.2	252.04	244.84
TP-2	9.5	280.73	271.23
TP-3	5.0	287.08	282.08
TP-4	5.5	356.94	351.44
TP-5	5.4	392.38	386.98
TP-6	15.5	349.96	334.46
TP-7	5.1	332.21	327.11
TP-8	12.5	328.53	316.03
TP-9	18.0	371.81	353.81
TP-10*	>18.0	323.6	<305.58
TP-11	6.0	347.60	341.60

Test Pit/Boring Number	Depth to Groundwater Below Land Surface (BLS) (ft)	Surface Elevation MSL (ft)	Groundwater Surface Elevation MSL (ft)
TP-12	5.8	349.63	343.83
TP-13	3.0	302.74	299.74
TP-14	11.5	295.82	284.32
TP-15*	>17.5	293.21	<275.71
TP-16	8.0	307.54	299.54
B-1	26.2	356.52	330.32
B-2	2.5	307.66	305.16
B-3	22.0	327.31	305.31

*Groundwater was not encountered, but it can be surmised that it occurs at a depth greater than the completion depth of the associated boring or test pit.

Figure 3-2 is a contour map of the groundwater. Field observations during the site geotechnical investigations noted the infiltration of groundwater into the Tinago River channel. Elevations of the river channel bottoms adjacent to the landfill site were recorded because this would be a control level for the groundwater levels at the site.

The water table below Layon is unconfined. The groundwater surface generally mirrors the topography and is located in the surficial alluvial or residual soils overlying the bedrock below the site. The surficial alluvial and residual soils at Layon are classified as low plastic to plastic silts (ML-MH), and the upper, highly weathered tuffaceous rock is generally fine grained. These deposits both have a generally low permeability. Site investigations indicated that the depth of the groundwater surface is variable -- from at the ground surface in the low lying stream beds to more than 20 ft in the higher elevations of the badlands and ridge dividing the Tinago, Fintasa, Fensol, and Ugum river drainage basins (Figure 3-1). The general flow of groundwater is from the highlands to the three rivers surrounding the landfill site -- the Tinago, Fintasa, and Fensol rivers (Figure 3-1). The landfill site is located in the higher elevations of the site to avoid areas where the groundwater surface is shallow.

Proximity to Drinking Water

There are no drinking water wells located adjacent to, downstream, or down gradient of Layon. The landfill site is located approximately 2,700 ft from the Ugum River, which is a source of drinking water. The Ugum River drainage area is depicted in Figure 3-1. Layon is not located within this drainage area. Based on the groundwater levels recorded at the site, a groundwater hydraulic divide exists between the Ugum River and Layon that isolates groundwater flows beneath the site from the Ugum River. Groundwater below the site flows into rivers proximal to the proposed footprint.

The 1994 "Surface Water Development Study" identified the Inarajan River as a potential site for a surface water dam and reservoir (Barrett Consulting Group 1994). The

proposed footprint is located adjacent to the Fintasa River and is within the drainage basin for this potential reservoir site. At one time, water for potable and agricultural uses was obtained from the Laolao and Fintasa Rivers. Laolao is the confluence of the Fintasa and Fensol Rivers and a tributary of the Inarajan River. The confluence is about two thirds of a mile downstream of the Layon footprint. The diversions no longer are active nor are they likely to be re-activated because the Ugum diversion now supplies the region. Therefore, based on stream flow, no plans are currently in place to develop groundwater or surface water supplies in the Layon area.

Several wells were drilled at Malojloj in the 1960-1970 period, and until the Ugum diversion was completed one of the wells served the Inarajan region. That well is now idle but can be restored if additional water supply is needed. At least one other Malojloj well was successful, but it has been abandoned. The Malojloj wells, which are about 1.5 miles from the footprint, obtain water from a buried limestone aquifer of limited extent rather than from the volcanic formations, and therefore its groundwater is not continuous with the volcanic groundwater in the vicinity of the proposed landfill. Because of this discontinuity, drainage from the landfill will not affect these wells.

The yields of wells drilled in the Umatac Formation are very low, and such wells are not likely to play a significant role in water supply. An unusually successful volcanic well may produce 50 gpm, but most attempts to extract water have been failures because of the low permeability of the volcanic lithology. To achieve a rate of even a few gallons per minute, a well must be several hundred feet deep in order to accommodate steep drawdowns.

3.2.1.3 Soils and Topography

Soils

There are two broad categories of soils on Guam: those derived from limestone and those of volcanic origin. Limestone soils are generally thin though well suited to some types of agriculture. Volcanic soils found over much of southern Guam consist of highly erodible fine clays.

The surficial alluvial and residual soils at Layon were generally classified as low plastic to plastic silts (ML-MH) materials, and the highly weathered tuffaceous rock is generally fine grained. The upper highly weathered tuffaceous rock was easily excavated. This highly weathered rock strata is fine grained and would restrict rainfall infiltration, and promote runoff from active work areas. The soils at Layon are suitable for daily landfill cover.

Topography

The southern half of Guam, where Layon is located, consists of rolling terrain of extrusive and pyroclastic rocks. This, combined with high rainfalls, is the cause for presence of almost all of the rivers in southern Guam. Wetlands are common due to the

poorly drained clay soils. Layan is located in an area of volcanic uplands comprised of steeply dissected slopes and gently sloping foothills cut by major streams (GDPW 1998). A large area of rolling lowlands and karst form the interior basin of Guam along the Talofofu River.

The Dandan parcel has predominantly gently sloping terrain and is topographically suitable for landfill development. However, because a substantial portion of the area selected for the landfill site is located within the upland portion of the site where "badlands" conditions prevail, there is little vegetative cover that would provide natural visual screening (See Figure 2-1). On the other hand, the selected area is situated well within the Dandan parcel such that visual screening from adjacent properties can be effectively provided during landfill development and subsequent operation.

3.2.1.4 Air Quality and Wind Direction

Air Quality

The National Ambient Air Quality Standards (NAAQS) criteria pollutants include ozone, carbon monoxide, particulate matter greater than 10 microns (PM₁₀), particulate matter greater than 2.5 microns (PM_{2.5}), nitrogen dioxide, sulfur dioxide, and lead. An air quality nonattainment area is one that does not meet applicable NAAQS or that contributes to ambient air quality in a nearby region that does not meet the NAAQS. Two areas in Guam are designated as nonattainment. These include the portion of Guam that is within a 3-1/2 kilometer (km) radius of the Piti Power Plant (located in Agana) and that portion of Guam that is within a 3-1/2 km radius of the Tanguisson Power Plant (located in Barrigada). Layan does not lie within either of these zones. The remainder of Guam is in attainment for all other NAAQS pollutants.

Landfill gas emissions are a result of bacterial activity that causes the waste in landfills to decompose over time. As these wastes decompose, gas is produced. The amount of gas created varies and depends on factors such as the following: the amount and type of waste, moisture content of the landfill, amount of oxygen present, landfill size and characteristics, and temperature. Also, certain chemical reactions and the evaporation of some chemicals produce landfill gas. Landfill gas is composed of methane (CH₄), carbon dioxide (CO₂), small amounts of non-methane organic compounds (NMOCs), PM₁₀ and PM_{2.5}. A summary of the pollutants is provided in Table-3-2. The ambient air quality standards for Guam do not address the primary landfill emissions: methane and carbon dioxide.

Table 3-2. Air Pollutants From Landfills and Their Characteristics

Pollutant	Characteristics
Methane	<ul style="list-style-type: none"> An odorless greenhouse gas that remains in the atmosphere for approximately 9-15 years. Generated in landfills and open dumps as waste decomposes under anaerobic (without oxygen) conditions.

Pollutant	Characteristics
	<ul style="list-style-type: none"> • Contributes to local smog. • Highly explosive at certain concentrations in air (between 5% and 15% of the total air volume).
Carbon Dioxide	<ul style="list-style-type: none"> • An odorless greenhouse gas • An excess amount in the air has the potential to create an oxygen-deficient environment. • Asphyxiation occurs if there is not enough oxygen in the air to breath. Symptoms include headache, increased breathing and heart rate, and dizziness.
Non-Methane Organic Compounds	<ul style="list-style-type: none"> • May occur naturally or be formed by chemical processes. • Include chemicals such as trichloroethylene, benzene, and vinyl chloride. • The amount of NMOCs emitted depends on whether the landfill receives wastes containing these chemicals and whether chemical reactions are occurring that create or remove them. • Often have recognizable odors. • Certain NMOCs are known carcinogens (e.g., vinyl chloride, benzene, and chloroform). • Some NMOCs may have adverse effects on organ systems such as the kidney, liver, pulmonary, reproductive, and central nervous systems.
Particulate Matter	<ul style="list-style-type: none"> • Mixture of solid particles and liquid droplets. • Fine particles (less than 10 and 2.5 micrometers) produced by landfills and diesel buses and trucks. • Can aggravate asthma; produce acute respiratory symptoms, including aggravated coughing and difficult or painful breathing, and chronic bronchitis. • Impairs visibility.

Source: Agency for Toxic Substances and Disease Registry (ATSDR) 2005.

Wind Direction

Based on observations between 1945 and 1982 obtained by the National Oceanic and Atmospheric Administration (NOAA) Weather Service Meteorological Observatory in Tiyan, Guam, the easterly tradewinds are dominant from April to December, while the prevailing wind from January to March is from an east-northeasterly direction. The higher average wind speed (i.e., 7.4 to 9.4 miles per hour [mph]) occurs during the dry season, December to June. A preferred sanitary landfill would be downwind of any sensitive receptors.

3.2.1.5 Noise

Some of the typical noise that is associated with daily activities benefits human health, safety, and welfare. These include sirens, garbage collection operations, and construction and maintenance equipment. Other noises, including vehicle and air traffic, are associated with the movement of people and goods. Existing noise levels on the island of Guam are typical of those normally associated with nearby land uses and the overall level of development on the island. Currently there are no noise control laws on Guam.

Currently there are no constant sources of noise at Layon. The existing land use in and around Layon is a mixture of agricultural and recreational land use. Recreational land uses include mountain biking, hiking, fishing, hunting, and the use of 4x4 off-road vehicles. There would be an occasional noise distraction from the hunters and the 4x4 off-road vehicles. The former NASA Tracking Station is also located within the Dandan parcel. There is no noise associated with the tracking station.

3.2.2 Surface Water

3.2.2.1 Hydrology

The source of all fresh water on Guam is rainfall, which averages about 85 to 115 inches per year (in./yr). Guam has distinct wet and dry seasons. The wet season occurs from July through December when approximately 70 percent of the total annual rainfall is recorded. The driest months are from January through June (Gingerich 2003).

Dandan is a large land parcel consisting of relatively flat grasslands lying on the drainage divide between the Tinago, Fensol, and Fintasa rivers (Figure 2-1). The majority of the site is located within the Inarajan River basin (see Figure 3-1). Within the Inarajan River basin, the Fintasa River and the Fensol River combine to form the Laolao River. The Laolao River then enters the Inarajan River approximately 0.9 mile south of the Layon site, and the Inarajan River drains into Inarajan Bay.

As discussed in Section 3.2.1.2, the Inarajan River is an unlikely site for a surface water dam and reservoir. The Inarajan River was identified in the 1994 "Surface Water Development Study" as a potential site for a surface water dam and reservoir. Layon is located adjacent to the Fintasa River and is within the drainage basin for this potential reservoir site; however, no plans are currently in place to develop surface water supplies in the Layon area.

The Fensol River has a perennial channel length of 1.1 miles (Best and Davidson, 1981). The headwaters of the Fensol River begin in the southeast corner of the Layon footprint and extend for 498 ft within the footprint. A tributary to the Fintasa River begins in wetlands within the northwest corner of the Layon footprint and traverses the footprint for 705 ft. The Fintasa River has a perennial channel length of 2.9 miles (Best and Davidson, 1981).

The northern corner of the site lies in the Tinago/Pauliluc River watershed (Figure 3-1). This area drains to a tributary of the Tinago River, which originates in the rolling upland hills between the landfill site and the NASA Tracking Station. The Tinago River enters the Pauliluc River approximately 1.5 miles east of the Layon site near Route 4 (Barrett Consulting Group, 1994), and the Pauliluc River flows into Pauliluc Bay.

The proposed Layon footprint is located approximately 2,700 ft from the Ugum River, which is a source of drinking water (Figure 3-1). However, the Layon footprint is not located within the Ugum River drainage area, and based on the groundwater levels recorded at the site, a groundwater hydraulic divide exists between the Ugum River and the footprint that isolates groundwater flows beneath the proposed landfill site from the Ugum River.

3.2.2.2 Water Quality

The Guam Water Quality Standards (GWQS) (GEPA 2001) divide Guam's surface waters into three categories:

Category S-1 High. Surfaces within this zone are used for drinking water resources, conservation of wilderness areas, and propagation and preservation of aquatic life, and aesthetic enjoyment. It is the objective that these waters shall be kept free of substances or conditions attributable to domestic, commercial, and industrial discharges, or agricultural, construction, or other land-use practices that impair their uses. No pollutant discharges would be permitted into S-1 waters via discharge or as a result of land uses adjacent to S-1 waters. Mixing zones would not be allowed within the boundaries of Category S-1.

Category S-2 Medium. Surface waters within this zone are used for recreational purposes including water contact recreation, for use as potable water supply after adequate treatment is provided, and for propagation and preservation of aquatic wildlife and aesthetic enjoyment.

Category S-3 Low. Surface waters within this zone are primarily used for commercial, agricultural, and industrial water supply. Aesthetic enjoyment and compatible recreation are acceptable in this zone, as well as maintenance of aquatic life. Compatible recreation may include limited body contact activities. All discharge permits under existing regulations may be required by GEPA to obtain such permits under these regulations.

The surface water quality standards are listed in Table 3-3 below for the island of Guam.

Table 3-3. Surface Water Quality Standards

Parameter	Surface Water Classification		
	S-1	S-2	S-3
<i>E. coli</i>	126 Colony Forming Units (CFU)/100 milliliters (ml) geometric mean (five sequential samples taken over a 30-day period). 235 CFU/100 ml maximum.	126 CFU/100 ml geometric mean (five sequential samples taken over a 30-day period). 235 CFU/100 ml maximum.	126 CFU/100 ml geometric mean (five sequential samples taken over a 30-day period). 406 CFU/100 ml maximum.
Enterococci	33 CFU/100 ml geometric mean (five sequential samples taken over a 30-day period). 61 CFU/100 ml maximum.	33 CFU/100 ml geometric mean (five sequential samples taken over a 30-day period). 61 CFU/100 ml maximum.	33 CFU/100 ml geometric mean (five sequential samples taken over a 30-day period). 108 CFU/100 ml maximum.
pH	6.5 to 9.0	6.5 to 9.0	6.5 to 9.0
Phosphorus	0.025 mg/L	0.05 mg/L	0.10 mg/L
Nitrogen	0.10 mg/L	0.20 mg/L	0.50 mg/L
Dissolved Oxygen (DO)	Concentration shall not be decreased to <75% saturation at any time, as influenced by salinity or naturally occurring temperature variations. Where natural conditions cause lower DO levels, controllable water quality factors shall not cause further reductions. (5.6 mg/L = 75% saturated)	Concentration shall not be decreased to <75% saturation at any time, as influenced by salinity or naturally occurring temperature variations. Where natural conditions cause lower DO levels, controllable water quality factors shall not cause further reductions.	Concentration shall not be decreased to <75% saturation at any time, as influenced by salinity or naturally occurring temperature variations. Where natural conditions cause lower DO levels, controllable water quality factors shall not cause further reductions.
Chlorides and Sulfates	250 mg/L	250 mg/L	250 mg/L
Total Dissolved Solids	500 mg/L or 133% of the ambient condition.	500 mg/L or 133% of the ambient condition.	500 mg/L or 133% of the ambient condition.

Parameter	Surface Water Classification		
	S-1	S-2	S-3
Salinity	Salinity of freshwater sources and wetlands shall not be more than 20% above ambient by discharges of saline water.	Salinity of freshwater sources and wetlands shall not be more than 20% above ambient by discharges of saline water.	Salinity of freshwater sources and wetlands shall not be more than 20% above ambient by discharges of saline water.
Total Suspended Solids	Concentrations of suspended matter at any point shall not be increased from ambient conditions at any time, and the total concentration should not exceed 5 mg/L, except when due to natural conditions.	Concentrations of suspended matter at any point shall not be increased more than 10% from ambient conditions at any time, and the total concentration should not exceed 20 mg/L, except when due to natural conditions.	Concentrations of suspended matter at any point shall not be increased more than 25% from ambient conditions at any time, and the total concentration should not exceed 40 mg/L, except when due to natural conditions.
Turbidity	Turbidity at any point, as measured by nephelometric turbidity units (NTU), shall not exceed 0.5 NTU over ambient conditions, except when due to natural conditions.	Turbidity values at any point shall not exceed 1.0 NTU over ambient conditions, except when due to natural conditions.	Turbidity values at any point shall not exceed 1.0 NTU over ambient conditions, except when due to natural conditions.
Temperature	Water temperature shall not be changed more than 1.0 degree Centigrade from ambient conditions. Effluent not meeting this standard shall be considered as having an adverse effect on coral and other aquatic resources.	Water temperature shall not be changed more than 1.0 degree Centigrade from ambient conditions. Effluent not meeting this standard shall be considered as having an adverse effect on coral and other aquatic resources.	Water temperature shall not be changed more than 1.0 degree Centigrade from ambient conditions. Effluent not meeting this standard shall be considered as having an adverse effect on coral and other aquatic resources.

Source: GEPA 2001. Guam Water Quality Standards.

Surface water is designated as S-2 (medium) within Layon (GEPA 2001). This category is used for recreational purposes; potable water use is only acceptable after adequate treatment is provided. GEPA performed a series of sampling events in 1997 at two sampling locations, which are referred to as INRAP along the Pauliluc River and INRL along the Laolao River (Figure 3-1). These samples were taken once a month from May to August during 1997, for a total of four samples. Both rivers may be influenced from the Layon site. Table 3-4 lists the results from the 1997 sampling event.

Table 3-4. Results From GEPA 1997 Sampling Events at Laolao and Pauliluc Rivers

Laolao River (GEPA Data location INRL)				
	Minimum	Maximum	Average	GWQS (S-2)
pH	7.0	8.8	7.6	6.5-9.0
Turbidity (NTU)	2.6	127.0	40.6	1.0
NO ₃ -N (mg/L)	0.0	0.052	0.0	0.200
P-tot (mg/L)	0.0	0.062	0.026	0.050
Temp (°C)	25.0	28.4	26.7	NA
Dissolved Oxygen (mg/L)	7.5	8.9	8.1	NA
Total Suspended Solids (mg/L)	100.0	100.0	100.0	20
Salinity (mg/L)	0.0	0.0	0.0	250
Pauliluc River (GEPA Data location INRAP)				
	Minimum	Maximum	Average	GWQS (S-2)
pH	7.1	7.4	7.3	6.5-9.0
Turbidity (NTU)	4.4	174.0	58.6	1.0
NO ₃ -N (mg/L)	0.0	0.016	0.009	0.200
P-tot (mg/L)	0.034	0.138	0.077	0.050
Temp (°C)	26.0	26.0	26.6	NA
Dissolved Oxygen (mg/L)	7.06	8.9	7.803	NA
Total Suspended Solids (mg/L)	129.0	120.0	120.0	20
Salinity (mg/L)	0.0	0.0	0.0	250

Notes:

NA – Not Applicable; GWQS – Guam Water Quality Standards (2001).

Salinity, nitrate-nitrogen (NO₃-N), and pH sampled during the 1997 GEPA sampling event all fall below the GWQS. Turbidity levels range from 2.6 to 127 NTU at the Laolao River and 4.4 to 174 NTU at the Pauliluc River. This wide range may be the result of heavy runoff and or heavy rains. The phosphorus level at the Laolao River falls below the GWQS. The phosphorus level (P-tot) for the Pauliluc River frequently exceeds the GWQS and is most likely the result of agricultural activity in the Layon area.

Layon is located in an agricultural zone. Non-point source pollution from the agricultural activities in Layon most likely contributes to the degradation of water quality in Layon and its receiving water bodies.

An additional study of the Inarajan River was conducted by the Water and Environmental Research Institute of the Western Pacific (WERI) in 2000 (Taborosi and Khosrowpanah 2000). WERI analyzed metals and nutrients from samples taken from the Laolao and Fintasa rivers in 1993. Most of the metals and nutrients fell below federal and territorial standards, with the exception of iron and nitrate-nitrogen which are probably from agricultural waste and mobilization of metal precipitates [Iron (Fe), Magnesium (Mg)] in volcanic rocks by groundwater. The study suggests that the iron and magnesium levels reported were "some of the highest on Guam." The Fintasa, Fensol, and Laolao rivers form a sub-basin of the Inarajan River, which could potentially be developed as a water source.

Stormwater Management

The Layon footprint has been located in the higher elevations of the site. The general storm water runoff flow direction is away from the landfill footprint. Currently, there are no stormwater management structures within the project area.

3.2.2.3 Wetlands

Wetland areas are defined as areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil conditions. In most cases, three wetland parameters must be present in order for an area to be considered a wetland. These include hydrophytic vegetation, hydric soil, and wetland hydrology. Wetlands act as natural filters and provide various functions including water quality improvements (pollution, nutrient, and sediment control), flood control, production of detritus, waterfowl and wildlife habitat, and erosion control.

Executive Order 11990, Protection of Wetlands, states, "avoid to the extent possible the long and short term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative."

None of Guam's wetlands is specifically designated as a protected area. The government of Guam owns parcels of land in several wetland areas and has begun to acquire property from private landowners with the goal being to protect the wetlands.

A wetland survey was completed at the Dandan parcel in southern Guam using remote sensing data. Wetland types were identified and the general location of the wetlands were mapped by using ground verification data from Duenas & Associates, Inc. (D&A), USGS geologic maps, USDA soils maps, and the geologic and hydrologic observations provided by Mink and Yuen. These data sources assisted in classifying high-resolution

IKONOS satellite imagery into classes of wetlands, vegetation, soil types, badland areas, agricultural lands, and building/structures and roads. Limited field surveys were conducted to ground truth the data. The four major wetland types identified include palustrine emergent, persistent, semipermanent (PEM1F); palustrine, emergent, persistent, seasonal (PEM1C); palustrine, forested, broad-leafed evergreen, seasonal (PFO3C); and palustrine open-water semipermanent wetlands (POWF). The predominant wetland type was found to be PFO3C (BAE Systems 2004).

Approximately 9.9 acres of wetlands within the Layon footprint have been delineated by D&A (see Figure 2-3). These wetlands consist of reed marshes dominated by *Eleocharis dulcis* and *E. ochrostachys*, and karriso (*Phragmites karka*), with an assortment of ferns (*Thelypteris interrupta*), grasses (*Paspalum orbiculare* and *Sacciolepis indica*), and sedges. The wetlands are associated with the Tinago, Fensol, and Fintasa rivers. The wetlands at Layon have also been identified as habitat capable of supporting the endangered Mariana common moorhen, although none were found during pedestrian surveys conducted by D&A, Inc. in 2004.

3.2.2.4 Coastal Zone Management

The Coastal Zone Management Act (CZMA) is a federal law that was established to preserve, protect, develop, and where possible, restore or enhance, the resources of the Nation's coastal zone. This protection of natural resources includes wetlands, floodplains, estuaries, and fish and wildlife and their habitats, within the coastal zone. Participation in the CZMA is a voluntary partnership between the federal government and the U.S. coastal states and territories. Under the CZMA, the Coastal Zone Management (CZM) Program was established and is administered at the federal level by the Coastal Programs Division (CPD) within the NOAA's Office of Ocean and Coastal Resource Management (OCRM). The CZM Program is a federal-state partnership for protecting, restoring, and responsibly developing the nation's diverse coastal communities and resources, and requires federal agencies to conduct their planning, management, development, and regulatory activities in a manner consistent with the State or Territorial CZM Program.

Under the CZMA, a federal consistency determination is required. CZMA requires that a federal agency determine that any activity that has effects on any land, water, or natural resource of the coastal zone is consistent to the maximum extent possible with the enforceable policies (i.e., policies that are legally binding) of an approved Coastal Management Plan (CMP). Federal consistency determinations help ensure the balanced use and protection of coastal resources through CMP policies. The Guam Bureau of Statistics and Plans is the lead agency responsible for the federal consistency review (OCRM 2004b). The Guam Coastal Management Program (GCMP) is responsible for conducting federal consistency review of federal activities (activities requiring a federal license or permit), federal assistance to local governments (review process is conducted as specified in 15 CFR Part 930 and in the Government of Guam Executive Order 78-37), and any federal wetland permit that would require that the GCMP make a determination of consistency.

The GCMP relies on a number of interagency partnerships to ensure that a balanced approach to coastal management is achieved. The most prominent issues that the GCMP focuses on include coral reef and water quality degradation, coastal hazards (including typhoons and flooding), public access, urban growth, wetlands, and cultural and historic resource preservation. In addition, the GCMP has a public education and outreach program that focuses on coral reef education (NOAA 2003).

The "Coastal Zone" for Guam includes all non-federal property within Guam, including offshore islands and submerged lands and waters extending seaward for a distance of 3 nautical miles. Layon is located within the coastal zone and must comply to the maximum extent possible with the enforceable policies set forth in the GCMP.

3.2.3 Terrestrial Ecology

Guam is an oceanic island that has never been connected to a continental land mass. Because of its isolation and great distance from Indonesia, the Philippines, and mainland Asia, the land plants and animals that inhabit Guam have been transported from elsewhere by man or nature and in a few cases evolved into distinct, endemic, species. Guam supports many introduced species of plants and animals. The U.S. Endangered Species Act of 1973 prohibits the taking of any listed species. For Guam, the USFWS lists thirteen species. These include two mammals, seven birds, three reptiles, and one plant (USFWS Pacific Islands Ecological Services, 2005). Twenty-three species, including two mammals, nine birds, six reptiles, three mollusks, and three plants, are listed as endangered or threatened by the Guam Department of Agriculture (GDA).

3.2.3.1 Vegetation

Guam shares a large number of plant and animal species with the Commonwealth of the Northern Mariana Islands, which administers the other 14 islands in the archipelago. The native biota of Guam has strong Australasian affinities. Most of Guam is covered by secondary growth forest. Scattered patches of potentially original forest still exist on the northern plateau and in less accessible areas (World Wildlife website, accessed July 27, 2004).

The terrestrial flora at Layon was recorded during pedestrian surveys conducted in July and November 2004 by D&A, Inc.

The Layon footprint contains four vegetation communities – savanna grassland, ravine forest, disturbed vegetation/badlands, and wetlands (Figure 3-4). The savanna grasslands are extensive, occupying most of the northwestern portion of the landfill site. The major species include swordgrass (*Miscanthus floridulus*), foxtail (*Pennisetum polystachion*), *Sorghum halepense*, *Dicanthium bladhii*, and wildcane (*Saccharum spontaneum*). Small herbs intermingled among the grasses include *Elephantopus mollis*, *Lycopodium cernuum*, *Stylosanthes guianensis*, *Stachytarpheta jamaicensis*, and *Rhynchospora rubra*. The vegetation transitions into a shrubby profile on slopes, with *Wikstroemia elliptica*, *Geniostoma micranthum*, *Decaspermum fruticosum*, *Glochidion marianum*, *Phyllanthus*

saffordii, and *Dianella saffordi*. Small trees, such as *Pouteria obovata* and *Cycas circinalis*, also occur among the mixed shrubbery.

The central and southern portions of Layon are composed of badlands with exposed soils and sparse vegetation, such as *Gleichenia linearis*, *Lycopodium cernuum*, *Dimeria chloridiformis*, *Hyptis capitata*, *Chrysopogon aciculatus*, *Pennisetum polystachion*, and *Melastoma malabathricum*. The disturbed vegetation community at the site is associated with past clearing activities for roads, trails, or agricultural fields. Fires have also cleared the original plant community and produced disturbed areas with species such as carpetgrass (*Axonopus compressus*), sleeping grass (*Mimosa pudica*), dodder (*Cassytha filiformis*), and *Eragrostis atrovirens*.

Only small pockets of ravine forest remain among the badland and savanna vegetation, hinting at what may have been a more extensive community prior to fires and other disturbances. Forested areas are found in the southwestern sector of the site along a tributary into the Fintasa River. The community contains kafu (*Pandanus tectorius*), fading (*Cycas circinalis*), da'ok (*Calophyllum inophyllum*), and lada (*Morinda citrifolia*), with an understory of bejuco halom tano (*Flagellaria indica*), *Scleria polycarpa*, *Chromolaena odorata*, and *Lantana camara*, and epiphytes such as pugua machena (*Davallia solida*) and *Pyrrosia lanceolata*. Da'ok trees also form small stands in the western and central sectors, with a similar species composition.

The landowner of the Dandan parcel, the Calvo family, authorized the Guam Department of Agriculture to enter the property for its Forest Stewardship Program. According to the Chief of the Forestry Division, the division has planted approximately 50 acres of *Acacia auriculiformis*, *Casuarina equisetifolia*, and *Calophyllum inophyllum* seedlings in scattered badlands throughout the Layon area under the Forest Stewardship Program. An estimated \$200,000 has been invested since plantings began about two to three years ago (Personal communication with Mr. David Limtiaco, Chief of Forestry Division, 7 April 2005).

3.2.3.2 Wildlife

Due to its isolation and distance from continental landmasses, Guam's land animals are few. The Mariana fruit bat, the only endemic mammal on Guam, exists in small numbers with a population of approximately 100-300 individuals, most of which are found on Andersen Air Force Base.

The introduction of the brown tree snake (*Boiga irregularis*), has been determined to be the primary cause of the near extermination and extinction of some of Guam's native birds. The only native species that is relatively common is the yellow bittern (*Ixobrychus sinensis*). Loss of bats and other small mammals has also been speculated to be due to the presence of the brown tree snake, an effective predator on juvenile bats.

Pedestrian surveys conducted by D&A, Inc. in July and November 2004 were the primary means of detecting fauna at Layon. Eight-minute bird counts using the

methodology of Reynolds et al. (1980) to quantify avian fauna were conducted at seven stations located along the access road, and northwest, northeast, southwest, and southeast of the site (Figure 3-4). A total of two mammals, eight birds, one reptile, four amphibians, and two mollusks were found at Layon during the pedestrian and bird count surveys (Table 3-5). No threatened or endangered species were found during the surveys. The wetlands at Layon have been identified as habitat capable of supporting the endangered Mariana common moorhen. The endangered Mariana common moorhen has been known historically to utilize wetlands at Dandan east of the footprint.

Table 3-5. Terrestrial and Avian Fauna Observed Within Layon

Common Name	Scientific Name	Status*
Mollusks		
African Snail	<i>Achatina fulica</i>	I
Land Snail	<i>Bradybaeana pellucida</i>	I
Amphibians		
Marine Toad	<i>Bufo marinus</i>	I
Arrowhead Frog	<i>Microhyla pulchra</i>	I
Brown tree frog	<i>Polypedates megacephalus</i>	I
Black-spotted pond frog	<i>Rana nigromaculata</i>	I
Reptiles		
Curious skink	<i>Carlia fusca</i>	I
Birds		
Rock dove	<i>Columba livia</i>	I
Blue-breasted quail	<i>Coturnix chinensis</i>	I
Black drongo	<i>Dicrurus macrocercus</i>	I
Black francolin	<i>Francolinus francolinus</i>	I
Yellow bittern	<i>Ixobrychus sinensis</i>	N
Eurasian tree sparrow	<i>Passer montanus</i>	I
Pacific lesser golden-plover	<i>Pluvialis dominica</i>	M
Philippine turtle-dove	<i>Streptopelia bitorquata</i>	I
Mammals		
Feral dog	<i>Canis familiaris</i>	I
Feral pig	<i>Sus scrofa</i>	I
TOTAL SPECIES = 17		

Notes:

*Status: I = Introduced, M = Migratory, N=Native

3.2.4 Aquatic Ecology

D&A, Inc. conducted biological surveys at Layon in July and November 2004. The surveys were the primary means of detecting terrestrial and aquatic fauna at Layon. No macrofauna were detected in the sectors of the Fensol and Fintasa rivers in the vicinity of Layon during the biological surveys.

The Fensol River was investigated by Division of Aquatic and Wildlife Resources (DAWR) and D&A, Inc. personnel on November 9, 2004. The only macrofauna observed were water striders, which are common insects in Guam's rivers. The freshwater eel, *Anguilla marmorata*, and the Tahitian prawn have been observed in the lower Fintasa River in the vicinity of Fintasa Falls by DAWR. Fintasa Falls is located approximately 0.25 miles from Layon.

The northeastern corner of Layon encompasses a short section of a tributary to the Tinago River mostly choked with wetland vegetation (*Eleocharis* sp.) (Figure 3-3). The flagtail (*Kuhlia rupestris*), tilapia (*Oreochromis* sp.), and green-spotted pond frogs (*Rana nigromaculata*) were noted in a survey of the northern branch of the Tinago River. Both freshwater and marine fish have been observed in the lower reaches of the Tinago River within 150 meters (m) upstream and 200 m downstream of the Tinago River Bridge (DAWR, Guam Department of Agriculture, unpublished data). These include *Anguilla marmorata*, *Awaous guamensis*, *Kuhlia rupestris*, *Lutjanus argentimaculatus*, *Moolgarda engeli*, *Sicyopterus macrostetholepis*, *Stenogobius* sp., *Stiphodon* sp., and *Zenarchopterus dispar*. Invertebrates, such as Tahitian prawn (*Macrobrachium* lar), thiarid snails, and possibly the grapsid crab *Varuna litterata*, were also reported by DAWR. Local residents of Malojloj report that freshwater eels and shrimp are harvested from the river systems surrounding the landfill site.

3.3 HUMAN ENVIRONMENT

The zone of influence, or geographic scope, for this section varies depending on the topic being discussed. The areas used for describing existing conditions vary from the entire island of Guam to the district or block group (BG), which are both U.S. Census-defined geographic areas, surrounding the site. A BG is a subdivision of a census tract.

3.3.1 Socioeconomic Conditions

When siting an MSWLF, adjacent land uses such as residential, commercial, recreational/tourism areas, wells, water courses, historic sites, and roads should be taken into consideration within 0.25 mile (1,320 ft) of the site (§23401 of the *Rules and Regulations for the GEPA Solid Waste Disposal*). For the purposes of this discussion on socioeconomics, a more conservative radius of 0.5 mile (2,640 ft) is used to determine effects of the proposed landfill relating to land use, demographics, recreation, and sensitive receptors.

3.3.1.1 Land Use

Guam covers an area of 549 square kilometers (km²) (212 square miles [mi²]) and is composed of 11 percent arable land, 11 percent agricultural, 15 percent meadows and pastures, 18 percent forest and woodland, and 45 percent other land uses (GovGuam 2004). Approximately 30 percent of the island is federally owned. GovGuam owns approximately 25 percent and the remaining 45 percent is privately owned (United States Department of the Interior [USDOI] 2004a).

The existing land use on the 126-acre Layon footprint is a mixture of agricultural and recreational (Figure 3-5). Agricultural uses occur within 0.5-mile of Layon. Cultivated fields of watermelon and other crops and a fenced enclosure for cattle are located to the north of the footprint, while a small garden plot is present to the southeast of the footprint. The western central sector shows evidence of previous planting activities.

Recreational land uses include mountain biking, hiking, fishing, hunting, and the use of 4x4 off-road vehicles. Tracks from off-road vehicles, as well as empty rifle shells from hunters, were observed during pedestrian surveys. No permanent manmade structures are present within Layon. All activities in the Dandan parcel must be coordinated through the Calvo family's caretaker, Mr. Frank Manglona; otherwise, they are unauthorized. Use of off-road vehicles and burning to attract feral deer for hunting are not authorized activities.

Adjacent Properties

The Dandan parcel (Lot B-3-REM) in which the Layon footprint is located is approximately 2,800 acres of undeveloped land (Figure 3-5). The Dandan parcel is privately owned by joint tenancy involving First Island Industry, Inc. (a subsidiary of Oxford Properties and Facilities, Ltd.) and Calvo's Insurance Underwriters. The undeveloped parcel provides greenspace on all sides between the footprint and the nearest property boundaries. Adjacent properties surrounding the parcel in which Dandan is located are listed below in Table 3-6.

Table 3-6. Adjacent Parcels to the Layon Footprint

Parcel Number	Owner/Land Use	Shortest Distance from Footprint to Parcel Boundary
Lot 380-R2	GovGuam (Undeveloped)	557 ft to south
Lot 354-3	GovGuam (Undeveloped)	3,379 ft (0.64 mi) to southeast
Lot 354-1	GovGuam	4,091 ft (0.77 mi) to southeast
Lot 354-4	GovGuam (Inarajan Middle School)	4,435 ft (0.84 mi) to southeast
Parcel 1	Former NASA Tracking Station (Currently inactive)	1,312 ft (0.25 mi) to northeast
Unsurveyed Gov't. Land	GovGuam (Undeveloped)	1.09 mi to east
Lot 275	Matsuzato Sogyo Co. Ltd. (Undeveloped)	3,083 ft (0.58 mi) to west

Parcel Number	Owner/Land Use	Shortest Distance from Footprint to Parcel Boundary
Lot 59-6	Rodney B. & Leonora F. Bordallo (Undeveloped)	3,323 ft (0.63 mi) to northwest
Lot B-3	Calvo's Insurance Underwriters, Inc./ First Island Industry, Inc. (Undeveloped, agricultural)	2,290 ft (1.42 mi) to northwest

3.3.1.2 Zoning

Layon is located in "A" or Agricultural zones (Figure 3-5). The following uses are permitted in an "A" zone:

- one-family dwellings and duplexes;
- farming and fisheries, including all types of activities customarily carried on in the field of agriculture and fisheries, including the raising of crops and fruits, poultry and livestock, grazing and dairying, and tree and other vegetative production, whether for commercial or personal uses;
- uses customarily accessory to any of the above uses, including home occupations and private automobile parking areas as well as accessory buildings and structures such as private garages, warehouses, barns, corrals, or other similar structures.

3.3.1.3 Demographics

For this section, general demographic and economic data are presented for the island of Guam, as well as some information for the three districts (or county subdivisions as referred to in the 2000 U.S. Census). Layon is located in the southern portion of the island in the Inarajan district.

The 2000 U.S. Census results for the island of Guam estimated the population to be 154,805. This represents an increase from the 1990 U.S. Census of 16 percent. The majority of Guam's population lives in urban areas (93.1 percent), while only 6.9 percent live in rural areas. The median age on Guam is 27.4 years.

The ethnic composition of the 2000 population was 47 percent Chamorro, 25 percent Filipino, 10 percent white, and 18 percent Chinese, Japanese, Korean, and others (USDOI 2004a). The 2000 population estimates for Inarajan is 3,052 a 24 percent change from 1990 of 2,469.

3.3.1.4 Economics

The economy of Guam depends mainly on U.S. federal and military spending and on revenues from tourism. As of March 2003, there were a total of 54,790 people employed

in Guam. Approximately 74 percent of the labor force is employed by the private sector, and the federal or Guam government employs the rest (GovGuam 2004). The unemployment rate in Guam was 11.4 percent in 2002 (USDOJ 2004b). The current Ordot Dump is employing 13 personnel, including equipment operators and solid waste technicians.

Tourism is Guam's number one industry, accounting for up to 60 percent of the government's annual revenues and providing more than 20,000 direct and indirect jobs (GEDA 2000). The Japanese normally account for 80 to 90 percent of tourists traveling to Guam, and the remaining travel from Korea, Taiwan, Hong Kong, and neighboring islands such as the Commonwealth of Northern Mariana Islands (CNMI). The tourism industry grew rapidly during the 1990s, but decreased in 2002 and 2003 due to air traffic concerns, the weak Japanese economy, the Severe Acute Respiratory Syndrome (SARS) epidemic, and several severe typhoons (USDOJ OIA 2004).

Agriculture, which makes up 7 percent of the Gross Domestic Product (GDP), is found throughout Guam. The 2002 Census of Agriculture recorded that there were 153 farms on the island, producing a total market value of approximately \$4.2 million for the agricultural products sold. Within the district of Inarajan, there were 21 farms in 2002 (compared to 19 farms in 1998) that sold \$863,550 of agricultural products. Within the district of Asan, there were no farms in 2002 (compared to two farms in 1998), and within the district of Chalan Pago-Ordot there were two farms (compared to 5 farms in 1998) with total sales undisclosed in 2002 (USDA 2002).

Currently, Layon has minimal economic use; however, the area has the potential to be used for residential or agricultural applications. Within the vicinity of Layon, there are farmers who sell produce to local supermarkets. There is an agreement between the local farmers and the Dandan parcel landowner wherein the farmers can use the land for free if they allow Payless Supermarkets the first opportunity to purchase their produce, which is a Calvo-owned enterprise.

3.3.1.5 Recreation

Within the vicinity of the Layon footprint, there are several tourist and recreation areas. The Talofofa Falls Park is a tourist-oriented facility located more than 1.27 miles northeast of the footprint. Three waterfalls, the Fintasa, Laolao, and Inarajan Falls, are located along rivers to the south of the footprint. These waterfalls are attractions for hikers and outdoor enthusiasts. The rivers and streams are used for fishing and the lands are used for hunting by local people. The caretaker of the Dandan parcel assigns the shrimp trappers and fishermen their sections of the river. He also notifies users, such as farmers, when authorized hunters are present on the land during hunting season. Hiking, mountain biking, and off-road vehicles are other recreational uses for the area. All activities within the Dandan parcel must be coordinated through the Calvo family's caretaker, Mr. Frank Manglona.

Dandan was the original release site for the introduced black francolin (*Francolinus francolinus*) by GDA, which permits licensed hunting of this game bird on private and Government of Guam lands. The vicinity around Layon is currently used for hunting activities.

3.3.1.6 Sensitive Receptors

Sensitive receptors to landfills include residences, schools, libraries, hospitals, clinics, old age homes, recreational areas and facilities, and other public facilities that may be located within a 0.5-mile radius of a landfill site. These facilities can be sensitive to issues such as air quality, water quality, noise, odor, and other aesthetic issues, which are discussed in the corresponding sections.

The proposed sanitary landfill would be operated in accordance with §23304, which requires operators of an MSWLF to cover solid waste daily with earthen material to "control disease vectors, fires, odors, blowing litter and scavenging." The proper management of the facility, along with a facility buffer area to allow sufficient distance or separation from abutting properties and sensitive receptors, would promote the facility as a good neighbor in the community. A good neighbor facility can have a neutral or positive effect in the area of the facility. Conversely, a facility that does not meet the requirements of §23304 or is not arranged to provide natural or constructed visual screening can have a negative impact.

The Layon footprint is not immediately adjacent to sensitive receptors, such as residences or schools. Potential residential sensitive receptors are more than 1 mile (5,280 ft) to the east in Malojloj village, and Guam Housing and Urban Renewal Authority's (GHURA's) Southern Rental Housing and private residences to the southeast. The Inarajan Mayor's Office and other facilities in the area are about 1.7 miles east of the Layon footprint. Inarajan Middle School is located 0.84 mile southeast of the footprint. There are private homes located along an approximately 2,500-ft section of Dandan Road that could be potential receptors of noise from vehicle traffic hauling waste to the site.

3.3.2 Infrastructure

3.3.2.1 Utilities

The locations of local utilities are shown in Figure 3-6.

Power

Guam Power Authority (GPA) generates and distributes all the power demands on Guam to more than 40,000 metered customers. Guam's electricity supply is derived 100 percent from fossil fuels. In 2001, the total electricity consumption on Guam was 771.9 million kWh (CIA 2005).

The Layon footprint is located approximately 8,300 linear ft from GPA's existing power distribution system near Route 4.

Potable Water Supply

The Guam Waterworks Authority (formerly the Public Utilities Agency of Guam) is responsible for developing, treating, and distributing approximately 74 percent of potable water demands. The remainder is handled by the US Air Force and Navy installations on Guam. The Northern Guam Lens Aquifer is the principal source of potable water for the island, which does not require extensive treatment (GDPW 1998). Approximately 40 mgd are currently pumped from this aquifer into the distribution system by more than 100 wells. Of this total, approximately 30 mgd is supplied to GWA customers (GWA 2004).

Surface drinking water sources used by GWA include an impoundment on the Ugum River, which produces approximately 2 mgd, and water purchased from the U.S. Navy Water System (Fena Lake), which produces approximately 9 mgd (GWA purchases 3 mgd from the U.S. Navy to service its customers). Spring water from Asan and Santa Rita supplements the potable water supply to Asan, Piti, Anigua, and Santa Rita villages (GWA 2004).

The Layon footprint does not have existing water transmission lines on site. It is approximately 2 miles from the nearest public water transmission system, located along Route 4 (Figure 3-6).

Wastewater/Sewer

The Guam Waterworks Authority is also responsible for the wastewater system. Improvements were made to the operation of the wastewater utility during 1998. The North District (ND) and the Agana sewage treatment plants (STPs) were about to be released from Administrative Orders issued by USEPA for not complying with NPDES discharge standards. The transfer of Tumon Bay sewage to the ND plant and the completion of the ND STP rehabilitation have facilitated this change. GWA has also reached agreement with the U.S. Navy in regard to the relocation of the Agat STP and the joint outfall has been designed. The plant would provide 20 mgd of secondary treatment capacity. The new Agat STP would phase out the Agat STP, and the Port treatment facility would be phased out and the effluent pumped to the Agana STP (USDOI 1999).

The closest public sewer system to the Layon footprint is approximately 2 miles away in Malojloj Village near Route 4.

Telecommunications

Guam Telephone Authority (GTA), a privately-owned utility, provides fixed line and wireless telecommunications services to the people of Guam. The Layon footprint is approximately 8,600 ft away from the closest GTA communications infrastructure along

Route 4. Cable TV infrastructure, owned and operated by Marianas Cable Vision, is more than 3 miles away from the site.

3.3.2.2 Road Network

Site Access and Haul Routes

Access to the Malojloj area is via Route 4, the primary access road to southern Guam, which is currently in need of improvements. The primary access to the Layon footprint is Dandan Road, which extends from Route 4 at Malojloj to the former NASA Tracking Station as depicted in Figure 3-6. Currently, there is no access road leading directly to the footprint from Dandan Road.

Haul routes to Layon would be via Guam's major highway routes to Route 4, then through Dandan Road, which extends from Route 4 at Malojloj to the former NASA Tracking Station, as depicted in Figure 3-6.

Traffic

Existing vehicular traffic flow to and from the Ordot Dump includes all varieties of vehicles, including, but not limited to solid waste packer trucks, dump trucks, pickups and trash trailers. These waste haulers have capacities ranging from 1 to 20 cubic yards. Current data recorded at the Ordot Dump show that more than 200 vehicle loads totaling greater than 400 tons of waste can be experienced on certain days.

According to the 2020 Guam Highway Master Plan, total vehicle trips in southern Guam in 2003 were estimated at 12,066. Total island-wide vehicle-trips in the same year were 446,022. These vehicle trips include all solid waste collection and disposal traffic movement.

Highway Safety

The highway safety issues that are relevant to traffic flow to and from the site are mostly along Route 4. Substandard geometrics and narrow travel lanes for certain segments of Route 4 exist, as well as a lack of climbing lanes for the segment of Route 4 from Ylig Bridge to Inarajan. There are no paved shoulders and the paved surface of Route 4 is in need of repair along certain segments.

3.3.2.3 Energy Use and Conservation Measures

Currently, there is no infrastructure or development at the site. Therefore, there are no energy requirements at Layon.

3.3.3 Public Health and Safety

This section provides existing conditions relating to public health issues associated with a landfill. Issues normally considered important to human health and safety include disease vectors (i.e., birds, insects, and rodents), inadvertent disposal of household hazardous waste, illegal roadside dumping and wind-blown litter near landfill, air pollution from dust-emitting operations (truck traffic), landfill gas migration, toxic air pollutants and odors associated with landfill operations, and groundwater and surface water contamination from leachate migration (Lee 1994). Air emissions from the landfill are discussed in Section 3.2.1.4, groundwater issues are discussed in Section 3.2.1.2, and surface water quality issues are discussed in Section 3.2.2.

Issues with the current landfill at Ordot Dump include containing wind-blown litter, reducing the presence of birds and other disease-carrying organisms, and managing odors that affect properties downwind. However, recent management has changed and conditions are improving.

3.3.3.1 Household Hazardous Waste

Currently, no hazardous waste is allowed into the Ordot Dump. The current Operating Plan for the Ordot Dump classifies the following as hazardous waste: paint, adhesives, solvents, cleaners, pesticides, herbicides, vehicle and non-vehicle batteries, used oil, gasoline, diesel, or any flammable liquid.

3.3.4 Aesthetics

Guam's aesthetic environment is unique based on its geology, vegetation, and climate. The northern half of the island is a limestone plateau with cliffs and limestone forests that support unique vegetation and wildlife. The southern half of Guam consists of hilly volcanic terrain with elevations up to 1,330 ft above MSL. Due to the soils and geology, all of the permanent rivers are found in the southern portion of the island. The central and southern parts of the island are mountainous and can be viewed from coastal areas (GDPW 1998).

The Dandan parcel is a relatively open expanse of land stretching between the Ugum watershed on the north and the Inarajan watershed to the south. The view corridor from the Layon footprint encompasses Inarajan Middle School and GHURA housing to the south, private residences to the east, and the Talofofa Falls Park to the north.

3.3.5 Archaeological/Historical Resources

3.3.5.1 Background

Archaeologists recognize two broad prehistoric (or pre-European contact) cultural periods in the Marianas, the Pre-Latte and the Latte, while they conventionally divide the historic record using the same units as the Historic Period (Spanish, First American,

Japanese/World War II, and Second American). Sites are considered historic as opposed to modern if they are at least 50 years old and are considered historically significant if they qualify for nomination to the National Register of Historic Places (MARS, 2005).

Micronesian Archaeological Research Services (MARS, 2005) prepared a cultural resources assessment including a literature review and reconnaissance-level archaeological survey in the Dandan parcel. PHRI conducted an inventory survey within Layon in 2004.

3.3.5.2 National Historic Preservation Act

The archaeological work at Layon is mandated by Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended, and its implementing regulations (36 CFR Part 60, 36 CFR Part 800, and the Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation). Other federal legislation pertaining to the protection of historic properties (e.g., the Antiquities Act of 1906, the National Trust for Historic Preservation Act of 1949, the Reservoir Salvage Act of 1960) and local historic preservation laws of Guam potentially apply as well.

Guam laws include Executive Orders 89-9, 89-24, Public Law 12-126, Public Law 20-104, Public Law 20-151, and Public Law 25-72. Also applicable to archaeological projects are the Dept. of Parks and Recreation's General Guidelines for Archaeological Burials. The Guidelines are pertinent when human skeletal remains are found at an archaeological site, requiring that such remains be avoided if at all feasible.

The National Register of Historic Places was established to recognize properties (districts, sites, buildings, structures, and objects) that are "significant in American history, architecture, archaeology and culture..." (36 CFR Part 60.1). Properties are significant if they satisfy each of two categories comprising the National Register criteria for evaluation (36 CFR Part 60.4): (1) they must possess integrity of location, design, setting, materials, workmanship, feeling, and association; and (2) they must be characterized by at least one of the following attributes:

- (a) associated with events that have made a significant contribution to the broad patterns of our history; or
- (b) associated with the lives of persons significant in our past; or
- (c) embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
- (d) have yielded, or may be likely to yield, information important in prehistory or history.

Section 106 of the NHPA and its implementing regulations define an undertaking as "a project, activity, or program that can result in the character or use of historic properties, if any such historic properties are located in the area of potential effects" (36 CFR Part 800.2(o)). Carried out during planning, the Section 106 process involves defining an area of potential effect: in this case, the alternative footprint selected for the landfill and adjacent areas that are likely to be affected by the construction and use of the landfill (roads, staging areas, etc.). Once this area (or areas) of potential effect has been established, the Section 106 process proceeds in steps.

The process begins with the identification of historic properties. A determination is made as to whether the undertaking will have an effect on those historic properties. If no historic properties are present within the area of potential effect, then a No Property finding is made and the undertaking may proceed. If historic properties are present within the area of potential effect, an assessment of effect is made and the properties are evaluated for their significance using National Register criteria a-d. A determination of No Effect results when the undertaking will not affect the historic properties. A determination of Adverse Effect results when the undertaking will harm one or more historic properties. A determination of Adverse Effect may be considered No Adverse Effect if an historic property is of value for its potential contribution to archaeological, historical, or architectural research, and when such value can be substantially preserved through the conduct of appropriate research, and such research is conducted in accordance with applicable professional standards and guidelines.

The Guam HRD must be consulted for their concurrence with the determination of effect and to establish any terms and conditions under which the undertaking will be carried out, especially for findings of No Adverse Effect. The undertaking may then proceed in accordance with the stipulations of an executed Memorandum of Agreement (MOA) or under the conditions for a No Adverse Effect determination. No further action is required for No Property or No Effect determinations.

3.3.5.3 Archaeological and Historical Resources

Archival Research

Archival research found that historic land use at Dandan included Spanish Period ranching and family subsistence farms. Evidence of prehistoric land use is indicated by several archaeological surveys in and near the parcel. Figure 3-7 shows archaeological site locations from the Guam Historic Resources Division (HRD) data base and locations of sites found during the present project.

Within the parcel, five sites had been located but none of them within the landfill footprint. Previously known sites in the western portion of the parcel are 66-09-0529, an artifact scatter with subsurface deposits; 66-09-0532, an artifact scatter with subsurface deposits and latte stones (Highness et al. 1991) and 66-09-0098 (South Ugum Ridge), an artifact scatter (Reinman 1965-66); in the northeast corner of the parcel is Site T-1, a

pottery scatter (Haun and Donham 1989); and in the eastern part of the parcel by Assupian Lake is 66-09-0099 (Assupian), a latte site (Reinman 1965-66).

The presence of wetlands in the Dandan parcel undoubtedly was a significant factor affecting prehistoric as well as historic land use patterns. In fact, Latte Phase sites tend to occur near wetlands in the interior of the island. Prehistorically, wetlands could have been used for rice cultivation as well as seasonal planting of taro. Wet soils are also conducive to cultivation of betel nut, coconut, and bananas. During Spanish and early American Periods, wetlands were important water sources for cattle raising and these wet soils were useful for subsistence farming as in prehistoric times.

Inventory Survey

During August and September 2004, PHRI conducted an inventory survey within the proposed Layon footprint and identified ten isolated occurrences (Table 3-7). The finds represent Prehistoric and Historic Period activities but the find locations lack the complexity and integrity normally associated with formal archaeological site designations. No such formal archaeological sites were identified during the survey.

Eight of the isolated occurrences are prehistoric; six consist of one or two slingstones and two are modified boulders, which were probably used in tool making. Near one of the boulders was a Latte Period pot sherd. A possible groundstone tool fragment and a chert core were also recovered. Two of the isolated occurrences are historic and relate to ranching: a single large wrought iron nail and a bail of barbwire.

A large quantity of bullet casings and spent bullets was noted throughout the Layon footprint. These bullets included .30, .45, and .50 caliber rounds commonly associated with WWII Era US military forces.

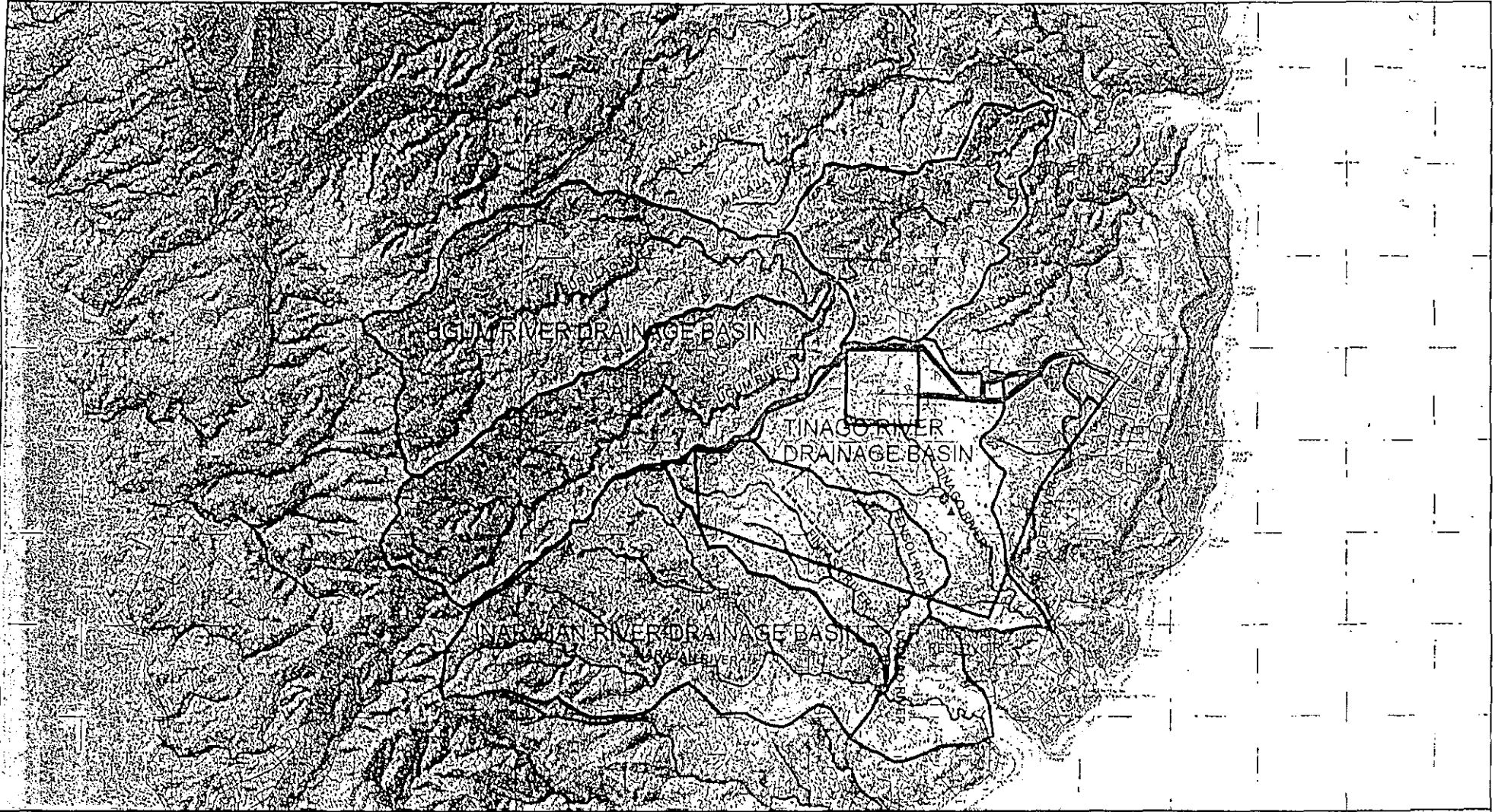
Table 3-7. Summary of Isolated Occurrences

Site No.	Description	Site Type	Site Environment
1	Wrought iron nail	Historic	Badland area
2	Barb wire	Historic	Badland area
3	Slingstone	Prehistoric	Partially vegetated Badland Area
4	Two slingstones	Prehistoric	Partially vegetated Badland Area
5	Groundstone fragment	Prehistoric	Badland area
6	Basalt boulder, sherd	Prehistoric	Badland area
7	Two slingstones	Prehistoric	Badland area
8	Chert core	Prehistoric	Badland area
9	Two slingstones	Prehistoric	Partially vegetated Badland Area
10	Basalt boulder	Prehistoric	Badland area

Reconnaissance Survey and Monitoring

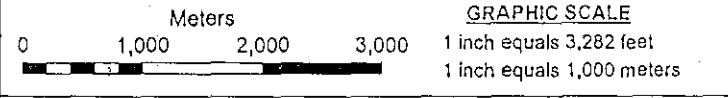
In July 2004, MARS conducted a reconnaissance survey and provided archaeological monitoring of soil tests and borings within the Dandan parcel located immediately northwest of Layon that was surveyed by PHRI in August and September. MARS' survey and monitoring located four sites: Dan S-1, Dan S-2, Dan S-3, Dan S-4 and three isolated occurrences: Dan IO-1, Dan IO-2, Dan IO-3. All of these localities are outside of Layon (Figure 3-7).

Dan S-1 is a scatter of five slingstones (collected) at the base of a low ridge. Dan S-2 is an artifact scatter consisting of two slingstones (collected), basalt flakes, World War II military issue beer bottles, other bottles, shrapnel, other metal machine parts, cartridges dated 1942, 1943, plastic, and wire located on an actively eroding slope. Dan S-3 is an historic fence remnant associated with economic tree plantings located on gently sloping terrain, probably part of the old Martínez ranch. Dan S-4 is a linear outcrop of weathered basalt with imprints from a tracked vehicle, possibly WWII military or a track hoe; it was located on a low ridge. The three isolated occurrences consist of single slingstones (collected); two were located in rolling terrain and one on a ridge.

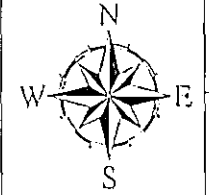


KEY TO FEATURES

RIVERS	APPROXIMATE SAMPLING LOCATION
PARCEL	PROPOSED DIVERSION
PROSPECTIVE LANDFILL FOOTPRINT	PROPOSED RESERVOIR
INARAJAN DRAINAGE BASIN	
TINAGO DRAINAGE BASIN	
UGUM DRAINAGE BASIN	

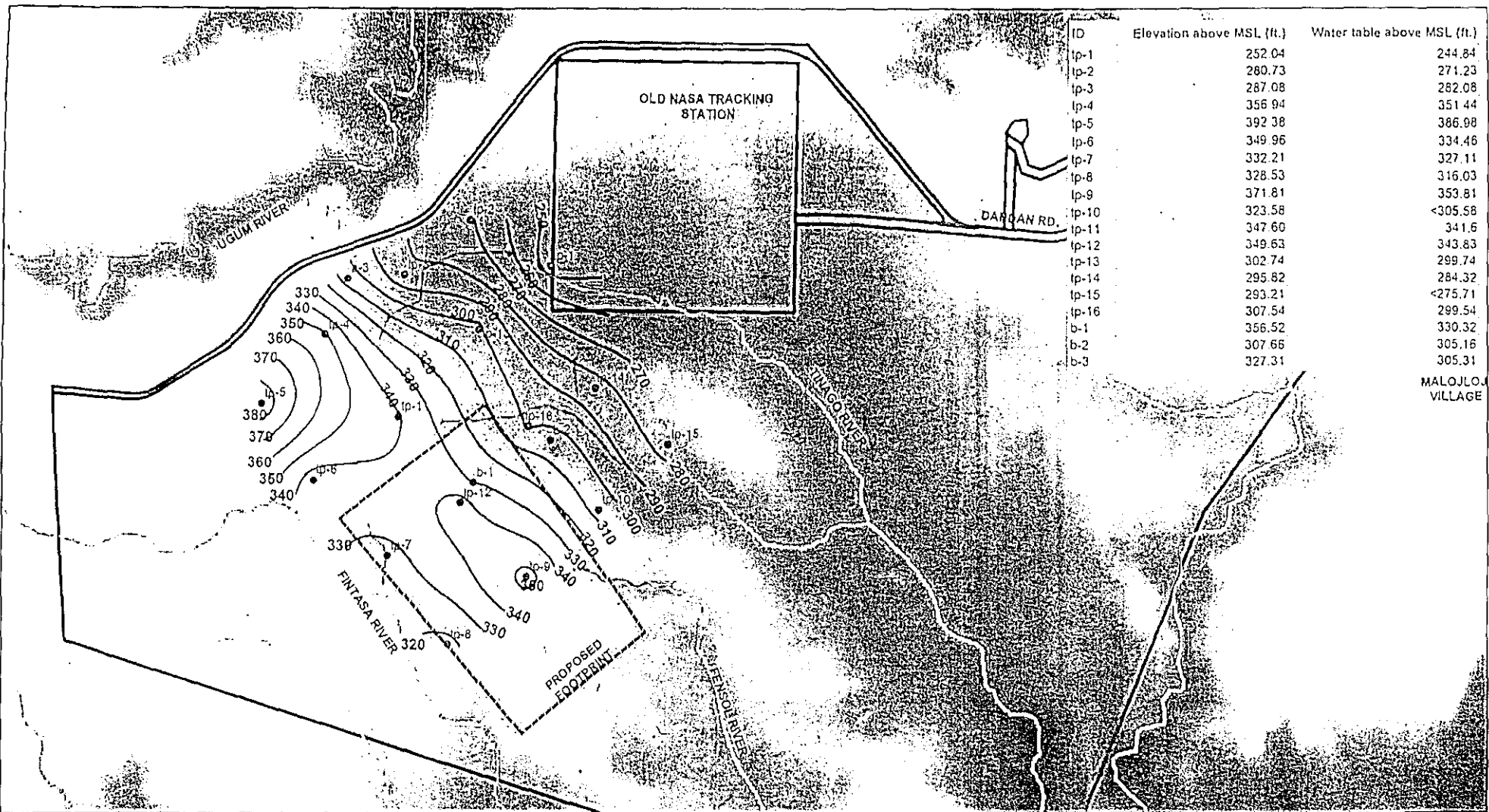


DATUM: UNIVERSAL TRANSVERSE MERCATOR ZONE 55N
 SPHERIOD: WGS84
 BASEMAP: GUAM RELIEF; USGS QUADRANGLES; DRAINAGE DIGITIZED FROM U.S. ARMY CORPS OF ENGINEERS WATERSHED MAPS



**FIGURE 3-1
DRAINAGE BASINS**

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ID	Elevation above MSL (ft.)	Water table above MSL (ft.)
tp-1	252.04	244.84
tp-2	280.73	271.23
tp-3	287.08	282.08
tp-4	356.94	351.44
tp-5	392.38	386.98
tp-6	349.96	334.46
tp-7	332.21	327.11
tp-8	328.53	316.03
tp-9	371.81	353.81
tp-10	323.58	<305.58
tp-11	347.60	341.6
tp-12	349.63	343.83
tp-13	302.74	299.74
tp-14	295.82	284.32
tp-15	293.21	<275.71
tp-16	307.54	299.54
b-1	356.52	330.32
b-2	307.66	305.16
b-3	327.31	305.31

MALOJLO VILLAGE

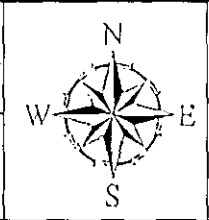
KEY TO FEATURES

- TEST PITS & BORINGS
- ▭ PARCEL
- ▭ LANDFILL FOOTPRINT
- SEASONAL DRAINAGE TO RIVER
- RIVERS
- WATER TABLE CONTOURS

GRAPHIC SCALE
 1 inch equals 984 feet
 1 inch equals 300 meters

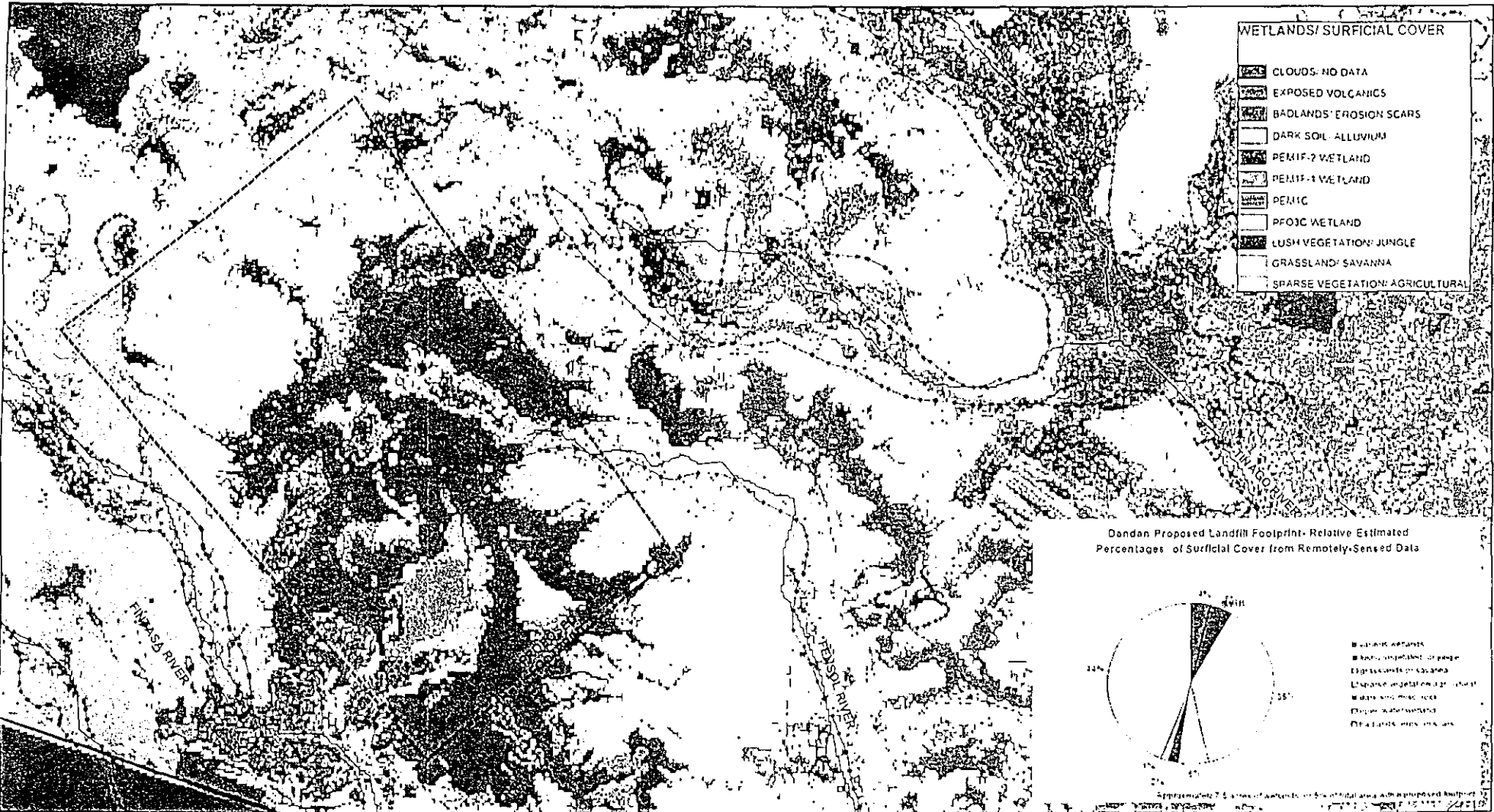
0 Meters 300 600

DATUM: UNIVERSAL TRANSVERSE MERCATOR ZONE 55N
 SPHERIOD: WGS84
 BASEMAP: GUAM DIGITAL ELEVATION MODEL



**FIGURE 3-2
 HYDROGEOLOGY**

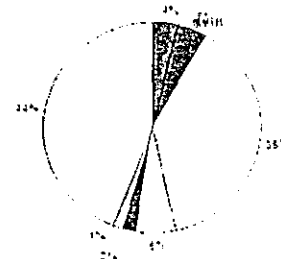
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 Inc.



WETLANDS/ SURFICIAL COVER

- CLOUDS- NO DATA
- EXPOSED VOLCANICS
- BADLANDS' EROSION SCARS
- DARK SOIL- ALLUVIUM
- PEMIF-2 WETLAND
- PEMIF-1 WETLAND
- PEMIC
- PFO3C WETLAND
- LUSH VEGETATION: JUNGLE
- GRASSLAND: SAVANNA
- SPARSE VEGETATION: AGRICULTURAL

Dandan Proposed Landfill Footprint- Relative Estimated Percentages of Surficial Cover from Remotely-Sensed Data

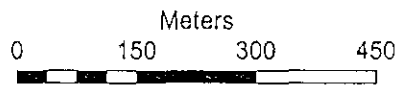


- Sparse Vegetation: Agricultural
- Grassland: Savanna
- Lush Vegetation: Jungle
- PFO3C Wetland
- PEMIC
- PEMIF-1 Wetland
- PEMIF-2 Wetland
- Dark Soil Alluvium
- Badlands Erosion Scars
- Exposed Volcanics
- Clouds - No Data

Approximately 7.5 acres of wetlands are located within the proposed footprint.

KEY TO FEATURES

- PARCEL
- LANDFILL FOOTPRINT
- RIVERS
- NWM WETLAND BOUNDARIES



GRAPHIC SCALE
 1 inch equals 492 feet
 1 inch equals 150 meters

DATUM: UNIVERSAL TRANSVERSE MERCATOR ZONE 55N
 SPHEROID: WGS84
 BASEMAP: BAE SYSTEMS SPECTRAL SOLUTIONS LLC, REMOTE SENSING DATA

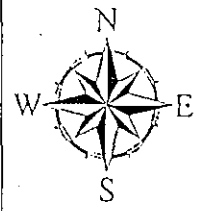
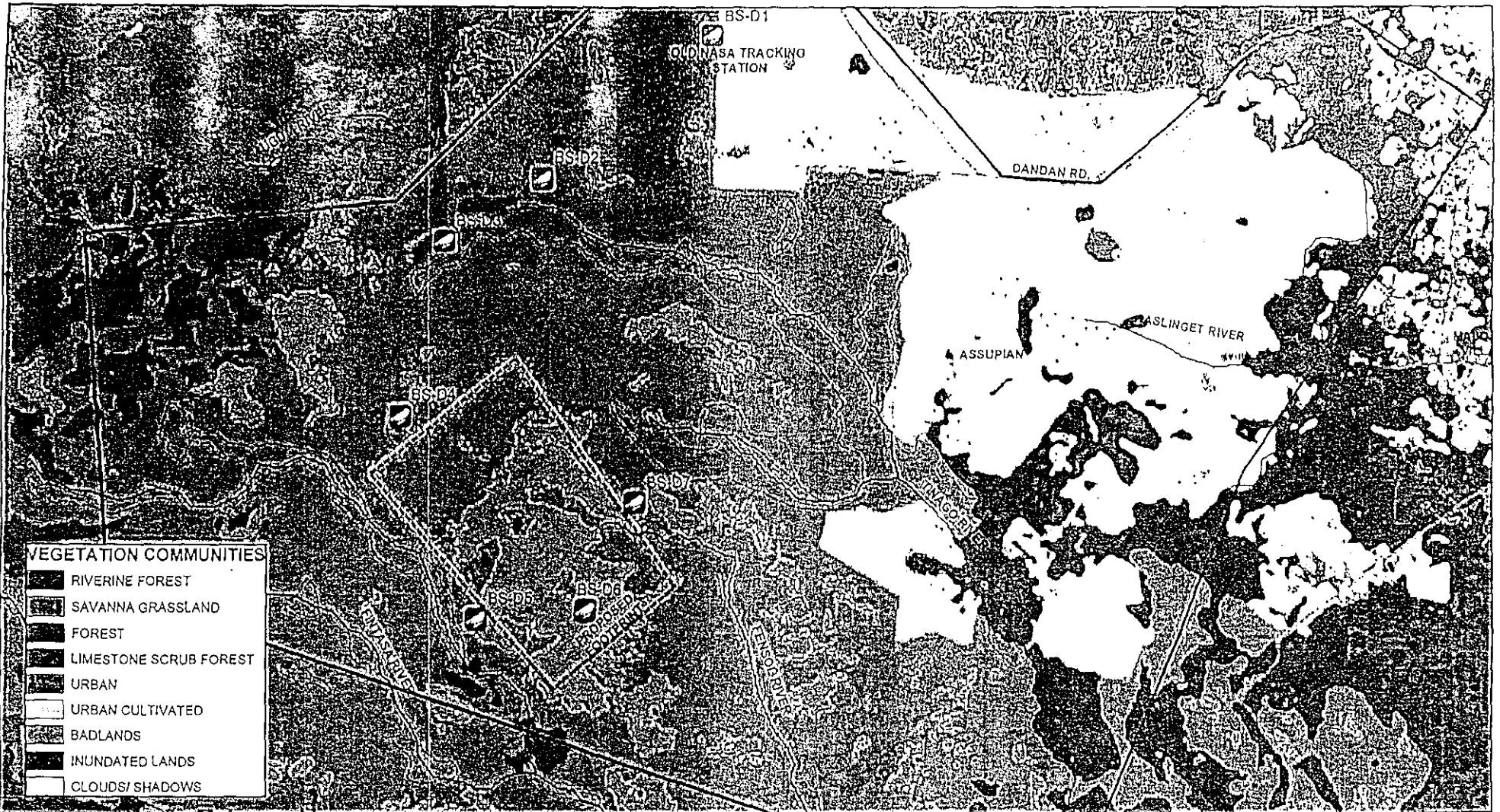


FIGURE 3-3
WETLANDS AND SURFICIAL COVER

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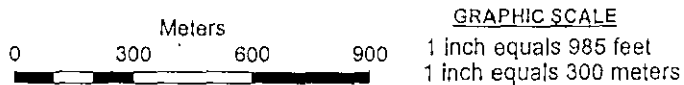


VEGETATION COMMUNITIES

- RIVERINE FOREST
- SAVANNA GRASSLAND
- FOREST
- LIMESTONE SCRUB FOREST
- URBAN
- URBAN CULTIVATED
- BADLANDS
- INUNDATED LANDS
- CLOUDS/ SHADOWS

KEY TO FEATURES

- RIVERS
- PARCEL
- LANDFILL FOOTPRINT
- BIRD COUNT STATIONS
- NWI Wetland Boundary



DATUM: UNIVERSAL TRANSVERSE MERCATOR ZONE 55N
SPHERIOD: WGS84
BASEMAP: USDA REMOTE SENSING DATA

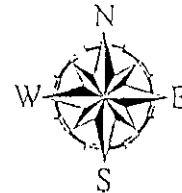
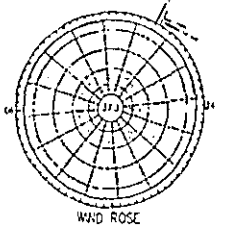
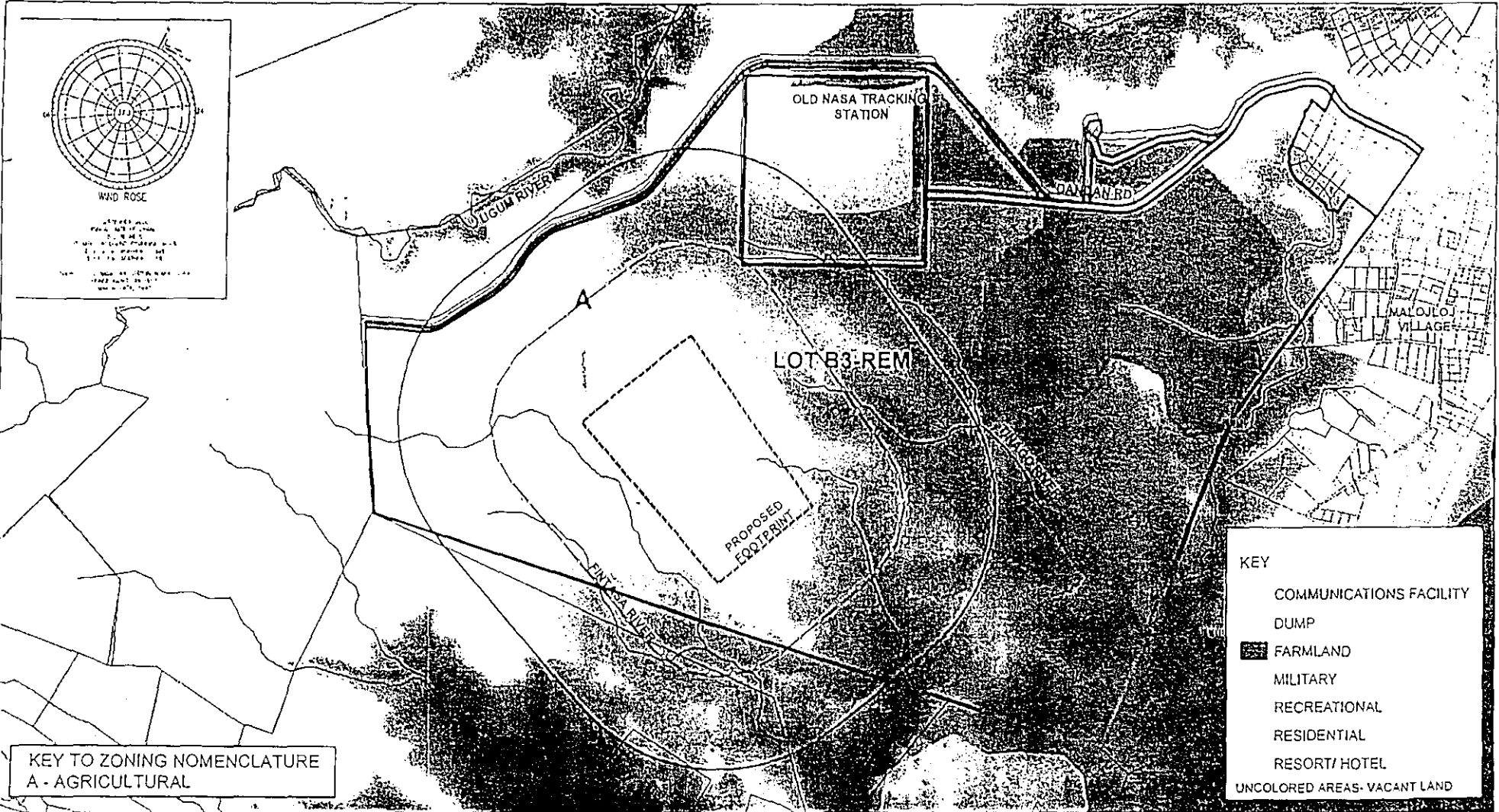


FIGURE 3-4
VEGETATION COMMUNITIES
AND BIRD COUNT STATIONS

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WIND ROSE

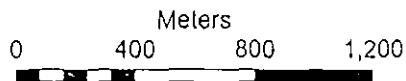
STREETS AND
 RIVERS ARE
 FROM THE
 1:50,000 SCALE
 MAP OF GUAM
 1:50,000 SCALE
 MAP OF GUAM
 1:50,000 SCALE
 MAP OF GUAM

KEY TO ZONING NOMENCLATURE
 A - AGRICULTURAL

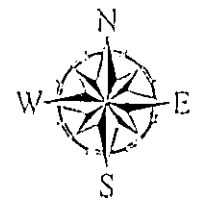
- KEY
- COMMUNICATIONS FACILITY
 - DUMP
 - FARMLAND
 - MILITARY
 - RECREATIONAL
 - RESIDENTIAL
 - RESORT/ HOTEL
 - UNCOLORED AREAS- VACANT LAND

KEY TO FEATURES

- RIVERS
- LANDFILL FOOTPRINT
- QUARTER-MILE BUFFER
- HALF-MILE BUFFER
- PARCEL
- LAND PARCELS



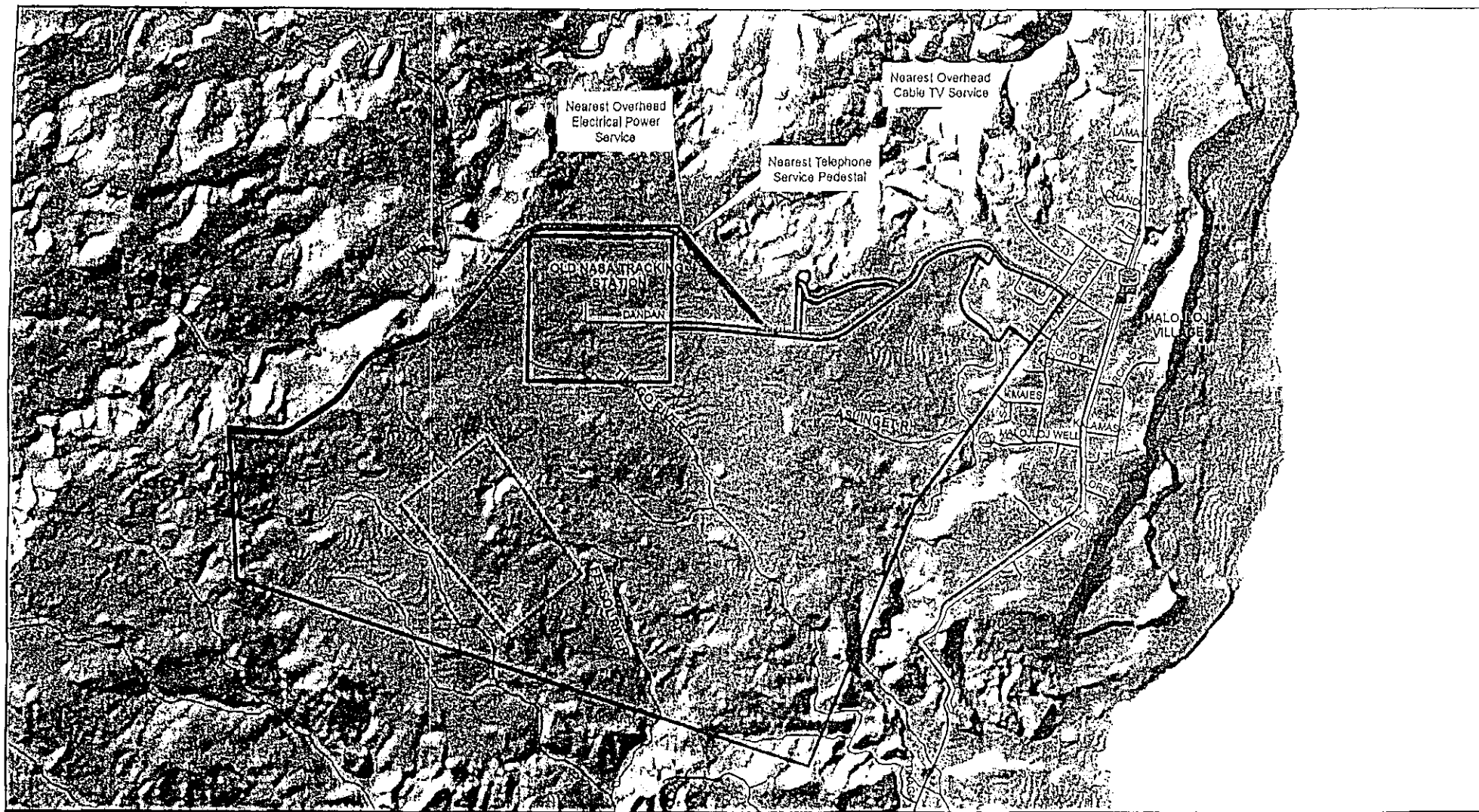
GRAPHIC SCALE
 1 inch equals 1,311 feet
 1 inch equals 400 meters



DATUM: UNIVERSAL TRANSVERSE MERCATOR ZONE 55N
 SPHEROID: WGS84
 BASEMAP: INCLUDES IMAGERY @ SPACE IMAGING LLC, ALL RIGHTS RESERVED
 BASEMAP: GUAM DIGITAL ELEVATION MODEL

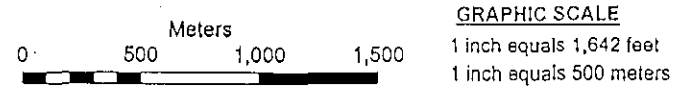
FIGURE 3-5
 LAND USE, ZONING
 AND PARCELS

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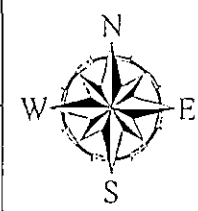


KEY TO FEATURES

- | | |
|--------------------------------|-------------------------|
| PARCEL | MUNICIPAL WATER WELLS |
| PROSPECTIVE LANDFILL FOOTPRINT | SEWER PUMP STATION |
| RIVERS | 6" WATERMAIN |
| WATER PUMP STATION | DANDAN PARCEL |
| RESERVOIR | 12" WATERMAIN |
| ROADS | POTENTIAL UTILITY ROUTE |

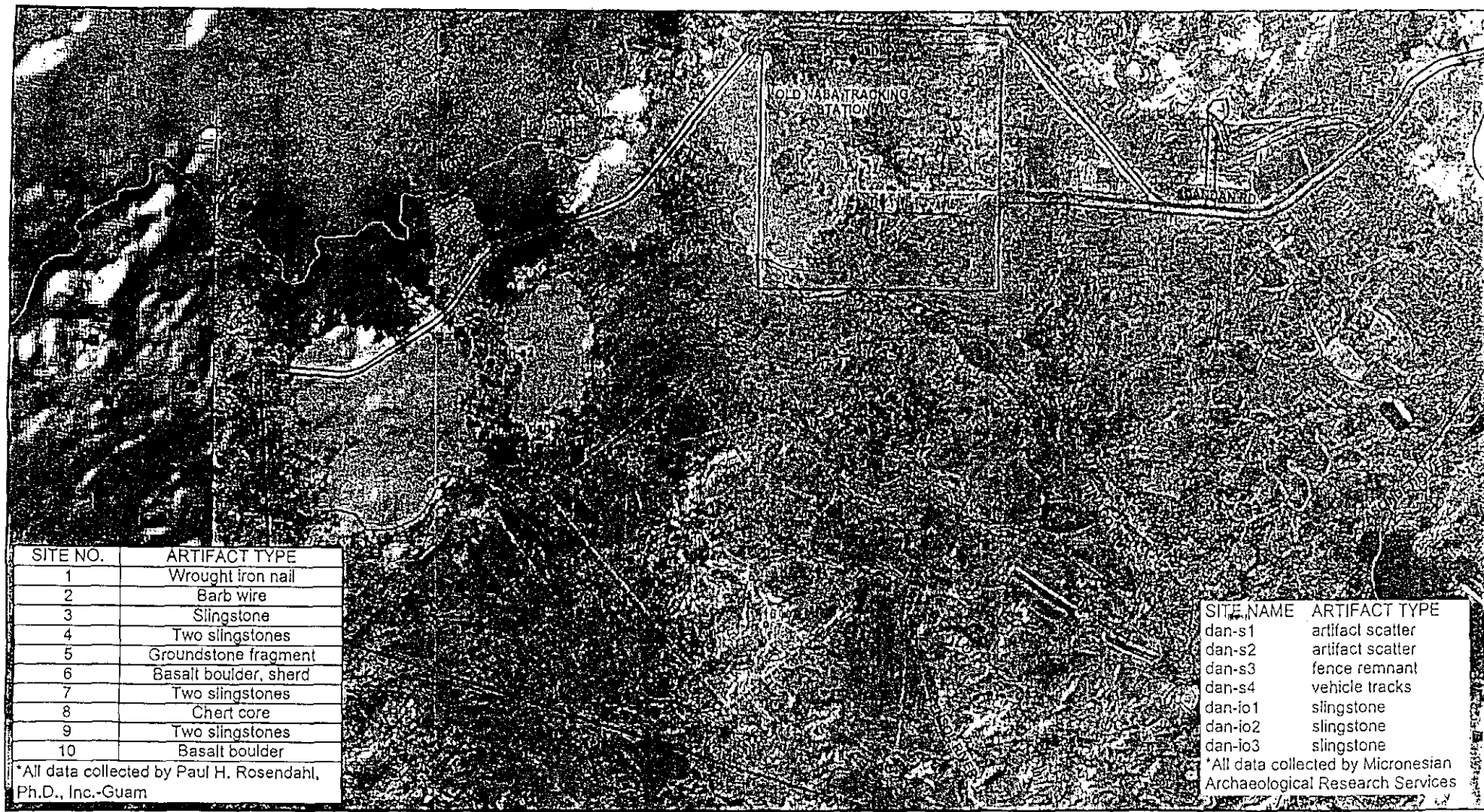


DATUM: UNIVERSAL TRANSVERSE MERCATOR ZONE 55N
 SPHERIOD: WGS84
 BASEMAP: GUAM DIGITAL ELEVATION MODEL



**FIGURE 3-6
 ROADS & EXISTING UTILITIES**

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SITE NO.	ARTIFACT TYPE
1	Wrought iron nail
2	Barb wire
3	Slingstone
4	Two slingstones
5	Groundstone fragment
6	Basalt boulder, sherd
7	Two slingstones
8	Chert core
9	Two slingstones
10	Basalt boulder

SITE NAME	ARTIFACT TYPE
dan-s1	artifact scatter
dan-s2	artifact scatter
dan-s3	fence remnant
dan-s4	vehicle tracks
dan-io1	slingstone
dan-io2	slingstone
dan-io3	slingstone

*All data collected by Paul H. Rosendahl, Ph.D., Inc.-Guam

*All data collected by Micronesia Archaeological Research Services

KEY TO FEATURES

- RIVERS
- ROADS
- ▭ PARCEL
- - - PROSPECTIVE LANDFILL FOOTPRINT
- ARCHAEOLOGICAL FINDS (MARS)
- ARCHAEOLOGICAL FINDS (PHRI)
- HPO Historic Sites

Meters

0 300 600 900

GRAPHIC SCALE

1 inch equals 983 feet

1 inch equals 300 meters

DATUM: UNIVERSAL TRANSVERSE MERCATOR ZONE 55N

SPHERIOD: WGS84

BASEMAP: INCLUDES IMAGERY @ SPACE IMAGING LLC, ALL RIGHTS RESERVED (2004 BAE SYSTEMS IKONOS SATELLITE IMAGERY)

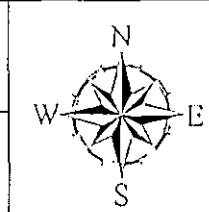


FIGURE 3-7
ARCHAEOLOGICAL RESOURCES

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4.0 ENVIRONMENTAL CONSEQUENCES

4.1 CHAPTER OVERVIEW

Chapter 4.0 describes and evaluates the nature and extent of impacts associated with the three footprint Alternatives and the No Action Alternative at Layon, Inarajan in order to identify the extent of mitigation needed to offset impact for the development and operation of a MSWLF. A description of the three conceptual footprint Alternatives and the No Action Alternative at Layon was presented in Chapter 2.0. Chapter 4.0 only addresses the topics that were not dismissed from further consideration as described in Section 3.1.1. Chapter 4.0 also describes the methodology used to analyze impacts and potential environmental consequences of each alternative.

Impact Analyses

Impacts are analyzed for resources of the natural and human environment. Natural environmental impacts include effects from landfill construction and operation on physical features including geology, hydrogeology, soils, air quality, and noise. Potential surface water impacts include effects of the landfill on hydrology, water quality, wetlands, and the coastal zone. Impacts to groundwater; terrestrial (vegetation and wildlife) and aquatic ecology; and rare, threatened, and endangered species will also be evaluated. Human environmental impacts from landfill construction and operation include socioeconomic, infrastructure, public health and safety, and aesthetics. Impacts of the alternatives on cultural resources involve how landfill construction and operational activities would affect archaeological and historic resources. Most of the information used to analyze the impacts for the natural and human environment in this chapter was taken from the *Final Site Selection Report* (GDPW 2005) unless otherwise stated.

As stated in Section 3.1, the proposed alternatives include the footprint, buffer area, access roads, and utilities, all of which comprise the limit of disturbance. The zone of influence is defined as the landfill footprint, and any adjacent areas, regions, and even island-wide if reasonably affected by the alternatives. Because resources vary in function and relation to environmental factors, the zone of influence was defined independently for the existing environmental resources (see environmental topic sections under Sections 4.2 and 4.3).

4.1.1 Methods for Evaluating Environmental Effects

The method of analysis of potential effects is based on direct and indirect consequences of long- and short-term impacts both adjacent to the site, regionally (i.e., village), and island-wide. The intensity of the impacts must also be defined. Where quantitative data were not available, best professional judgment was used to determine impacts. In general, the thresholds used are derived from existing literature, consultation with subject experts, and appropriate agencies.

To analyze impacts, methods were selected to predict the potential change in resources that would occur with the implementation of each alternative. Evaluation factors were established for each impact topic to assess the changes in resource conditions of the alternative.

would also be used as closure material during the completion phase. Additional storage of excavated soils, if necessary, would be located in the areas planned for future cell development.

The closure system design would minimize infiltration and erosion, as specified in §23601. The closure system would include a geomembrane as well as an 18 in. of earthen material with permeability equal to or less than the permeability of the bottom liner system, or permeability no greater than 1×10^{-5} cm/sec. The erosion layer must be a minimum of 6 in. of earthen material that is capable of sustaining native plant growth. This may be increased during the design phase, but would be assumed similar for all of the footprint alternatives. Minor adverse impacts from sediment and erosion may occur during construction but would be controlled using best management practices. This is further discussed in Section 4.2.2.2, Water Quality.

The construction and operational phases of the landfill project are expected to create moderate permanent impacts on soils. Ground-disturbing activities would impact approximately 145 acres of soil for Alternative 1, 164 acres for Alternative 2, and 171 acres for Alternative 3.

The size of the footprint alternatives ranges from 126 to 141 acres in area. The conceptual layouts of the alternative excavation would provide sufficient material for cover soils within the boundaries of Layon. Excavation of the landfill is estimated to be an average of 15 ft below surface level. Approximately 3.0×10^6 CY of soil would be excavated and stockpiled onsite for use throughout the active life of the landfill. This amount of soil would be adequate to meet the amount of cover material required; therefore, soils would not need to be transported from offsite.

Topography

Regardless of which footprint is chosen, regrading of the site contours during construction would be necessary. The site has some steep erosion gullies in the footprint that would require regrading. There would be major permanent impacts to topography at all three footprint alternatives.

Layon is envisioned to be a mounded landfill (see Figure 2-2). The topographic changes to the site during construction, operations, and completion would be similar for all three alternatives, with the final elevation being 103 ft above the existing grade, 435 ft MSL in all layout cases. However, Alternatives 2 and 3 would also require the landfill to be approximately 1.4 ft higher or approximately 40 ft longer to the south/southeast to avoid impacts to natural resources. These details would be decided during the design phase.

Regardless of the alternative, the final closure contours would be based on side slopes of 4 horizontal to 1 vertical to an approximate average height of 55 ft above grade. The top of the landfill would be sloped at approximately 5 percent to maintain drainage on the top of the landfill. The exact landfill contours after completion of the landfill would be based on future land use plans for the area after closure.

4.2.1.4 Air Quality

Air quality impacts would not differ among the three alternatives; therefore, this would not be a determining factor in selecting an alternative.

The construction phase of the landfill project is expected to create minor long-term impacts to the air quality regardless of the alternative. Construction activities include the initial site preparation, ongoing cell development, and cell closure. Emissions associated with construction include particulate matter (PM₁₀ and PM_{2.5}) and vehicle exhaust constituents. Particulate matter would be emitted from the dust from earthmoving activities and truck traffic on the paved and unpaved roads. The access road would be an asphalt paved two-lane road, and interior roads include two-lane, gravel/limestone surfaced roads surrounding each individual cell. Also, carbon monoxide, carbon dioxide, volatile organic compounds, and nitrogen would be emitted due to the increase of trucks and construction equipment. A total of 12 cells for Alternative 1, or 9 cells for Alternatives 2 and 3, would be excavated to a depth of 15 ft or deeper below grade level.

The operational phase of the landfill project is expected to create minor long-term impacts to the air quality. Particulate matter and carbon monoxide would be emitted into the atmosphere through vehicle exhaust emissions from garbage trucks, employee, and public travel to and from the landfill. Fugitive dust would be generated from operations at the active face of the landfill and from vehicle travel on the unpaved roads.

During operations and for many years after operations, the landfill would generate landfill gas. Solid waste begins to decompose immediately upon being placed in a landfill, releasing gaseous emissions into the atmosphere. Gas containing carbon dioxide, methane, non-methane organic compounds (NMOCs), and particulate matter would migrate from the landfill on a path through the refuse and surrounding soils that offer the least resistance. The rate of gas movement would be strongly affected by weather conditions. During low barometric pressure, gas flows more rapidly than high barometric pressure. Also, wet surface soil conditions may prevent the gas from escaping into the atmosphere at the edge of the landfill. The landfill would be operated in accordance with rule §23304 to include daily cover of all wastes. Daily cover is assumed to be 6 in. of soil placed at a ratio of 4 to 1 waste to soil cover. This operation would decrease the amount of air emissions.

The New Source Performance Standards (NSPS) and Emission Guidelines for air emissions for new and existing landfills were published in the Federal Register on March 1, 1996. The NSPS/Emission Guidelines affect landfills with a design capacity of 2.5 million megagrams (Mg) or more. It is estimated that the Guam landfill would be greater than the 2.5 million Mg design capacity. The regulation requires that Best Demonstrated Technology (BDT) be used to reduce landfill emissions from affected new and existing municipal solid waste (MSW) landfills emitting greater than or equal to 50 Megagrams/year (Mg/yr) (55 tons/yr) of NMOCs. Control systems require: (1) a well-designed and well-operated gas collection system, and (2) a control device capable of reducing NMOCs in the collected gas by 98 percent. Table 4-1 shows an estimate of the amount of methane, carbon dioxide, and NMOCs emitted from the Guam landfill every 5 years. Since the landfill would exceed this design capacity over the 30-year period, methane and NMOC emissions would be collected and flared in accordance with §23306 and §23307. Minor long-term impacts to air quality would be minimized during the operational

phase by gas collection, flaring, monitoring, and the covering of the landfill on a daily basis. Gas collection would be by vertical wells. The flare would be located in the support facilities area. It is estimated that 80 percent of the methane and NMOCs emitted would be collected; 98 percent of these gases would be destroyed by flaring. With these controls, the landfill would not exceed the NMOC emission standard over the 30 years of operation.

Table 4-1. Total Non-Methane Organic Compounds, Methane, and Carbon Dioxide Air Emissions

Year	Air Emissions Mg/yr		
	NMOCs	Methane	CO ₂
2007-2011	28	4,349	11,931
2012-2016	68	10,620	29,137
2017-2021	101	15,753	43,223
2022-2026	128	19,957	54,760
2027-2031	150	23,398	64,200
2032-2036	168	26,217	71,930
2037-2041	160	25,000	68,600
2042-2046	131	20,500	56,200
2047-2051	107	16,800	46,000
2052-2056	88	13,700	37,600
2057-2061	72	11,200	30,800
2062-2066	59	9,200	25,200
Net Air Emissions	1,258	196,694	539,581

The completion phase of the landfill project is expected to create minor temporary impacts to air quality. At the time of site closure all routine landfill operations and periodic construction activities would cease. The buried waste would continue to generate methane, carbon dioxide, and other trace gases following closure. The flaring of gas that would occur during the 30-year operation phase, would continue after closure. The production of the landfill gas would eventually diminish.

Since, the same amount of waste is proposed for all footprint alternatives, air emissions would be the same for each alternative. A preferred sanitary landfill site would be downwind of any receptors sensitive to odors or air emissions.

The integrated solid waste management strategy which features the use of regional transfer stations as the destination for solid waste collection vehicles would effectively limit landfill-bound solid waste-related vehicular traffic to large waste haulers. Current solid waste collection and transport practice features round trips by solid waste packer trucks and other waste haulers of all types (with capacities ranging from 1 to 20 cubic yards) from service areas to and from the Ordot Dump. Current data recorded at the Ordot Dump show that over 200 vehicle loads, totaling over 400 tons of waste can be experienced on certain days. Large waste haulers have a range in nominal capacity of 55 to 145 cubic yards of compacted wastes. Preliminary calculations show that when compared to existing practice, the proposed new solid waste

management strategy of limited access to the landfill to large waste haulers would significantly reduce the volume of landfill-bound traffic to a range of 15 to 27 vehicle loads. This volume is expected to double by the end of the projected 30-year design life of the new landfill, but, because the magnitude is insignificant, the overall increase in vehicle trips in central Guam would be negligible. Furthermore, it is anticipated that the frequency and hours of operation of bulk waste hauling from transfer stations to the new landfill would be regulated as required to minimize impacts to the traveling public.

The potential receptors within a 0.50-mile (2,640-ft) radius surrounding Layon include farmlands along the Tinago River to the east of the site, and a portion of the NASA Tracking Station located to the northeast of the site. Residential uses are located more than a mile away from the footprint, and are situated mostly to the east in Malojloj Village, and to the southeast in the GHURA Southern Rental Housing areas. The Inarajan Middle School is located 0.84 miles to the southeast of the site. There would be no impacts on these receptors due to the wind patterns on the island of Guam.

The easterly tradewinds are dominant from April to December, while the prevailing wind from January to March is from the east northeasterly direction. Those receptors located south, west, and southwest of Layon would be exposed to minor adverse impacts. This includes the villages of Umatac and Merizo, which are located approximately 3 and 4 miles west and southwest, respectively, of Layon. Also, most of the recreational land uses, including mountain biking, hiking, fishing, and hunting are located downwind of the landfill site. Impacts to occur offsite include odor and dust migration, and the migration of methane underground. The migration of methane can cause potential explosive situations at adjacent buildings. A landfill gas collection system would be installed to prevent the uncontrolled gas migration from the landfill. It also enables the methane to be burned by flaring.

Regional transfer station locations are unknown. It is estimated that the number of vehicle trips would be 30 to 50 trips per day. Impacts to air quality during the operational phase would result from hauler traffic. The average hauler miles per year is estimated to be 73,000 miles. Emissions from the hauler traffic are estimated to be 0.0283 ton/yr of volatile organic compounds, 0.1139 ton/yr of carbon monoxide, and 0.44 ton/yr of NO_x.

4.2.1.5 Noise

Noise impacts would not differ among the three alternatives; therefore, this would not be a determining factor in selecting an alternative.

The construction phase of the landfill project would create minor temporary impacts to the noise levels, regardless of the alternative chosen. Excavation activities would have the greatest potential for generating offsite noise impacts in areas adjacent to Layon. Trucks used to import the liner material and employees of the landfill would generate additional traffic on the roadways serving the landfill, and could increase noise levels along the roadways.

The operational phase of the landfill project would create minor temporary impacts to the noise levels at Layon. Trash trucks, employee vehicles, and public travel to and from the landfill site would generate additional traffic on the roadways serving the landfill and could increase noise

levels along the roadways. Excavation and closure of cells would generate noise from construction equipment.

The completion phase of the landfill would create negligible impacts at Layon. Closure of the landfill would involve the installation of a cover, which would use minimal construction equipment. Trash trucks, employee vehicles, and public travel to and from the landfill would cease and noise levels would return to normal.

According to USEPA, the maximum daily noise dose should be no more than the equivalent of 70 decibels (dBA) for 8 hours a day. Permanent hearing damage is likely to occur if this daily dose is exceeded repeatedly. For a typical suburban area, background noise levels are approximately 50 dBA and 70 dBA near sidewalks adjacent to traffic routes. Heavy machinery operation is typically 90 dBA and garbage trucks are 100 dBA. No more than 15 minutes of unprotected exposure is recommended for noise at 90 dBA and above (Noise Pollution Clearinghouse [NPC] 2004).

A preferred sanitary landfill site would have no receptors close enough to the site where typical construction equipment noise would not be compatible or would have adequate screening capability to diffuse or adequately reduce the noise. As distance increases from the landfill facility, noise levels decrease. Doubling of a distance (i.e., 0.25 mile to 0.50 mile) from a facility results in a reduction of 6 dBA in the noise level. Sounds from a roadway are emitted along the entire length and acts like a line source. Noise levels decrease at a slower rate than from a facility. Doubling of a distance from a roadway results in a reduction of 3 dBA in the noise level. Buildings, barriers, and hills attenuate sound in the environment. As sound waves "bend" around obstructions, they lose a great deal of energy. The soil which would be excavated from each cell would be stockpiled, and a fence would be placed around the perimeter of the active portion of the landfill site. These would help to diffuse the levels of noise that would reach the potential receptors.

Layon is located more than 1 mile from potential receptors in the residential areas of Malojloj to the east, and GHURA's Southern Rental Housing and private residences to the southeast. However, the Inarajan Middle School is situated 0.84 miles southeast of the footprint. Private homes along an approximately 2,500 linear foot (LF) sector of Dandan Road would be receptors of noise from vehicle traffic hauling waste to the site (see Table 3-6 in Chapter 3).

4.2.1.6 Effects of the No Action Alternative on Physical Features

Under the No Action Alternative no disturbance to the physical features (geology, hydrogeology, soils, topography, air quality, or noise) at Layon would occur if the landfill were not constructed. Physical features at those locations would remain as-is but could be subjected to other land uses in the future.

Under the No Action Alternative, however, solid waste disposal would have to continue somewhere else if Ordot Dump were to reach capacity. There would be impacts to physical features (soil, topography, air quality, and noise) associated with whatever site is used, but these impacts cannot be determined at this time. If disposal were to continue at Ordot Dump, it would

continue to have negative impacts to surrounding resources, and it would also violate the Consent Decree.

4.2.2 Surface Water

Landfill development and operational activities would result in impacts on surface waters. These impacts include the filling and relocating of wetlands and streams during the site and cell construction, sedimentation of receiving waters from eroded soils during the construction and operation phase, increased stormwater runoff, and discharge from the leachate treatment plant.

4.2.2.1 Hydrology

Impacts to the hydrology (watersheds) are anticipated for all three conceptual alternatives at Layon during the construction and operational phases of the project. Minor long-term impacts would occur to the Fensol River due to increased stormwater runoff to this watershed. The Tinago River would experience a decrease in stormwater since the runoff would be diverted to the Fensol River resulting in minor long-term impacts. The Fintasa River would also experience a decrease in stormwater due to the diverted stormwater to the Fensol River, however these impacts would be relatively less (negligible) since the upstream watershed is larger. The final stormwater control system design will address drainage to appropriately distribute stormwater runoff so as to maintain hydrology.

The completion phase of the project includes revegetating the site, which would allow stormwater flow to return to the site resulting in negligible impacts to the hydrology (watersheds) due to stormwater.

Alternative 1

Due to the filling of wetlands and the filling of seasonal drainage to the Tinago River, the tributary to the Fintasa River, and the headwaters of the Fensol River minor permanent impacts would occur to the Inarajan River watersheds during the construction, operational, and completion phases of Alternative 1. Filling of waters of the US (i.e., wetlands, streams) would likely require a 404 permit, 401 certification and mitigation. Requirements for a 404 permit, 401 certification and associated wetland mitigation are discussed in Sections 4.2.2.2 and 4.2.2.3. Approximately 2.41 acres of wetlands within the footprint of Cells 1, 2, and 3 and 1.14 acres in the northeastern portion of the buffer area (Administration and Support Facilities) would be filled if Alternative 1 were selected (see Figure.2-3). Approximately 705 linear ft of the Fintasa River located in the wetlands of Cell 1 and 3 would be filled for construction of Alternative 1. Seasonal drainage from wetlands that flows into a tributary to the Tinago River in the northeastern portion of Alternative 1 would be filled when Cell 2 and the Administration and Support Facilities in the buffer area are constructed. Finally, approximately 498 linear ft of the headwaters of the Fensol River in Cell 10 in southeast corner of the landfill would be filled.

Alternatives 2 and 3

Alternatives 2 and 3 avoids the filling of wetlands located within the footprint and buffer area of the landfill at Layon. However, approximately 700 linear ft of the headwaters of the Fensol

River located in Cell 7 and in the corner of the stormwater detention pond in southeast corner of the landfill would be filled for Alternatives 2 and 3. Therefore, minor permanent impacts would occur to the watershed during the construction, operational, and completion phases of Alternatives 2 and 3.

Filling of waters of the US (i.e., wetlands, streams) would likely require a 404 permit and mitigation. Requirements for a 404 permit and associated wetland mitigation are discussed in Section 4.2.2.3.

4.2.2.2 Water Quality

If uncontrolled, construction activities would impact water quality. When the land is cleared, there would be erosion and sedimentation. The landfill project would result in new, impervious surface area (i.e., roads, buildings, parking lots). Contractors would be required to provide an Environmental Protection Plan (10 Guam Code Annotated, Chapter 47), which specifies erosion and sediment control measures that would need to be implemented. Impacts to water quality associated with construction would be minimized, but not eliminated by employing Best Management Practices (BMPs):

- The project would comply with Guam's Soil Erosion and Sediment Control Regulations 10 Guam Code Annotated, Chapter 47 (Water Pollution Control Act); An Erosion Control Permit would need to be issued by GEPA.
- To protect water quality of the closest body of water (fresh or marine), contractors would be required to prepare an Erosion Control Plan (ECP) to accompany a Clearing and Grading Permit.
- Contractors would be required to prepare a Stormwater Pollution Prevention Plan (SPPP) for the project.
- A National Pollutant Discharge Elimination System Permit (NPDES) permit will be required. It is a federal permit for all stormwater and point source pollution discharges. GEPA reviews and certifies (401 WQC) the permit for compliance with all local regulations and policies and in accordance with the Guam Water Quality Standards. USEPA coordinates, drafts, and issues the permit for facilities that require wastewater discharges.

The construction phase of the landfill project would create minor long-term adverse impacts (primarily sedimentation from erosion) to the water quality at all three footprint alternatives. These impacts would be long-term in nature, lasting for the duration of construction activities, which would occur throughout the life of the landfill from initial site development through closure. However, only a small area of soil would be disturbed/unstabilized at any given time. During development and operation of the landfill, approximately 10 acres would be developed at any time; within this 10-acre area, only 0.5 acre would actively receive waste. An ECP and SPPP would be prepared to minimize these impacts. An NPDES permit would be required for this project. Detailed plans for drainage and erosion control would be addressed in the Operation Plan that will be prepared for the MSWLF.

Beneficial impacts to the water quality would also occur at Layon. Sediment that currently erodes from the badlands from within the footprint of Layon creating impacts on the downstream watersheds would be decreased due to improved erosion control practices carried out in the construction, operation, and completion phases of the landfill.

During the operation and closure phases of the landfill project, minor long-term impacts to water quality would occur, regardless of which alternative is selected, if treated leachate is discharged onsite. The conceptual leachate collection system design specified in rule §23401 would consist of a sloped drainage layer immediately above the liner system that drains to a series of perforated collection pipes and sumps. The leachate would then be pumped to storage tanks for onsite treatment and then discharged, or transported to a local WTF. Leachate pumping and monitoring would continue through closure and post-closure care until it is verified that leachate production has ceased.

Additionally, minor long-term adverse impacts to water quality would occur downstream of each alternative during the operation phase due to the discharge of stormwater. Stormwater as well as discharged treated leachate has the potential to impact water quality in the Fensol River. The proposed footprints are located in the higher elevations of the site. The general stormwater runoff flow direction would be away from the landfill. The overall site stormwater run-on/run-off requirements (§23309) would minimize impacts to receiving surface waters from stormwater and would not be expected to generate major changes in the existing stormwater drainage patterns in the vicinity of the site.

The proposed access road would require drainage culverts to allow the existing stormwater flow from the Ugum River drainage divide to the Tinago and Fintasa rivers to continue. An increase in runoff from the access road due to an increase in impervious surface would create minor long-term adverse impacts to the water quality in the nearby watersheds during the construction, operation, and completion phases of the landfill.

The completion phase of the project would allow stormwater flow to return to the site resulting in negligible impacts to the water quality due to stormwater; however, discharged treated leachate would still have the potential to impact water quality.

Choosing any of the action alternatives would result in the closure of the Ordot Dump. Gradually, the water quality below the Ordot Dump would be improved. The No Action Alternative would result in the continued degradation of water quality.

Stormwater Management

A run-on control system would be designed and installed onsite to prevent flow into the active portion of the landfill during peak discharge from a 25-year storm. Since the landfill activities would create impervious surface, there would also be a stormwater detention pond that would collect and control run-off from the active portion of the landfill, which would conceptually include one cell undergoing closure and one new operating cell. The pond would be sized to control at least the volume resulting from a 24-hour, 25-year storm event for the area of two cells. These stormwater systems would be designed in accordance with §23309 of the *Rules and*

Regulations for the GEPA Solid Waste Disposal. Runoff from the active portions of the landfill unit must be handled in accordance with rule §23310 to meet the requirements of the NPDES. These requirements are further defined in Section 2.3.1.

In the case of a storm event greater than a 25-year storm occurs, which would be expected once within the 30-year operation phase of the landfill, there would be temporary minor adverse impacts to receiving waters from a sudden increase in stormwater run-off. Recommendations to minimize water quality and quantity impacts to surface water from stormwater run-off are discussed in Section 5.1.2.

4.2.2.3 Wetlands

Wetlands would be affected at Layon if they are permanently filled or by altering the site hydrology by extensive site excavation and regrading. In accordance with restriction §23203, final design plans for the landfill at any site should avoid or minimize the acreage of wetlands permanently altered during construction and operation of the landfill. Mitigation for the loss of wetlands would be necessary to offset any loss or alteration. The Honolulu District of the United States Army Corps of Engineers (USACE) and the USEPA require compensatory mitigation for unavoidable adverse impacts to waters of the US and special aquatic sites, including wetlands. Filling of wetlands would likely require a Clean Water Act, Section 404 permit from the USACE (Honolulu District) and Section 401 certification from GEPA. Mitigation for permanent loss of wetlands requires the preparation of a mitigation plan that specifies how functions and values of the resource would be replaced. The USACE specifies a minimum compensatory mitigation ratio of one replacement acre for every one acre of waters of the U.S. lost; however, a higher ratio may be required depending on the functions and values of the resource (USACE 2005).

Alternative 1

Due to the filling of wetlands and the headwaters of the Fensol River for Alternative 1 moderate to major permanent impacts would occur during the construction and operational phases. Based on wetlands delineated by D&A at Layon, approximately 2.41 acres of wetlands within the footprint of Cells 1, 2, and 3 and 1.14 acres in the northeastern portion of the buffer area for Administration and Support Facilities would be filled if Alternative 1 were selected (see Figure 2-3). Approximately 498 linear ft of the headwaters of the Fensol River in Cell 10 in southeast corner of the landfill would also be filled. Filling of waters of the US (i.e., wetlands, streams) would likely require a 404 permit, 401 certification and mitigation. It is likely that unavoidable permanent impacts to wetlands within Alternative 1 would require mitigation to offset the impacts of loss and/or alteration of the Layon wetlands. The impact on ecological function and value of the wetlands would need to be assessed before determining precise mitigation requirements for this alternative.

Alternatives 2 and 3

Alternatives 2 and 3 avoids the filling of wetlands located within the footprint and buffer area of the landfill at Layon. However, approximately 700 linear ft of the headwaters of the Fensol River located in Cell 7 and in the corner of the stormwater detention pond in southeast corner of the landfill would be filled for Alternatives 2 and 3. Therefore, minor permanent impacts would

occur to the headwaters of Fensol River during the construction and operational phases of Alternatives 2 and 3. Filling of waters of the US (i.e., wetlands, streams) would likely require a 404 permit, 401 certification and mitigation.

4.2.2.4 Coastal Zone Management

Impacts to the coastal zone would not differ among the three alternatives; therefore, this would not be a determining factor in selecting an alternative.

The "Coastal Zone" for Guam includes all non-federal property within Guam and, as defined, includes Layon; therefore, a consistency determination would be required. Consistency review by the Guam Coastal Management Program (GCMP) would determine whether the action is in compliance with the enforceable policies of GCMP for the chosen alternative. The proposed project is expected to comply with the enforceable programs of GCMP and will be conducted in a manner consistent with the program.

GovGuam's Bureau of Statistics and Plans is the lead agency for the GCMP. Consistency with GCMP by the landfill project will be determined through review of this SEIS by the Bureau of Statistics and Plans.

4.2.2.5 Effects of the No Action Alternative on Surface Water

Under the No Action Alternative, no disturbance to the surface water (hydrology, water quality, and wetlands) at Layon would occur if the landfill was not constructed. The surface water features would remain as is, but could be subjected to other land uses in the future.

However, the No Action Alternative could involve the continuation of operations at the existing Ordot Dump, which could have continued major adverse impacts on surface water.

If the Ordot Dump continues collecting solid waste and reaches capacity, eventually another site would have to be selected and developed, but the effects on surface water cannot be determined because the site is not known.

4.2.3 Terrestrial Ecology

4.2.3.1 Vegetation/Habitat

Implementation of the landfill project would result in a direct loss of barren lands, savanna grasslands, and a small amount of ravine forest. As mentioned in Chapter 3.0, the savanna grasslands occupy the northern portion of Layon. Common species include swordgrass, foxtail, wildcane, *Decaspermum fruticosum*, and *Dianella saffordi*. The barren lands occupy the southern portion of the landfill site, consisting of exposed soils and sparse vegetation. Common species include carpetgrass, sleeping grass, dodder, and *Lycopodium cernuum*. Ravine forests are interspersed throughout the site and include species such as kafu, fading, da'ok, and lada.

An access road would extend from Dandan Road to the northeast corner of the landfill. This road would be a two-lane road with 8-ft-wide shoulders approximately 2.75 miles long. The

access road right-of-way is occupied by majority savanna grassland and barren lands. All vegetation along this road would be cleared during construction. A portion of the 400-ft buffer surrounding the landfill would be cleared for office and maintenance facilities, stormwater detention ponds, and site access control.

If any of the footprint alternatives overlap with the Forestry Division's tree plantings that have been done within the Dandan parcel, these seedlings would be relocated outside of the footprint boundary.

The construction phase of the landfill project is expected to create moderate adverse permanent impacts on forest vegetation and moderate long-term impacts to grasslands at each of the three alternatives. Vegetation clearing would be necessary in the proposed footprints of the landfill, access roads, and portions of the buffer area of the landfill. During development and operation of the landfill, approximately 10 acres would be developed at any time. Within this 10-acre area, only a 0.5-acre area would actively receive waste.

The operational phase of the landfill project is expected to have no impacts on forest vegetation at each of the three alternatives. During the operational phase, there would be daily trash dumping and covering. No vegetation would be cleared during these activities.

The completion phase of the landfill project is expected to create minor beneficial impacts to vegetation at each of the three alternatives. At the closure of each cell, the exposed soils would be revegetated with grasses to return to its natural state. BMPs would be used to prevent erosion and soil removal. By revegetating, those areas that were barren and eroded would be enhanced to savanna grasslands to the maximum extent possible. Forested areas would be permanently cleared. A detailed closure plan is being developed and will contain full descriptions of the closure process including the return of the site to open space.

Beneficial impacts to the habitat would also occur at Layon during the operational and completion phases of the landfill. Barren land occurring at Layon would be revegetated to grassland during the closure of the cells. Additionally, the undisturbed vegetated buffer area of the landfill would help to buffer and protect offsite habitats such as wetlands, forests, and savanna grasslands from landfill operations.

Alternative 1

Alternative 1 would require clearing of 12 cells, each approximately 10.5 acres (126 acres total) for the landfill cells, 9.6 acres for the stormwater detention pond, 5 acres for support facilities, and 4.6 acres for access and utilities.

Alternative 2

The landfill footprint of Alternative 2 would be extended approximately 400 ft south of Alternative 1, increasing the overall land requirements for each alternative by 15 acres. Therefore, an additional 15 acres of vegetation would be cleared from this area. A total of nine cells, each approximately 14 acres (126 acres total) for the landfill, 13 acres for the stormwater detention pond, 15 acres for the site extension, 5 acres for the support facilities, and 4.6 acres for

access and utilities would be cleared. This alternative would also have to be approximately 1.4 ft higher or approximately 40 ft longer to the south/southeast than Alternative 1 to avoid wetlands located in the northeastern corner of the landfill near Cell 1. These details would be decided during the design phase.

Alternative 3

Alternative 3 is similar to Alternative 2 and would require the same amount of vegetation clearing as described under Alternative 2. In addition it would require an additional 7 acres of land to the northeast for the relocated administration and leachate storage and treatment areas. This 7-acre area is a mixture of old farmland, savanna grasslands, and badlands.

4.2.3.2 Wildlife

Disturbance of terrestrial habitats (major vegetation clearing) as each cell is opened and closed, would affect wildlife that inhabits the site regardless of the alternative. This would result in a long-term moderate adverse impact during the construction and operational phases. Impacts would primarily occur as disturbance and/or displacement of wildlife utilizing the various habitats at Layon. Wildlife would also avoid areas of major activity during construction and active open cell areas during operation, causing some animals to relocate to other areas; relocation could be permanent or temporary depending on each species needs and/or tolerance for disturbance. Active landfills are also known to attract scavenging wildlife. Operating the landfill according to a developed operation plan that includes daily coverage of the waste would reduce the numbers of wildlife attracted to the open landfill and avoid bird control issues. Security fencing would also reduce the potential for scavenging wildlife. Species common to savanna grasslands would return to each cell area after it is closed and to the entire site after final closure is completed.

Wildlife species potentially impacted at Layon consist of species native and not native to Guam, and migrant birds. The one native species observed at Layon, the yellow bittern, is a common species in grasslands on Guam, but the population is not likely to be adversely affected by the construction or operation of the landfill. None of the species identified were considered rare, threatened, and endangered (RTE) species although the endangered Mariana common moorhen has been observed historically in the wetlands at Dandan. The wetlands at Layon may serve as seasonal habitat for moorhen, however, no moorhens were observed during recent surveys conducted by D&A, Inc. at Layon for this SEIS.

Many of the species of wildlife found at Layon are non-native animals, including several that are tolerant of human disturbance and activity (feral pigs, feral dogs) and may be less affected by the construction and operation of the landfill than other species identified within the site. Some wildlife may be attracted to the waste in the landfill; however, daily coverage of the active landfilling areas of the active cell and security fencing as provided for in an operation plan would reduce the presence of scavenging wildlife.

The proposed design of Alternatives 2 and 3 would require the clearing and disturbance of an additional 15 acres of vegetation than for Alternative 1. Impacts to wildlife for Alternatives 2 and 3 would be similar to those in Alternative 1, but would occur over the larger acreage.

proposed. The construction and operations of the landfill proposed in all the alternatives would have a minor long-term adverse impact on resident wildlife.

4.2.3.3 Effects of the No Action Alternative on Terrestrial Ecology

Under the No Action Alternative, no disturbance to the vegetative habitats identified at Layon would occur if the landfill were not constructed. The terrestrial habitats would remain as they are but could be subjected to other land uses in the future. Wildlife use would continue in the available habitats. Under the No Action Alternative, however, solid waste disposal would have to continue somewhere. There would be impacts to terrestrial ecology associated with whatever site is used, but the impacts cannot be determined at this time.

4.2.4 Aquatic Ecology

The construction and operational phases of the landfill project would create minor long-term impacts to the aquatic ecology of the Fensol River and the tributaries of the Fintasa and Tinago Rivers due to increased sedimentation of the receiving waters regardless of the alternative. However, only a small area of soil would conceptually be disturbed/unstabilized at any given time. During development and operation of the landfill, approximately 10 acres would be developed at any time; within this conceptual 10-acre area, only 0.5 acre would actively receive waste.

Landfill practices would benefit the aquatic community and habitat by removing the sedimentation impacts from the eroded areas in the badlands of the Layon footprint during construction, operation and completion.

Minor long-term impacts (discharge of stormwater) to the aquatic community would occur downstream of the three layout alternatives during the operation and completion phases. Aquatic species in the Fensol River that would potentially be impacted include shrimp, snails, fish, eels, and frogs.

Impacts to the aquatic community associated with construction and operation would be minimized by employing BMPs as discussed previously in Section 4.2.2.2. BMPs would include an Environmental Protection Plan, Erosion Control Plan, and a Stormwater Pollution Prevention Plan. Sedimentation should be gradually eliminated after the landfill is closed and the surface is stabilized. Detailed plans for drainage and erosion control will be addressed in the Operation Plan that will be prepared for the MSWLF.

No impact is expected to the freshwater eels and shrimp that are harvested by the local residents of Malojloj from the river systems surrounding the landfill site.

Alternative 1

Permanent minor adverse impacts are expected to the aquatic community if Alternative 1 is selected due to the loss of habitat at the site during the construction and operational phases. This habitat is located in wetlands and the seasonal drainage to the Fintasa and Tinago Rivers. These areas are planned to be graded and filled if this alternative is selected. Approximately 3.55 acres

of wetlands, 705 linear ft of a tributary to the Fintasa River, and seasonal drainage in the wetlands of a tributary to the Tinago River would be impacted for this alternative. Additionally, approximately 498 linear ft of the headwaters of the Fensol River in Cell 10 in southeast corner of the landfill would also be filled. Potential aquatic species inhabiting the site in the wet season include water striders, thiarid snails, freshwater eels, Tahitian prawns, fish, pond frogs, and possibly the grapsid crab.

Alternatives 2 and 3

Negligible impacts are expected to the aquatic community during the construction and operational phases if conceptual Alternative 2 or 3 is selected. This would be due to the loss of habitat at the site since approximately 700 linear ft of the headwaters of the Fensol River located in Cell 7 and in the corner of the stormwater detention pond in southeast corner of the landfill would be filled for these alternatives. However, impacts would be negligible to the aquatic community. No macrofauna were detected in this portion of the Fensol River during the site surveys conducted in July and November 2004.

In addition, Alternative 3 provides more protection to the aquatic community than Alternative 2. The administration and support facilities were relocated to the northeastern portion of the landfill in Alternative 3 to create more distance between the wetlands and the support facilities. This relocation could potentially buffer the aquatic community from any indirect impacts (see Figures 2-4 and 2-5).

No Action Alternative

Under the No Action Alternative, no disturbance to the aquatic ecology at Layon would occur if the landfill were not constructed. The aquatic ecology would remain as is, but could be subjected to other land uses in the future. The aquatic community would continue to utilize the available habitats. Under the No Action Alternative, however, solid waste disposal would have to continue somewhere. There would be impacts to aquatic ecology associated with whatever site is used, but these impacts cannot be determined at this time.

If the No Action Alternative would involve the continuation of operations at the existing Ordot Dump, this would have continued major adverse impacts on the aquatic community in the Lonfit River.

4.3 HUMAN ENVIRONMENT

4.3.1 Socioeconomic Conditions

Socioeconomic conditions for all three alternatives would be the same; therefore, the selection of the layout footprint would not be based on land use, zoning, demographics, economics, recreation, or sensitive receptors.

4.3.1.1 Land Use

Buffer areas between the landfill and adjacent land uses can assist in reducing adverse impacts of the landfill, such as odors, birds, etc., that occur with landfilling operations (Lee 1994). Buffers can include green space, access roads, stormwater structures, and utility provisions. Buffer areas may also include landscaping and vegetation to provide a visual boundary. An additional 30 to 40 acres of additional buffer areas for site access control, office facilities, stormwater run-off control, etc. would be needed at each alternative beyond the landfill footprint. There is adequate land available for additional buffer areas.

During construction and operational activities at Layon, minor changes to existing land use would occur from the construction of permanent access roads and utility lines, and minor, long-term changes to land use at the footprint would occur from converting an unused site to an industrial activity. Surrounding land uses may indirectly change during the construction and operations phases, based on siting an industrial activity in any of the alternative locations. Residential land use is not likely to occur within the vicinity of the landfill, and would not be compatible with landfill operations. If surrounding land use during operations and completion of the landfill follows the current agricultural zoning classification, this use would be compatible with a landfill. Following the 30-year period of operations of the landfill, land use may revert back to an unused site landscaped with native plants, with potential to be used for recreational activities or similar uses that limit public access. Future land use plans at the site following the completion of the landfill are unknown at this time; however, considering that the current site is not being utilized, and that after the completion of the landfill, land use could go back to an unused or open site with slightly more limited use, it can be assumed that there would be no permanent changes in land use.

No Action Alternative

The No Action Alternative would not cause changes to land use on Guam. The current Ordot Dump would remain in operation and would not require any changes in land use because it would not be allowed to expand beyond its current boundaries. Future land uses would remain unchanged with the No Action Alternative. Surrounding land uses at the Ordot Dump include residential and recreational activities. These activities are compatible with a modern solid waste landfill, but incompatible with a dump, such as Ordot Dump. The Ordot Dump does not have a capacity for 30 years, which is why it is scheduled for closure by late summer 2007. Therefore, another site would have to be chosen causing land use changes somewhere else on Guam.

4.3.1.2 Zoning

The proper zone for a landfill facility is "M-2," Heavy Industrial, which permits any uses not specifically prohibited by law, including those which are or may be objectionable, obnoxious, or offensive by reason of odor, dust, smoke, noise, gas fumes, cinders, vibrations, or water-carried waste (§61309, 21 GCA). M-2 zoned properties are extremely limited throughout the island.

Regardless of the alternative, rezoning can occur through approval by the Guam Land Use Commission, or by the Guam Legislature introducing legislation to be signed by the Governor of Guam that would allow landfill operations on the site. Both of these processes require approval by the Governor of Guam.

The Guam Land Use Zoning Regulations (GLUZR) do not identify sanitary landfills as a permitted use or conditional use on Agricultural zone lands. The development of a sanitary landfill at Layon would require rezoning from Agriculture to Heavy Industrial via the Guam Land Use Commission or rezoning via the legislative process.

No Action Alternative

The No Action Alternative would not result in changes to zoning. The current Ordot Dump would continue to function as a landfill and would not require any changes to zoning at the current dump location or at any of the three alternative sites. Existing zoning would remain the same.

4.3.1.3 Demographics

A landfill at Layon would not be expected to affect demographics of the Inarajan District, because the landfill site is surrounded by undeveloped, open fields, and all the land within 0.5 mile of the site is zoned for agricultural use. In addition, no plans are currently in place for development surrounding the landfill.

No Action Alternative

The Ordot Dump is located in the Chalan Pago-Ordot District. The effect of the landfill on the demographics of the Chalan Pago-Ordot District is unknown. In the near future, the demographics of the Inarajan district would not be affected by the No Action Alternative. In the long-term, a new landfill site would have to be developed, but the effects on demographics cannot be determined because the site is not known.

4.3.1.4 Economics

A new landfill would generate economic activity by the creation of new jobs during initial site construction, and during the 30-year operational period for daily operations and maintenance, new cell construction, and any recycling programs implemented. The number and quality of jobs created by the operation and maintenance of the new sanitary landfill would likely be greater than the number and quality of jobs lost by closure of the Ordot Dump. Any jobs created would be a minor beneficial impact to the economy of Guam and would last only for the duration of landfill construction, operations, and closure.

In addition, with a properly designed, constructed, and operated solid waste management facility, the local infrastructure is typically improved. This improvement would be in the form of upgraded and new roads, utility access and capacity, and stormwater control. As these improvements are made, local properties can generally become more valuable resulting from new industry locating in the area, which would be a beneficial permanent impact throughout all three phases of the landfill and beyond. Overall, a new landfill would be an economic and social benefit to the island by separating waste streams and implementing a recycling program, which would create a source of revenue for the recycling and solid/hazardous waste industries.

The landfill at Layon may have minor adverse impacts on the local economy in southern Guam by decreasing the acreage currently available for agriculture, recreation, and hunting, as well as possibly impacting nearby tourist attractions along the rivers, such as Talofofa Falls Park. However, if the landfill is shielded from the viewshed of tourist attractions, and odors and other aesthetic issues are controlled, impacts to tourism near Layon would be negligible.

Property Values

Although real estate values can be affected by nearby solid waste disposal facilities, modern laws, permit restrictions, and management technologies make it possible to limit or even remove the potential adverse impacts of a nearby sanitary landfill. Sanitary landfills are designed and managed to limit their effect on the surrounding community. Examples of design and management techniques include: shielding the actual dumping area from sight, remote entrance to the facility, shielded access roads onsite, control of litter onsite, and frequent patrols for litter offsite. Modern management techniques also target operational activities to limit the propagation of disease vectors, fires, odors, blowing litter, and scavenging. The techniques used to combat these undesirable conditions include the timely placement of daily cover, portable litter fences, and visual barriers such as soil berms or vegetation.

Modern sanitary landfills have been able to contribute to improved land values through host community fees, tax revenues, jobs, reliable waste disposal services, and infrastructure improvement. Because environmentally protective disposal facilities are needed, regardless of the level of source reduction or recycling, disposal facilities and communities should work together for the benefit of the surrounding area. A key community goal should be to ensure environmentally protective disposal of solid waste and to show how a disposal facility and the surrounding community can work together.

Costs Associated with Landfill and Funding Sources

Alternatives for funding that were considered in DPW's Landfill Financial Plan (GDPW 2004b) include the Solid Waste Management Fund, Design-Build-Operate-Transfer (DBOT) structure, appropriations from the General Fund of the Government of Guam, grants, Special Activity Bonds, General Obligation Bonds and Revenue Bonds. The proposed action would most likely be funded using a combination of these financial sources. Funding of approximately \$37.8 million would be required by 2007 for costs associated with the opening of the first cell at the new facility. An additional \$20.8 million would be required by 2010 for the opening of the second cell at the new landfill. These costs associated with the development of a new MSWLF at Layon, which total approximately \$58 million, are broken down in Section 2.2.4.7 (GDPW 2004b).

Projected costs associated with the proposed landfill include land acquisition costs. According to the Landfill Financial Plan, approximately 150 acres of land would need to be acquired at a total cost of approximately \$6 million (\$40,000 per acre). Costs were also estimated for off-site infrastructure improvements (i.e. road widening and construction of new utilities), which are projected to be approximately \$1.9 million for Layon (GDPW 2004b).

No Action Alternative

The No Action Alternative would have moderate adverse impacts on the economy by not creating any new jobs or industrial activity. A new landfill would be an economic and social benefit to the island by separating waste streams and implementing a recycling program, which would create a source of revenue for the recycling, and solid and hazardous waste industries. These benefits would not be realized with the No Action Alternative.

GovGuam has agreed to specific terms under the Consent Decree to initiate and complete the construction of a fully compliant RCRA Subtitle D MSWLF within a specific schedule. If GovGuam fails to meet any of the deadlines outlined in the Consent Decree, they would be fined anywhere from \$250 to \$1,000 per day per violation for the first 30 days, and the fines would increase after 30 days of violating any of the conditions of the Consent Decree. Due to the terms and conditions of the Consent Decree, the No Action Alternative would not be an economically viable alternative.

4.3.1.5 Recreation

There are no designated recreational areas within 0.5 mile of Layon; therefore, there would be no impacts to recreational resources. However, recreational activities such as hunting and off-road activities could occur within a 0.5-mile radius of Layon, which may experience minor adverse impacts during construction and operations of the landfill from construction noise and dust, and any visible activities that would degrade the quality of the viewshed from areas used for recreation.

No Action Alternative

The Lonfit River to the south of the Ordot Dump supports recreational activities such as fishing, shrimping, and swimming. The current operations at Ordot Dump would continue to create adverse effects on recreational activities in the area, and it would not be managed and regulated in a manner equivalent to a modern MSWLF. When the current Ordot Dump reaches capacity, another site would have to be selected and developed, but the effects on nearby recreational resources cannot be determined because the site is not known.

4.3.1.6 Sensitive Receptors

There are no sensitive receptors such as residences or schools within 0.84 mile of Layon. Because of the size of the site, and distances to adjacent landowners, it appears a well designed and properly operated facility has the potential to exist in this location as a good neighbor to the community with limited, negligible impacts to nearby properties.

No Action Alternative

If the No Action Alternative involves the continuation of the Ordot Dump collecting waste, doing so would continue to create major adverse impacts to nearby residences, schools, and other places with public access. The current landfill would not be managed and regulated in a manner equivalent to a modern MSWLF. When the current Ordot Dump reaches capacity, another site

would have to be selected and developed, but the effects on adjacent sensitive receptors cannot be determined because the site is not known.

4.3.2 Infrastructure

Impacts resulting from proposed utilities, energy use, or road network changes would not differ among the three site layout alternatives. There may be slight differences in the length/distance of utility lines required based on the location of the administration and support facilities; however, this would be minor and would not be a determining factor in the selection of a site layout alternative. In addition, the stormwater detention pond size varies among alternatives; however, this would not be a determining factor in site layout selection.

4.3.2.1 Utilities

Any utility (power, water, or sewer) lines installed between the existing systems and the landfill would create additional infrastructure for future development that may occur during and after completion of the landfill, creating a permanent beneficial impact to the surrounding region.

Power

The electrical peak load requirement for operation and maintenance of the new landfill facility would be 225 KVA. At Layon, the existing power distribution system adjacent to Route 4 in Malojloj is adequate and would satisfy this power service requirement. Since the existing capacity of the power distribution system can accommodate the needs of the landfill during construction, operations, and completion, there would be no adverse impacts to the power supply on Guam.

Potable Water Supply

The landfill site would need new water supply lines constructed to connect to the nearest water line. The potable water demand of the new landfill facility would be nominal and minimal; however, the fire protection supply requirement would be 1,200 gallons per minute. This water supply requirement would be satisfied by a 6-inch diameter line connected to the GWA system located at Route 4 in Malojloj. Actual design of the system will determine whether a booster pump station would be necessary to provide adequate service pressure to the landfill site. The potable water demands of the landfill would be accommodated with minimal impact to the existing public water supply system.

Wastewater/Sewer

The wastewater disposal requirements for the new landfill may be accommodated either by connection to the existing wastewater collection system in Malojloj, or through the use of a properly designed on-site wastewater disposal system. These wastewater and leachate disposal options will be evaluated in detail during the design phase of the project and the most feasible and cost-effective alternative will be implemented.

Telecommunications

Telecommunications lines would need to be installed to provide phone and cable services at the landfill. New lines would be connected to existing systems, which would provide adequate service.

No Action Alternative

The No Action Alternative would not involve construction of additional utilities, and there would be no increases in water, power, or wastewater requirements beyond the current conditions at Ordot Dump. If the Ordot Dump continues receiving solid waste and reaches capacity, eventually another site would have to be selected and developed, but the effects on utilities cannot be determined because the site is not known.

4.3.2.2 Road Network

Site Access and Haul Routes

According to the Guam Highway Master Plan, Route 4, from Ylig Bridge to Inarajan Village, would undergo reconstruction and widening to current GDPW standards as part of the Short Range Highway Improvement Program. There is presently no schedule for the Route 4 project; however, it would be implemented in time to support the opening of the new landfill. The current Route 4 reconstruction program features full highway improvements from Yona Village to Ylig Bridge and the upgrading of the section from Agana to Route 10 in Mangilao. The Route 4 improvements appear to support the transportation corridor requirements for development of the proposed landfill; however, these improvements would proceed regardless of which alternative is chosen in this SEIS, including the No Action Alternative. Impacts from additional roadway improvements outside the scope of the landfill will be discussed in Section 5.4, Cumulative Impacts.

The integrated solid waste management strategy features the use of regional transfer stations as the destination for solid waste collection vehicles; however, the proposed location of these stations is unknown at this time. Haul routes are estimated between the centroid of solid waste generation, the alternative landfill sites, and approximated transfer station locations.

The creation of a new two-lane asphaltic-concrete paved roadway would be needed to access Layon from Dandan Road for a distance of approximately 2.75 miles, which would be located along the proposed utility route (see Figure 3-6). Additional features needed would be 8-ft-wide paved shoulders, attendant roadside drainage improvements, and appropriate signage from Route 4 to the landfill site.

Temporary minor adverse impacts to citizens working and living near the proposed access route would occur during construction of a new road, as well as landfill operations. After completion of the landfill, the roads would still be available for regional traffic and would function at a higher level of service when truck traffic is removed from the haul routes, which would result in a permanent, beneficial moderate impact.

Traffic

Based on 2020 Guam Highway Master Plan traffic forecasts, total vehicle-trips in southern Guam in 2015 and 2020 are estimated at 15,619 and 17,546, respectively. This compares with total island-wide vehicle-trips in the same years at 566,365 and 627,248, respectively. These vehicle-trips include all solid waste collection and disposal traffic movement. Vehicle-trips in southern Guam would increase slightly with the addition of a landfill at Layon, as the current solid waste haul routes would probably not generate a large amount of traffic in southern Guam. However, compared to the existing traffic generated by transporting waste, the new system could decrease levels of truck traffic island-wide by as much as 50 percent and completely eliminate medium and small self-haul vehicle traffic (GovGuam 2005). Layon also requires longer haul routes to the centroid of solid waste generation compared to the other two sites, and would generate more highway traffic overall (depending on where the transfer stations were to be located).

The integrated solid waste management strategy, which features the use of regional transfer stations as the destination for solid waste collection vehicles, would limit landfill-bound, solid-waste-related vehicular traffic to large waste haulers. Compared to current solid waste packer trucks and other waste haulers that are being used, which have capacities ranging from 1 to 20 CY, large waste haulers have a range in nominal capacity of 55 to 145 CY of compacted wastes. Preliminary calculations show that when compared to existing practice, the proposed new solid waste management strategy of limited access to the landfill to large waste haulers would reduce the volume of landfill-bound traffic in the range of 15 to 27 vehicle loads. This volume is expected to double by 2020, but, because the magnitude is insignificant, the overall increase in vehicle trips in southern Guam is negligible. Furthermore, it is anticipated that the frequency and hours of operation of bulk waste hauling from transfer stations to the new landfill would be regulated as required to minimize impacts to the traveling public.

Approximately 2,500 LF of Dandan Road passes through a portion of Malojloj Village, where truck traffic would increase and cause minor adverse impacts to local residents from noise, dust, and possibly stray pieces of litter.

Highway Safety

The integrated solid waste management strategy would limit landfill-bound, solid-waste-related vehicular traffic primarily to large waste haulers, which would decrease the number of trips required; however, minor long-term adverse impacts to highway safety would occur during construction, operations, and completion of the landfill due to the addition of large vehicles to routes that may not have been used for solid waste transport previously, especially in the vicinity of Dandan.

Landfill-bound traffic would be restricted to large capacity trash/waste haulers with capacities ranging from 75 to 100 CY of compacted waste. Haul vehicles to be used to transport solid waste from the transfer stations to the landfill site would meet vehicle height and width requirements and would not exceed the maximum vehicle loading requirements established for Guam's highways.

The upgrading of Dandan Road and the reconstruction of Route 4 would address potential highway safety issues involved with the movement of traffic to and from Layon.

The centroid of solid waste generation overlays the centroid of population and is located in the Dededo-Tamuning region. Layon is located a distance of approximately 23 miles from the centroid of solid waste generation. Impacts to highway safety would be the same for all three alternatives.

No Action Alternative

The No Action Alternative would not involve any additional changes to site access, haul routes, highway safety, or traffic in the vicinity of the three alternatives. Roadway improvements outlined in the Guam Highway Master Plan would still be implemented, which would improve highway safety and traffic issues along the proposed routes.

Over time, waste being transported to the Ordot Dump, if kept in operation, would increase; therefore, vehicle trips to and from the existing landfill would also increase. If the Ordot Dump continues receiving solid waste and reaches capacity, eventually another site would have to be selected and developed, but the effects on Guam's road network cannot be determined at this time because the site is not known.

4.3.2.3 Energy Use and Conservation Measures

Energy use and conservation measures would be similar at all three alternatives, regardless of which alternative is selected. Energy use would be moderate during construction and would involve the use of non-renewable fossil fuels to operate heavy equipment for extensive mass grading and excavation. The types of equipment to be used may include, but would not be limited to, bulldozers, tractors, scrapers, water tankers to minimize dust during construction, and road building equipment. Energy use would create temporary, moderate impacts during construction.

Minor temporary energy needs during operation of the landfill would be associated with the periodic construction and excavation of individual cells. Long-term energy needs during landfill operation would result from transporting waste to and from the landfill, and the use of bulldozers, graders, and trucks to push and compact waste and haul and spread daily cover. Minor amounts of electricity may be used at the site for administration and support facilities. Connections to the closest telephone and cable utility lines would be required for administrative offices and support facilities.

Energy use during closure would create negligible temporary impacts. Unlike the opening of the landfill, closure would require minimal grading for final capping and landscaping since previously completed cells would already have been capped. Closure would involve using heavy equipment to place cover material and to landscape the site.

Potential energy conservation measures that could be implemented would be defined during the more detailed landfill design phase. There is a potential for generation of electric power from methane gas produced during operation and closure of the MSWLF.

No Action Alternative

If the Ordot Dump continues receiving solid waste and reaches capacity, eventually another site would have to be selected and developed, but the effects on energy use cannot be determined at this time because the site is not known.

4.3.3 Public Health and Safety

Public health and safety issues would not differ among the three site layout alternatives; therefore, this would not be a determining factor in the selection of site layout alternatives. Impacts to public health and safety would be reduced because hazards would be controlled during the construction, operation, and completion phases.

The design of the landfill would take into account public health and safety issues by including a leachate collection and gas collection system, and groundwater monitoring would be performed, which would meet the requirements §23501 through §23506 outlined in the *Rules and Regulations for the GEPA Solid Waste Disposal*. A perimeter security fence would be built around the administration and support facilities and any active cells to secure the site and prevent trespassers. Household hazardous waste would be prohibited (§23302); however, some hazardous materials may inadvertently enter the waste stream. This would be monitored through vehicle inspections. Daily cover and leachate control would prevent any hazardous materials that should get into the landfill from reaching the environment.

An Operation Plan for the Guam MSWLF is to be prepared that would outline methods to control litter, dust, vectors, odor, fire, birds, access, types of wastes accepted, release of hazardous or toxic wastes, as well as a contingency plan outlining emergency and evacuation procedures, and personnel safety. One of the operational procedures includes covering the waste material daily with 6 in. of soil, which would assist in controlling potential fire hazards, wind-blown litter, odor, and disease vectors. With these procedures in place, public health and safety impacts would be negligible in the long-term.

No Action Alternative

The No Action Alternative would not involve impacts to public health and safety at the three alternatives. If the Ordot Dump continues receiving solid waste and reaches capacity, eventually another site would have to be selected and developed for solid waste disposal, but the effects on public health and safety cannot be determined at this time because the site is not known.

If the No Action Alternative involves the continuation of operations at the existing Ordot Dump, this would prolong any existing adverse impacts occurring to public health and safety within the vicinity of the Ordot Dump.

4.3.4 Aesthetics

Aesthetic impacts would not differ among the three alternatives because the average height of the profile at closure and slopes would remain similar for each site layout. The rearrangement of the site layout would not cause drastic changes to the viewshed; therefore, this would not be a

determining factor in selecting an alternative.

The landfill is envisioned as a mounded landfill. During development and operation of the landfill, approximately 10 acres would be developed at any time. Within this 10-acre area, only a 0.5-acre area would actively receive waste, which minimizes the amount of activity and noise to a small area at any given time. The final conceptual elevation of the landfill upon closure would have a maximum approximate height of 103 ft above grade, 435 ft above MSL (see Figure 2-2). The conceptual development of the landfill would leave the southernmost sectors for the final phase; thus, the landfill would not be perceived by southern receptors (such as the Inarajan Middle School) until much later in its lifespan.

During the construction phase, there would be no impacts to the viewshed of surrounding parcels; however, there would be temporary adverse impacts during operations near the end of this phase, as well as during completion, since construction would be visible from certain places such as Inarajan Middle School and the NASA Tracking Station parcel. After completion and the return of the site to a vegetated state, there would no longer be impacts to aesthetics.

No Action Alternative

The No Action Alternative would not involve impacts to aesthetics at the three alternatives. If the Ordot Dump continues receiving solid waste and reaches capacity, eventually another site would have to be selected and developed for solid waste disposal, but the effects on aesthetics cannot be determined at this time because the site is not known.

The No Action Alternative would result in impacts to aesthetics within the vicinity of the Ordot Dump if current landfill operations would continue. Aesthetic impacts would continue to increase over time, as the landfill is visible from adjacent villages and the Leo Palace Resort. Fires and odors are occasionally detected at the Ordot Dump, which are both aesthetic impacts to adjacent businesses and residents.

4.3.5 Archaeological/Historical Resources

Archaeological and historical resources are present at all three alternatives and could be affected by earthmoving activities that disturb surface or subsurface resources. Section 106 of the National Historic Preservation Act (NHPA) prescribes steps that are used to assess the affects of the undertaking upon historic properties. If a determination of No Adverse Effect is made, Guam HRD's concurrence should be sought along with any terms and conditions under which the undertaking would be carried out. Examples of conditions are the implementation of archaeological data recovery plans and/or monitoring plans to collect and preserve significant information that would be lost due to the undertaking. Heritage loss due to the undertaking would be mitigated by these and other measures, as deemed appropriate during the consultation. Protection or preservation covenants to be attached to a lease, transfer or sale of a historic property may also be obtained from the Guam HRD.

Impacts to archaeological and historic resources are negligible for the shared footprint area in the site layouts of all three alternatives. Artifacts were collected from two localities within the Dandan parcel (Dan S-1 and Dan S-2) and information about the sites recorded; hence, the loss

Resource Topic	Impacts of the Conceptual Layout Alternatives		
	Alternative 1	Alternative 2	Alternative 3
Hydrology	Minor long-term (stormwater) and permanent (filled wetlands/streams) impacts	Minor long-term impacts (stormwater); minor permanent (filled stream) impacts	Minor long-term impacts (stormwater); minor permanent (filled stream) impacts
	3	1.5	1.5
Water Quality	N/A	N/A	N/A
Wetlands	Moderate/major permanent adverse impacts (3.55 acres of wetlands filled)	No direct impacts to wetlands (0 acres of wetlands filled); 700 ft of stream filled	No impacts to wetlands (0 acres of wetlands filled); 700 ft of stream filled; more buffer for wetlands
	3	2	1
Vegetation	Moderate adverse long-term impacts (145 acres disturbed)	Moderate adverse long-term impacts (164 acres disturbed)	Moderate adverse long-term impacts (171 acres disturbed)
	2	2	2
Wildlife/Habitat	Moderate adverse long-term impacts (145 acres disturbed)	Moderate adverse long-term impacts (164 acres disturbed)	Moderate adverse long-term impacts (171 acres disturbed)
	2	2	2
Aquatic Ecology	Minor permanent adverse impacts (filled wetlands); long term impacts (stormwater)	Minor long-term impacts (stormwater)	Minor long-term impacts (stormwater); buffer provides more protection for aquatic life
	3	2	1
Socioeconomics	N/A	N/A	N/A
Infrastructure	N/A	N/A	N/A
Public Health & Safety	N/A	N/A	N/A
Cultural Resources	Minimal Impacts	Minimal Impacts	Minimal Impacts
	2	2	2
TOTAL SCORE	17	13.5	11.5

Note: 1 = least impact; 3 = most impact.

5.0 MITIGATION AND MONITORING

This chapter provides a summary of the mitigation measures for the preferred layout footprint alternative, Alternative 3. This alternative appears to offer the most protection to the natural resources at Layon. Impact mitigation would be required to construct the new landfill. Factors such as stormwater control and diversion, offsite monitoring wells, transportation, community concerns (incentives and compensation), wetlands mitigation, air pollution control, archaeological/historical resource mitigation, rare or threatened species management, and other factors must be accurately identified to permit acceptable cost estimating for subsequent project elements. This chapter also addresses irreversible and irretrievable commitments of resources, unavoidable adverse effects, cumulative impacts, and compliance with regulations/statutes.

Categories of mitigation measures include:

- Avoiding certain impacts altogether by not taking a certain action or parts of an action;
- Minimizing impacts by limiting the degree or magnitude of the action and its implementation;
- Rectifying impacts by repairing, rehabilitating, or restoring the affected environment;
- Reducing or eliminating impacts over time by preservation and maintenance operations during the life of the action; and/or
- Compensating for impacts by replacing or providing substitute resources or environments.

To the extent possible, potential impacts associated with the proposed action were avoided through use of an interdisciplinary process (integrating comments and concerns from resource agencies, and comments from public scoping) to select the best layout alternative and best available technology for the proposed MSWLF. While some impact to the environment cannot be avoided, GovGuam has determined that the preferred footprint layout alternative poses the least potential impact among the alternatives considered. A summary of the proposed mitigation measures are found in Table 5-1.

Table 5-1. Proposed Mitigation Measures for Potential Impacts Associated with the Preferred Alternative

Area of Concern	Design/Operational Feature
Seismic Zone	<ul style="list-style-type: none"> • Secondary containment for leachate storage • Flexible piping connections for the leachate tank • Flattening of landfill slopes as required for stability
Groundwater	<ul style="list-style-type: none"> • Groundwater monitoring system with financial assurance for remedial action for impacts to ground water as required by MSWLF regulations
Water Quality	<ul style="list-style-type: none"> • Create wet extended detention pond with sediment forebay and vegetated permanent wet pool • Composite liner system and leachate collected, treated, and disposed
Wetlands	<ul style="list-style-type: none"> • Wetlands entirely avoided in Alternatives 2 & 3 • Increased distance between wetlands and support facility structures
Vegetation	<ul style="list-style-type: none"> • Revegetation of exposed soils from excavated cells
Community Concerns	<ul style="list-style-type: none"> • Proper landfill design and maintenance throughout the active life of the landfill • Benefits provided to host community
Transportation	<ul style="list-style-type: none"> • Regional transfer stations • Reduction in waste transport directly to landfill
Archaeological/Historical Resources	<ul style="list-style-type: none"> • Design/Operational Feature: N/A

5.1 PROPOSED MITIGATION MEASURES FOR POTENTIAL IMPACTS ASSOCIATED WITH ALTERNATIVE 3 (PREFERRED ALTERNATIVE)

This section discusses the proposed mitigation measures for potential impacts associated with the preferred footprint alternative at Layon. Mitigation measures are presented for seismic activity, water quality, wetlands, vegetation, community concerns, transportation, archaeological/historical resources, and landfill operations.

5.1.1 Seismic Zones

The following features are recommended to be included in the final detailed landfill design to avoid impacts from seismic activity to the leachate collection system:

- Secondary containment for leachate storage.
- Flexible piping connections for the leachate tank.

Additionally, the design of the landfill to have side slopes of 4 horizontal to 1 vertical would reduce or eliminate any impacts (i.e., shifting, moving) from seismic activity to the

material located within the landfill cells. The liner and leachate collection system would be designed to be stable under seismic loads. No impacts are expected to the liner since it is made of flexible membrane materials.

5.1.2 Water Quality (Surface and Ground Water)

Additional stormwater management techniques are recommended to minimize water quality and quantity impacts to receiving surface waters. The current proposed stormwater detention pond is designed for temporary storage of runoff and controls peak discharge rates into receiving waters. This provides benefits in controlling water quantities, but not water quality, except for some gravitational settling of sediment. A wet extended detention pond is recommended to be used as an alternative, which is designed to increase settling of pollutants with features such as a sediment forebay and a permanent wet pool with wetland vegetation that would increase benefits to water quality.

Leakage from the landfill is controlled by the design of the landfill system. This includes:

- Composite liner system
- Leachate collection and removal system
- Storm water run-on and run-off control
- Minimization of active open landfill areas
- Progressive closure of landfill to minimize rainfall infiltration into the landfill

5.1.3 Wetlands.

The preferred layout alternative, Alternative 3, would require a Section 404 permit from the USACE; therefore a Section 404 permit would be prepared. The USACE and USEPA also require compensatory mitigation for unavoidable adverse impacts to waters of the US. A mitigation plan that specifies how functions and values of the resource would be replaced would be prepared if it is determined that mitigation is required.

Even though the headwaters of the Fensol River would have to be filled for Alternative 3, wetlands were entirely avoided, which protects this important resource. In addition to avoiding wetlands, Alternative 3 provides additional protection to the wetlands by minimizing the distance to wetlands by providing a larger buffer between hydrological features and support facility structures within the landfill footprint.

In the event that Alternative 1 or Alternative 2 would be selected a 404 permit would also need to be obtained which would include a detailed mitigation plan for impacted wetlands and streams. A typical wetland mitigation plan can include the provision of open water pond areas suitable for moorhen habitat.

5.1.4 Vegetation

The preferred alternative, layout Alternative 3 would rectify the impacts to vegetation by restoring the vegetation removed from the landfill site. At the closure of each cell, the exposed soils would be revegetated with grasses to return to its natural state. BMPs (Environmental Protection Plan, Erosion Control Plan, and Stormwater Pollution Prevention Plan) would be used to prevent erosion and soil removal. By revegetating, those areas that were barren and eroded would be enhanced to savannah grasslands to the maximum extent possible.

After completion of the landfill, revegetation of the site would occur, which would also enhance the aesthetic nature of the site.

5.1.5 Community Concerns

Community concerns that were mentioned during public scoping include impacts to land used for hunting, fishing and farming, the use of historic and natural areas in Guam, long transport distances required to haul waste from waste source and road congestion, impacts on recreation, economy, tourism, low-income populations, noise, odor, air and water quality and other public health and quality of life concerns, property values, costs associated with recycling and the new landfill, and future uses of the landfill site.

Mitigation for these valid community concerns would be in the form of proper landfill design and maintenance throughout the active life of the landfill to minimize or reduce these concerns. Most of these issues, such as odor, noise and aesthetics, would be controlled through standard operational procedures and would be outlined within the operation plan for the landfill, as well as through compliance with applicable federal and local regulations as discussed throughout Chapter 4.0. Land that is currently used for farming and recreational activities would not be affected by the preferred layout alternative, and the landfill site would be restored as open space after completion of landfill operations.

Any impacts to communities within the vicinity of Layon would be offset with mitigation measures that would focus on the host community. Possible mitigation measures to provide benefits to the host community may include, but not be limited to, providing the host community with a revenue stream as a percentage of the tipping fee, discounted waste disposal, preferential hiring in the waste management industry, special contingency funds, regular water tests and property value protection. Actions such as using landscaping for screening to preserve the viewshed of neighboring properties, performing construction and operational activities during times that would minimize noise disturbance (i.e., no late night operations and limited weekend operations), and restricting waste transport to non-peak traffic hours (i.e., avoid weekday AM/PM work commute traffic, lunchtime traffic) would also mitigate against negative impacts associated with a landfill (GovGuam 2005).

5.1.6 Transportation

The integrated solid waste management strategy features the use of regional transfer stations as the destination for solid waste collection vehicles. The proposed new strategy of using transfer stations would allow consolidation of waste into larger hauling trucks to transport to the landfill. Although siting the landfill in southern Guam would increase traffic traveling between the population centers located in northern and central Guam to the landfill, the system of combining trips into large waste haulers could reduce the volume of landfill-bound traffic by up to 15 percent. Compared to the existing traffic generated by transporting waste, the new system could decrease levels of truck traffic by as much as 50 percent and completely eliminate medium and small self-haul vehicle traffic (GovGuam 2005). Landfill-bound traffic would be primarily restricted to large capacity trash/waste haulers with capacities ranging from 75 to 100 CY of compacted waste.

5.1.7 Archaeological/Historical Resources

The preferred layout alternative, Alternative 3, would require additional archaeological survey within the 400-foot extension to the south of the present footprint. The findings within this area are expected to be similar to those within the present footprint; however, if historic properties are discovered and found to be significant according to National Register criteria, then a determination of No Adverse Effect would require mitigation in coordination with the Guam (State) Historic Preservation Officer (SHPO) under the National Historic Preservation Act.

5.1.8 Operations

Article 3 of the Solid Waste Management Rules and Regulations, GCA Title 22, Chapter 23, sets forth criteria for the operation of solid waste management facilities including landfills. The criteria address monitoring and mitigation measures for the following landfill operation and maintenance issues and activities:

- Types of solid waste accepted at the landfill and procedures for handling of such wastes
- Types of solid waste excluded at the landfill and procedures for assuring their exclusion
- Cover material
- Disease vector control
- Explosive gases control
- Air quality control and compliance with air quality regulations
- Access control
- Run-on and run-off control systems
- Surface water quality control and compliance
- Liquid waste restrictions
- Operations recordkeeping
- Operation and maintenance safety requirements

Compliance with these criteria is overseen and regulated by Guam Environmental Protection Agency.

5.1.8.1 Groundwater Monitoring

Article 5 of the Solid Waste Management Rules and Regulations, GCA Title 22, Chapter 23, sets forth specific measures for groundwater monitoring and corrective action. These provisions establish very strict standards for the type, placement, operation and maintenance of groundwater monitoring systems to minimize and mitigate the potential adverse impacts of landfill operations up to and including closure and post-closure periods. Financial assurance is required by regulations (Article 5.4.8.4) for remedial action or mitigation for impacts to ground water.

5.1.8.2 Surface Water Monitoring

Per Section 23310 of the Solid Waste Management Rules and Regulations, operators and owners of a MSWLF unit are required to comply with area-wide or territorial-wide water quality management plan established by GEPA under the requirements of the Clean Water Act, including, but not limited to, the National Pollutant Discharge Elimination System (NPDES) and non-point source pollution control requirements. These compliance requirements must be documented and implemented under the mandatory landfill operations plan and apply to all surface waters, including wetlands.

5.1.8.3 Landfill Gas

Section 23306 of the Solid Waste Management Rules and Regulations set forth standards and requirements for the implementation and monitoring of explosive gas control systems.

5.1.8.4 Corrective Action Plan

Corrective action plans are required as a subset of all specific landfill systems control plans and cover the operational as well as closure and post-closure periods of the landfill as defined in the Solid Waste Management Rules and Regulations. Furthermore, implementation of corrective action plans are firmly integrated with financial assurance requirements set forth in Article 7 of the Regulations.

5.2 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

This section discusses irreversible and irretrievable commitments of resources. A resource commitment is considered irreversible when primary or secondary impacts from its use limit future options. Irreversible commitment applies primarily to nonrenewable resources, such as minerals or cultural resources, and to those resources that are only renewable over long time spans, such as soil productivity. A resource commitment is

considered irretrievable when the use or consumption of the resource is neither renewable nor recoverable for use by future generations.

Implementation of the landfill would involve the following irreversible environmental changes to the existing onsite resources:

- Commitment of energy (i.e., electricity) and water resources as a result of the construction, operation, and maintenance of the landfill facility.
- Alteration of the existing topographic character of the site.
- Consumption of soil resources.
- Use of fossil fuels to operate fixed and mobile construction equipment including bulldozers, graders, trucks, dump trucks, and generators.
- Removal of, or potential destruction of archaeological and paleontological resources on the site.
- Alteration (filling of streams) of waters of the US.

The commitment of the parcel to landfill uses was not listed since, upon closure, the landfill site would be returned to open space for future use. Future uses of the site would be limited by the underlying wastes; for example the land could not be used for buildings as the site would settle over time. Additionally, direct and indirect impacts on biological resources (native plant communities and wildlife) were not listed, since upon closure the site would be revegetated and habitat would be available again for wildlife use. The loss of vegetation to the construction and operation of the landfill would be restored.

5.3 UNAVOIDABLE ADVERSE EFFECTS

Effects that cannot be avoided due to the constraints involved in landfill design and construction include:

- Construction of a landfill within a seismic impact zone;
- Construction of a landfill within a coastal zone;
- Increases in truck traffic along haul routes that were previously not used for hauling waste;
- Long-term aesthetic impacts that would be rectified at the site through revegetation;
- Minor long-term noise impacts;

- Minor long-term air quality impacts; and
- Minor to moderate long-term impacts to terrestrial resources (vegetation and wildlife) including native species regardless of alternative chosen.
- Minor permanent impacts to waters of the US (headwater stream).

5.4 CUMULATIVE IMPACTS

The additive effects or cumulative impacts of siting the landfill at Layon must be considered in conjunction with aggregate past, present and reasonably foreseeable future actions. These potential cumulative impacts are discussed below.

- **Development Incentives.** The proposed action would result in construction of a landfill at Layon and include the installation and upgrading of existing infrastructure and utilities. It is foreseeable that the vast land area of Dandan offers other areas potentially suitable for the development of a new landfill following the closure of the proposed sanitary landfill. This may potentially encourage additional landfill-compatible developments in the surrounding area, such as waste management facilities. Such developments would potentially bring economic benefits to the island, such as tax revenues to the government and employment opportunities for local residents.
- **Agricultural Viability.** The presence of the landfill in the Dandan area may potentially increase viability of agricultural activity because of the proximity to utilities and availability of compost material and by-products.
- **Effects on Watershed.** The potential increase in development activity in the Dandan area could gradually impact the watershed as growth occurs in the area. Non-point sources, such as leaching fields from residential development, pesticides and nutrients from farming activities, and sedimentation from earthmoving, may contribute to degradation of the watershed.
- **Accessibility by Others.** The upgraded infrastructure may lead to an increase in unauthorized activities, such as hunting-related arson, because of the ease of accessibility to the area. Security measures, such as gated entry to the landfill access road, could help deter this activity. The road would provide better access for fire suppression, forest stewardship, and other legitimate activities.
- **Recreational Resources.** Visual impacts to the landscape from the access road and landfill facility, especially when viewed from southern vistas and recreation areas, add to changes on the aesthetic environment. The development of Layon and growth of new developments in the area would add to the loss of outdoor recreational resources for hiking, biking, etc.; however, road development would also provide greater accessibility to other areas for recreation.

- **Community Character.** The change in land use in the Dandan area would potentially add to a shift in community character initiated by the establishment of the NASA tracking station.
- **Regional Transportation.** Additional roadway improvements presented in the 2020 Guam Highway Master Plan are not part of this proposed action. However, the proposed Route 4 improvements would be beneficial to the proposed action because construction schedules would be coordinated with the landfill schedule in order to provide adequate infrastructure before transport of solid waste to the proposed landfill begins. These improvements support the proposed action by improving a major access and haul route to be utilized by the future landfill. All three layout alternatives would use a portion of this major highway and would benefit from other highway projects planned along future haul routes.

5.5 COMPLIANCE WITH REGULATIONS/STATUTES

5.5.1 Federal Regulations

The primary federal regulatory authority over the siting, construction, and operation of MSWLF's is RCRA, specifically, CFR 40 part 258, "Solid Waste Disposal Facility Criteria." Part 258 applies to new landfill units and lateral expansion of existing units that accept waste after October 1993. Owners or operators of landfills that do not meet the criteria are considered to be engaging in the practice of open dumping in violation of RCRA. The landfill would not be permitted by the federal government, the permit would be issued by GEPA. GEPA rules for permitting must be in conformance to CFR 40 part 258, "Solid Waste Disposal Facility Criteria."

Section 404 processing of the CWA would be necessary since the proposed project would involve the filling of waters of the US. A Section 404 permit would be obtained from the USACE (Honolulu District). Additionally, an NPDES permit would be obtained through GovGuam to control discharges from the project site to the nation's surface waters. GEPA reviews and certifies (401 WQC) the permit for compliance with all local regulations and policies and in accordance with the Guam Water Quality Standards. USEPA coordinates, drafts, and issues the permit for facilities that require wastewater discharges.

To comply with Section 7 of the Endangered Species Act, GovGuam is in the process of consulting with USFWS. Comments are not anticipated from USFWS that would alter the proposed action's compliance with Section 7 of the Endangered Species Act.

The project would comply with Guam's Soil Erosion and Sediment Control Regulations 10 Guam Code Annotated, Chapter 47 (Water Pollution Control Act); an Erosion Control Permit would need to be issued by GEPA.

Archaeological and historic resources were evaluated and field investigations (monitoring and inventory survey) were conducted by professional archaeologists in coordination

with the Guam (State) Historic Preservation Officer (SHPO) and in compliance with Section 106 of the National Historic Preservation Act (NHPA) (16 U.S.C. 470). Additional field investigations in the 400-ft extension of the landfill footprint would be required. Concurrence would be sought from the SHPO for the determination of effect on historic properties.

5.5.2 Guam Regulations/Laws

GovGuam Bureau of Statistics and Plans is the lead agency for the Guam Coastal Management Program (GCMP) established under the Coastal Zone Management Act (16 U.S.C. §§ 1451-1465, October 27, 1972, as amended 1975, 1976, 1978, 1986, 1990, 1992 and 1996). GovGuam will review this EIS for consistency with the GCMP.

The GEPA Well Head Protection Program (WHPP) was adopted to prevent the contamination of public water supplies. The guidance establishes a groundwater management protection zone within a 1,000-ft radius of public wells within specified land use standards. The project complies with Guam's WHPP as well as the Federal Safe Drinking Water Act since the closest public well is located more than a mile from the landfill site.

The landfill will comply with Guam's Solid Waste Disposal Rules and Regulations, *Rules and Regulations for the Guam Environmental Protection Agency (GEPA) Solid Waste Disposal* (GCA Title 22, Div. 4, Chapter 23).

Use of the Layon site for landfill development and operation would require a zoning change in accordance with the process defined by the Zoning Code (GCA Title 21, Div 2, Chapter 61).

The landfill will comply with Guam Water Quality Standards to meet the requirements for the S-2 surface water classification. The proposed industrial activities cannot degrade the surface water quality beyond its present condition, as the area's surface waters are suitable as a potable water supply.

6.0 CONSULTATION AND COORDINATION

6.1 PUBLIC PARTICIPATION

Public participation is a fundamental element of the National Environmental Policy Act (NEPA). Although this SEIS for siting a landfill at Layon is not required to follow formal NEPA guidelines with their structured public participation requirements, the Government of Guam has provided its residents opportunities for public comment and interaction throughout the process.

6.1.1 Public Scoping (July 2004)

The public scoping comment period was open from June 30 to August 3, 2004. Scoping was the first opportunity for the public to participate in the EIS process and help define the appropriate scope of analyses in the EIS document. The public was also invited to comment on preliminary siting criteria that would be used to evaluate the three candidate sites. The public was invited through published notices in the local newspaper, radio announcements, presentation to the Mayors' Council of Guam, press releases, and televised and print media coverage. Several avenues were made available to receive oral or written comments from the public on the scope of the EIS during the comment period, including the project Web site (www.guamlandfill.org), which was launched on July 7, 2004. Public meetings were held in July 7, 8, and 12, 2004 in each of the three candidate site villages. The background and other aspects of the project were presented to the public at each meeting, and a brief video was shown depicting landfill construction. At the end of the presentation, the public was given the opportunity to provide oral comments and receive feedback from the consultants and Government officials from GEPA and GDPW.

The public comments were arranged into five groups: water protection, on-site environment, land use, transportation, and other issues. The comments were further categorized into 40 siting criteria developed by the project team. Many comments focused on potential impacts to groundwater or surface waters in the event that the landfill liner system fails. Inarajan residents raised particular concerns that the candidate site in Dandan would affect the Ugum watershed-- the potable water source for Guam's southern villages--and nearby streams used for farming and recreation. Impacts to existing and future land use and potential property devaluation were common concerns among the residents at the three public scoping meetings. The public cited existing and planned tourist resorts, and on-going farming activities as some of the economically productive uses that would be affected by the landfill.

Incineration, either alone or combined with a landfill facility, was the most common waste management alternative proposed by the public. The public asked about the cost comparison between operation of an incinerator and a landfill, and about the possibility of harnessing electricity from the incineration process. Several comments were in strong support of a recycling program. Alternative landfill sites were also suggested, including

Harmon Field in Dededo, Tiyan in Barrigada, Fadian in Mangilao, and Mt. Lamlam in Umatac.

At the close of the public comment period, all written and oral comments were compiled and summarized in a Preliminary Public Scoping Report issued in September 2004 (GDPW 2004c). The report was published on-line on the project Web site for public review, and copies were made available to the public by request.

6.1.2 Final Public Scoping Report (October 2004)

The Preliminary Public Scoping Report was finalized in October 2004 after a 30-day comment period (GDPW 2004a). No public comments were received during that time. The final report was posted on the project Web site for public review.

6.1.3 PSSR Public Meetings (January 2005)

The public comment for the Preliminary Site Selection Report (PSSR) for the siting of a new municipal solid waste landfill facility was open from January 11 through 22, 2005. The PSSR was posted on the project Web site <http://www.guamlandfill.org>, and hard copies of the report were deposited at the Asan-Maina, Ordot-Chalan Pago, Inarajan, and Yona Mayors' Offices, Guam Environmental Protection Agency, Guam Department of Public Works, Duenas & Associates, Inc., and the Nieves M. Flores Memorial Library in Hagatna. In addition, copies of the report were provided to U.S. EPA; U.S. Department of Agriculture, Water and Environmental Research Institute (WERI), the Territorial Archaeologist (Department of Parks & Recreation-Historic Resources Division), Bureau of Statistics and Plans, and Senators Benjamin J. Cruz and Joanne M. Brown (28th Guam Legislature) for review. Review comments were also solicited from the U.S. Army Corps of Engineers, Guam Regulatory Branch. Members of the public were provided electronic copies on CD-ROM on an individual basis by request. Several means of submitting comments were available to the public, i.e., through the Web site, U.S. Postal Service, hand-delivery, voice mail, or facsimile. Written comments were also accepted at the three public meetings.

The project team and the Government presented the information in the PSSR and solicited public comments at three public meetings held on January 13, 14 and 17, 2005 at the Asan-Maina Community Center, Yona Community Center, and Inarajan Mayor's Office, respectively. The Government was especially interested in comments that cited any missing or erroneous information contained in the PSSR, as well as comments directed at the site selection criteria or the weighting factors for these criteria. The project team and Government provided immediate responses to oral comments and questions during the meetings. Twenty-eight comments were submitted either in writing during the meetings, or afterwards via facsimile or telephone. In addition, two CD-ROM disks were received from an individual at the Inarajan meeting on January 17, 2005.

Comments were received for each of the major groups of siting criteria, i.e., water protection, geology, on-site environment, transportation and land use. No significant

comments were received under the water protection and the geology categories. Other comments were received in the following categories: public education, recycling, alternative landfill locations, incompatibility with future land use, landfill post-closure land use, development and design costs, Consent Decree penalties, accountability for compliance with regulations, and not-in-my-backyard (NIMBY).

The public comment summary was incorporated into the Final Site Selection Report, along with a description of the selection process for a preferred landfill site by the Landfill Site Evaluation Team (LSET) (GDPW 2005). The report was finalized in March 2005 and posted on the project Web site for public reference.

6.1.4 Draft SEIS (May 2005)

The public was given the opportunity to comment on the Draft SEIS immediately following the release of the report during a public comment period from May 18 to June 16, 2005. A public meeting was held on May 24, 2005 at the Inarajan Mayor's Office to receive oral and written comments. Oral comments were received from 17 people at the meeting; additional written comments and one voice-mail comment were received during the comment period. A comment summary and copies of written comments are presented in Appendix C.

6.2 AGENCY COORDINATION

Coordination letters describing the project and soliciting comments or information were sent to the following local and federal government resource agencies and the U.S. Navy. Copies of these letters are included in Appendix D. Guam Department of Parks and Recreation's Historic Resources Division and Bureau of Statistics and Plans provided the only responses, which are also included in Appendix D.

Federal Government

U.S. Army Corps of Engineers
U.S. Fish and Wildlife Service Pacific Islands Office.
U.S. Navy Public Works Center Guam

Government of Guam

Bureau of Statistics and Plans
Department of Agriculture
Department of Land Management
Department of Parks and Recreation

7.0 LIST OF PREPARERS

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APPENDIX A

Ordot Consent Decree

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ORIGINAL

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Attorneys for the United States of America

FILED
DISTRICT COURT OF GUAM
FEB 11 2004
MARY L. M. MORAN
CLERK OF COURT

UNITED STATES DISTRICT COURT
TERRITORY OF GUAM

UNITED STATES OF AMERICA,
Plaintiff,

v.

GOVERNMENT OF GUAM,
Defendant.

CIVIL CASE NO. 02-00022

CONSENT DECREE

COPY

1 WHEREAS, Plaintiff United States of America, on behalf of the United States
2 Environmental Protection Agency ("U.S. EPA"), filed a civil lawsuit against the Government of
3 Guam;

4 WHEREAS, the Government of Guam owns and operates a solid waste disposal
5 facility in the Village of Ordot, hereinafter referred to as the "Ordot Dump;"

6 WHEREAS, the operation of the Ordot Dump is subject to, among other things,
7 the provisions of the Clean Water Act, 33 U.S.C. §§ 1251-1387;

8 WHEREAS, 33 U.S.C. § 1311(a) makes it unlawful to discharge pollutants from
9 a point source to waters of the United States, except as authorized by a permit issued pursuant to
10 33 U.S.C. § 1342;

11 WHEREAS, in the Complaint, the United States alleges that discharges from the
12 Ordot Dump into the Lonfit River constitute discharges of pollutants into a water of the United
13 States and that such discharges are not authorized by a permit issued pursuant to 33 U.S.C.
14 § 1342;

15 WHEREAS, pursuant to the authority in 33 U.S.C. § 1319, on July 24, 1990,
16 U.S. EPA issued an administrative order to the Government of Guam, Department of Public
17 Works ("DPW") requiring the cessation of discharges in accordance with a plan and schedule to
18 be submitted to and approved by U.S. EPA;

19 WHEREAS, pursuant to the authority in 33 U.S.C. § 1318(a), on September 19,
20 1997, U.S. EPA requested DPW to obtain and submit to U.S. EPA certain data and information
21 on the discharges from the Ordot Dump and the receiving water in accordance with specified
22 deadlines;

23 WHEREAS, in the Complaint, the United States alleges that the Government of
24 Guam did not comply with the terms and conditions of the administrative order and the request
25 for information;

26 WHEREAS, Guam law, at 10 G.C.A. § 51118, provides for a financing source
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1 from tipping and user fees for the Government of Guam costs and expenses directly related to the
2 closure of Ordot Dump and the development, design, construction, and operation of a new
3 sanitary landfill;

4 WHEREAS, the parties agree that settlement of the civil judicial claims as
5 alleged in the Complaint is in the public interest and that entry of this Consent Decree without
6 further litigation is the most appropriate way to resolve this action and avoid protracted litigation;

7 THEREFORE, based on the pleadings, before taking testimony or adjudicating
8 any issue of fact or law, and without any finding or admission of liability against or by the
9 Government of Guam;

10 IT IS ORDERED, ADJUDGED, AND DECREED as follows:

11 I. JURISDICTION

12 1. This Court has jurisdiction over the subject matter of this action and over the
13 parties pursuant to 33 U.S.C. § 1319(b) and (d) and 28 U.S.C. §§ 1331, 1345, and 1355. Venue
14 is proper in this Court pursuant to 28 U.S.C. §§ 1391(b) and 1395(a) and 33 U.S.C. § 1319(b).

15 II. PARTIES BOUND

16 2. This Consent Decree shall apply and be binding upon the Government of Guam
17 and its boards, directors, agencies, authorities, departments (including and not limited to DPW
18 and the Guam Environmental Protection Agency ("GEPA")), and their successors and assigns,
19 and on the United States on behalf of U.S. EPA.

20 3. The Government of Guam shall give written notice of this Consent Decree to any
21 successor in interest prior to the transfer of any ownership interest or right to operate the Ordot
22 Dump. The Government of Guam shall send a copy of such notification to U.S. EPA prior to
23 such sale or transfer. Upon sale or transfer of the Ordot Dump, the Government of Guam shall
24 attach a copy of this Consent Decree to the agreement which effects the sale or transfer and shall
25 make performance of the obligations of the Government of Guam under this Consent Decree an
26 obligation of the purchaser or transferee. Transfer of ownership of the Ordot Dump will not
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submitted by the Government of Guam concerning operation and closure of Ordot Dump and the construction or operation of the new Municipal Solid Waste Landfill ("MSWLF"). In the event that U.S. EPA provides written comments, the Government of Guam must respond in writing within 30 days and incorporate such comments into the document. Representatives of the Parties shall make themselves readily available during and after the comment period to informally discuss questions and comments on any documents.

a. For purposes of this Consent Decree, (i) "Ordot Dump" shall refer to Ordot Dump in its current configuration and current boundaries as depicted in Appendix B; and (ii) the new Municipal Solid Waste Landfill or "MSWLF" shall include the option of constructing and operating new cells at a location adjacent to the Ordot Dump location.

8. Closure of Ordot Dump and Cessation of Discharge of Pollutants from Ordot Dump into Waters of the United States.

a. Within 300 days (approximately 10 months), DFW shall:

i. Submit a Draft Closure Plan to U.S. EPA that shall include, but not be limited to:

- Site investigation, survey & mapping.

- Environmental baseline survey.

- 40% (conceptual) design of the dump cover system including methods and procedures to be used to install the cover system and operational plans to implement measures to cease discharge of pollutants into waters of the United States.

- 40% (conceptual) design of perimeter surface water diversion system.

- Other measures necessary to comply with Government of Guam regulations regarding closure of municipal solid waste landfills (22 G.A.R. § 23601).

ii. Submit a permit application to GEPA pursuant to Government of Guam

2 regulations (22 G.A.R. § 23104) for the disposal of municipal solid waste at Ordot
3 Dump until such time as the facility is closed and no longer accepts municipal
4 solid waste for disposal. DPW shall provide a copy of this permit application to
5 U.S. EPA at the time of submission.

6 b. Within 450 days (approximately 15 months), DPW shall:

7 i. Submit to U.S. EPA a 90% Draft Final Closure Plan that shall include, but
8 not be limited to:

9 - 100% design of the dump cover system including methods and procedures
10 to be used to install the cover system and operational plans to implement
11 measures to cease discharge of pollutants into water of the United States.

12 - 100% design of the perimeter surface water diversion system.

13 - 100% post-closure care and monitoring plan.

14 - 40% Draft Specifications (including a Construction Management Plan)
15 that describes the quality assurance measures necessary to ensure that the
16 final dump closure system meets the design specifications.

17 - Other measures necessary to comply with Government of Guam
18 regulations regarding closure of municipal solid waste landfills (22 G.A.R.
19 § 23601).

20 ii. Submit to U.S. EPA and GEPA a draft final plan and a schedule to
21 implement post-closure requirements.

22 iii. Submit to U.S. EPA a supplement to its original permit application to
23 GEPA that includes complete information about closure plans, in compliance with
24 Government of Guam Regulations (22 G.A.R. § 23104).

25 c. Within 570 days (approximately 19 months), DPW shall:

26 i. Submit to U.S. EPA a Final Closure Plan that shall include, but not be
27 limited to:

2 100% design of the dump cover system including methods and procedures
3 to be used to install the cover system and operational plans to implement
4 measures to cease discharge of pollutants into waters of the United States.

5 100% design of the perimeter surface water diversion system.

6 Final Specifications (including a Construction Management Plan) that
7 describes the quality assurance measures necessary to ensure that the final
8 dump closure system meets the design specifications.

9 Other measures necessary to comply with Government of Guam
10 regulations regarding closure of municipal solid waste landfills (22 G.A.R.
11 § 23601).

12 ii. Submit to GEPA a final plan and schedule to implement post-closure
13 requirements, in accordance with Government of Guam requirements. A copy
14 shall be provided to U.S. EPA at the same time.

15 iii. Submit to GEPA, U.S. EPA, and U.S. Army Corps of Engineers a 90%
16 Draft Wetland Mitigation Plan for closure of Ordot Dump. An approved Wetland
17 Mitigation Plan, including a viable financial plan, shall be required before the
18 issuance of any closure construction permits.

19 d. Within 570 days (approximately 19 months), GEPA shall notify DPW and U.S.
20 EPA of the adequacy of the solid waste permit application filed pursuant to Paragraph
21 8(a)(ii) and 8(b)(iii) above in accordance with Government of Guam regulations (22
22 G.A.R. § 23104(c)(2)).

23 e. Within 660 days (approximately 22 months), GEPA shall issue or deny a solid
24 waste permit for the continued operation of Ordot Dump for a period not to extend
25 beyond 1,350 days (approximately 45 months) after the entry of this Consent Decree and
26 for the closure of Ordot Dump and provide a copy of the permit, including any
27 conditions, or the denial to U.S. EPA.
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2 f. Within 700 days (approximately 23 months), DPW shall advertise for bids to
construct Ordot closure plans and specifications.

3 g. Within 800 days (approximately 27 months), DPW shall award a construction
4 contract for Ordot Dump closure and provide a notice to proceed to the selected
5 contractor and submit evidence of such award and notice to U.S. EPA.

6 h. Within 1,350 days (approximately 45 months), DPW shall complete closure of
7 Ordot Dump, begin implementation of the post-closure plan in accordance with
8 Government of Guam requirements, and submit a certification to U.S. EPA that
9 the Ordot Dump no longer receives municipal solid waste for disposal.

10 i. Within 1,350 days (approximately 45 months), DPW shall cease all discharges to
11 waters of the United States and submit a certification to U.S. EPA that discharges
12 to waters of the United States from the Ordot Dump have ceased.

13 9. Construction and Operation of New Municipal Solid Waste Landfill ("MSWLF").

4 a. Within 30 days, DPW shall submit a list of at least three potential landfill sites to
15 U.S. EPA and GEPA. Within 300 days (approximately 10 months), DPW shall complete
16 an Environmental Impact Statement ("EIS") that includes a detailed analysis and
17 comparison of at least three potential landfill sites for the MSWLF and identifies DPW's
18 preferred alternative for the MSWLF. DPW shall provide U.S. EPA and GEPA with a
19 copy of the draft and final EIS within 10 days after completion of the draft and final EIS.

20 b. If U.S. EPA does not agree with DPW's preferred alternative, the parties shall use
21 their best efforts to come to an agreement regarding the location of the new MSWLF
22 within 90 days after completion of the final EIS. If the parties are unable to agree on a
23 location, the Government of Guam shall file a motion within 110 days after completion of
24 the final EIS, submitting the disputed matter to the Court for resolution. The Government
25 of Guam's motion shall request oral argument and shall be set for hearing not less than 45
26 after service of the moving papers. The United States shall have 30 days to respond to
27

2 the Government of Guam's motion. The Court shall render a decision on the location of
3 the new MSWLF based on the written materials on file and any oral argument.

4 c. Within 540 days (approximately 18 months), DPW shall submit a Draft Plan for
5 the design, construction, and operation for the new MSWLF to U.S. EPA. The Draft
6 Plan shall include but not be limited to:

- 7 - Site investigation, survey, and mapping.
- 8 - Hydrogeologic/subsurface investigation.
- 9 - 40% design and specifications for construction and operation of the new
10 MSWLF system.
- 11 - Other measures necessary to comply with Government of Guam
12 regulations regarding siting, design, and operational criteria for Municipal
13 Solid Waste Landfills (22 G.A.R. § 23601).

14 d. Within 725 days (approximately 24 months), DPW shall:

- 15 i. Submit a 90% Draft Final Plan for the design, construction, and operation
16 for the new MSWLF to U.S. EPA. The Draft Final Plan shall include but
17 not be limited to:
 - 18 - 100% design for construction and operation of the new MSWLF system.
 - 19 - Draft Specifications (including a Construction Management Plan) that
20 describes the quality assurance measures necessary to ensure that the final
21 new municipal solid waste landfill system meets the design specifications.
 - 22 - Other measures necessary to comply with Government of Guam
23 regulations regarding siting, design, financial and operational criteria for
24 Municipal Solid Waste Landfills (22 G.A.R. § 23401).
- 25 ii. Submit a permit application to GEPA in accordance with Government of
26 Guam Regulations (22 G.A.R. § 23104) to site, construct, and operate a
27 new municipal solid waste disposal landfill in accordance with applicable
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Guam and Federal regulations. A copy of the application shall also be submitted to U.S. EPA at the same time.

iii. Submit to GEPA, U.S. EPA, and U.S. Army Corps of Engineers a 90% Draft Wetland Mitigation Plan and submit a Wetland Development Permit application to the Guam Land Use Commission. Approval of the 100% Final Wetland Mitigation Plan, including a viable financial plan, and a Wetland Development Permit shall be required before the issuance of any landfill construction permits.

e. Within 845 days (approximately 28 months, which is 120 days after DPW's application is submitted), GEPA shall notify DPW and U.S. EPA of the adequacy of the permit application filed pursuant to Paragraph 9(d)(ii) above in accordance with Government of Guam Regulations (22 G.A.R. § 23104(c)(2)).

f. Within 845 days (approximately 28 months), DPW shall:

i. Submit 100% Final Plan for the design, construction, and operation for the new MSWLF to U.S. EPA. The Final Plan shall include but not be limited to:

- 100% design for construction and operation of the new MSWLF system.

- Other measures necessary to comply with Government of Guam regulations regarding the design criteria for Municipal Solid Waste Landfill (22 G.A.R. § 23401).

- Final Specifications (including a Construction Management Plan) that describes the quality assurance measures necessary to ensure that the final new municipal solid waste landfill system meets the design specifications.

ii Advertise for bids to construct the new MSWLF.

g. Within 935 days (approximately 31 months), GEPA shall issue or deny a permit for the new MSWLF and provide a copy of the permit, including any conditions, or the

denial to U.S. EPA.

2 h. Within 975 days (approximately 32 months), DPW shall award a construction
3 contract for the new MSWLF in accordance with applicable procurement rules and
4 policies of the Government of Guam and provide a notice to proceed to the selected
5 contractor, and submit evidence of such award and notice to U.S. EPA.

6 i. Within 1,320 days (approximately 44 months), DPW shall begin operations of the
7 new MSWLF and so certify to U.S. EPA within 7 days of commencement of operation.

8 10. Financing Closure of Ordot Dump and Construction and Operation of New
9 Municipal Solid Waste Landfill.

10 a. Within 120 days, the Government of Guam shall submit to U.S. EPA a financial
11 plan for funding those actions identified in Paragraphs 8 and 9, over time, including the
12 funding source or sources and a schedule to secure funds for the capital and operating
13 costs necessary to fully implement those actions identified in Paragraphs 8 and 9 above.
The parties acknowledge and agree that the total amount of funding needed to complete
15 the projects required under this Consent Decree is not currently available. The parties
16 agree that the projects shall be funded by the Solid Waste Operations Fund, established by
17 10 G.C.A. § 51118, including the costs and expenses directly related to the closure of the
18 Ordot Dump and the development, design, construction, and operation of a new sanitary
19 landfill. The parties also agree that the Solid Waste Operations Fund shall not be regarded
20 as the exclusive source of funding for the projects, and that the Government of Guam may
21 obtain funding from other sources. The Government of Guam shall use its best efforts to
22 obtain sufficient funding to fully implement the projects required by this Consent Decree.
23 If funding from the Solid Waste Operations Fund is not sufficient to fully implement the
24 projects, the Government of Guam shall seek funding through legislative appropriation,
25 loans, grants, and rates charged for consumer services such as tipping or user fees.

26 b. Notwithstanding any of the time frames set forth in Paragraph 8 or 9 above, upon
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1 the opening of a properly licensed and permitted municipal solid waste landfill prior to the
2 times set forth in Paragraphs 8 and 9 above, no further dumping of any kind will be
3 permitted at the Ordot Dump.

4 V. REPORTING REQUIREMENTS

5 11. Beginning with the first quarter following the quarter in which this Consent Decree
6 is entered and continuing until termination of this Consent Decree, the Government of Guam shall
7 submit to U.S. EPA written quarterly reports of its progress in implementing the provisions of this
8 Consent Decree. Quarterly reports shall be submitted within twenty-one (21) days after the last
9 day of each quarter. At a minimum, these Progress Reports shall include:

- 10 a. All tasks required under the Consent Decree and performed during the reporting
11 period;
- 12 b. All deadlines in this Consent Decree that the Government of Guam was required to
13 meet during the reporting period;
- 14 c. A report whether the Government of Guam met these deadlines;
- 15 d. The reasons for any failure to meet these deadlines and all steps taken to remedy
16 such failure; and
- 17 e. A projection of the tasks to be performed pursuant to this Consent Decree during
18 the next reporting period.

19 VI. STIPULATED PENALTIES

20 12. Stipulated Penalties.

21 a. The Government of Guam shall pay stipulated penalties for failure to meet
22 deadlines specified in Section IV (Compliance) as follows:

- 23 i. For failure to meet any of the deadlines specified in Paragraphs 8(a) - 8(f)
24 and 9(a) - 9(g):
25 \$250 per day per violation for the first 30 days, \$500 per day per violation
26 for the following 30 days, and \$1,000 per day per violation for each day
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thereafter.

2 ii. For failure to meet any of the deadlines specified in Paragraphs 8(g), 9(h),
3 and 10:

4 \$500 per day per violation for the first 30 days, \$1,000 per day per violation
5 for the following 30 days, and \$2,000 per day per violation for each day
6 thereafter.

7 iii. For failure to meet any of the deadlines specified in Paragraphs 8(h), 8(i),
8 and 9(i):

9 \$1,000 per day per violation for the first 30 days, \$2,000 per day per
10 violation for the following 30 days, and \$5,000 per day per violation for
11 each day thereafter.

12 b. The Government of Guam shall pay stipulated penalties in the amount of \$500 per
13 day for failure to timely pay the civil penalty required by Section III.

4 c. The Government of Guam shall pay stipulated penalties for failure to meet any
15 other requirements of this Consent Decree (with the exception of the failure to complete
16 the Supplemental Environmental Project as set forth in Appendix C that is subject to
17 penalties pursuant to Paragraph 18) as follows:

18 \$250 per day per violation for the first 30 days, \$500 per day per violation
19 for the following 30 days, and \$1,000 per day per violation for each day
20 thereafter.

21 13. Stipulated penalties shall begin to accrue on the day after performance is due and
22 shall continue to accrue through the final date of completion even if no notice of the violation is
23 sent to the Government of Guam. Nothing herein shall prevent the simultaneous accrual of
24 separate penalties for separate violations of the Consent Decree.

25 14. Any stipulated penalty accruing pursuant to this Consent Decree shall be payable
26 upon demand and due not later than THIRTY (30) days after the Government of Guam's receipt

of U.S. EPA's written demand. Stipulated penalties shall be paid by certified or cashier's check in the amount due, shall be made payable to the "U.S. Department of Justice," referencing DOJ #90-5-1-1-06658 and USAO File Number 1998V00094, and shall be delivered by certified mail with return receipt requested to:

United States Attorney, District of Guam
Attention: Financial Litigation Unit
Suite 500, Sirena Plaza
108 Hernan Cortez
Hagatna, Guam 96910

Concurrently with making the payment, Defendant shall send notice of payment to U.S. EPA and DOJ, directed to the addresses provided in Section XI (Notification). The notice of payment shall also identify: (i) the specific provision of this Section VI (Stipulated Penalties) related to such payment, and (ii) a description of the violation(s) of this Consent Decree for which the stipulated penalties or interest are being tendered.

15. If the Government of Guam fails to pay stipulated penalties owed pursuant to this Consent Decree within THIRTY (30) days of receipt of U.S. EPA's written demand, the Government of Guam shall pay interest on the late payment for each day after the initial thirty day due date. The rate of interest shall be the most recent interest rate determined pursuant to 28 U.S.C. § 1961.

16. Stipulated penalties are not the Plaintiff's exclusive remedy for violations of this Consent Decree. The United States expressly reserves the right to seek any other relief it deems appropriate, including, but not limited to, action for statutory penalties, contempt, or injunctive relief against the defendant.

VII. SUPPLEMENTAL ENVIRONMENTAL PROJECT

17. In partial satisfaction of Plaintiff's claims, the Government of Guam shall perform and complete the Supplemental Environmental Project ("SEP") set forth in Appendix C, which has the objective of securing significant environmental or public health protection and improvements. The Government of Guam shall complete the SEP in accordance with the

1 schedule and requirements set forth in Appendix C. The SEP shall be completed by March 2007.

2 The SEP shall develop and implement a comprehensive waste diversion strategy for household
3 hazardous waste on Guam.

4 18. The total expenditure for the SEP shall be not less than the present value of
5 \$1,000,000. The Government of Guam shall include documentation of the expenditures made in
6 connection with the SEP as part of the SEP Completion Report described in Paragraph 21 below.

7 In the event that the Government of Guam fails to perform and complete the SEP as set forth in
8 Appendix C, it shall, in the same manner as set forth in Paragraph 14, pay a civil penalty to the
9 United States equal to the difference between the sum of \$1,000,000 and the total SEP costs that
10 the Government of Guam has incurred and itemized according to the requirements set forth in
11 Paragraph 21.

12 19. The Government of Guam is responsible for the satisfactory completion of the SEP
13 in accordance with the requirements of this Decree. The Government of Guam may use
14 contractors and/or consultants in planning and implementing the SEP.

15 20. The Government of Guam hereby certifies that, as of the date of this Consent
16 Decree, it is not required by any federal, state or local law or regulation to perform or develop the
17 SEP; nor is the Government of Guam required by agreement, grant or as injunctive relief in this or
18 any other case to perform or develop the SEP. The Government of Guam further certifies that it
19 has not received, and is not presently negotiating to receive, credit in any other enforcement action
20 for the SEP; nor will the Government of Guam realize any profit attributable to or associated with
21 the SEP, or receive any reimbursement for any portion of the SEP from any other person.

22 21. SEP Completion Report. The Government of Guam shall complete the SEP by
23 March 2007. The Government of Guam shall submit a SEP Completion Report to the United
24 States within thirty (30) days after completion of the SEP. The SEP Completion Report shall
25 contain the following information:

26 a. A detailed description of the SEP as implemented;

- b. A description of any implementation problems and the solutions thereto;
- c. An itemization of all SEP costs and acceptable evidence of such costs;
- d. Certification that the SEP has been completed pursuant to the provisions of this Consent Decree, including Appendix C;
- e. A description of the environmental and public health benefits resulting from implementation of the SEP (with a quantification of the benefits and pollutant reduction to the extent feasible); and
- f. Copies of any training materials, brochures, databases, or software relating to the SEP.

22. Periodic Reports. While the SEP is being planned and implemented, the Government of Guam shall submit quarterly reports to U.S. EPA describing the progress of the SEP within twenty-one (21) days after the end of each Calendar Quarter.

23. Following receipt of the SEP Completion Report described in Paragraph 21 above, U.S. EPA will do one of the following in writing:

- a. Accept the SEP Completion Report; or
- b. Reject the SEP Completion Report, notifying Government of Guam in writing of deficiencies in the SEP Completion Report. If U.S. EPA rejects SEP Completion Report, the Government of Guam shall have thirty (30) days from the date of receipt of U.S. EPA's notice in which to correct any deficiencies and submit a revised SEP Completion Report. If U.S. EPA rejects a revised SEP Completion Report, it shall notify the Government of Guam about the rejection. The Government of Guam shall be subject to stipulated penalties in accordance with Paragraph 12(c) herein for each day after receipt of U.S. EPA's notice of rejection of the revised SEP Completion Report until an acceptable SEP Completion Report is submitted to U.S. EPA.

24. If U.S. EPA rejects the SEP Completion Report pursuant to Paragraph 23(b), U.S. EPA shall permit the Government of Guam the opportunity to object in writing to the notification

of deficiency within ten (10) days of receipt of such notification. U.S. EPA and the Government of Guam shall have an additional thirty (30) days from the receipt by U.S. EPA of the notification of objection to reach agreement relating to U.S. EPA's notice of deficiency. If agreement cannot be reached on any issue in the notice of deficiency within this thirty (30) day period, U.S. EPA shall thereafter provide a written statement of its decision to the Government of Guam, which decision shall be final and binding. Any such decision shall not be subject to Dispute Resolution. The Government of Guam agrees to comply with any SEP-related requirements imposed by U.S. EPA's written decision.

25. If upon receipt of the SEP Completion Report, U.S. EPA determines in its sole discretion that part or all of the SEP has not been implemented in accordance with this Consent Decree, including Appendix C, and any statements of work, U.S. EPA may require the Government of Guam: (1) to repeat any deficient tasks; or (2) if specific tasks set forth in Appendix C were not performed at all, to perform such tasks. U.S. EPA shall provide any such requirement to the Government of Guam in writing.

26. The Government of Guam bears the burden of segregating eligible SEP costs from costs not eligible for SEP credit. Any non-segregable cost evidence (i.e., containing both eligible SEP costs and costs not eligible for SEP credit) shall be disallowed in its entirety. "Acceptable evidence" includes invoices, purchase orders, or other documentation that specifically identifies and itemizes the individual costs of the goods or services for which payment is made. Cancelled drafts are not acceptable evidence unless such drafts specifically identify and itemize the individual costs of the goods or services for which payment is made. Each submission required under this Section shall be signed by an official with knowledge of the SEP and shall bear the certification language set forth in Paragraph 42 below.

27. The Government of Guam hereby agrees that if, in estimating the cost of the SEP, it did not subtract the estimated savings achieved from deducting the cost of each SEP in calculating state and federal taxes, any funds expended by the Government of Guam in the

performance of each SEP shall not be deductible for purposes of such taxes. The Government of
2 Guam, at the time of completion of the SEP, shall submit to the United States written certification
3 that any funds expended in the performance of each SEP have not been and will not be deducted
4 for purposes of such taxes.

5 28. In the event the Government of Guam does not spend the present value attributed
6 to a SEP pursuant to Paragraph 18 above, the Government of Guam shall perform additional work
7 on the SEP, as set forth in Appendix C, such that the total expenditures on the SEP equals or
8 exceeds the required present value of the SEP. If the Government of Guam performs the
9 additional work as required by this Paragraph, it shall not be subject to the civil penalty set out in
10 Paragraph 18.

11 29. Any public statement, oral or written, in print, film, or other media made by the
12 Government of Guam making reference to the SEP shall include the following language, "This
13 project was undertaken in connection with the settlement of a civil enforcement action taken by
14 the United States for violations of the Clean Water Act."

15 VIII. RIGHT OF ENTRY

16 30. U.S. EPA and its contractors and consultants shall have the authority to enter Ordot
17 Dump and any facility related to the SEP at all reasonable times, upon proper presentation of
18 credentials. This provision in no way limits or otherwise affects any right of entry held by U.S.
19 EPA pursuant to applicable federal or territorial laws, regulations, or permits.

20 IX. FORCE MAJEURE

21 31. The Government of Guam shall perform all requirements of this Consent Decree in
22 accordance with the time schedules set forth except to the extent, and for the period of time, that
23 such performance is prevented or delayed by events which constitute a force majeure. The
24 schedule set forth in Paragraph 9 above for the construction of a new municipal solid waste
25 landfill is not based on, or dependent upon, the existence of any contractual arrangements the
26 Government of Guam may or may not have, now or in the future, for the construction and

operation of a new landfill or incinerator.

2 .32. For the purposes of this Consent Decree, a force majeure is defined as any event
3 arising from causes beyond the control of the Government of Guam and that cannot be overcome
4 by diligent and timely efforts of the Government of Guam, including its contractors. Economic
5 hardship, normal inclement weather, and increased costs of performance shall not be considered
6 events beyond the reasonable control of the Government of Guam for purposes of determining
7 whether an event is force majeure. The requirement that the Government of Guam exercise
8 diligent and timely efforts to fulfill its obligations includes using best efforts to anticipate any
9 force majeure event and best efforts to address the effects of any potential force majeure event
10 (1) as it is occurring and (2) following the potential force majeure events, such that delay is
11 minimized to the greatest extent possible.

12 .33. In the event of a force majeure, the time of performance of the activity delayed by
13 the force majeure shall be extended by U.S. EPA for the time period of the delay attributable to
14 the force majeure. An extension of one compliance date based on a particular incident does not
15 necessarily result in an extension of a subsequent compliance date or dates. The Government of
16 Guam must make an individual showing of proof regarding each delayed incremental step or other
17 requirement for which an extension is sought. The Government of Guam shall adopt all
18 reasonable measures to avoid or minimize any delay caused by a force majeure.

19 .34. When an event occurs or has occurred that may delay or prevent the performance
20 of any obligation under this Consent Decree, the Government of Guam shall notify by telephone
21 the Manager, Pacific Islands Office, Region 9, (415) 972-3774, or the Guam Program Manager,
22 Pacific Islands Office, Region 9, (415) 972-3770, within 72 hours of Government of Guam's
23 knowledge of such event. Telephone notification shall be followed by written notification made
24 within SEVEN (7) days of Government of Guam's knowledge of the event. The written
25 notification shall fully describe: the event that may delay or prevent performance; reasons for the
26 delay; the reason the delay is beyond the reasonable control of the Government of Guam if Guam

believes the event constitutes a force majeure; the anticipated duration of the delay; actions taken or to be taken to prevent or minimize the delay; a schedule for implementation of any measures to be taken to mitigate the effect of the delay; and the time needed to implement any dependent activities. For purposes of this Section, the Government of Guam shall be deemed to have knowledge of anything it or its contractors knew or should have known.

35. Failure of the Government of Guam to comply with the force majeure notice requirements provided in Paragraph 34 for any delay in performance will be deemed an automatic forfeiture of its right to assert that the delay was caused by a force majeure.

36. After receiving written notification from the Government of Guam of a force majeure, U.S. EPA shall determine whether the Government of Guam's request for delay is justified and U.S. EPA shall notify the Government of Guam of its determination in writing. U.S. EPA's failure to respond within THIRTY (30) days to a request for delay by the Government of Guam shall be deemed a denial of that request. If the Government of Guam disagrees with U.S. EPA's determination, the Government of Guam may initiate dispute resolution procedures pursuant to Section X (Dispute Resolution).

37. The Government of Guam shall bear the burden of proving that any delay or violation of any requirement of this Consent Decree was caused by circumstances beyond its control, or any entity under its control, including consultants and contractors, and that the Government of Guam could not have reasonably foreseen and prevented such violation. The Government of Guam shall also bear the burden of proving the duration and extent of any delay or violation attributable to such circumstances.

X. DISPUTE RESOLUTION

38. The Dispute Resolution procedures of this Section shall be the exclusive mechanism to resolve disputes arising under or with respect to the Consent Decree. However, the procedures set forth in this Section shall not apply to actions by the United States to enforce obligations by the Government of Guam under this Consent Decree that have not been disputed in

accordance with this Section.

2 39. If the Government of Guam disputes any determination made by U.S. EPA under
3 this Consent Decree, the Government of Guam shall send a written notice to U.S. EPA and DOJ
4 outlining the nature of the dispute, submitting all supporting information and document relating to
5 the dispute, describing its proposed resolution, and requesting informal negotiations to resolve the
6 dispute. Such period of informal negotiations shall not extend beyond FIFTEEN (15) days from
7 the date when notice was received by U.S. EPA and DOJ unless the parties agree otherwise in
8 writing.

9 40. If the informal negotiations are unsuccessful, the disputed determination by U.S.
10 EPA shall control, unless the Government of Guam files a motion with this Court for dispute
11 resolution. Any such motion must be filed within TWENTY (20) days after termination of
12 informal negotiations and must be concurrently sent to U.S. EPA and DOJ. The United States
13 shall then have THIRTY (30) days to respond to the Government of Guam's motion. In any such
14 dispute resolution proceeding, the Government of Guam bears the burden of proving that U.S.
15 EPA was arbitrary and capricious.

16 XI. NOTIFICATION

17 41. Except as otherwise specifically stated, all notices and submissions from the
18 Government of Guam to U.S. EPA required by this Consent Decree shall be sent via express mail
19 or similar service with a return receipt requested, or, in the alternative, by both fax and e-mail, and
20 addressed to:

21 Manager, Pacific Islands Office (CMD-6)
22 U.S. Environmental Protection Agency, Region 9
23 75 Hawthorne Street
24 San Francisco, CA 94105
25 Fax: (415) 947-3560
26 e-mail: machol.ben@epa.gov

27 42. All notices and submissions to U.S. EPA shall be signed and affirmed by a
28 responsible official of the Government of Guam using the following certification

statement:

2 I certify under penalty of law that I have examined and am familiar with the information
3 submitted in this document and all attachments and that this document and its attachments
4 were prepared either by me personally or under my direction or supervision in a manner
5 designed to ensure that qualified and knowledgeable personnel properly gathered and
6 presented the information contained therein. I further certify, based on my personal
7 knowledge or on my inquiry of those individuals immediately responsible for obtaining the
8 information, that the information is true, accurate, and complete. I am aware that there are
9 significant penalties for submitting false information, including the possibility of fines and
10 imprisonment for knowing and willful submission of a materially false statement.

11 43. All notices and submissions to the Government of Guam required by this Consent

12 Decree shall be sent to:

13 Attorney General of Guam
Guam Judicial Center, Suite 2-200E
120 West O'Brien Drive
Hagatna, Guam 96910
15 Fax: (671) 472-2493
e-mail: law@mail.justice.gov.gu

16
17 Director, Department of Public Works
542 North Marine Drive
Tarnuning, Guam 96911
18 Fax: (671) 649-6178
e-mail: dpwdir@mail.gov.gu

19
20 Administrator, Guam Environmental Protection Agency
15-6101 Mariner Avenue
Tiyán, Guam 96913
21 Fax: (671)-477-9402
e-mail: fcastro@guamepa.govguam.net

22
23 44. All notices and submissions to DOJ required by this Consent Decree shall be sent

24 to:

United States Attorney
District of Guam
Sirena Plaza
108 Hernan Cortez Ave., Suite 500
Hagatna, Guam 96910
Fax: (671) 472-7215
e-mail: mikel.schwab@usdoj.gov

Section Chief, Environmental Enforcement Section
D.J. Ref 90-5-1-1-06658 (Mullaney)
U.S. Department of Justice
301 Howard Street, Suite 1050
San Francisco, CA 94105
Fax: (415) 744-6476
e-mail: robert.mullaney@usdoj.gov

XII. MISCELLANEOUS

45. Entry of this Consent Decree and compliance with the requirements herein shall be in full settlement and satisfaction of the civil judicial claims of the United States against the Government of Guam as alleged in the Complaint filed in this action through the date of the lodging of this Consent Decree. This Consent Decree in no way relieves the Government of Guam of any criminal liability.

46. Nothing in this Consent Decree shall limit the ability of the United States to enforce any and all provisions of applicable federal laws and regulations for any violations unrelated to the claims in the Complaint or for any future events that occur after the date of lodging of this Consent Decree.

47. The United States does not guarantee that implementing the relief described in this Consent Decree will ensure compliance with the Clean Water Act. This Consent Decree in no way affects the Government of Guam's responsibilities to comply with all applicable federal and territorial laws and regulations.

48. Except as specifically provided herein, the United States does not waive any rights or remedies available to it for any violation by the Government of Guam of federal and territorial laws and regulations.

49. Except as provided herein, each party shall bear its own costs and attorney's fees in

1 this action. Should the Government of Guam subsequently be determined to have violated the
2 terms and conditions of this Consent Decree, then the Government of Guam shall be liable to the
3 United States for any costs and attorney's fees incurred by the United States in any actions against
4 it for noncompliance with this Consent Decree.

5 50. This Consent Decree contains the entire agreement between the parties and no
6 statement, promise, or inducement made by any of the parties or agent of the parties that is not
7 contained in this written Consent Decree shall be valid or binding, and this Consent Decree may
8 not be enlarged, modified, or altered except by using procedures described in this Consent Decree.

9 51. The Attorney General of the Government of Guam and the Assistant Attorney
10 General for Environmental and Natural Resources Division of the Department of Justice each
11 certify that he is fully authorized to enter into the terms and conditions of this Consent Decree, to
12 execute the document, and to legally bind the party he represents to this document.

13 52. The Government of Guam shall identify, on the attached signature page, the name,
14 address and telephone number of an agent who is authorized to accept service of process by mail
15 on behalf of that party with respect to all matters arising under or relating to this Consent Decree.
16 The Government of Guam hereby agrees to accept service in that manner and to waive the formal
17 service requirements set forth in Rule 4 of the Federal Rules of Civil Procedure and any
18 applicable local rules of this Court, including, but not limited to, service of summons.

19 XIII. RECORD RETENTION

20 53. In addition to any state or federal requirements relating to record retention, the
21 Government of Guam shall retain at least one legible copy of all records, documents, reports or
22 plans required by its permit or which relate to its performance under any provision of this Consent
23 Decree and any documentation which the Government of Guam relied on in preparing such
24 records, documents, reports or plans, for a period of five (5) years from the date of such record,
25 document, report, or plan, or underlying documentation, or until two (2) years after termination of
26 this Consent Decree, whichever is later.

1 54. Not less than sixty (60) days prior to destruction of any reports or documents
2 created pursuant to the requirements of this Consent Decree and any documents used to create
3 such submittals, the Government of Guam shall notify the U.S. EPA and DOJ in writing, as
4 provided in Section XI, that destruction of documents is planned and make such records available
5 to the United States for inspection, copying or retention. This notification will identify the nature
6 of the documents and their storage location or locations. The Government of Guam shall not
7 claim that any such reports or documents are confidential or privileged.

8 55. Within fifteen (15) days of a written request from the United States, the
9 Government of Guam shall provide the United States with copies of the documentation
10 underlying any document, report or plan submitted pursuant to this Consent Decree, or any
11 documents, reports or plans retained pursuant to Paragraph 53.

12 XIV. TERMINATION

13 56. This Consent Decree shall remain in effect until the later of: (1) one year after the
14 Government of Guam completes all activities contained in Sections III, IV, and VII; or (2) the
15 resolution of any matters pending in this Court regarding this Consent Decree.

16 57. If the Government of Guam believes that the requirements of Paragraph 56 have
17 been met, the Government of Guam may request that the United States make a determination that
18 this Consent Decree may be terminated. Any such request shall be in writing and include a
19 certification that the applicable requirements have been met.

20 58. If the United States agrees that the requirements of Paragraph 56 have been met,
21 the United States will notify the Government of Guam and the Court that the Consent Decree has
22 terminated.

23 59. Until termination of this Consent Decree, the Court shall retain jurisdiction to
24 handle any disputes that arise under this Consent Decree.

25 60. The parties agree to the foregoing Consent Decree and agree that the Consent
26 Decree may be entered upon compliance with the public notice procedures set forth at 28 C.F.R.

1 § 50.7, which states that the public shall have THIRTY (30) days to comment on this Consent
2 Decree, and upon notice to this Court from DOJ requesting entry of this Consent Decree. The
3 United States reserves its right to withdraw consent to this Consent Decree based upon comments
4 received during the public notice period. The Government of Guam consents to entry of this
5 Consent Decree without further notice to the Court.

6 **XV. MODIFICATION.**

7 61. There shall be no material modifications of this Consent Decree without the
8 written approval of the parties to this Consent Decree and the approval of the Court. All non-
9 material modifications, which may include extensions of the time frames and schedules for
10 performance of the terms and conditions of this Consent Decree and certain modifications to the
11 attachments, may be made by agreement of the parties and shall be effective upon filing by the
12 United States of such modifications with the Court.

13 **XVI. FINAL JUDGMENT**

14 62. Upon approval and entry of this Consent Decree by the Court, the Consent Decree
15 shall constitute a final judgment pursuant to Federal Rules of Civil Procedure 54 and 58.

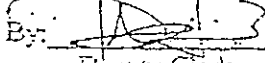
16 **ORDER**

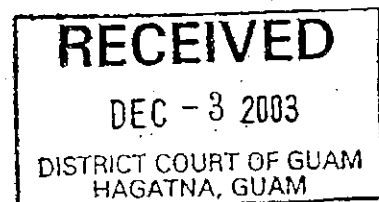
17 IT IS SO ORDERED this 11th day of February, 2003.

18 
19
20 United States District Judge

21
22
23
24 Notice is hereby given that this document was
entered on the docket on 02/12/04.
25 No separate notice of entry on the docket will
be issued by the Court.

26 Mary L. M. Moran
Clerk, District Court of Guam

27 By:  02/12/04
28 Deputy Clerk Date



For the United States of America, Plaintiff:

Dated: 11/7/03

Kelly A. Johnson
~~THOMAS L. SANSONETTI~~
Acting Assistant Attorney General
Environment & Natural Resources Division
ROBERT D. MULLANEY
Environmental Enforcement Section
Environment & Natural Resources Division
United States Department of Justice

LEONARDO M. RAPADAS
United States Attorney
Districts of Guam and NMI
(671) 472-7332

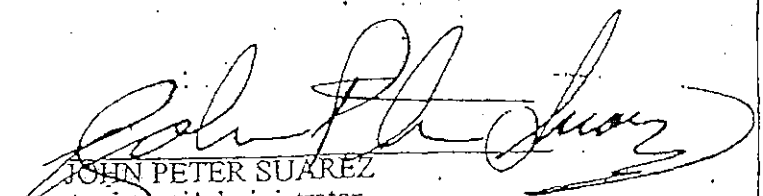
Dated: 11/26/03

[Signature]
MIKEL W. SCHWAB
Assistant U.S. Attorney

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Dated: 11/20/03


JOHN PETER SUAREZ
Assistant Administrator
for Enforcement
U.S. Environmental Protection Agency

2 Dated: 11/05/03

Wayne NASTRI
3 WAYNE NASTRI
4 Regional Administrator
U.S. Environmental Protection
Agency, Region 9

5 OF COUNSEL:

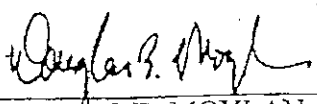
6 JULIA JACKSON
Assistant Regional Counsel
7 U.S. Environmental Protection Agency
75 Hawthorne Street
8 San Francisco, CA 94105

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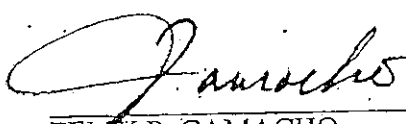
For the Government of Guam, Defendant:

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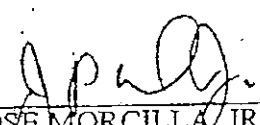
Dated: 10/20/03


DOUGLAS B. MOYLAN
Attorney General of Guam
Guam Judicial Center, Suite 2-200E
120 West O'Brien Drive
Hagatna, Guam 96910
(671) 475-3324

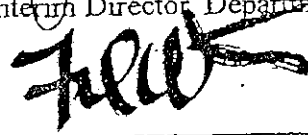
Dated: 10/21/03


FELIX P. CAMACHO
Governor of Guam

Dated: 10/20/03


JOSE MORCILLA, JR.
Interim Director, Department of Public Works

Dated: 10/20/03


FRED CASTRO
Administrator
Guam Environmental Protection Agency

Agent for service of process:

Douglas B. Moylan
Attorney General of Guam
Guam Judicial Center, Suite 2-200E
120 West O'Brien Drive
Hagatna, Guam 96910
(671) 475-3324

APPENDIX B.

**Municipal Solid Waste Landfill (Guam)
Site Evaluation Report and
USEPA Approval Letter**

**Municipal Solid Waste Landfill (Guam)
Site Evaluation Report**
January 28, 2005

Introduction

Seven members of the Consent Decree¹ project team from the Department of Public Works (DPW) and Guam Environmental Protection Agency (GEPA) were empanelled as a Landfill Site Evaluation Team (LSET). The LSET reviewed the Preliminary Site Selection Report (PSSR)² and related information to evaluate three candidate sites as required by paragraph 9.a. of the Consent Decree during the week of January 24, 2005. Initial efforts to site a new landfill began in February of 2004 with the Preliminary Landfill Site Suitability study conducted by GEPA and DPW.

This report summarizes the efforts of the LSET to identify a preferred landfill site based on the relevant available scientific and technical data from preliminary site investigations, existing studies, and stakeholder input. This site evaluation is an integral component of the Environmental Impact Statement for the siting of a Municipal Solid Waste Landfill Facility (MSWLF) in Guam.

The primary goal in siting a MSWLF is to select a location which will pose the least environmental impact to onsite resources, adjacent properties, to the host community, and regionally. Impacts to the human, biological and physical environment, including infrastructure, were assessed by applying thirty-nine environmental/landfill development siting criteria to each candidate site.

The results of this evaluation are summarized as total scores and rank order in the table below. The LSET determined that the Dandan candidate site located in the Municipality of Inarajan is best suited for the development of a MSWLF. A decision on the location of Guam's new MSWLF will be made by the Director of DPW with the concurrence of the Administrator of GEPA and approval by the U.S. Environmental Protection Agency.

Evaluation Process

The LSET evaluation process involved a four-step facilitated discussion format:

¹ Civil Case No. 02-00022 Consent Decree U.S. District Court Territory of Guam

² Preliminary Site Selection Report Environmental Impact Statement For the Siting of a Municipal Solid Waste Landfill Facility, Guam January 11, 2005

1. Review the PSSR and final technical amendments - Much of the PSSR review occurred prior to the team meetings; however, expanded explanations by certain team experts were provided for the benefit of all members. There were some minor technical amendments to the PSSR involving terminology in the archaeological/historical sections of the report provided by the project consultants.
2. Review & consider public input from village meetings - The project consultants also prepared a PSSR Comment Summary³ document of the final round of village meetings and other input from the two week comment period.
3. Review recommended siting criteria & importance weighting - Two (2) criteria were combined and two (2) criteria importance weights were modified. The LSET also clarified that "sensitive receptors"⁴ should include both human and wildlife considerations. The LSET revisited a number of transportation infrastructure (primary and secondary road improvements, bridge projects, secondary road requirements, etc.) as well as integrated solid waste management (i.e., transfer stations, recycling, etc.) issues critical to support each of the candidate sites.
4. Consider consensus issues & criteria - As a result of the LSET criteria and importance weighting review, it was decided that twelve (12) of the forty (40) site evaluation criteria described in the PSSR could be equalized to ensure consistency, where warranted (i.e., scored by consensus).

The LSET also further discussed a number of transportation assumptions necessary for any of the three candidate sites, including that there will be no direct self-hauling of waste, highway improvements would be made using Federal Highway Administration funding and program flexibility, transfer stations would be developed, and transportation of waste could be strategically scheduled to occur during off-peak traffic hours.

These deliberations were followed by individual assessments and independent scoring of the sites. All members of the LSST participated throughout.

³ PSSR Comment Summary, Duenas & Associates, Inc.

⁴ see PSSR Site Evaluation Criteria No. 22. Wind Direction to abutting properties and No. 38. Proximity to Sensitive Receptors

Results

The LSET completed the evaluation component of its work by requiring that each member evaluate and formally score the three candidate sites and that the cumulative points assigned would determine the final rank. The site given the highest total points would be ranked as the best potential landfill site. The following table summarizes the evaluation results.

Table 1. Total Score and Rank of Candidate Landfill Sites

Site	Dandan	Sabanán.Batea	Lonfit
Total Score	2552	2094	1898
Rank	1	2	3

Landfill Site Evaluation Team (LSET)


C. Omar Damian, E.I.T. Project Manager, GEPA

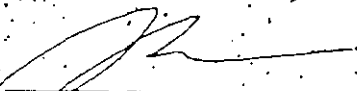
1/31/05

Date


Sonya P. Dancog, Project Engineer, DPW

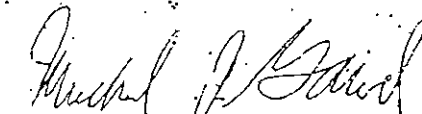
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Date


Marc A. Gagarin, P.E. Chief Engineer, DPW

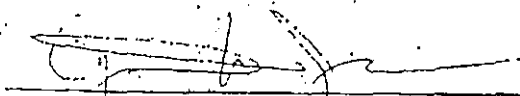
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Date


Michael J. Gawel, Acting Chief Planner, GEPA

1/31/05

Date


Cynthia U. Jackson, Project Manager, DPW

1/31/05

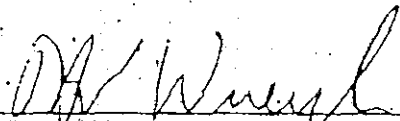
Date



Christopher A. Lund, P.E. Chief Engineer, GEPA

1-31-05

Date



H. Victor Wuerch, Hydrogeologist GEPA

Jan. 31, 2005

Date

Prepared by:



Randel L. Sablan, LSET Facilitator

Jan. 31, 2005

Date

MSWLF Site Evaluation (Master)

SITING CRITERIA	DANDAN	SABANAN BATEA	LONFIT
Geology			
CJ	69	70	58
CL	74	75	49
OD	69	75	54
MG	78	67	54
VW	83	66	49
MJG	65	75	58
SD	79	70	49
Sub-total	517	498	371
Geology			
CJ	93	75	75
CL	89	83	65
OD	93	79	79
MG	93	69	74
VW	80	84	78
MJG	93	79	65
SD	88	79	74
Sub-total	629	548	510
Geology			
CJ	65	47	45
CL	69	43	41
OD	61	47	55
MG	69	43	39
VW	69	45	39
MJG	57	47	43
SD	59	51	47
Sub-total	449	323	309
Transportation			
CJ	27	37	24
CL	34	37	29
OD	15	45	41
MG	29	29	26
VW	15	39	41
MJG	15	45	30
SD	24	30	35
Sub-total	159	262	226

DPW1	118	50	73
GEPA1	114	63	71
GEPA2	100	64	80
DPW2	118	54	81
GEPA3	118	75	65
GEPA4	112	81	57
DPW3	118	76	55
Sub-total	798	463	482

Grand Total	2552	2094	1898
Rank	1	2	3



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 9
75 Hawthorne Street (CMD-6)
San Francisco, CA 94105

February 14, 2005

Via Email and Facsimile

Joseph W. Duenas, Director
Department of Public Works
542 North Marine Drive
Tamuning, GU 96911

Re: U.S. EPA Acceptance of DPW's Preferred Landfill Site

Dear Mr. Duenas:

At this time the Environmental Protection Agency, Region 9 (EPA) is recognizing that the Department of Public Works (DPW) has met its obligations under Paragraph 9.a. of the Consent Decree. This letter notifies you that EPA accepts the Government of Guam's preferred landfill site, Dandan.

Under Paragraph 9.a. of the Consent Decree, DPW shall, within 300 days: a) complete an Environmental Impact Statement (EIS) that includes a detailed analysis and comparison of at least three potential landfill sites and b) identify a preferred landfill site. As discussed in Fred Castro's letter of August 5, 2004, the EIS process now consists of two distinct phases, a site selection process followed by a more detailed analysis of mitigation options for the selected site. As noted in EPA's November 30, 2004 letter, EPA determined that DPW would comply with Paragraph 9.a. of the Consent Decree when it identified a preferred site alternative after the first phase of the EIS. Based on the August 5, 2004 letter, this would occur after the Preliminary Site Selection Report is: a) made available to the public, b) presented at three public meetings, and c) reviewed by the Technical Advisory Committee.

On January 31, 2005, DPW submitted, via fax, a letter announcing that the Government of Guam has selected Dandan, in the village of Inarajan, as the preferred location. The fax also included a summary of comments received during the public comment period, amendments to the Preliminary Site Selection Report, and a site evaluation report. The material presented with the fax, in addition to the original Preliminary Site Selection Report dated January 11, 2005, demonstrates that DPW and Guam EPA were very thorough in their evaluation of the three sites.

EPA recently received a draft petition supporting the elimination of Dandan as a potential landfill site. The draft petition raises issues similar to those discussed in the public comment period and subsequently addressed, namely: water resource concerns, existing local laws, mitigation costs, roadway constraints, tourism impacts, and effects on quality of life. While there may be concerns of a similar or greater magnitude for landfill sites anywhere on Guam (e.g., above the Northern aquifer, on active faults, on sites with poor soil characteristics), these comments remind us all of the heavy burden that DPW and Guam EPA face. The Government of Guam is tasked

with the very difficult duty of ensuring that the new landfill is properly planned (including mitigation), constructed, and, ultimately, maintained. To ensure success, Guam must similarly develop and implement a comprehensive solid waste plan that integrates collection, transfer, processing, recycling, composting, and all other aspects of solid waste management. Only with an effort of this magnitude can Guam ensure that: 1) the new landfill will not devolve into the next Ordot Dump, 2) the residents of Inarajan will not be overly impacted by Guam's siting decision, and 3) the new landfill will last for many years to come.

With the above considerations in mind, EPA finds that DPW and Guam EPA have conducted a detailed analysis and comparison of three sites, and have met their commitments for the first phase of the EIS. Therefore, EPA accepts DPW's decision to select Dandan as the site of the new municipal solid waste landfill. We expect that DPW and Guam EPA will proceed to analyze mitigation options for the Dandan site under the second phase of the EIS, and submit a draft plan for design, construction, and operation of the new municipal solid waste landfill pursuant to Paragraph 9.c. of the Consent Decree.

Please call me at (415) 972-3770 if you would like to discuss this matter further.

Sincerely,



Ben Machol
Guam Program Manager, P.E.

cc: Douglas Moylan, Attorney General of Guam
Fred Castro, Guam EPA Administrator
Mikel Schwab, Assistant U.S. Attorney

11/14/11

APPENDIX C

Draft Supplemental EIS Comment Summary

11/14/11

Draft Supplemental EIS for the Siting
of a Municipal Solid Waste Landfill Facility
Comment Summary
July 15, 2005

The public comment for the Draft Supplemental Environmental Impact Statement (SEIS) for the siting of a new municipal solid waste landfill facility was open from May 18 through June 16, 2005. The Draft SEIS was posted on the project Web site <http://www.guamlandfill.org>, and hard copies of the report were deposited at the Ordot-Chalan Pago and Inarajan Mayors' Offices, Guam Environmental Protection Agency, Guam Department of Public Works, Duenas & Associates, Inc., and the Nieves M. Flores Memorial Library in Hagatna. Hard or electronic copies of the report were provided to the following resource agencies: U.S. EPA, the State Historic Preservation Officer (Department of Parks & Recreation-Historic Resources Division), Bureau of Statistics and Plans-Guam Coastal Management Program, Department of Land Management, Department of Agriculture (Division of Aquatic & Wildlife Resources), Department of Agriculture (Forestry Division), U.S. Army Corps of Engineers (Guam Regulatory Branch) and U.S. Fish & Wildlife Service. In addition, copies were also provided to Guam Waterworks Authority, Guam Power Authority, and Water and Environmental Research Institute (WERI) for review. Members of the public were provided electronic copies on CD-ROM on an individual basis by request. Several means of submitting comments were available to the public, i.e., through the Web site, U.S. Postal Service, hand-delivery, voice mail, or facsimile. Written comments were also accepted through a comment box at the public meeting. Notice for the public meeting, availability of the DSEIS and comment period was published twice in the Pacific Daily News, and announced through a press release to the local media.

The project team and the Government presented the information in the DSEIS and solicited oral and written comments at a public meeting held on May 24, 2005 at the Inarajan Mayor's Office. The project team presenters comprised Mr. John Duenas (Duenas & Associates, Inc.), Mr. Thomas Knox (Black & Veatch), and Ms. Tracy Layfield (EA Engineering). Mr. Larry Perez, Director of Public Works, moderated during the oral comment period. Responses to oral comments were provided by these individuals and Mr. Fred Castro, Administrator of Guam EPA. Thirty-eight people signed the attendance log at the public meeting; however, more attendees were present who chose not to sign in. Oral comments were received from 17 people at the public meeting (Table C-1). The project team and Government provided immediate responses to oral comments and questions during the meeting. Five written comments were received from the general public during the public comment period; one oral comment was submitted via voice mail. The Bureau of Statistics and Plans was the only resource agency to comment on the Draft SEIS (see Appendix D). The Guam Waterworks Authority submitted comments with Brown and Caldwell, the GWA consultant on the Guam Water Master Plan.

Most of the comments may be grouped in the following categories: surface/groundwater hydrology; infrastructure improvements/landfill design; alternative waste management.

(recycling); host community benefits; alternative sites (Ordot Dump, Guatali); sensitive receptors; and feelings of the host community.

As in previous public meetings and during the public scoping period, several commentors expressed concern that the siting of the landfill in Dandan would impact the Inarajan and Ugum watersheds, and the municipal potable water supply for southern residents. Since potential impacts to the surface and groundwater hydrology have been continual concerns throughout the EIS process, the project team focused considerable efforts on generating conceptual design alternatives that minimize impacts to these resources. Geotechnical, hydrological and field investigations at the Dandan site, as referenced in the DSEIS, were used to develop groundwater contours and conclude that groundwater does not flow from the landfill footprint to the Ugum River; the drainage net is from the landfill footprint to the Tinago, Fensol and Fintasa Rivers.

Infrastructure improvements, in particular, the construction of adequate roads to accommodate waste haulers, were a concern of a few commentors. Road improvements to support the landfill are being addressed by Department of Public Works through the reprogramming of funds in the State Transportation Improvement Plan. Concerns regarding the potential impacts from natural disasters to the landfill have been anticipated, and will be addressed in the landfill operations plan and detailed design of the facility.

The public commented on the urgent need for recycling to divert waste from or eliminate the need for the landfill. Recycling is an integral part of the island's Solid Waste Management Plan and will factor importantly in extending the life of the landfill.

Some members of the public commented that other alternative sites should be used in place of the Dandan parcel. One suggested that Ordot Dump could continue to operate and receive waste for an additional 50 years. This alternative was examined in the DSEIS and determined to be unfeasible because closure of the dump is mandated by the Federal Consent Decree in order to address violations of the Clean Water Act. Another suggestion was to place the landfill at Guatali. This alternative was examined and eliminated from further consideration in the *Preliminary Landfill Site Suitability Report* prepared by Guam EPA in March 2004. A recent court ruling has decreed that a Guam public law designating Guatali as a landfill site is invalid.

One commentor was concerned about the proximity of the landfill to the Inarajan Middle School. A similar concern was mentioned during the public scoping period. The DSEIS analyzed the surrounding land uses and determined that there are no sensitive receptors such as residences or schools within 0.84 mile of Layon. Because of the size of the site, and distances to adjacent landowners, it appears a well designed and properly operated facility has the potential to exist in this location as a good neighbor to the community with limited, negligible impacts to nearby properties.

As described in the DSEIS, any impacts to communities within the vicinity of Layon would be offset with mitigation measures that would focus on the host community.

Possible mitigation measures to provide benefits to the host community may include, but not be limited to, providing the host community with a revenue stream as a percentage of the tipping fee, discounted waste disposal, preferential hiring in the waste management industry, special contingency funds, regular water tests and property value protection. The details of such benefits to the host community of Inarajan would be negotiated by the residents with the appropriate Government of Guam entities.

The public also commented that the feelings of the host community were not considered in the selection of the Dandan site. In the preparation of the DSEIS, the project team reviewed the Public Scoping Report and other written or oral comments subsequently received throughout the EIS process. The site selection and EIS process represents an objective evaluation of potential environmental impacts from the siting of a municipal solid waste landfill facility.

Public Meeting Attendees

Roman L.G. Quinata
Alfred S.N. Flores
Michael Jury
Jose Chargualaf
L.T. Perez
Tony Carbullido
John Raymond N. Aguon
Frank Taitague
Cole Herndon
Loretta C. Rollins
Mayor P. Paulino
Daniel Chargualaf
William W. Weare
Peggy Denney
Tor Gudmundsen
Bob Perron
Barbara F. Torres
Toraj Ghofrani
Robert Shambach

Chip Brown
Frank Barranco
Sarah Ridgway
David L.G. Shimizu
Helen Kennedy
Juan T. Mendiola
A.B. Palacios
Eduardo Paulino
Katie W.
Ric E.
Judy Flores
Juan Flores
Jason T. Paulino
A. Diego
Betwin Alokoo
Rose Farrell Sizemore
Trini Torres
Angel C. Santos
Amanda L.G. Santos

Lists of People who Submitted Comments
During the DSEIS Public Comment Period

Oral Comments at Public Meeting

William Weare
Jose Chargualaf
Ed Paulino
Rose Farrell Sizemore
Trini Torres
Angel Santos
John Raymond N. Aguon
Cole Herndon
Loretta C. Rollins

Palofofo Mayor Paulino
Former Mayor Roland L.G. Quinata
Alicia Diego
Florencio Ramirez
Alfred S.N. Flores
Amanda L.G. Santos
Former Senator Ted Nelson
Inarajan Mayor Franklin Taitague

Written Comments at Public Meeting

Cole Herndon

Oral Comments Via Voice Mail

Rico Joaquin Tajalle, May 25, 2005

Other Written Comments

Don Antrobus, Chief Engineer, Guam Waterworks Authority

Ramon Camacho

Jose S.N. and Lolita B. Chargualaf

Anthony P. Sanchez, Acting Director, Bureau of Statistics and Plans (See Appendix.D)

Berrie Straatman

Martin G. Steinpress, Chief Hydrologist, Brown and Caldwell

Paul Tobiason, Recycling Association of Guam

Table C-1 Summary of Oral Comments

Commentor	Comments
William Weare	<ul style="list-style-type: none"> • EIS inadequate, does not address off-site impacts • Need road for large haul trucks. • Impacts to rivers from stormwater diversion • Property not acquired, not re-zoned. • How will hydrology to wetlands be maintained? • Life span of landfill cells not indicated.
Jose Chargualaf	<ul style="list-style-type: none"> • Not a complete EIS. • Watersheds and groundwater will be impacted. Seven rivers impacted by ¾ of landfill footprint. • No money for roads. • Dandan is bad idea.
Ed Paulino	<ul style="list-style-type: none"> • Concern whether there is guarantee no contamination to water in Inarajan
Rose Farrell Sizemore	<ul style="list-style-type: none"> • Zero waste, no landfill. Reduce, reuse, recycle. • Humans produce waste, but can we produce water? • Newspaper has been biased in favor of landfill. • Not one person who attended public scoping meeting last year was in favor of Dandan site, yet no matter how many people voiced concerns, we were never heard. • Many Inarajan residents did not want landfill on Inarajan watershed because of water. • This is not an issue of NIMBY, but NOW "not on water" Inarajan and Ugum Watershed. Watersheds supply southern residents and could supply northern residents in future. Once Earth's limited supply contaminated, can science produce fresh uncontaminated drinking water? • Landfill is prime example of Corporate gain. No democratic government, this is monarchy, small group makes decisions. • Water in Inarajan area should supercede landfill.
Trini Torres	<ul style="list-style-type: none"> • Did not tell negative impact of landfill. • Did not consider host community's feelings, or island as a whole. • Did you make a comparative study? We have wet & dry season. Have you measured how much water is there when it rains heavily? • What kind of waste are we talking about? • Too many tourists. I don't want the military to build-up on Guam. Guam will bear burden of all their waste. • What benefits for the host community? Southern part of island is last to get any improvements, but you are trying to throw trash at them. • If we destroy South, will destroy culture of island. No culture in Dededo. Culture attracts tourists. • We are hiding landfill but contaminating island. • You can never reverse whatever impacted on the natural environment.

Angel Santos	<ul style="list-style-type: none"> • Ordot before landfill/dump was very beautiful. Ordot good for another 50 years.
John Raymond N. Aguon	<ul style="list-style-type: none"> • Ugum River water is sweet. Impacts to water, contamination. How many will be alive in 10 years?
Cole Herndon	<ul style="list-style-type: none"> • Other villages should pay tipping fee of host community.
Loretta C. Rollins	<ul style="list-style-type: none"> • Why 3 alternatives? • Leachate sump near river drains to river. Pressure from rivers. • Plastic liner won't last. • Earthquakes, floods, etc. on Guam will affect landfill.
Talofoto Mayor Paulino	<ul style="list-style-type: none"> • Past statement "over my dead body". • Can someone guarantee in writing that no impact? • Existing plan from previous administration to use Guatali.
Former Mayor Roland L.G. Quinata	<ul style="list-style-type: none"> • Need another Ugum or Fena-type water supply. Military will build up and Northern Guam will over-pump. Inarajan Dam closed 30 years ago, more volume than Ugum or Fena. • Separate trash and recycle.
Alicia Diego	<ul style="list-style-type: none"> • Feelings of people are important. • No words from GWA, Richard Craddock. Need an impact study for Ugum.
Florencio Ramirez	<ul style="list-style-type: none"> • Water will be contaminated.
Alfred S.N. Flores	<ul style="list-style-type: none"> • Guatali is public law. • In 1949, typhoon wiped out Ylig, Talofoto Bridges, etc. Cannot guarantee that Mother Nature will not impact landfill.
Amanda L.G. Santos	<ul style="list-style-type: none"> • Immigrants to island bring problems. Every day Chamorro people dying of cancer. We have to say no to Dandan before we lose more lives of Chamorro people.
Former Senator Ted Nelson	<ul style="list-style-type: none"> • Should have had this meeting at the Legislature. No senators, vice speaker present at tonight's meeting. • Public law says to put landfill at Guatali.
Inarajan Mayor Franklin Taitague	<ul style="list-style-type: none"> • In Table 5-1 list of concerns, put "impacts to community" under top left. Table summarizes entire community's sentiments. • Put community first.
Rico Joaquin Tajalle (Voice mail)	<ul style="list-style-type: none"> • Inarajan Middle School is right next to landfill site. You will never know that this place might turn out to look like Ordot. Dandan site is not good because it might burn. • We kids catch fish and swim in rivers. Waste will go in rivers. • The government says it will protect us, but they are showing a bad image. I'll bet this Dandan area will look like Ordot.

Duenas Associates, Inc.

From: Guam Landfill Website [admin@guamlandfill.org]
Sent: Friday, May 20, 2005 10:52 AM
To: admin@guamlandfill.org; env@dnaguam.com
Cc: admin@iconpacific.com
Subject: Guam Landfill Contact

name: Paul Tobiason
email: tobiasonp@eccomm.com
live: Ordof/Chalan Pago
live2:

comments: In the PDN Public Notice, 18.May.2005:
"...and identifies mitigation needed to offset potentially significant impacts for the development and operation of a MSWLF."

I would like to comment that reducing the volume of waste going into the landfill "and" banning certain types of material will prove to be extremely important on the operation of the MSWLF.

As there are now several recycling companies, materials such as aluminum and steel should be banned.

Especially important is food waste. This will putrify and create a terrible smell attracting flies and rodents. This aspect of waste disposal is what makes nearby residents strongly opposed to siting a landfill in their area. DPW and GEPA should try to create a solution to avoid this type of waste from entering the new landfill.

Composting this material will all the "green, vegetative" type of material may be an option.

Sincerely, Paul Tobiason
member: Recycling Assoc. of Guam
tel: 477.7579
e-mail: tobiasonp@eccomm.com

Duenas Associates, Inc.

From: Guam Landfill Website [admin@guamlandfill.org]
Sent: Monday, May 23, 2005 8:00 AM
To: admin@guamlandfill.org; env@dnaguam.com
Cc: admin@iconpacific.com
Subject: Guam Landfill Contact

name: Berrie Straatman
email: bernene@ite.net
live: Tamuning
live2:

comments: To extend the life of a new landfill it will imparative to mandate recycling and composting. Since it costs around \$45/ton (?) to operate a landfill this money could be paid to a recycler to keep waste out of the landfill or ship off-island to a material recycling facility.

Cole Herndon

5-24-2005
DRAFT SEIS PUBLIC NO
Murray's Maps OFF

Whichever village finally does take the new landfill, its residents should be made exempt from paying tipping fees and DPW monthly trash bills. All the other villages' residents should pay extra for these services to offset the village that does not pay. This will help to diffuse the feeling of being "dumped on".

May 25, 2005
200 Liang Kin Chele Ct.
Inarajan, Guam

To Whom It May Concern:

I am writing on behalf of my family. The all wanted me to write something to express their concerns regarding the Landfill at Dandan. Due to our busy schedules, we were unable to attend the public meetings. Please, take this letter very seriously as it expresses concerns of multiple residences of Inarajan and their families. We realize the need for a new landfill and are worried from previous type projects on the island (Ordot Dump).

The first concern is the possible contamination of the water supply. Several of my uncles ranch in Inarajan and fish on the surrounding coastline. They are worried that contamination from the landfill will enter the surface water (Inarajan River and watershed, Pauliluc River and watershed, and Ugum River and watershed). Livestock and wildlife will be effected and contaminates may be eaten. The proximity of the landfill to our drinking water supply (Ugum River) worries everyone greatly. I realize that if the landfill is set up and monitored properly this issue will be minimal. However, previous dumps on Guam have not followed proper procedures and regulations. How will you enforce and monitor such activities? You must put in a program to monitor the surface water daily or weekly at multiple sites and rivers around the future landfill. You should also monitor the sediments below and around the landfill for contamination on a weekly to monthly basis. These results need to be published and made available to the public similar to the beach contamination closing information given out currently.

Another big issue is that the roads will need to be widened and passing lanes will need to be added in several locations. Bridges need to be tested and re-enforced as heavier loads will continuously be using them. Roads need to be painted, marked, and signs posted, and all of this needs to maintained. Crews will need to patrol Route 4 daily to clear, bushcut, mow, remove dead animals, pick up trash, and maintain the roads properly. This all needs to be done in a timely fashion and on a regular basis.

The final worry is who is responsible. When problems or medical issues develop, who do we sue? Someone in the government needs to be pointed out as responsible or a particular company that does the work needs to similarly be addressed as a responsible party. This would put many people at ease that they will have recourse if something happens.

You need to strictly monitor the development and building the landfill on a daily basis. I have seen several examples of road construction where silt fences and other erosion controls are not always used. This is just an example of the failure of the Government of Guam (Guam EPA) in the past. So, the government needs to demonstrate and reassure the public that it has the situation monitored and under control.

You need to notify the residents of your plans for the above concerns. Send letters out with information explaining your actions. Go house-to-house, make phone calls to residents, and put materials in the media to do this.

Sincerely,
Ramon Camacho



Jose S.N. & Lolita B. Chargualaf
POB 170152, Inarajan, Guam 96917
457 San Nicolas Rd., Malojloj
TeleFax: (671) 828-1217
e-Mail: malojloj@msn.com
malojlojbov@msn.com

15 June 2005

Testimony Against Proposed Mounded Landfill in Dandan,
Municipality of Inarajan

From the very beginning of this proposed project, I (and 435+ individuals) have and will continue to stand against Guam EPA, USEPA, and DPW in proceeding to construct a super mounded landfill in Dandan. I, and most if not, the entire residents of Inarajan believe that it is very clear that this proposed project is a threat now and will be a super manmade disaster to our drinking water in the municipality of Inarajan. This site known as Leyon (Lalagon) in Dandan is the drainage basin for surface water, underground streams, wetlands and last-but not least-numerous rivers such as Tinaga, Fensu, Aslinget, Finatasa, and the Inarajan River with four tributaries. The Ugum watershed is in very closed proximity for any activity to be taking place such as the daily traffic in transporting tons after tons of trash on top of the Inarajan and Ugum watersheds.

The so-called Draft Supplemental Environmental Impact Statement (no preliminary EIS or ELA Studies) confirmed my position on the issue of major wetlands, streams, and the major rivers like Tinaga, Fensu, Finatasa, Lelansa (Inarajan Rivers) that are now showing within and around the designated buffer zone of the footprint of the site further southwest from the first location, on pamphlets issued during the first scoping meeting in Malojloj. To date, GEPA has not produced written or documented studies of the 12 initial potential sites. I requested GEPA to provide or furnish a written study as to where and how the 6 sites were rated, none provided to this date.

It is very clear now that the group who rated Dandan did not know and lacked sufficient and reliable geological and hydrological data to truly make an informed and accurate assessment of Dandan. Several employees of GEPA and DPW have no idea where and how close the Atate River (known as the Talofofu River) to the actual overlay of the proposed landfill.

The presentation of the Draft Supplemental EIS in Malojloj May 23rd, 2005 did not change or convince the residents of Inarajan even by presenting three alternatives. The real fact is that this proposed super mounded landfill, 100 plus feet (435 msl) above ground is a threat and will

be a disaster as leaks will occur and contaminate the Inarajan watersheds, wetlands, streams, and rivers (ALL LANDFILL LEAKS): The proximity of the roadways to be constructed to and from the landfill will contaminate our drinking water at the Ugum watershed through airborne pollutions, insects, flies, rodents and other creatures not known to have entered and left the landfill above or below ground.

Flooding in Dandan is a natural occurrence and with its present pristine ecosystem, it is a normal activity during the rainy season. The construction of a landfill should this risky proposed project proceed will definitely alter the natural drainage of the surface water and will displace and accelerate run-offs carrying more silts and soil into the bays of Inarajan.

Mitigating the sites around and the actual footprint of the landfill will not, and I repeat, will not prevent, and further more, will not protect the groundwater from impaired use. "The municipal solid waste "dry tomb" will be a threat effectively forever". "The liner cover and groundwater monitoring systems will not prevent leachate from being generated and leaving the landfill?". (G. Fred Lee, PhD, PE, DEE and Anne Jones-Lee, PhD.)

In summary, I submitted several documented studies, together with GEPA, DPW, and GWA Studies, in support of my strong opposition to move forward with this risky and dangerous proposed project. This is a threat to our natural resources especially our watersheds and as a very concern citizen, I will continue to do everything possible to bring this issue to other appropriate officials for further action. Water is an absolute necessity for all of us and must be protected at all cost.


Jose S.N. Chargualaf

JSNC:ibc



THIS PHOTO OF DANDAN IS FURTHER TO THE SOUTHEAST AND WEST OF THE NAMA TRADING STATION. THE PARTIAL FOOTPRINT OF THE PROPOSED LANDFILL HAS BEEN CHANGED AND SITED CLOSER TO THE AREA KNOWN AS PULUTABA HALF MILE OR LESS FROM THE NARAJAN MIDDLE SCHOOL AND THE GOURMA COMPLEX. IN THE FOREGROUND IS THE TINAGA RIVER WITH THE WETLANDS ON BOTH SIDES. THE HILL ABOVE IS CALLED MULATO HILL. ON THE OTHER SIDE OF MULATO HILL IS TERAU AND PULUTABA RIVERS. LOCATIONS OF THESE RIVERS AND SEVERAL OTHER WETLANDS, PONDS, STREAMS AND RIVERS ARE GEOGRAPHICALLY SHOWN ON THE MAPS. PHOTO BY JOSE CHARGUALAF 9/19/04

Correction Mulato to Asmulato

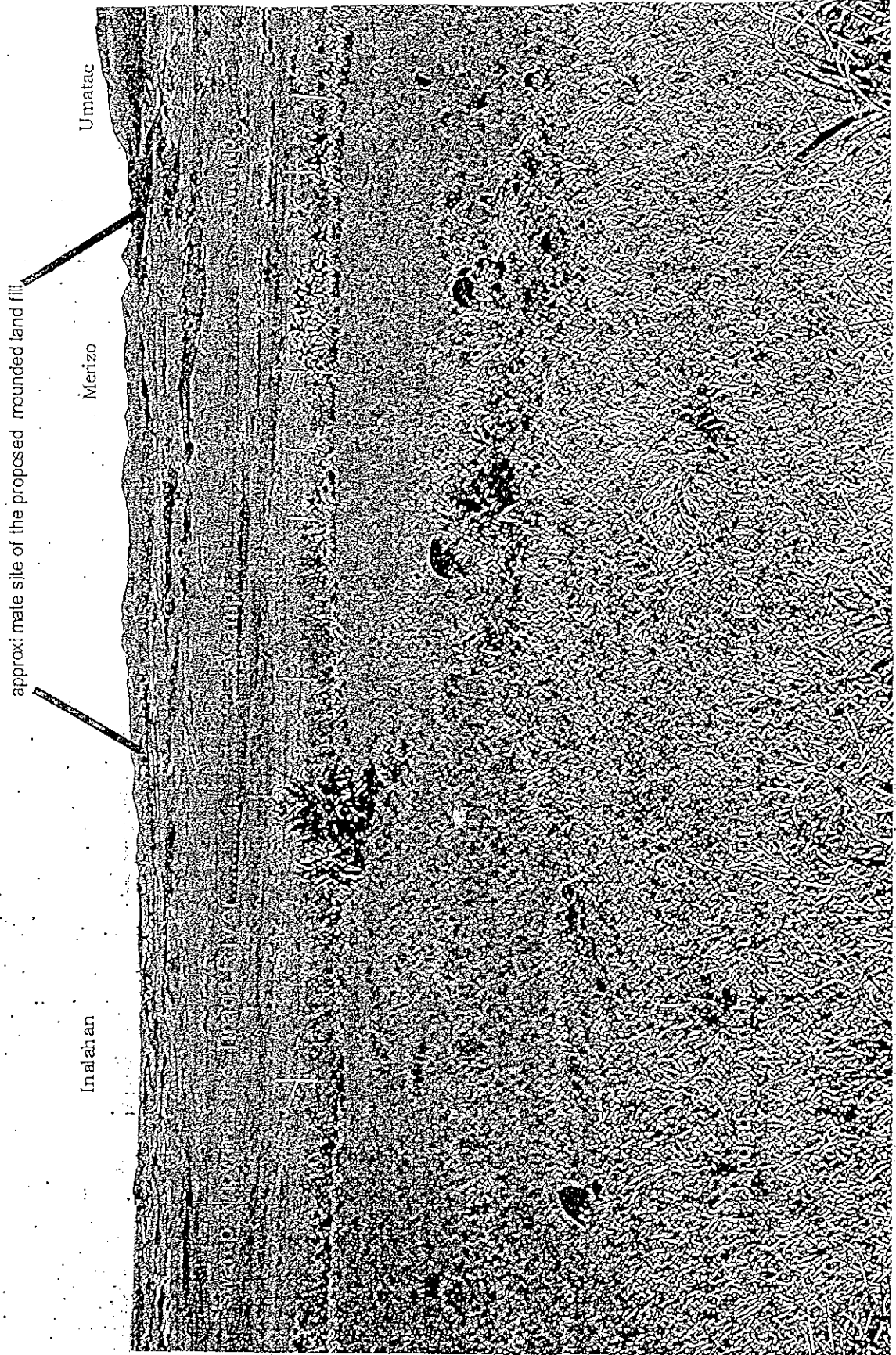
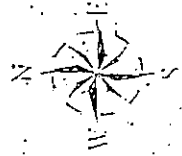




FIGURE 5
UGUM & INARAJAN
RIVER WATERSHEDS

DUGMAS &
ASSOCIATES
INC.



GRAPHIC SCALE

1 inch = 200 feet
1 centimeter = 200 feet

KEY TO FEATURES

- TOWN
- VILLAGE
- ROAD
- RAILROAD
- POWER LINE
- TELEPHONE LINE
- WATERWAY
- WATERSHED BOUNDARY
- ELEVATION
- CONTOUR
- SPOT ELEVATION
- DEPRESSION
- STREAM
- RIVER
- LAKE
- SWAMP
- SAND BAR
- SAND PIT
- SAND BAR
- SAND PIT
- SAND BAR
- SAND PIT

BASE MAP: UNITED STATES GEOLOGICAL SURVEY, 1:50,000 SCALE
 ABSOLUTE SCALE: 1:50,000
 VERTICAL SCALE: 1:50,000
 HORIZONTAL SCALE: 1:50,000
 BASE MAP: UNITED STATES GEOLOGICAL SURVEY, 1:50,000 SCALE

"The landfill is still forced on those potentially impacted in the region where it will be sited. The potentially impacted public is rarely involved in the decision-making process in a meaningful way to ensure that the potential adverse impacts of the landfill are controlled and that appropriate compensation is made for the non-controllable impacts. As long as landfills are forced on people there will be justifiable NIMBYs." *



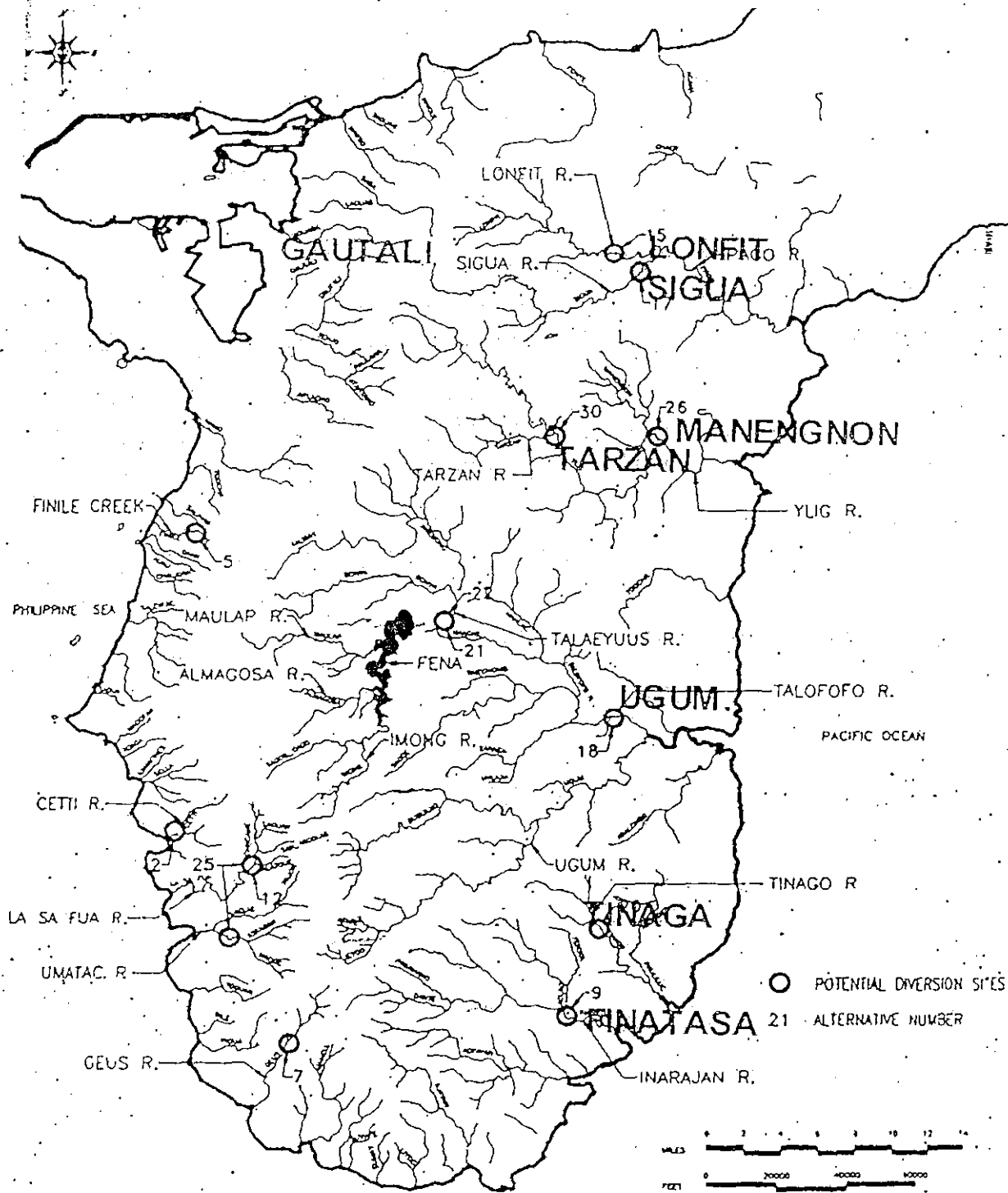
This Is Our Water, Our Survival
Depend on Every Drop of It.

The rivers are Aslinget, Tinaga, Fensu, Finatasa, Ylidegao, Lelansa and even Atate which flows from the southwest to the east toward Talofofo Bay. All of these rivers have existed for hundreds of years without too much degradation to the entire ecosystem. The indigenous fish, shrimp and eels in the swamps and rivers will undoubtedly be threatened once the plastic liners and clay begin to leak and the toxic chemicals start to migrate underground. The four bays in the Inalahan locale will be contaminated as the affected rivers transport the toxic chemical toward the ocean. The people especially in Inalahan and quite possibly Talofofo, Merizo, Agat and Santa Rita are the recipients for polluted or contaminated waters in the very near future. Unless people forget, the farmers will also be adversely affected not knowing if and when their crops will be destroyed when the soils and groundwater are polluted or contaminated and not safe for human or animals. For the other people who fish in the bays from Talofofo, Inalahan, Merizo and Umatac they too will have to be very concerned of the fishes and numerous things taken from the sea for food to eat or sell to the public. Incidents of contaminated sea weeds did kill and also poisoned some people. It is a very common and quite frequent occurrence of the daily and weekly warning in Guam for people to not swim or fish in several of the bays due to pollutions or some type of contaminations in the waters. Given this everyday scenario, must GEPA, DPW and their consultants continue with their preconceived and capricious selection of Dandan to build a landfill in the "Inarajan Rivers in the Inarajan Watershed". To mitigate is their justification for bad choice..

Probability of Polluting the Environment the Surface and Underground Water Resources
Excerpts from Lee, G. F., and Jones-Lee, A., "Addressing Justifiable Nimby" 1994 addresses very similar concerns of the residents in the southern villages who are against the construction of a mounded landfill within the Inalahan Watershed. "The authors have frequently found that inadequate attention is given in the early phases of landfill site-selection to the long-term groundwater quality issue. Nevertheless, once the "best site" for the landfill has been selected by a committee using this process, it becomes very very difficult, if not impossible, to acknowledge the short-comings of, and errors made in, the site-selection, and to start over. While the arbitrarily developed numeric scoring and ranking procedure that is being used today to select sites for landfills gives the appearance of technical justification. The selection of a site as the "best possible" site in such a process is often arbitrary, capricious, and certainly not well-thought-out, rational, objective, or defensible. In the absence of a discipline methodology and technical support for thorough investigations, the CAC has insufficient capacity to obtain sound technical input; evaluate the technical data and analysis; assign meaningful priorities on the issues of groundwater, public health, and environment, and the community impact; assess the design parameters of a landfill that impact the critical issues; or make meaningful management and design tradeoffs."

*G. Fred Lee PhD, PE, DEE; and Ann Jones-Lee PhD

by J.S.N. Chagnalaf



**FIGURE 1.7-2
POTENTIAL DIVERSION SITES**

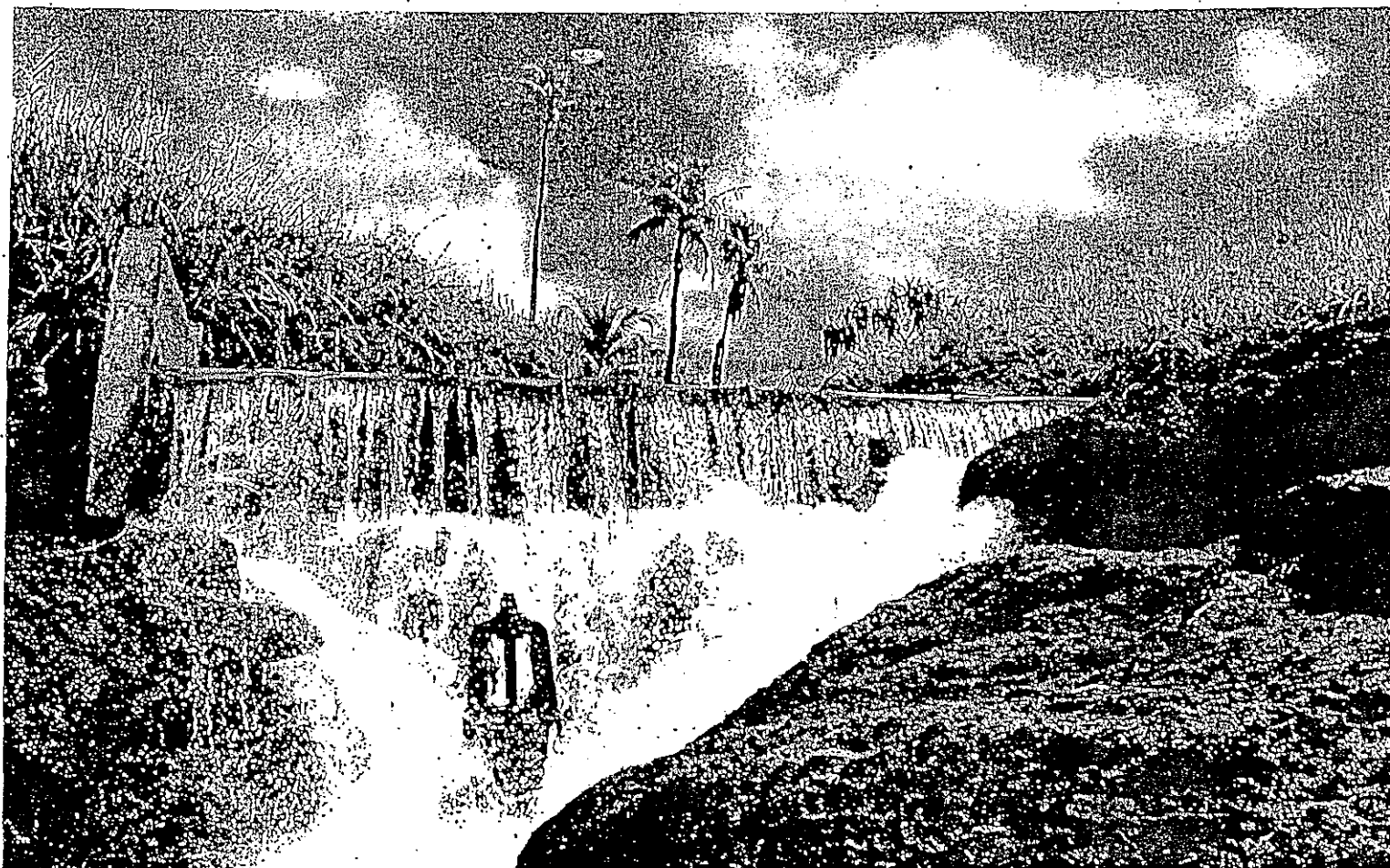


Photo shows the former dam of Inarajan (close-up). This waterfall is approximately 1/2 mile or less from the latest site of the proposed landfill now showing on the EIS Study of Dandan by CEPA. Copy of this map showing the new site from the initial footprint of the proposed site is included. Mr. David Cradlick, Manager of OWA toured this site as well as all the other sites in Dandan, 2,000 acres sited for a possible landfill. This former dam provided water for the people of Inarajan on or about 1948 to 1980 when the Ugim water source developed and replaced the Inarajan dam.

The "bad neighbor" reputation of landfills was earned, in part, because those who generate the wastes placed in the landfills have not been asked, or required, to provide sufficient funds (e.g., in garbage disposal fees) to properly control many of the significant adverse impacts that are readily controllable in landfilling of MSW. As discussed by Lee and Jones-Lee (1994), most of the justifiable NIMBY that occurs today associated with the siting of new or expanded landfills can be readily addressed through adequate funding of appropriate solid waste management. It is well-known that the costs for attempting to rectify problems discovered with leaking landfills and to compensate for lost resources due to groundwater pollution by landfill leachate far-outweigh those associated with taking the steps necessary to ensure groundwater quality protection for as long as the wastes represent a threat, i.e., in perpetuity.

ADVERSE IMPACTS OF "DRY TOMB" LANDFILLS ON PROPERTY OWNERS/USERS

While the US EPA has stated that one of the benefits of the Subtitle D regulations will be reduced opposition to siting landfills, in fact, the Agency has not addressed many of the key issues that cause public opposition to particular landfills. As discussed by Lee and Jones-Lee (1993c; 1994), the wide variety of justifiable reasons for opposing landfills in the vicinity of a property, residence, or workplace include,

- public health, economic and aesthetic aspects of groundwater and surface water quality
- methane and VOC migration - public health hazards, explosions and toxicity to plants
- illegal roadside dumping and litter near landfill
- truck traffic
- noise
- dust and wind-blown litter
- odors
- vectors, insects, rodents, birds
- condemnation of adjacent/nearby property for future land uses

- decrease in property values
- impaired view-shed/aesthetics
- destruction of wildlife habitat
- destruction of archaeological sites

Many of the problems associated with landfills listed above, are related to problems during the active life of the landfill. As discussed by Lee and Jones-Lee (1993c; 1994), one of the most expedient ways that such problems can, in large part, be addressed in a rural setting is by providing an adequate landfill-owned land buffer between the landfill site and adjacent property owners' lands. The land buffer areas typically provided at landfills, however, are very limited, commonly a few hundred yards. The result is that those who own or use lands next to a landfill find that their use and enjoyment of these lands impaired because of the landfill. Any proposed landfill should have at least a mile or more of land between the active area of the landfill and adjacent property owners' lands. While it may be possible in some terrains to have smaller land buffers, in most cases even a one-mile land buffer will allow adverse impacts of a landfill on adjacent property owners/users due to truck traffic, illegal dumping, etc. Alternatively, substantial amounts of funds, effort, oversight, and public recourse would have to be provided to ensure that at the first occurrence of problems off-site, the facility would be closed permanently and the affected public appropriately compensated.

It is the authors' view that an equitable solution could be for anyone owning property within two miles of a proposed landfill to be given the option of selling their property to the landfill company/agency should they choose to do so, for at least the fair-market value. The value of the land should be based on its value prior to the proposal to develop a landfill in that area, and should reflect possible increased value that could otherwise occur over the next 10 years were it not for the placement of the landfill. It should be recognized, however, that some may not find this an equitable settlement, for example where loss of the land destroys a person's livelihood.

One of the most significant consequences of the adoption of the "dry tomb" approach for managing MSW is that it perpetuates the garbage crisis that exists in the US, rather than address the issues contributing to the crisis in a committed, meaningful, technically reliable way so as to provide credible assurance to the people who reside on or otherwise use lands near a proposed landfill that the landfill will not represent a significant threat to their public health, groundwater resources, environmental quality, or social and economic welfare. The public will, with justification, continue to vigorously oppose "dry tomb" landfills that are to be sited in their vicinity until the issues are properly resolved, and the responsible commitment to that resolution is evidenced.

UNRELIABLE APPROACHES FOR ADDRESSING LEGITIMATE NIMBY

Today, some responsible for developing solid waste management capacity in particular jurisdictions are adopting public participation processes in which the public is ostensibly provided an opportunity to actively participate in site selection. Often this is done through a site-selection committee representing various interests in solid waste management in the area where the wastes are generated and in the areas where a landfill could be located. That committee develops a numeric site ranking procedure, under the guidance of the department of public works or some other entity responsible for solid waste management in the region. The committee identifies various criteria/issues of importance and then arbitrarily assigns a numeric value within a range of 1 to 10 to each of those criteria to represent the committee's consensus on its importance. Examples of such criteria include groundwater quality protection, solid waste transportation distance, significance of aboriginal artifacts, and various social/political/legal factors that could influence the siting of a landfill. The public works department then provides, sometimes blind, information on candidate sites within the region based on the information that is readily available on the characteristics of the areas. The selected potential sites are

evaluated based on the criteria selected by the committee, and a "best possible" site(s) is selected.

Claims are made that this process is technically valid, unbiased, value-driven, well thought-out, rational, objective, and defensible, and that it "involves" the public in the decision-making process. The authors have been involved in reviews of such site-selection processes (Lee and Jones-Lee, 1993d) and have found that that type of site-selection process is typically technically invalid and can readily be manipulated to select for a particular site or group of sites. First, a critical aspect is the composition of the committee, itself. While purporting to be representative of the areas involved, rarely do such committees include a meaningful, influential representation of the individuals who actually stand to be adversely affected by the landfill at the various candidate sites. While those on the committee may have political, occupational, or other "interest" in the site selection, no interest is as intent on protecting the interests of those in need of protection than that of the public that stands to be affected.

Second, the authors have found that generally the committee does not have the expertise, and is not provided with appropriate independent expertise, to evaluate the technical validity or sufficiency of the information provided to it. For example, such committees often rank groundwater quality protection very high in site selection. However, at the time that the committee is selecting the "best possible site," there is commonly insufficient information available on the hydrogeological characteristics of the candidate sites to reliably evaluate and compare the sites for their natural ability to protect groundwater from leachate-pollution. There is also typically inadequate information to properly evaluate the ability of the "engineered" containment system - liners, etc. - to prevent groundwater pollution for as long as the wastes represent a threat. Absent such information and/or the ability to properly evaluate it, the committee is generally led to believe that the landfill that would be

constructed at any of the sites would be protective of the groundwater resources of the region. However, understanding of the regulatory agency's minimum prescriptive standards (such as those of the US EPA Subtitle D requirements) for design, construction, operation, closure and post-closure care of landfills, and the associated funding requirements shows that the dry tomb landfill will do nothing more than postpone groundwater pollution.

Part of this "assurance" commonly comes from landfill proponents who often claim that the proposed landfill will meet or exceed regulatory requirements. However, what is not made clear to the committee is the fact that meeting or even exceeding inadequate prescriptive regulatory requirements does not provide assurance of protection of groundwater quality, public health, or welfare. At this time, few state regulatory agencies have requirements that in fact ensure a high degree of groundwater quality protection for as long as the MSW in the landfill represents a threat to groundwater quality. Even in those states such as California that have performance requirements that state that such protection shall be provided, the implementation of those requirements often falls far-short of achieving the performance standard. Thus, when the site-selection committee ranks groundwater quality protection as an area of great concern in landfill siting but has inadequate information and background, it assigns a numerical ranking for that criterion based on unsubstantiated, typically unreliable assurances that groundwater will be protected.

Also of concern in the site-selection process is the combining of scores for the various criteria in making the overall site-selection recommendations. For example, the committee numerically ranks its perception of the importance of not disturbing aboriginal artifacts, along with rankings of groundwater quality protection based on unreliable information (see Lee and Jones-Lee, 1993e). As discussed by Lee and Jones-Lee (1993d), it is inappropriate to give equivalent or comparative weight to the importance of

future generations' groundwater resources and the potential presence of aboriginal culture remnant artifacts - on a scale of 1 to 10 or some other scale - contrived to yield a numeric score that can be mechanically plugged into the site-selection process.

The authors have frequently found that inadequate attention is given in the early phases of landfill site-selection to the long-term groundwater quality issues. Nevertheless, once the "best site" for the landfill has been selected by a committee using this process, it becomes very difficult, if not impossible, to acknowledge the shortcomings of, and errors made in, the site-selection, and to start over. While the arbitrarily developed numeric scoring and ranking procedure that is being used today to select sites for landfills gives the appearance of technical validity, objectivity, and public involvement, it is seriously flawed and is in many respects without technical justification. The selection of a site as the "best possible" site in such a process is often arbitrary, capricious, and certainly not well-thought-out, rational, objective, or defensible. In the absence of a disciplined methodology and technical support for thorough investigations, the CAC has insufficient capacity to obtain sound technical input; evaluate the technical data and analysis; assign meaningful priorities on the issues of groundwater, public health, environment, and community impact; assess the design parameters of a landfill that impact the critical issues; or make meaningful management and design tradeoffs.

Another significant problem with landfill site-selection committees is the way in which those responsible for site selection interact with the potentially impacted public. Previously, those responsible for developing solid waste management capacity would work behind the scenes until a site had been selected, then force that selection on property owners in the region. Today, the public (NIMBYs) have become sufficiently organized and effective so that they can, in many cases, block the siting of a landfill. This has led to attempts to involve the potentially impacted public in the decision-

making process. With few exceptions, however, the authors have found that the so-called public involvement means that those potentially impacted are merely given the opportunity to express their views on why a landfill in their area is inappropriate. Rarely does such an expression result in any significant change in the landfill location or design. The landfill is still forced on those potentially impacted in the region where it will be sited. The potentially impacted public is rarely involved in the decision-making process in a meaningful way to ensure that the potential adverse impacts of the landfill are controlled and that appropriate compensation is made for the non-controllable impacts. As long as landfills are forced on people, there will be justifiable NIMBYs.

Lee and Jones-Lee (1994) discussed approaches that could potentially change "NIMBY" to "GIVE ME" through appropriate consideration and protection of the interests of those in the zone of influence of a proposed landfill. These include technically justifiable and achievable approaches with sufficient funding guarantees for preventing groundwater pollution at any time in the future, adequate land buffer zones, and appropriate financial compensation packages developed from increased garbage collection fees to compensate those in the sphere of influence of the landfill to enable them to readily leave the area or to accept the non-health and environmental impact-related effects of the landfill, such as altered/degraded view-shed.

SYSTEMS ENGINEERING PARADIGM

AB939, the California Integrated Solid Waste Management Act of 1989 (CA, 1989), was, in large part, the result of NIMBY politics. In this regard AB939 has four major thrusts: (1) diversion of 50% of MSW from landfills into reuse, recycling and composting, (2) a local, pentannual review of MSW management by a local CAC to review the status of, and recommend revisions in, the management of MSW in the community, (3) provision for the siting and planning of new landfills with a 15-year horizon, (4) active

management and operation of landfills to protect the public health with emphasis on post-closure requirements and activities. Thus, a major component of AB939 is the incorporation in MSW management and planning of active CAC to identify solid waste management issues; determine the regional need for solid waste collection systems, facilities, and market strategies for recyclable materials; facilitate multijurisdictional arrangements for marketing recyclable materials; facilitate resolution of conflicts and inconsistencies locally and in a multijurisdictional region; develop policies and procedures to guide the development of sites for processing and disposing of MSW, both locally and regionally.

The general public is becoming more involved, at least ostensibly, in the planning and management of MSW. However, managing MSW is an SE process that involves a host of technical, economic, and societal issues. From a SE perspective, can a role be defined for the CAC? Does it represent the customer and user of the system? Would it be part of the multidisciplinary team that assists and advises the systems engineer in managing the program? Is it integral to the SE process with authority on the level of the systems engineer? How is the public to be given an opportunity to exert an influence in the decisions regarding MSW management, beyond being tolerated by decision-making staff in "public hearings"? Beyond its pentannual cycle for review and analysis, how does it retain a consistent commitment to quality management of MSW?

THE SE AND NIMBY PARADIGM

In the management of MSW, and the siting and operation of an MSW landfill in particular, the SE process has six functions tailored to meet the needs of a CAC and the general requirements for the development and operation of a landfill, presuming appropriate representation of those within the sphere of landfill influence, on the CAC. As shown in Figure 1, these six functions, tailored so as to

attach the CAC to the systems engineer, are (1) problem definition and system definition, (2) derived functional requirements, (3) key parameters and risks, (4) tradeoffs and synthesis into a pragmatic program, (5) Systems Analysis and control for overall objectives (the Engineer), (6) CAC.

Figure 1 shows the engineering process flowing from definition to synthesis under the control of the systems engineer, with the CAC as an adjunct to the engineer. By its nature the CAC suggests that it represents the customer, the user, and the public interest as a whole, as well as and especially those within the sphere of influence of the landfill whose public health, welfare, and resources stand to be adversely affected by it. On behalf of the public it has the basic task of setting standards, priorities, acceptable levels of risk, and arbitrates the jurisdictional conflicts and inconsistencies.

The process of developing a landfill for disposal of MSW has five stages in this paradigm (Figure 2). Although as noted earlier, post-closure activities are frequently ignored or, at best, vaguely acknowledged, they figure prominently in the mandates of AB939 and in the acquisition process. This importance has been recognized in Figure 2 by the division of the design stage into operations and post-closure design, with a feedback loop to the beginning of the process. Also indicated are major milestones and review in the acquisition process. It is critical that acquisition not go forward until there is a clear understanding of the site and its impact on the community during operation as well as

in perpetuity after closure, and that the design and site-selection of a landfill must be concurrent, coordinated activities, not sequential ones.

Each stage of the acquisition involves the SE process of Figure 1. The CAC participates at each stage and shapes the process and design to try to ensure that all requirements affecting the public interest are satisfied. The CAC has a major role for public approval at the milestone for the review and acceptance of the proposed project and site. The CAC, representing the public interest as defined in AB939, needs to consider and evaluate a host of factors including: landfill design and alternatives, landfill operation, public health, air pollution, hydrogeology, use and potential future (*ad infinitum*) use of groundwaters hydraulically connected to the proposed landfill area, water pollution, natural habitat and open space, community impacts, site monitoring, post-closure use, and cost. It may not be possible to optimally satisfy all of these factors, but a landfill site is an ineluctable feature of our lifestyle so tradeoffs and adjustment to priorities with detailed assessments made on alternative technologies and sites, and compensation of those affected, will be a major effort for the engineers and the CAC. The methodology and practice of SE in the aerospace industry includes a number of tools for matching estimated system performance to the functional requirements. While these have not been applied in urban planning, one of the authors has illustrated their potential for such use (Martin, 1992, 1993).

Findings in these studies and other investigations in other US cities are inter-related if not very similar to the landfill to be built in Dandan on top of the watershed.

LANDFILLS IN NORTHWEST INDIANA (APPLICABLE TO THE PROPOSED LANDFILL IN DANDAN):

What is a Landfill?

According to Zero Waste America's website, a landfill is a carefully designed structure built into or on top of the ground in which trash is isolated from the surrounding environment. The purpose is to avoid any water related connection between the waste and the surrounding environment, particularly groundwater. This isolation is accomplished with a bottom liner and daily covering of soil. Basically, a landfill is like a bathtub in the ground; a double-lined landfill is one bathtub inside another. Unfortunately, unlike bathtubs all landfills eventually will leak, out the bottom or over the top.

What is the Composition of a Landfill?

There are four components of any secured landfill; a bottom liner, a leachate collection system, a cover and hydro geologic setting. The natural setting can be selected to minimize the possibility of wastes escaping to groundwater beneath a landfill. The other component must be engineered. Each component or element is critical for success.

Regarding the natural hydro geologic setting; you want geology to do two things that are in fact contradictory. To prevent the wastes from escaping, you want rocks as tight (waterproof) as possible. If leakage occurs and it will, you want the geology to be as simple as possible so you can easily predict where the wastes will go. This is the reason why the type of soil around the liner is vitally important. Another crucial element in any landfill is the bottom liner. The state of the art bottom liners on the market today are plastic (HDPE) liners, which are only 100 mils or 1/10 of an inch thick. Liners may be clay or made of a synthetic flexible membrane. The bottom liner in effect creates a bathtub in the ground. If it fails, wastes will migrate directly into the environment. Even though these tough plastic polyethylene liners (HDPE) are recommended by EPA, a number of household chemicals will degrade HDPE, permeating it (passing through it). This will cause it to lose strength, softening it or making it become brittle and crack. In addition to common household chemicals, items such as mothballs, margarine, vinegar, ethyl alcohol (booze), shoe polish, peppermint oil will all degrade HDPE and render it dangerous to the surrounding environment. Studies show that a 10-acre landfill will have a leak rate somewhere between 0.2 and 10 gallons per day. The Leachate collection system is also an extremely important component to any effective landfill. Leachate is water that gets contaminated by contacting wastes. It seeps to the bottom of the landfill and is collected by a

series of pipes. Pipes laid along the bottom of the landfill capture the contaminated waste and other fluid (leachate); this leachate is then pumped to a wastewater treatment plant. If leachate collection pipes clog up or if they are crushed by the tons of garbage, they may become weakened by chemical attack (acids, solvents, oxidizing agents or corrosion). If this occurs and leachate remains in the landfill, fluids can build up in the bathtub. The Cover is generally several sloped layers; clay or membrane line (to prevent rain from intruding and to prevent leachate formation) overlain by a very permeable layer of sandy soil, overlain by topsoil in which vegetation can root and stabilize the underlying layers of the cover. If it is not maintained, rain will enter the landfill resulting in buildup of leachate to the point where the bathtub overflow and waste enter and burrowing soil-dwelling mammals, reptiles, insects and worms, sunlight, cave-ins and rubber tires which "float" upward in a landfill all present constant threats to the integrity of the cover. (Zero Waste)

Summary of Northwest Indiana Soil

These soils have severe limitations for landfill applications because of their physical properties. Any excavation of one soil would impact other soils in the vicinity. Another common feature to these soils is their wetness. The seasonal high water tables are near the surface for almost all of the soil types, except Pinhook and Tracy. The high water tables make them highly vulnerable to contamination and require a great deal of money and materials to drain water away for excavation sites. (Very similar to the Dandan conditions specially the watershed).

These soils are very suitable for farming. Northwest Indiana is a large farming community for these reasons. The soils are perfect for growing crops such as corn and beans; however, the soils are very poor for landfill use. In addition to contamination, the high water table will require significant dewatering to allow excavation. This has the potential to dramatically lower the water table and cause existing home and irrigation wells to go dry. (Camp).

Best Soil Used for Landfill Applications

The best soil to use in a landfill is blue clay. Blue clay is composed of fine particles transported by glacial melt ways and deposited in deep ocean waters between 50,000 and 37,000 years ago. The soil is best suited for landfills because it is impervious to water, chemicals and it compacts very well. When a landfill site has been excavated, the clay is saved and used as landfill cover. After each layer of garbage is placed in the landfill, a layer of clay is placed on top of the garbage and compacted. This results in a solid layer of garbage that are impervious to the elements.

Proposing a Landfill in Northwest Indiana

To proposed a landfill in Northwest Indiana, certain criteria and regulations must be adhered to: Prior to 1995, there was no criterion regarding the design of landfill until the Federal CFL

Subtitle D was passed. This federal law mandates that all landfills in the United States must comply with minimum standards. According to "How a Landfill Works" at Lycos Zone, an environmental impact study must be done on the proposed site to determine:

- The area of land necessary for the landfill;*
- The composition of the underlying soil and bedrock;*
- The flow of surface water over the site;*
- The impact of the proposed landfill on the local government and wildlife;*
- The historical or archaeological value of the proposed site. (Howstuffworks)*

Excerpts very similar and perhaps applicable to the proposed landfill in Dandan.

What Type of Landfills Are There in Northwest Indiana?

Currently, there are two types of landfills, a public landfill which we have in Munster and private landfill which is located in Laporte County. Public landfills are easier to regulate and control because they control what comes into their landfill. A private landfill is more predicated on making money and is often less concerned on what is brought in. The interstate commerce clause is often not an issue because local government have their right to restrict who can dump what the local landfill. (Lynch).

Sanitary landfill in the United States has made monumental strides in the past 20 years, moving open dumps with little or no regulation to state of the art facilities with sophisticated containment systems and environmental monitoring, improved operations, and increased regulations. At the same time, stringent regulations have caused landfill capacity to decline: between 1986 and 1996, the total number of landfills in the United States fell from 7,683 to 3,581. The trend now is "waste to energy" system (incineration), recycling and reuse.

Northwest Indiana currently accepts waste from other locations across the United States. The total out of state waste received during 1999 was 2,147,830 tons. The table represents the states that contributed to Northwest Indiana's wastes sites. (IDEM).

Out of State Waste Received in 1999

<u>State</u>	<u>Totals Tons Received</u>
California	93
Illinois	1,779,180
Kansas	60
Kentucky	176,376
Michigan	37,021
Missouri	1,935
Nevada	155
Ohio	151,614
Texas	122
Wisconsin	1,274

Do Landfills Work?

Unfortunately, starting in the 1970's and continuing throughout the 1980's and 1990's, the U.S. Environmental Protection Agency (EPA) funded research, which showed that burying household garbage in the ground poisons the groundwater. EPA has spelled out in detail the reason why all landfills leak. (Dr. Peter Montague, REHN). Even with the state of the art double liners, EPA officials still expect landfills to fail and eventually poison the groundwater. (Dr. Peter Montague, REHN). There is just inadequate known data relating to contamination due to landfills leaking; however, there were ground wells tested in the Wheeler area surrounding the Wheeler Landfill. These ground wells were found to be contaminated and the water unsafe to drink. As a result, Waste Management negotiated a settlement with the affected citizens, and paid for city water to be brought to their homes. Unfortunately, the problem of the contaminated water still remains in the ground, and the potential for groundwater contamination in Wheeler is very real. (Lynch).

Groundwater contamination may result from leakage of very small amounts of leachate. TCE is a carcinogen and one of the volatile organic compounds typically found in landfill leachate. It would take less than 4 drops of TCE mixed with the water in an average sized swimming pool (20,000 gallons) to render the water undrinkable. (Landfill Leaks).

Landfills and Your Health

There is insufficient data linking health problems with our local landfills in Northwest Indiana; however, there have been more than adequate documentation nationwide to assure a direct correlation with landfills and health problems. According to Dr. Peter Montague in Rachel's Environment & Health Weekly, the following are just a few documented studies that highlight the extent of the problem:

Significantly reduced stature (height) for a given age among children who live near Love Canal; the chemical waste dump in Niagara Falls, N.Y.

Low birth weight and defects in California born in census tracts having waste disposal sites. In Tucson Arizona, abnormal amounts of children born with heart defects revealed that 35% of them were born to parents living in a part of the city where the water supply was contaminated with trichloroethylene (TCE) from a hazardous waste site. The rate of birth defects of the heart was three times higher among people drinking contaminated water compared to people in Tucson not drinking contaminated water.

Enlargement of the liver and liver functions test in reported resident exposed to solvents from a toxic waste dump in Hardemann County, Tenn.;

Dermatitis, respiratory irritation, neurologic symptoms and pancreatic cancer at 7 waste disposal sites. (Dr. Montague REHM)

Landfills Affect on the Environment

Landfills present a clear and present potential threat to human health as well as a threat to our environment. As noted even the best landfill liners will leak... 82% of surveyed landfill cells had leaks while 41% had a leak area of more than 1 square feet," according to Leak Location Services, Inc. (LLSI website March 15, 2000). This is an alarming statistic considering that in addition to leakage, landfills also provide problems to our health and environment through hazardous contaminated air emissions. Over ten toxic gases are released from landfills especially the toxic gas of methane gas. Methane gas is a naturally occurring gas created by the decay of organic matter inside a landfill. As it is formed, it builds up pressure and then begins to move through the soil. In a recent study of 288 landfills, off-site migration of gases, including methane was detected at 83% of these sites. (REHM).

When a new municipal landfill is proposed; advocates of the project always emphasize that "no hazardous wastes will enter these landfill." Studies have shown that even though municipal landfills may not legally receive "hazardous" wastes, the leachate they produce is as dangerous as the leachate from hazardous waste landfills.

CONCLUSION

There is no debate that all landfills eventually contaminate our environment and pose a serious threat to our health. In Indiana these landfills are monitored and regulated by EPA and IDEM. The main problem associated with contamination is the "corrective action" that needs to occur to clean up the problem. In a recent study of 163 municipal solid waste landfills, there was evidence of ground-water contamination or adverse trends in ground-water quality of 146 of them. That's a 90% contamination rate for groundwater beneath municipal solid wasteland fills. Once it is contaminated it is almost impossible to clean it up. The only way to guarantee clean groundwater is to never contaminate it in the first place. (Zero Waste).



GUAM WATERWORKS AUTHORITY

"Good Water Always"

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June 15, 2005

Omar Damian
Guam Environmental Protection Agency
Municipal Solid Waste Landfill Project Manager

RE: Comments on Draft Supplemental Environmental Impact Statement (SEIS)

Mr. Damian,

The Guam Waterworks Authority (GWA) has contracted with Brown and Caldwell (B&C) to prepare a water and wastewater master plan. Based on their efforts to develop the master plan, B&C is familiar with existing GWA water sources and conceptual future water sources. GWA requested that B&C conduct a review of the SEIS with an emphasis on potential impacts on both current and future drinking water sources. B&C's comments on the SEIS are attached to this correspondence.

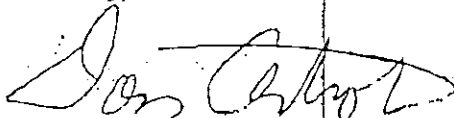
The review raises several concerns regarding the hydrogeological characterization of the proposed landfill site and its potential impacts on both groundwater and surface water resources. Based on these findings, GWA requests that additional analysis and/or research be conducted to address the specific concerns delineated in the attachment and summarized below:

- Impact of high groundwater on the installation of proposed liner system and the behavior of the liner system when subjected to high groundwater after construction.
- The minimum slope on the bottom of each cell required to prevent leachate collection.
- Potential for migration of gases downward to the groundwater.
- Conclusion that local geology does not support development of groundwater aquifers as drinking water sources based on insufficient data.
- The reliability of groundwater contours and the conclusion that a hydraulic divide exists between the landfill site and the Ugum River drainage.
- Claim that GWA has no plans to develop drinking water sources in the area when in fact several potential groundwater and surface water sources are being considered.
- The ability to physically keep the landfill base above the groundwater table when

the proposed cells are 15-feet deep and groundwater was found at or near the surface.

Thank you for the opportunity to review and comment on the SEIS. If you have any questions regarding our submittal, please do not hesitate to contact me at (671) 647-2607.

Sincerely,



Don Antrobus
Chief Engineer

cc: General Manager
USEPA

2005 JUN 14 10:00 AM
GUAM WATER WORKS
P.O. BOX 3010
HAGATNA, GUAM 96932



June 14, 2005

Mr. David Craddock, General Manager
Guam Waterworks Authority
P.O. Box 3010
Hagatna, Guam 96932

127553.120

Subject: Draft Supplemental Environmental Impact Statement (SEIS) for the Siting of a Municipal Solid Waste Landfill Facility, Guam.

Dear Mr. Craddock:

Brown and Caldwell, as per the amendment to the GWA Master Plan contract, has reviewed the Draft SEIS for the Siting of a Municipal Solid Waste Landfill Facility in the Layon area of Dandan, Inarajan, Guam and related pertinent documents. Brown and Caldwell provides the following comments with respect to potential impacts to groundwater and surface water resources:

2.2.1 Landfill Design and Operating Features

The SEIS essentially ignores the issue of the high water table and does not provide an explanation or description of how the excavations will be maintained dry during installation of the proposed liner system. According to the discussion in 4.2.1.2 Hydrogeology and Groundwater (see below), the base of some cells will be at or below the water table rather than above it as shown in Figure 2-7. In addition, even if dewatering and/or diversion systems can be devised for during construction of each cell, there should be a discussion on how the liner system will behave when submitted to the groundwater pressures after construction, not only at the base of the cells, but also along the side slopes. In general, there is a lack of construction details in the SEIS. At a minimum, the slope ratios for the excavation (typically 2:1) and final cover system (3:1) should be provided.

The proposed minimum slope of the bottom of each cell (0.5%) may be too flat to convey the leachate generated to the single collection sump for each cell and prevent the ponding of leachate on the liner. Ponding would likely lead to migration of leachate to groundwater.

Groundwater beneath new lined landfills becomes impacted mostly by migration of VOCs within landfill gas (LFG). The vapor permeability of liner systems is greater than the liquid permeability, especially when the landfill gas is

2005 JUN 14 10:00 AM GUAM WATER WORKS P.O. BOX 3010 HAGATNA, GUAM 96932

Mr. David Cradlick
June 14, 2005
Page 2.

not properly collected and a significant positive pressure (i.e. driving force) is produced within the landfill. Section 4.2.1.4 of the SEIS indicated that only 80% of the LFG generated would be collected by an active extraction system. Therefore, 20% of the LFG generated would be available for migration and release into the environment, including downward to groundwater.

3.2.1.2 Hydrogeology and Groundwater - Aquifers (in Chapter 3.0 Affected Environment)

The Draft SEIS characterizes the volcanic geological formation at Layon as not supporting aquifers from which groundwater can easily be extracted. However, this opinion appears to be based on a single U.S. Geological Survey well in 1971, the construction details of which are not provided. Furthermore, the SEIS acknowledges that faults and fissures may harbor a potentially exploitable aquifer (p. 3-7), and apparently no groundwater recovery tests were performed in the deep borings at Layon.

Without a thorough groundwater resource evaluation, it is not possible to rule out sufficient yields from deep wells for municipal supply or other development. In fact, wells have provided local water sources in the past in southern Guam (i.e. Malojlo); and others (Asalonso, GORCO and Tafofoso) may have use in the future; according to the pre-draft Guam Water Budget Report (Mink and Yuen, Inc., April 2005) prepared for the GWA Water Resources Master Plan (Brown and Caldwell, in preparation). Although GWA's Fena surface water reservoir and Ugum diversion currently supply southern Guam, future needs may require groundwater development. Since groundwater beneath Layon falls within the G-1 Resource Zone category, it must be protected to drinking water quality standards.

Groundwater

Water table depths and elevations at Layon are provided in Table 3-1, but dates of the measurements are not provided in the SEIS or in the Final Site Selection Report (SSR)/EIS. Unless the dates of measurement are close to simultaneous or other data to document consistent water table elevations are available, the groundwater contours in Figure 3-2 are unreliable.

Without separate measurements of distinct seasonal groundwater elevations, seasonal flow northward beneath the drainage divide into the Ugum River drainage cannot be ruled out. Although the Final Site Selection Report/EIS (GDPW, 2005) states that "based on the groundwater levels recorded at the site, a groundwater hydraulic divide exists between the Ugum River and the landfill footprint that will isolate groundwater flows from the landfill to the

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Mr. David Caddick

June 14, 2005

Page 3

Ugum River", no such hydraulic groundwater divide is shown or apparent from the groundwater contours shown on Figure 3-2 of the SEIS. In fact, the contours indicate that groundwater from beneath the North site would flow northeast toward the Ugum River drainage.

Proximity to Drinking Water

The SEIS acknowledges that the Inarajan River has been identified as a potential site for a surface water dam and/or reservoir. SEIS Figure 3-1 also shows proposed reservoir and/or diversion sites on the Tinago River that have been previously studied (Barrett, 1994) and are included in the pre-draft Guam Water Budget Report (Mink and Yuen, Inc., 2005). Both of these proposed sites would be downstream of the proposed landfill site. In spite of the SEIS claim that "no plans are currently in place to develop groundwater or surface water supplies in the Layan area" (p. 3-9), GWA considers both of the above proposed reservoir and/or diversion sites as potentially viable and necessary for the future water supply needs. In fact, the pre-draft Guam Water Budget Report (Mink and Yuen, Inc., 2005) recommends that consideration be given to investigating the feasibility of diversions at other rivers in addition to the Ugum, and that opportunities to utilize the existing wells be reexamined (p.4).

The SEIS arguments against groundwater being a potential source of drinking water are equally unconvincing. No citations or evidence is provided that the limestone aquifer tapped by the Malojloj wells is either limited in extent or that groundwater within it is not continuous with that in the volcanic formations in the Layan area. In addition, until a groundwater exploration program specifically designed to locate (using geologic mapping and geophysical tools) and drill test faults and fractures in the Umatac Formation is conducted, previous well yields do not rule out development of an economic groundwater resource in either the limestone or volcanic aquifers of Southern Guam. The GORCO well produced over 100 gallons per minute (gpm) (Mink and Yuen, Inc., 2005), which is evidence that well yields comparable to northern Guam are possible.

3.2.2.1 Hydrology

The SEIS discounts the development of surface water supplies on the Inarajan and/or Tinago Rivers, and rules out groundwater flow from the proposed landfill site to the Ugum River. As detailed above, these statements are not defensible based on the data presented in the SEIS and SSR/EIS and above in this letter.

~~RE: EXS PALTEX/MS/01 GRAY/255/02 GWA LF 5018 Rev 1-14-05~~

Mr. David Craddock
June 14, 2005
Page 4

3.2.2.2 Water Quality

The SEIS correctly states that the Inarajan River could potentially be developed as a water source (p. 3-17) (in contradiction of statements to the contrary in previous SEIS sections).

4.2.1.2 Hydrogeology and Groundwater (in Chapter 4.0 Environmental Consequences)

The SEIS correctly notes that the Guam EPA's preferred hydrogeologic conditions of a deep water table and thick, low permeability deposits with a confining layer over any water bearing zone are not present at the site, and that in fact groundwater at the Layon footprint is at ground surface in some locations. Since the landfill base is to be located on average of 15 feet below grade, it is unclear how the landfill base could be maintained above the water table. Further, since seasonal fluctuations in groundwater levels have not been established, the basis for designing landfill cells to maintain separation between the base of the landfill and the water table at each cell is lacking. Since groundwater could flow north to the Ugum River, this issue should be of concern to the GWA.

4.2.2.2 Water Quality

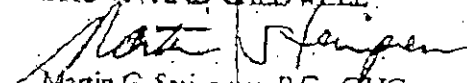
The SEIS correctly acknowledges that minor long-term adverse impacts to water quality would occur throughout the life of the project from both erosion and leachate discharge. These impacts could affect GWA's ability to develop either surface water or groundwater resources downgradient of the site.

To summarize, the SEIS generally provides an incomplete and inadequate hydrogeological characterization of the proposed landfill site and its potential impacts on both groundwater and surface water resources.

Thank you for the opportunity to review and comment on the Draft SEIS. Should you have any questions, please contact me at 925-210-2408.

Very truly yours,

BROWN AND CALDWELL


Martin G. Steinpress, P.G., CHG.
Chief Hydrogeologist

cc: Ray Mutasca

6714779402 FAX: 925-210-2408

APPENDIX D

Agency Consultation Letters

**DUEÑAS &
ASSOCIATES**
Inc.

RECEIVED

'AUG '09 2004 *[Signature]*
Historic Resources Division
DPR

Website: www.dnaguam.com
E-mail: dna@dnaguam.com

August 3, 2004

Ms. Lynda B. Aguon
State Historic Preservation Officer
Historic Resources Division
Guam Department of Parks and Recreation,
P.O. Box 2950
Hagatna, Guam 96932

Dear Ms. Aguon:

**SUBJECT: ENVIRONMENTAL IMPACT STATEMENT FOR THE SITING OF A
MUNICIPAL SOLID WASTE LANDFILL FACILITY**

Duenas & Associates, Inc. and an interdisciplinary project team are preparing an Environmental Impact Statement for the siting of a new municipal solid waste landfill facility (MSWLF) on Guam. The team is working on behalf of the Department of Public Works and Guam Environmental Protection Agency. Based on a scientifically-based screening process, the Government of Guam selected three candidate sites that will be evaluated in the EIS. The sites are located at Lonfit in Asan, Dandan in Inarajan, and Sabanan Batea in Yona (Figures 1 and 2). The sites are currently undergoing field studies to characterize the existing environment, including archaeological, geotechnical, and biological features. A Draft EIS will be available for public review in October 2004. We are interested in any comments or concerns your agency may have regarding the proposed development and operation of a MSWLF at one of these sites. More information is available on the project Web site at <http://www.guamlandfill.org>, or you can call our office at 646-7991.

Sincerely,

Claudine Camacho

Claudine Camacho
Environmental Services Division
Duenas & Associates, Inc.

Enclosures (2)

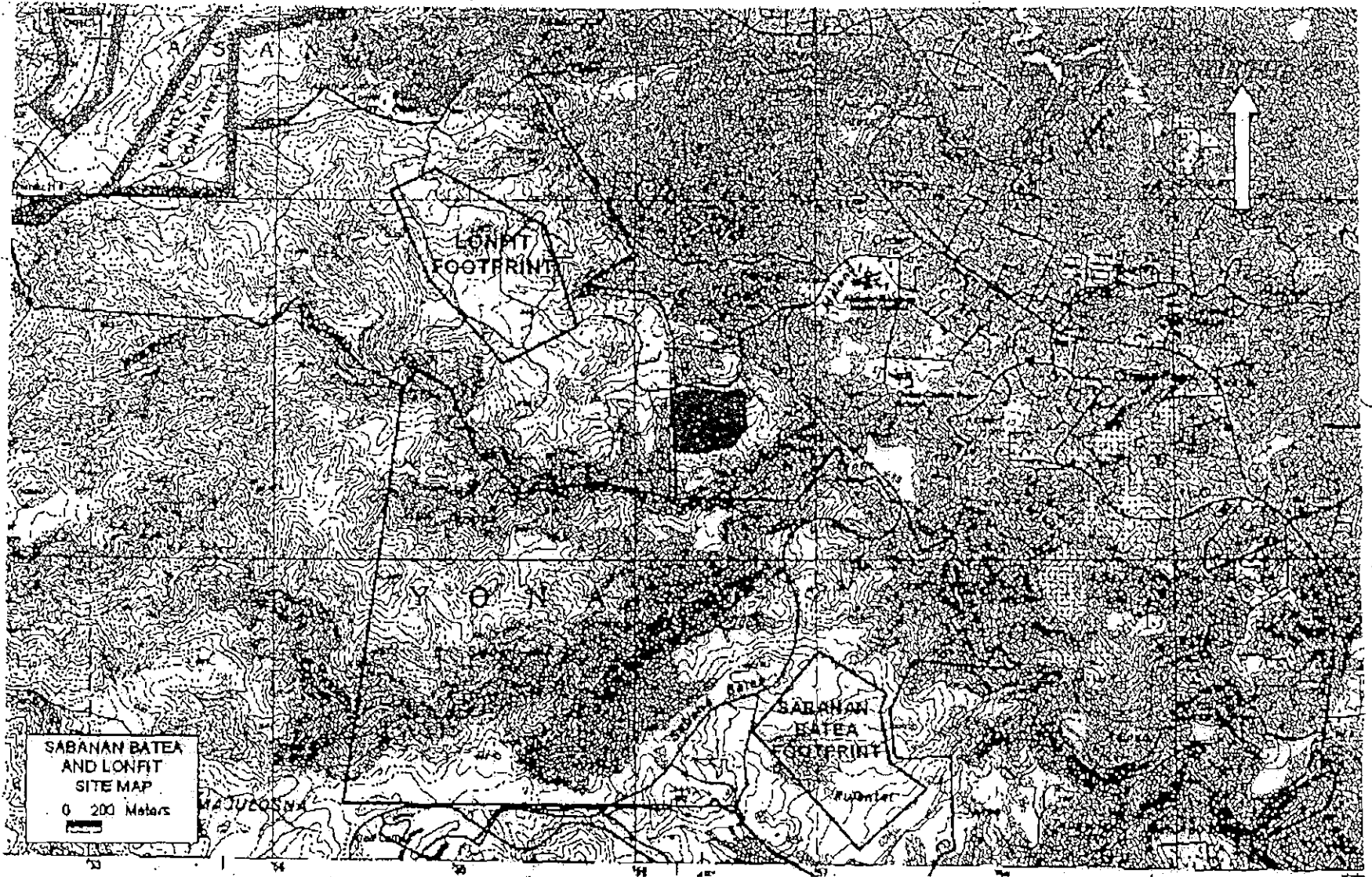


Figure 1. Site map of candidate landfill sites at Sabanan Batea, Youa and Lonfit, Asan, Guam, with proposed landfill footprints.

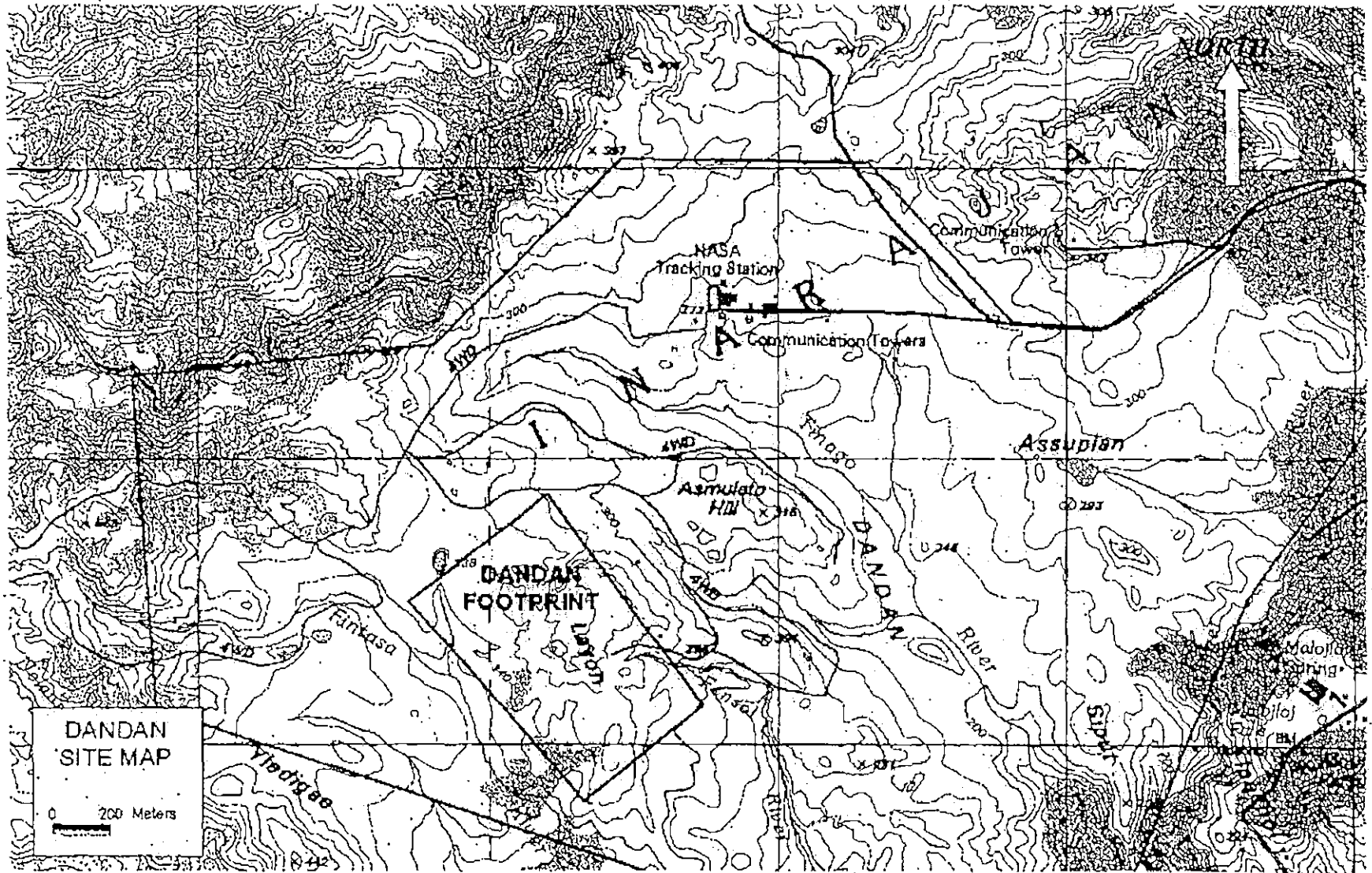
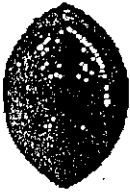


Figure 2. Site map of candidate landfill site at Dandan, Inarajan, Guam, with proposed landfill footprint.



Department of Parks and Recreation
 Dipattamenton Plaset Yan Dibuetision
 Government of Guam

490 Chalan Palasyo
 Agana Heights, Guam 96910
 Director's Office: (671) 477-6896/47
 Facsimile: (671) 477-0997
 Parks Division: (671) 475-6294/80
 Guam Historic Resources Division: (671) 475-6294/95/72
 Facsimile: (671) 477-2887



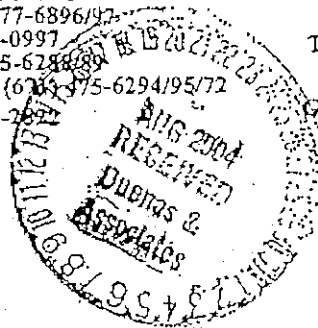
Thomas A. Morrison
 Director

Felix P. Camarbo
 Governor

Kaleo S. Moylan
 Lt. Governor

Gregory A. Matanane
 Deputy Director

IN REPLY REFER TO:
 RC2004-093F



August 13, 2004

Claudine Camacho
 Environmental Specialist
 Environmental Services Division
 Duenas & Associates
 P.O. Box 8900
 Tamuning, Guam 96931

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT FOR THE SITING OF A MUNICIPAL SOLID WASTE LANDFILL FACILITY

Dear Ms. Camacho, *Claudine*

Our main concern is with regard to the archaeological assessment of all the proposed Municipal Solid Waste Landfills. We understand that archaeological consultants have been hired to perform such assessments. Two of the proposed landfills, Lonfit and Sabanan Batea have been previously surveyed. The information on how significant sites may or may not be affected by the landfill project should be clearly stated in the Environmental Impact Statement (EIS). We understand that the Dandan site survey is in progress and we expect to see the results in the EIS relative to historic properties and cultural resources.

If you have any questions, please contact me or Vic April, Territorial Archaeologist at 475-6294/5/72.

Sincerely,

Lynda B. Aguon
 LYNDA B. AGUON
 Guam (State) Historic Preservation Officer

- Cc: Administrator, Guam Environmental Protection Agency
 Director, Guam Department of Public Works
 Director, Bureau of Statistics and Plans
 Director, Department of Land Management
 Executive Director, Guam Ancestral Lands Commission
 ACOE, Guam Office Manager
 Director, Department of Agriculture
 Chief, Aquatic and Wildlife Resources Division



Department of Parks and Recreation
Dipattamenton Plaset Yan Dibuetision

Government of Guam

490 Chalan Palasyo

Agana Heights, Guam 96910

Director's Office: (671) 477-6896/97

Facsimile: (671) 477-0997

Parks Division: (671) 475-6288/89

Guam Historic Resources Division: (671) 475-6294/95/72

Facsimile: (671) 477-2822



Thomas A. Morrison
Director

Gregory A. Matanane
Deputy Director

Felix P. Camacho
Governor

Kaleo S. Moylan
Lt. Governor

In reply refer to:
RC2004-093F

January 25, 2005

Claudine Camacho
Duenas and Associates, Inc.
P.O. Box 8900
Tamuning, GU 96931

Subject: Preliminary Site Selection Report, Environmental Impact Statement for the siting of a
Municipal Solid Waste Landfill Facility, Guam

Dear Ms. Camacho:

We have reviewed the EIS for the siting of a Municipal Solid Waste Landfill Facility and have the following comments.

On page 39, seventh line of paragraph 6.3.3, archaeological/historical resources, it should read; *a finding of No Adverse Effect* rather than No Effect.

On page 40; fourth line of paragraph 6.4.4.4, it should read; *in order to have a determination of No Adverse Effect, mitigation....* Instead of no effect.

Same goes with the seventh line of paragraph 7.3.3 on page 56 and first line of third paragraph under 7.3.3.4 on page 58.

The third line of the second paragraph under 7.3.3.2 should read; *If the landfill is built at Lonfit many of these sites would be adversely affected which should be mitigated.*

The first line of the third paragraph under 7.3.3.4 should be changed from No Effect to *No Adverse Effect*.

Other than the above, the rest of the information seems to be accurate.

If you have further questions, please call us at 475-6294/6295/6272 or email us at laguon@mail.gov.gu and yicaprili@mail.gov.gu.

Sincerely,

LYNDA B. AGUON
Guam (State) Historic Preservation Officer

Cc: Department of Public Works
Guam Environmental Protection Agency.

August 3, 2004

Mr. Paul Bassler
Guam Department of Agriculture
192 Dairy Road
Mangilao, Guam 96913
Attn: Mr. Brent Tibbatts/Mr. Celestino Aguon

Dear Mr. Bassler:

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT FOR THE SITING OF
MUNICIPAL SOLID WASTE LANDFILL FACILITY

Duenas & Associates, Inc. and an interdisciplinary project team are preparing an Environmental Impact Statement for the siting of a new municipal solid waste landfill facility (MSWLF) on Guam. The team is working on behalf of the Department of Public Works and Guam Environmental Protection Agency. Based on a scientifically-based screening process, the Government of Guam selected three candidate sites that will be evaluated in the EIS. The sites are located at Lonfit in Asan, Dandan in Inarajan, and Sabanan Batea in Yona (Figures 1 and 2). The sites are currently undergoing field studies to characterize the existing environment, including archaeological, geotechnical, and biological features. A Draft EIS will be available for public review in October 2004. We are interested in any comments or concerns your agency may have regarding the proposed development and operation of a MSWLF at one of these sites. More information is available on the project Web site at <http://www.guamlandfill.org>, or you can call our office at 646-7991.

Sincerely,

Claudine Camacho

Claudine Camacho
Environmental Services Division
Duenas & Associates, Inc.

Enclosures (2)

REC. by [Signature]
08/04/04 12:25 PM
DOAG

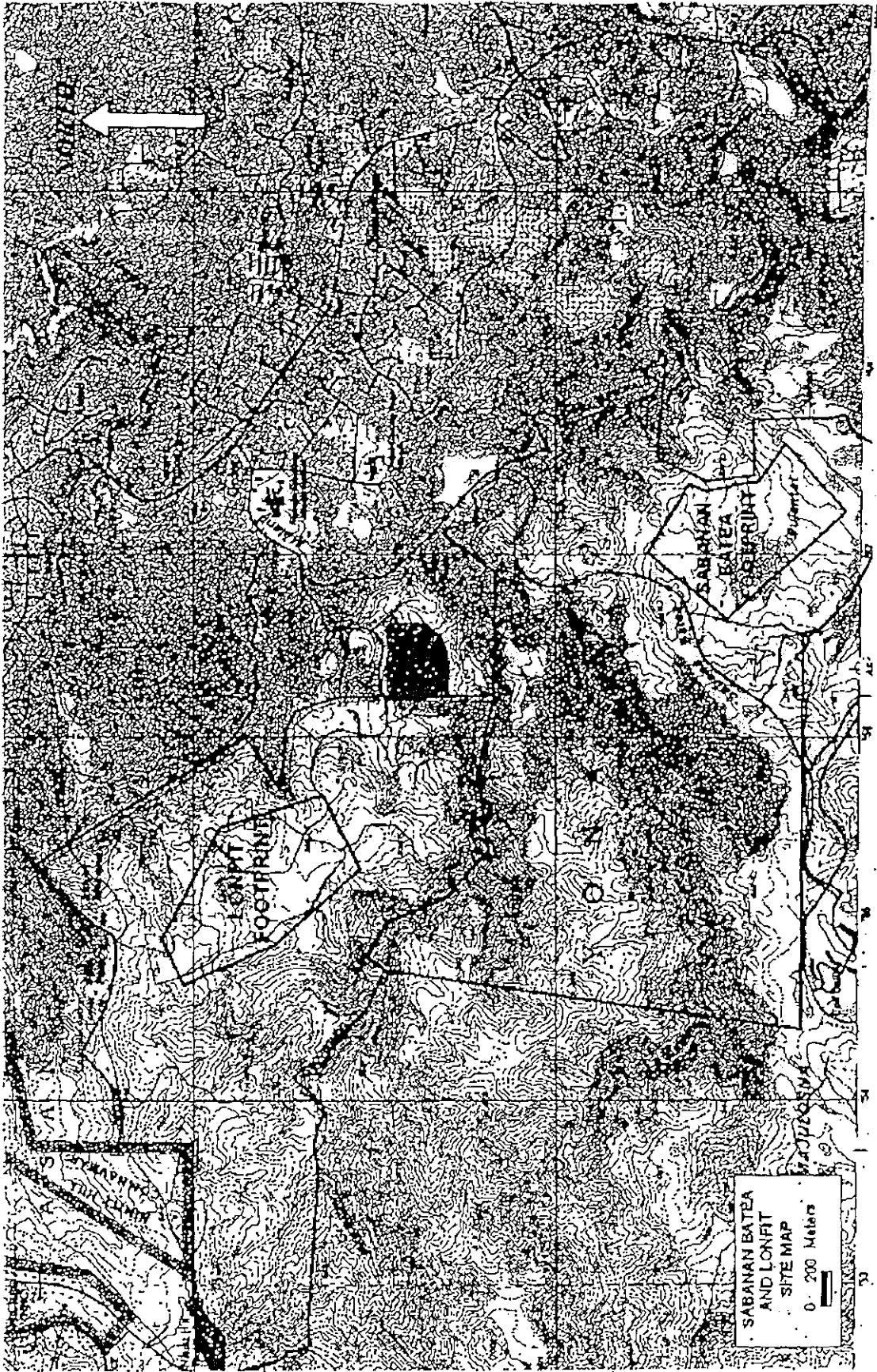


Figure 1. Site map of candidate landfill sites at Sabanan Batea, Yona and Loufit, Asan, Guam, with proposed landfill footprints.

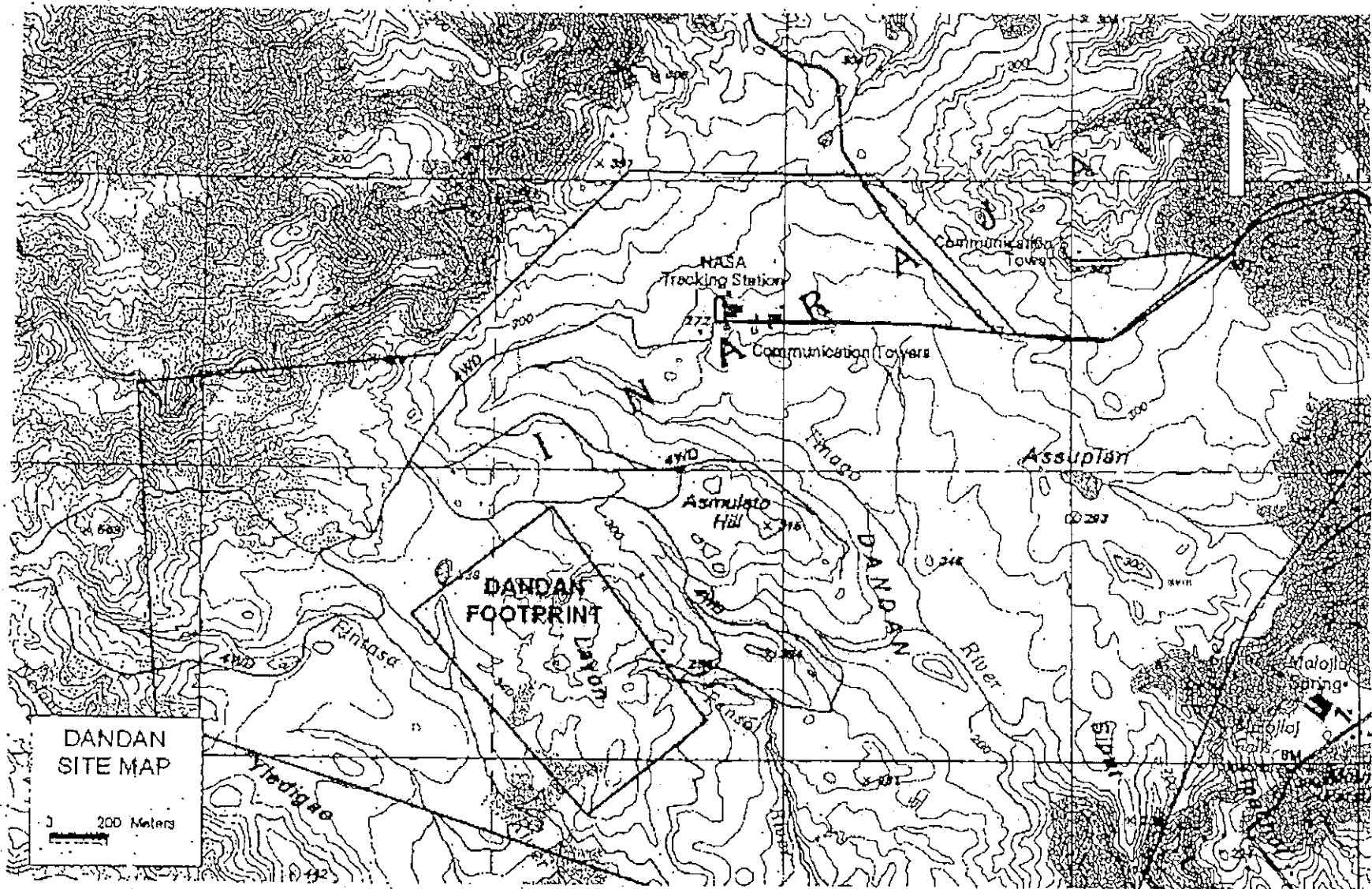


Figure 2. Site map of candidate landfill site at Dandan, Inarajan, Guam, with proposed landfill footprint.

DUEÑAS & ASSOCIATES

Inc.

Website: www.dnaguam.com
E-mail: dna@dnaguam.com

August 3, 2004

Capt. David M. Boone
U.S. Navy Public Works Center Guam
PSC 455 Box 195
FPO AP 96540-2937

Dear Capt. Boone:

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT FOR THE SITING OF
MUNICIPAL SOLID WASTE LANDFILL FACILITY

Duenas & Associates, Inc. and an interdisciplinary project team are preparing an Environmental Impact Statement for the siting of a new municipal solid waste landfill facility (MSWLF) on Guam. The team is working on behalf of the Department of Public Works and Guam Environmental Protection Agency. Based on a scientifically-based screening process, the Government of Guam selected three candidate sites that will be evaluated in the EIS. The sites are located at Lonfit in Asan, Dandan in Inarajan, and Sabanan Batea in Yona (Figures 1 and 2). The sites are currently undergoing field studies to characterize the existing environment, including archaeological, geotechnical, and biological features. A Draft EIS will be available for public review in October 2004. We are interested in any comments or concerns the Navy may have regarding the proposed development and operation of a MSWLF at one of these sites. More information is available on the project Web site at <http://www.guamlandfill.org>, or you can call our office at 646-7991.

Sincerely,



Claudine Camacho
Environmental Services Division
Duenas & Associates, Inc.

Enclosures (2)

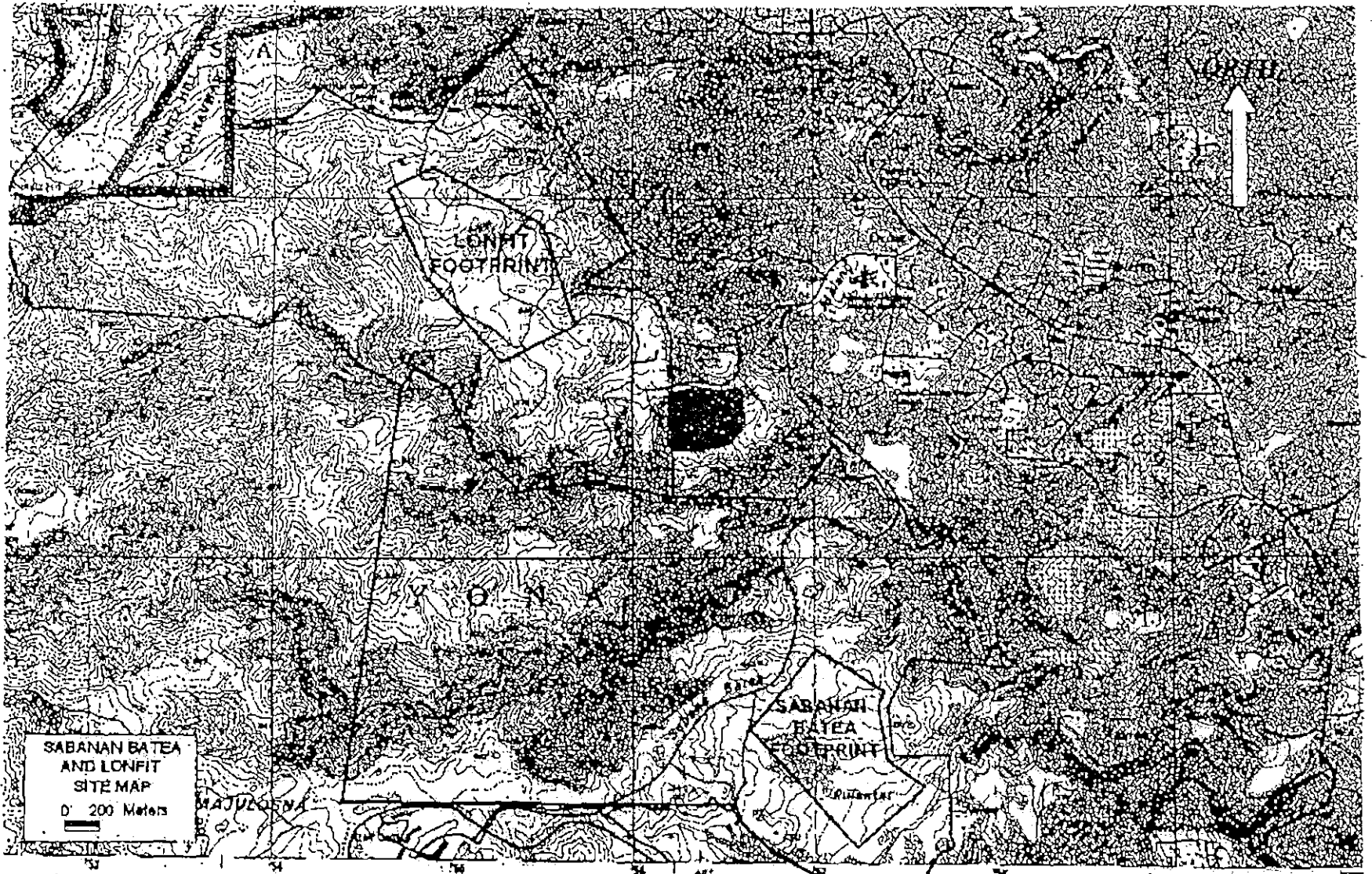


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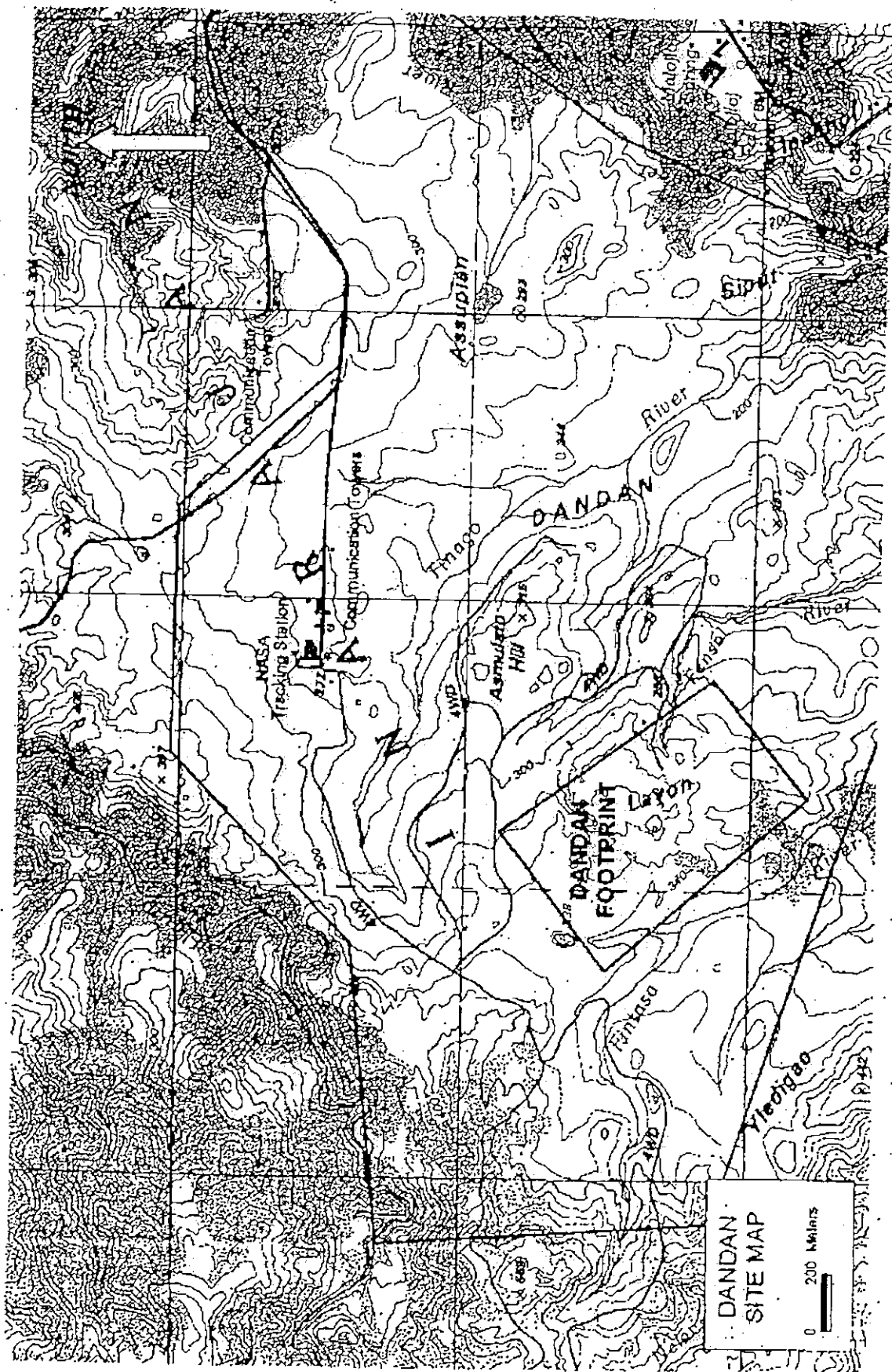


Figure 2. Site map of candidate landfill site at Dandan, Inarajan, Guam, with proposed landfill footprint.

DUEÑAS & ASSOCIATES Inc.

Website: www.dnaguam.com
E-mail: dna@dnaguam.com

August 3, 2004

Mr. Joseph M. Borja
Director
Department of Land Management
P.O. Box 2950
Hagatna, Guam 96932.

RECEIVED

15 09 04

Department of Land Management
Date: 8-4-04 Initial: mj

Dear Mr. Borja:

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT FOR THE SITING OF A
MUNICIPAL SOLID WASTE LANDFILL FACILITY

Duenas & Associates, Inc. and an interdisciplinary project team are preparing an Environmental Impact Statement for the siting of a new municipal solid waste landfill facility (MSWLF) on Guam. The team is working on behalf of the Department of Public Works and Guam Environmental Protection Agency. Based on a scientifically-based screening process, the Government of Guam selected three candidate sites that will be evaluated in the EIS. The sites are located at Lonfit in Asan, Dandan in Inarajan, and Sabanan Batea in Yona (Figures 1 and 2). The sites are currently undergoing field studies to characterize the existing environment, including archaeological, geotechnical, and biological features. A Draft EIS will be available for public review in October 2004. We are interested in any comments or concerns your agency may have regarding the proposed development and operation of a MSWLF at one of these sites. More information is available on the project Web site at <http://www.guamlandfill.org>, or you can call our office at 646-7991.

Sincerely,



Claudine Camacho
Environmental Services Division
Duenas & Associates, Inc.

Enclosures (2)

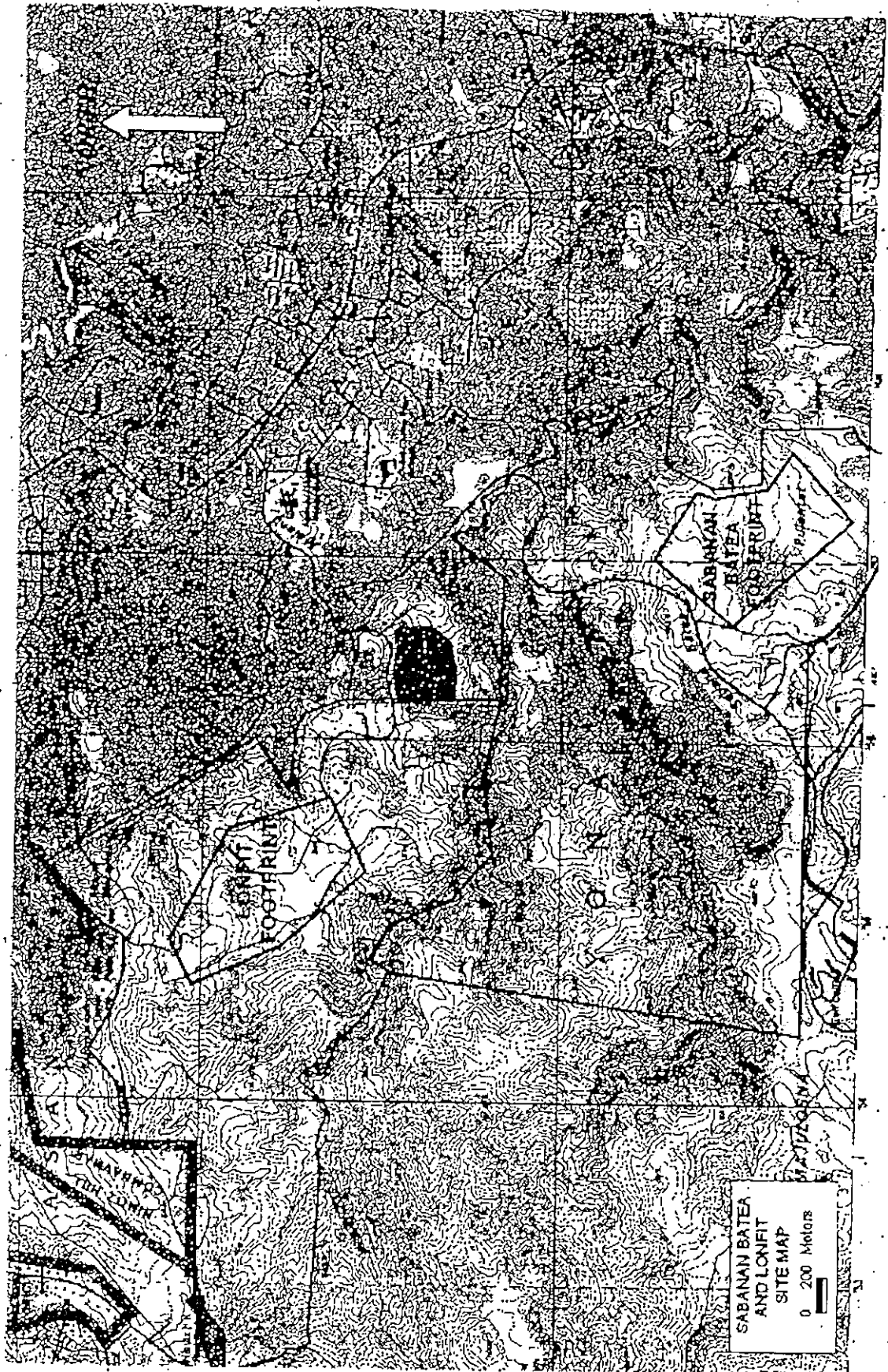


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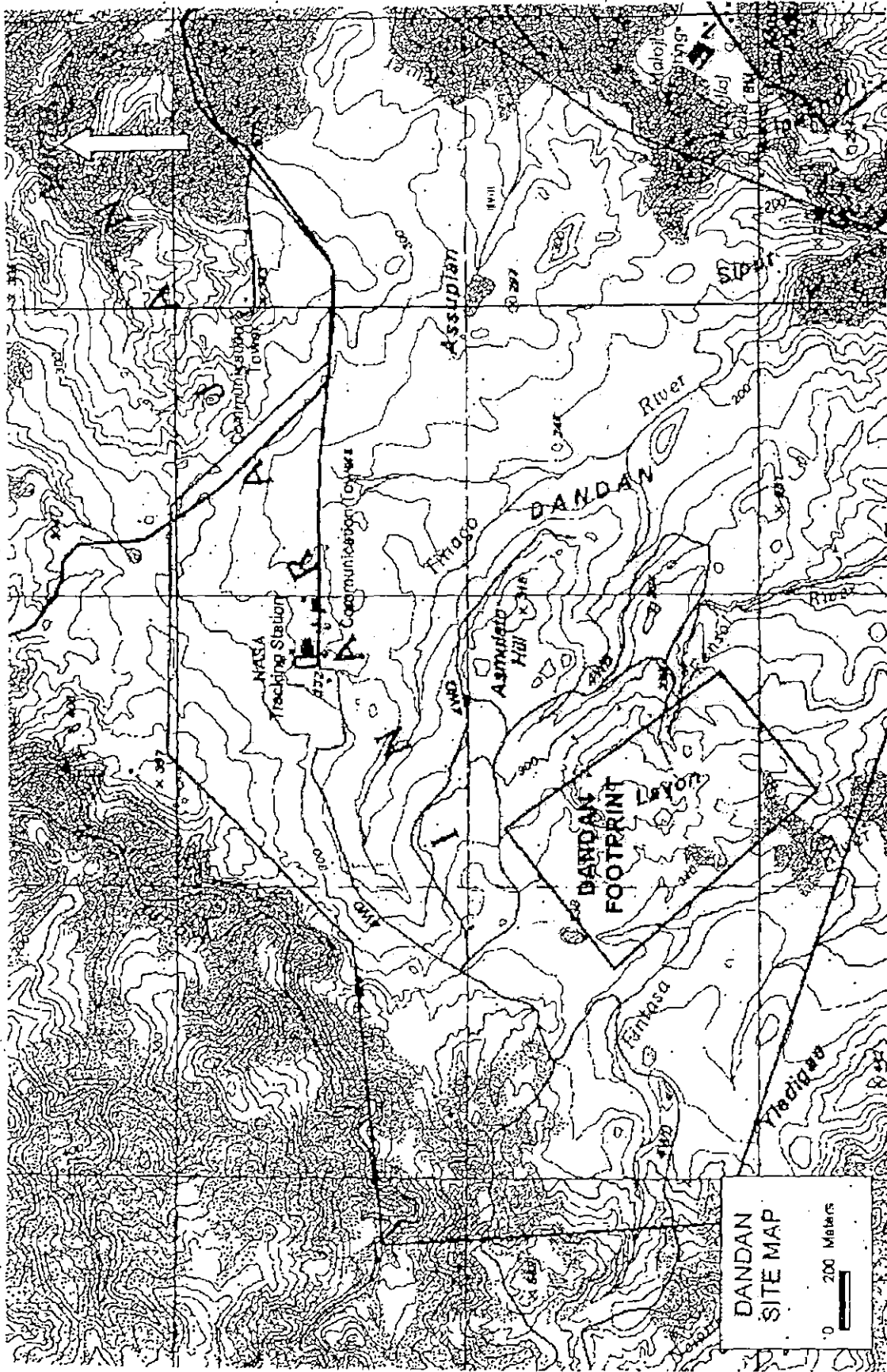
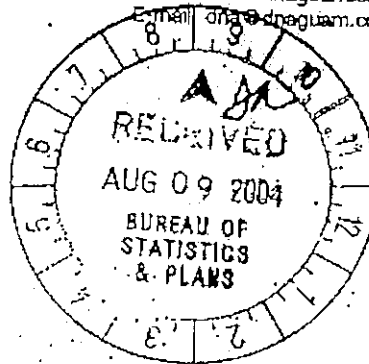


Figure 2. Site map of candidate landfill site at Dandan, Inarajan, Guam, with proposed landfill footprint.

DUEÑAS & ASSOCIATES Inc.

Website: www.dnaguam.com

E-mail: dna@daguam.com



August 3, 2004

Mr. Manuel Q. Cruz
Director
P.O. Box 2950
Hagatha, Guam 96932
Attn: Ms. Evangeline D. Lujan

Dear Mr. Cruz:

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT FOR THE SITING OF A
MUNICIPAL SOLID WASTE LANDFILL FACILITY

Duenas & Associates, Inc. and an interdisciplinary project team are preparing an Environmental Impact Statement for the siting of a new municipal solid waste landfill facility (MSWLF) on Guam. The team is working on behalf of the Department of Public Works and Guam Environmental Protection Agency. Based on a scientifically-based screening process, the Government of Guam selected three candidate sites that will be evaluated in the EIS. The sites are located at Lonfit in Asan, Dandan in Inarajan, and Sabanan Batea in Yona (Figures 1 and 2). The sites are currently undergoing field studies to characterize the existing environment, including archaeological, geotechnical, and biological features. A Draft EIS will be available for public review in October 2004. We are interested in any comments or concerns your agency may have regarding the proposed development and operation of a MSWLF at one of these sites. More information is available on the project Web site at <http://www.guamlandfill.org>, or you can call our office at 646-7991.

Sincerely,

Claudine Camacho
Environmental Services Division
Duenas & Associates, Inc.

Enclosures (2)

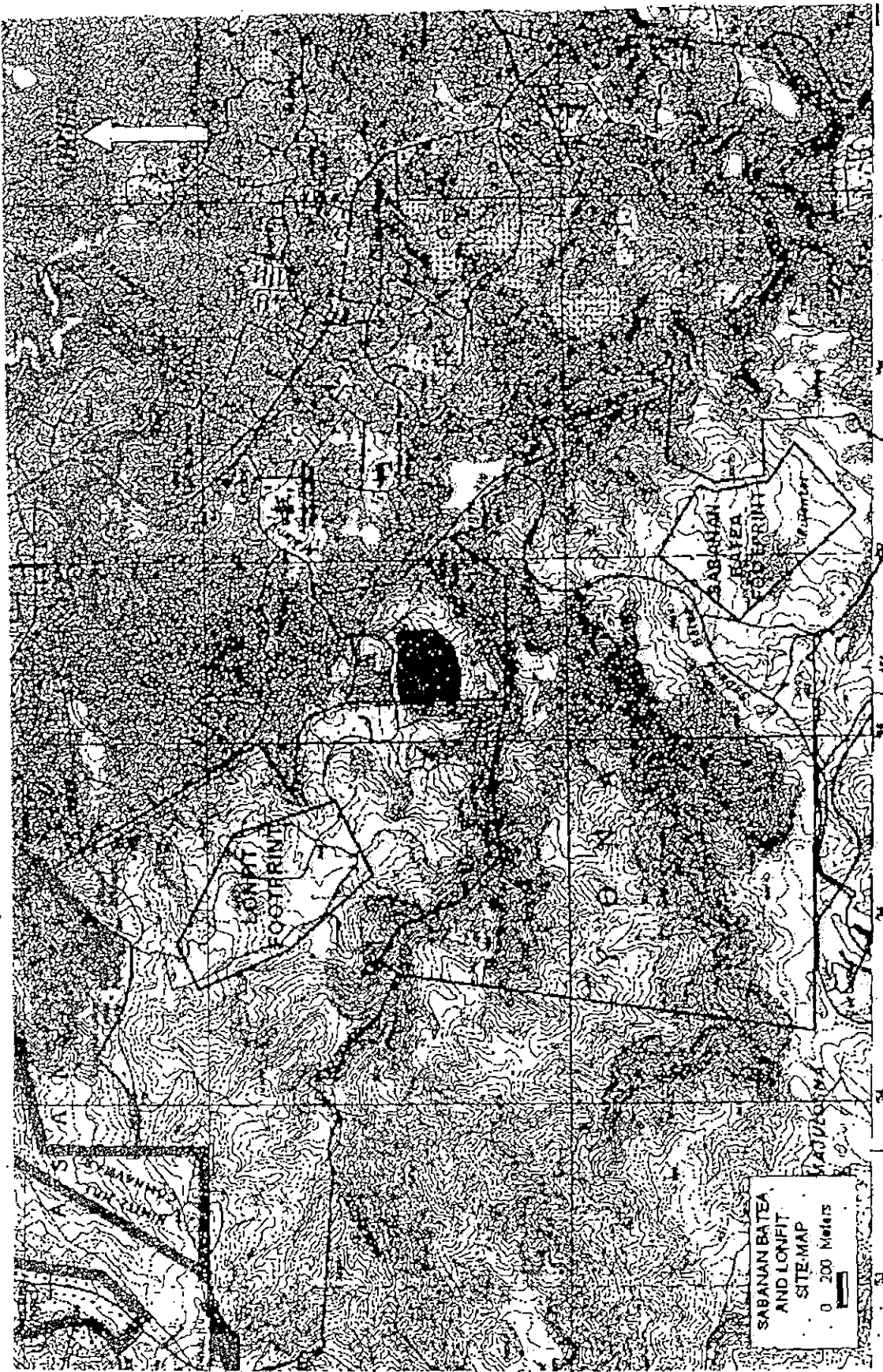


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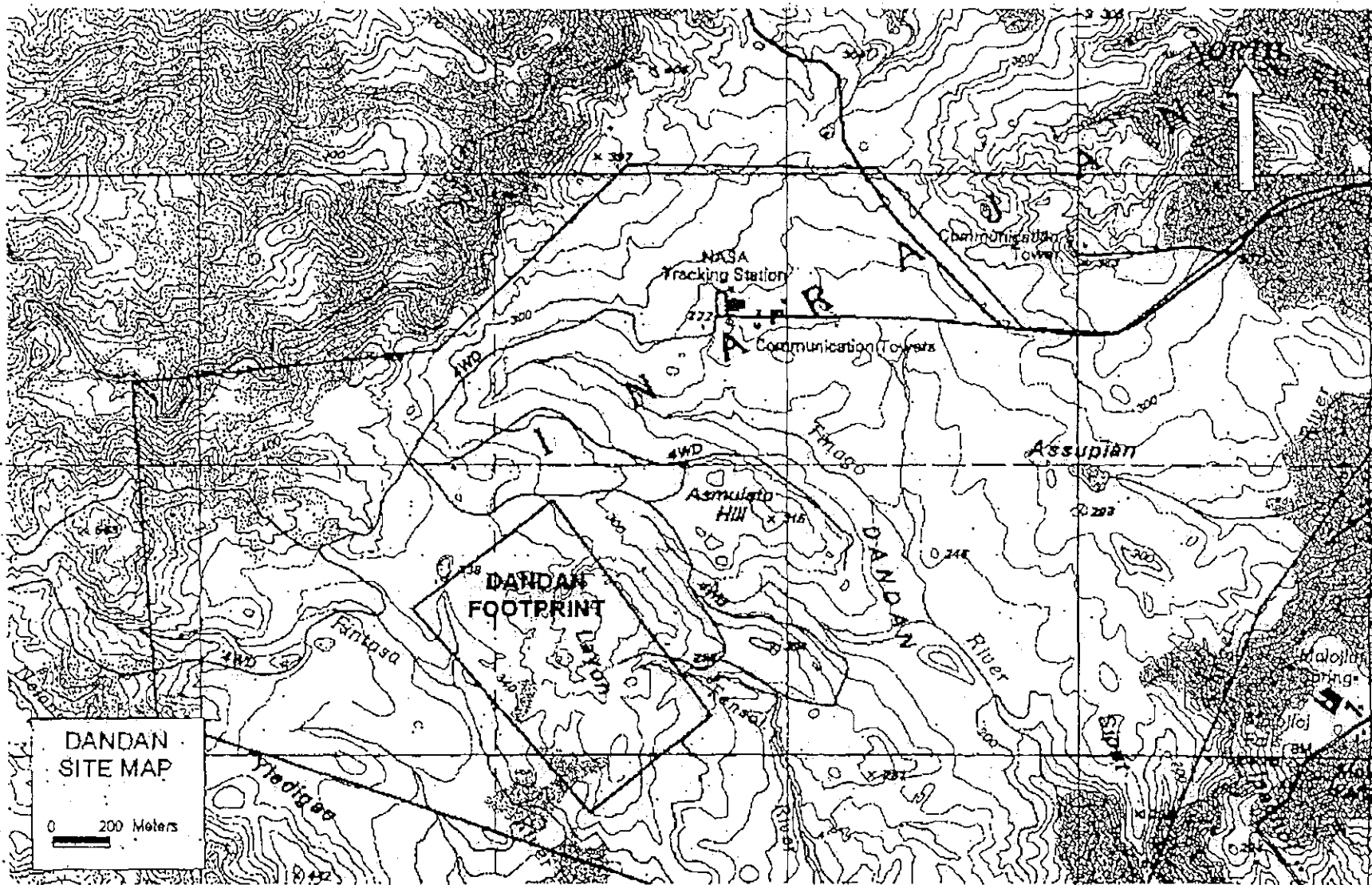


Figure 2. Site map of candidate landfill site at Dandan, Inarajan, Guam, with proposed landfill footprint.

August 3, 2004


Francis M. Dayton
U.S. Army Corps of Engineers
Regulatory Branch
U.S. Navy Public Works Center, Guam
PSC 455 Box 195
FPO AP 96540-2937

Dear Mr. Dayton:

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT FOR THE SITING OF
MUNICIPAL SOLID WASTE LANDFILL FACILITY

Duenas & Associates, Inc. and an interdisciplinary project team are preparing an Environmental Impact Statement for the siting of a new municipal solid waste landfill facility (MSWLF) on Guam. The team is working on behalf of the Department of Public Works and Guam Environmental Protection Agency. Based on a scientifically-based screening process, the Government of Guam selected three candidate sites that will be evaluated in the EIS. The sites are located at Lonfit in Asan, Dandan in Inarajan, and Sabanan Batea in Yona (Figures 1 and 2). The sites are currently undergoing field studies to characterize the existing environment, including archaeological, geotechnical, and biological features. A Draft EIS will be available for public review in October 2004. We are interested in any comments or concerns the Army Corps of Engineers may have regarding the proposed development and operation of a MSWLF at one of these sites. More information is available on the project Web site at <http://www.guamlandfill.org>, or you can call our office at 646-7991.

Sincerely,



Claudine Camacho
Environmental Services Division
Duenas & Associates, Inc.

Enclosures (2)

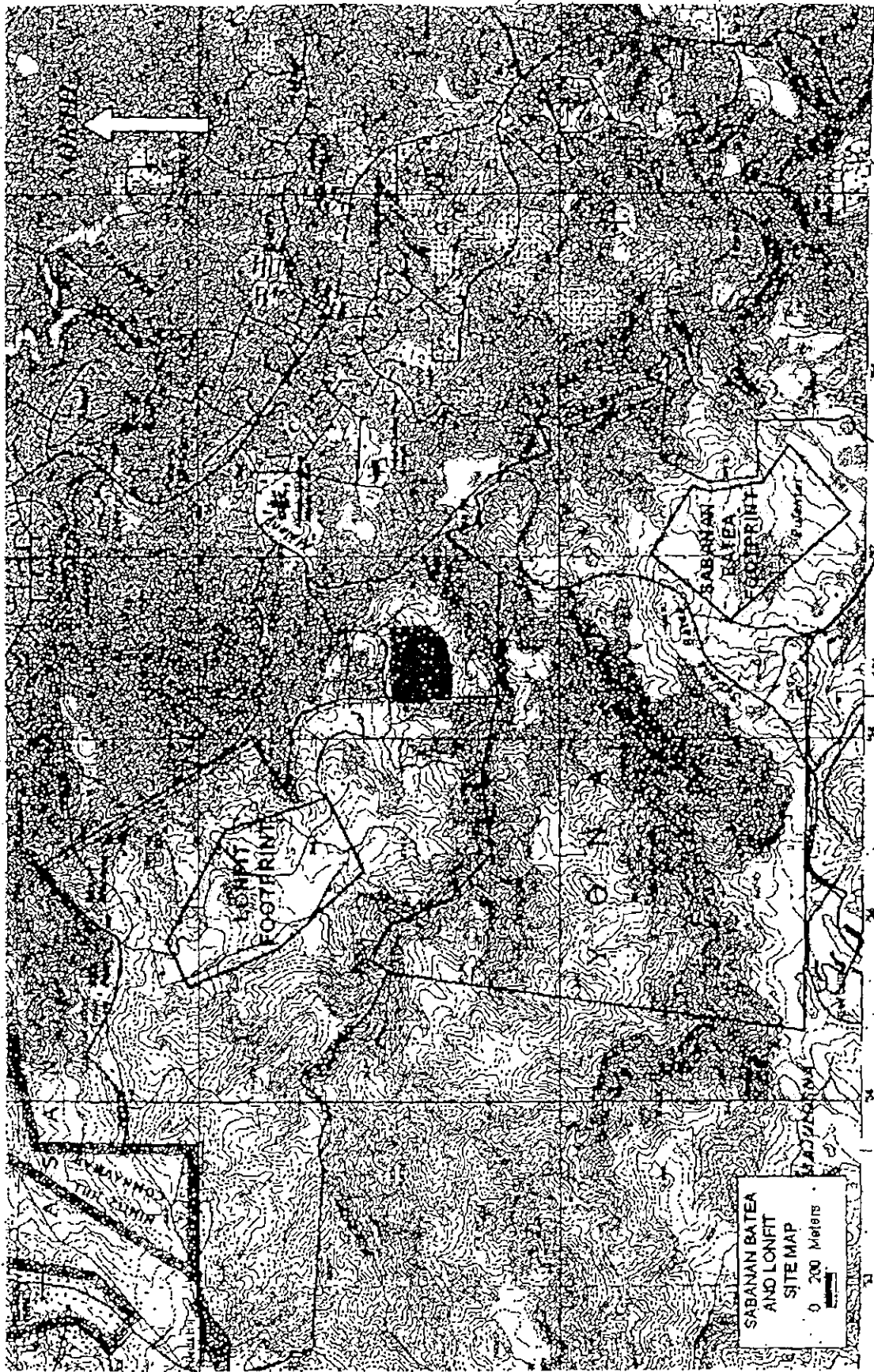


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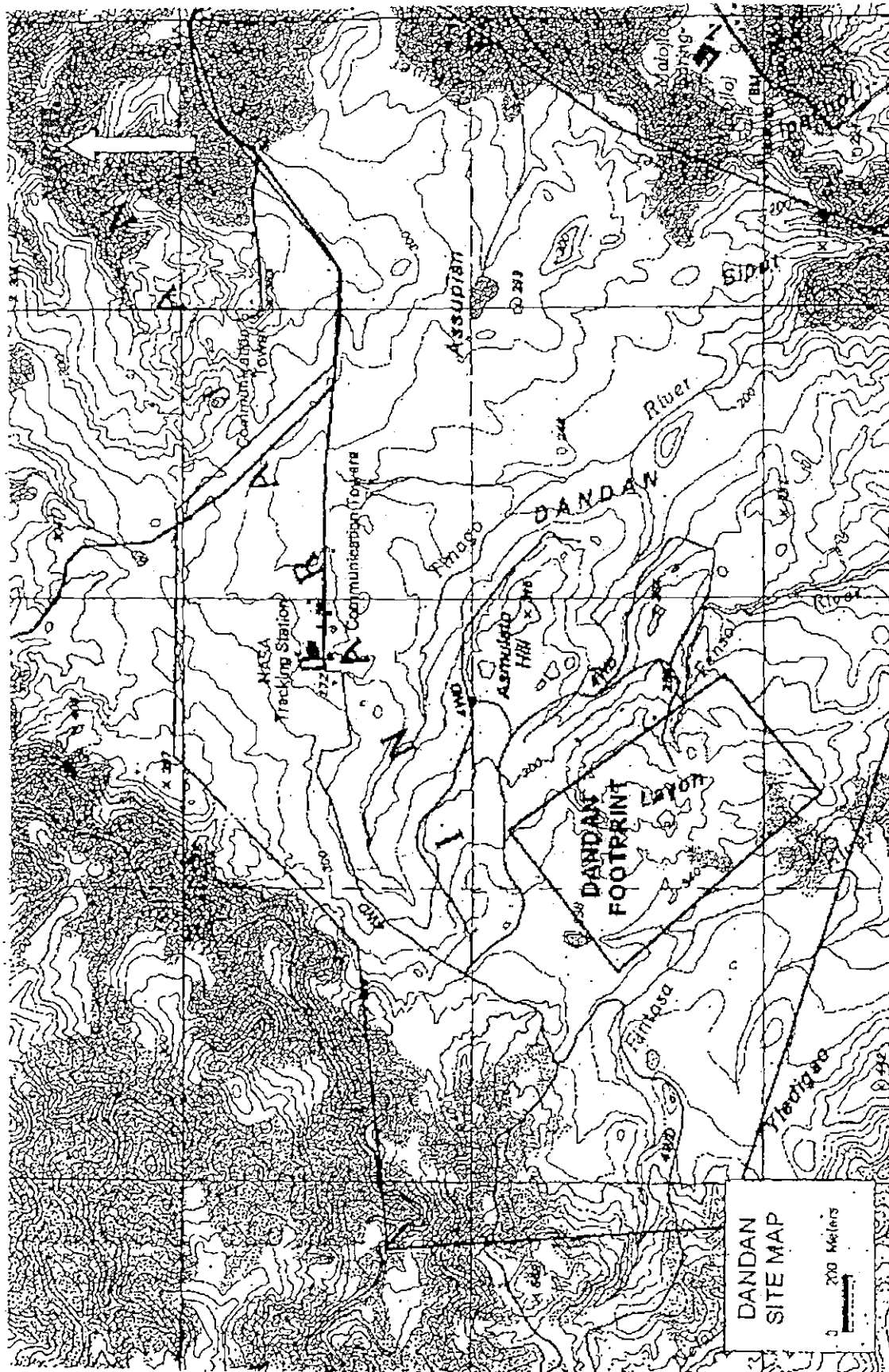


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DUEÑAS & ASSOCIATES Inc.

Website: www.dnaguam.com
E-mail: dna@dnaguam.com

August 3, 2004

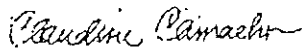
Ms. Gina Schultz
Acting Field Supervisor
Pacific Islands Office
U.S. Fish and Wildlife Service
300 Ala Moana Boulevard, Room 3-122
Box 50088
Honolulu, HI 96850

Dear Ms. Schultz:

**SUBJECT: ENVIRONMENTAL IMPACT STATEMENT FOR THE SITING OF A
MUNICIPAL SOLID WASTE LANDFILL FACILITY**

Duenas & Associates, Inc. and an interdisciplinary project team are preparing an Environmental Impact Statement for the siting of a new municipal solid-waste landfill facility (MSWLF) on Guam. The team is working on behalf of the Department of Public Works and Guam Environmental Protection Agency. Based on a scientifically-based screening process, the Government of Guam selected three candidate sites that will be evaluated in the EIS. The sites are located at Lonfit in Asan, Dandan in Inarajan, and Sabanan Batea in Yona (Figures 1 and 2). The sites are currently undergoing field studies to characterize the existing environment, including archaeological, geotechnical, and biological features. A Draft EIS will be provided for your review in October 2004. We are interested in any comments or concerns the Service may have regarding the proposed development and operation of a MSWLF at one of these sites. More information is available on the project Web site at <http://www.guamlandfill.org>, or you can call our office at 671-646-7991.

Sincerely,



Claudine Camacho
Environmental Services Division
Duenas & Associates, Inc.

Enclosures (2) _

ENGINEERING (CIVIL, STRUCTURAL, MECHANICAL, ENVIRONMENTAL) ■ CONSTRUCTION MANAGEMENT ■ SURVEYING
ENVIRONMENTAL SERVICES ■ PLANNING ■ DEVELOPMENT CONSULTATION ■ GEOGRAPHIC INFORMATION SYSTEM

GUAM P.O. Box 8900, Tamuning, Guam 96931 / 155 ET Calvo Memorial Parkway, Suite 200, Tamuning, Guam 96913 / Tel: (671) 646-7991 / Fax: (671) 646-6315

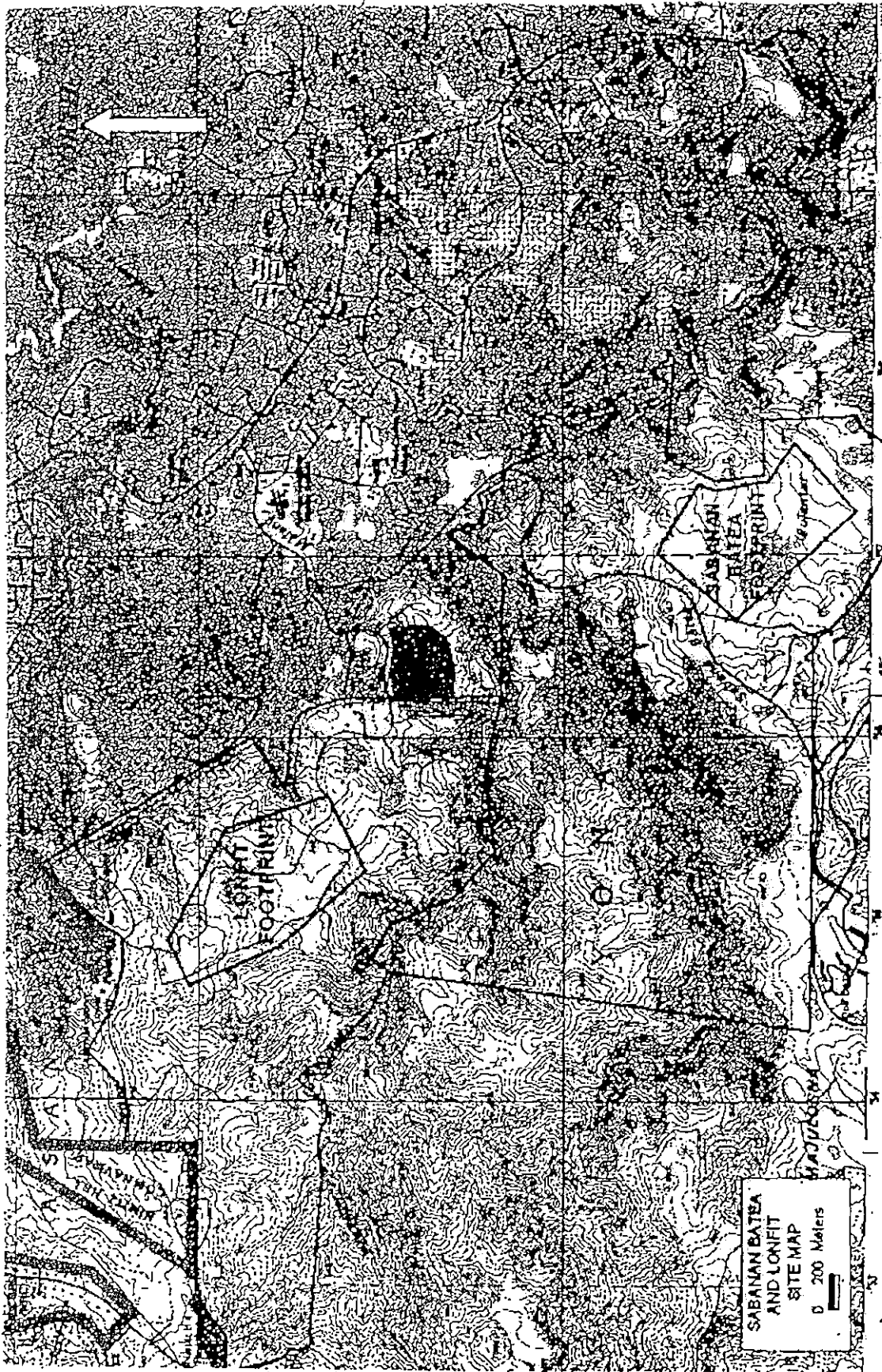


Figure 1. Site map of candidate landfill sites at Sabanan Batea, Yona and Lonfit, Asau, Guam, with proposed landfill footprints.

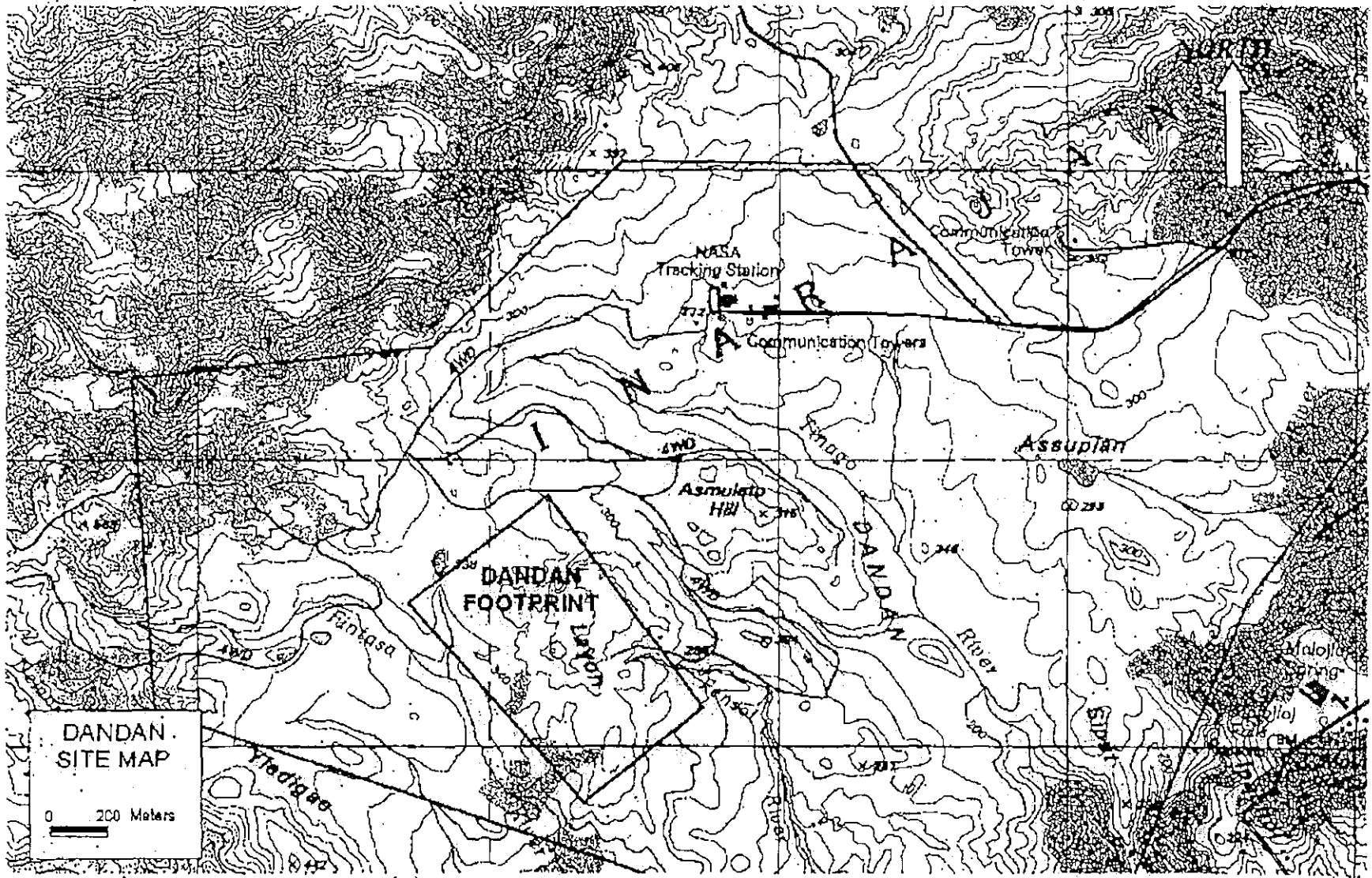


Figure 2. Site map of candidate landfill site at Dandan, Inarajan, Guam, with proposed landfill footprint.

DUEÑAS & ASSOCIATES

Inc.

Website: www.dnaguam.com
E-mail: dna@dnaguam.com

March 29, 2005.

Ms. Gina Schultz
Acting Field Supervisor
U.S. Fish and Wildlife Service
Pacific Islands Office
300 Ala Moana Blvd.
P.O. Box 50088
Honolulu, HI 96850-0001

Dear Ms. Schultz:

**SUBJECT: ENVIRONMENTAL IMPACT STATEMENT FOR THE SITING OF A
MUNICIPAL SOLID WASTE LANDFILL FACILITY, INARAJAN, GUAM**

The Government of Guam, through the Department of Public Works and Guam Environmental Protection Agency, is proposing to develop a new municipal solid waste landfill on Guam. Three sites, located at Lonfit in Asan, Dandan in Inarajan, and Sabanan Batea in Yona (Figures 1 and 2), were investigated by a multidisciplinary team led by Duenas & Associates, Inc. The results of these investigations were summarized in a Preliminary Site Selection Report. The Government of Guam used this report, with other information, to select Dandan (also known as Layon) as the preferred site for the landfill. The Government of Guam, through a contract with Duenas & Associates, Inc., is in the process of preparing an Environmental Impact Statement for the development of a new landfill at this site.

Wetlands surveyed within the proposed landfill footprint and buffer area at the Dandan (Layon) site were verified by the U.S. Army Corps of Engineers, Guam EPA, and Guam Department of Agriculture in March 2005 (Figure 3). Wetland investigations extended to the 300-foot buffer west of the footprint, and to the 400-foot buffer east of the footprint. The proposed road and utility corridor was also investigated, and no wetlands occur within this corridor. Approximately 7.86 acres of wetlands occur within the proposed landfill footprint and buffer area. These wetlands are associated with the Fintasa and Fensol Rivers, and may potentially serve as habitat for the endangered Mariana common moorhen (*Gallinula chloropus guami*). The Mariana common moorhen was not detected in the landfill footprint and buffer area during our field investigations; however, Takano (2003) observed a single moorhen in the Tinago River and in the Assupian pond to the northeast of the landfill footprint during her surveys in 2001.

Figures 4 to 6 present the three preliminary layouts of the landfill facilities that have been developed at the Dandan (Layon) site. Option 1 would impact approximately 1.89 acres of wetlands associated with the Fintasa River. Option 2 and Option 3 would have no direct impact on wetland areas; however, Option 3 would provide the greatest separation between the landfill facility and wetlands. Ms. Diane Vice (Acting Wildlife Supervisor) and Ms. Suzanne Medina (Wildlife Biologist) of the Guam Department of

March 29, 2005

Agriculture's Division of Aquatic and Wildlife Resources visited the site in March 2005 and have been consulted regarding the potential impacts to moorhen habitat.

We are interested in any comments the Service may have regarding the proposed development and operation of a MSWLF at the Dandan (Layon) site. Preliminary field investigations are summarized in the Final Site Selection Report (FSSR). An electronic copy of the FSSR is enclosed for your reference. A copy of the Draft EIS will be provided to the Service once it is available. More information is available on the project Web site at <http://www.guamlandfill.org>, or you can call our office at 646-7991.

Sincerely,



Claudine Camacho
Environmental Services Division
Duenas & Associates, Inc.

Enclosures (Figures 1 to 6, FSSR on CD)

cc: Ms. Diane Vice, Guam Department of Agriculture
Ms. Cynthia U. Jackson, Guam Department of Public Works

Reference:

Takano, L. 2003. Seasonal movement, home range, and abundance of the Mariana Common Moorhen (*Gallinula chloropus guami*) on Guam and the Northern Mariana Islands. Unpublished Masters of Science Thesis, Oregon State University. 96 pp.

Figure 1. Site Location Map of Dandan Candidate Landfill Site.

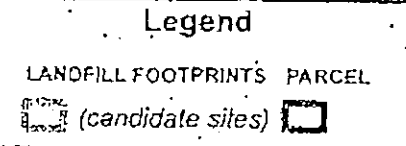
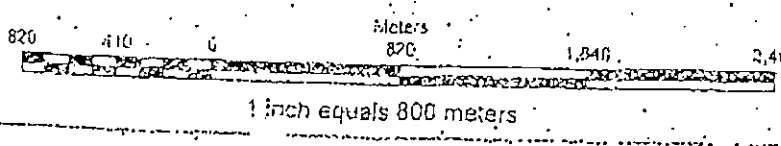
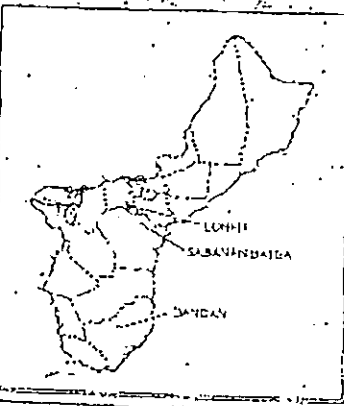
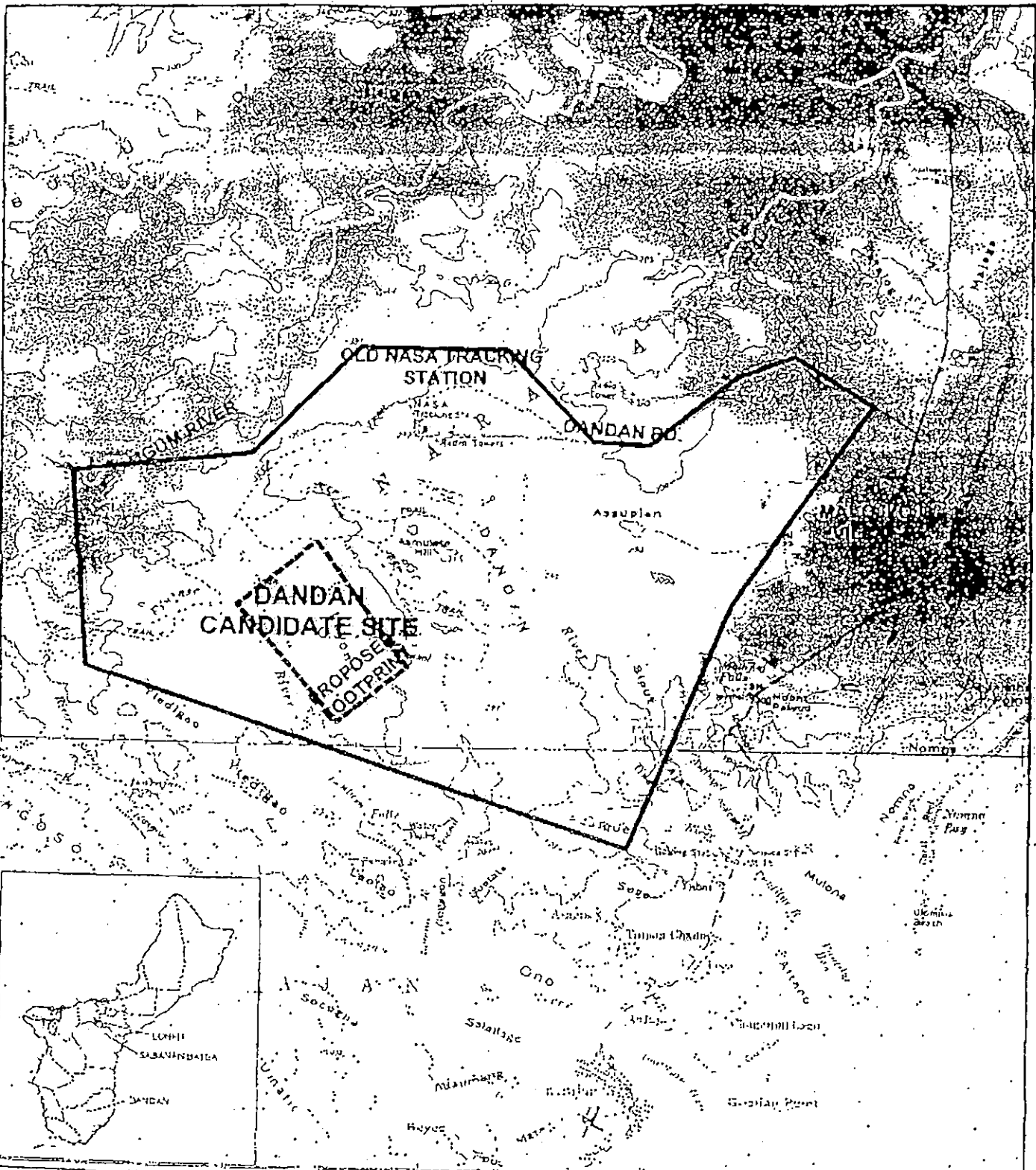
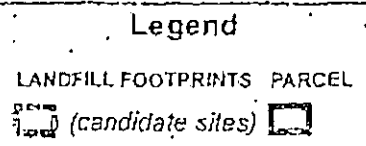
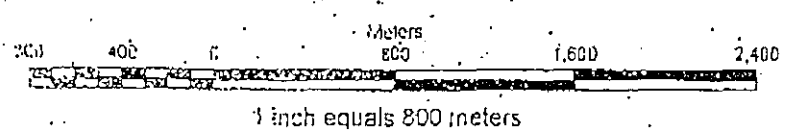
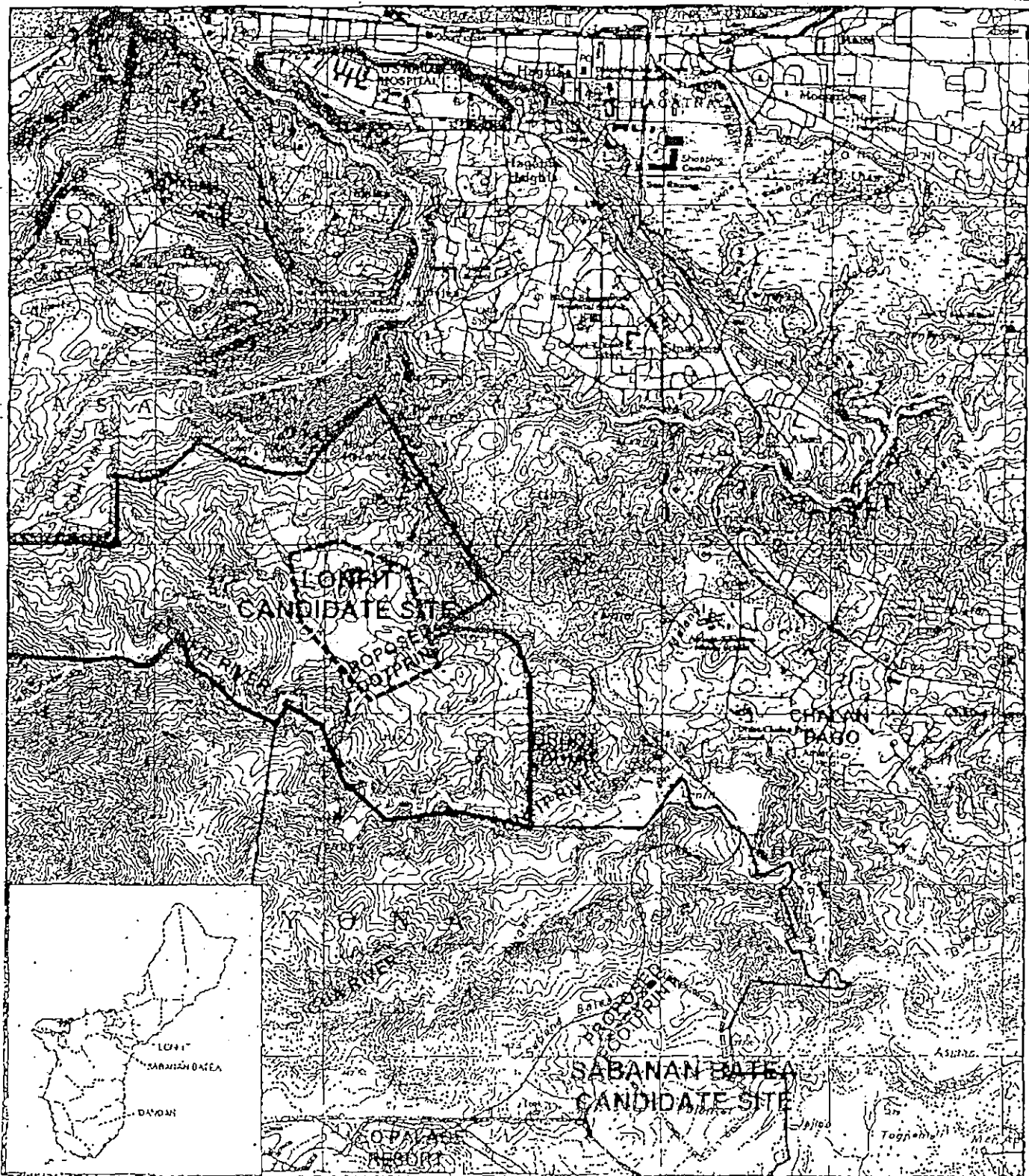


Figure 2. Site Location Map of Sabanan Batea and Lonfit Candidate Landfill Sites.



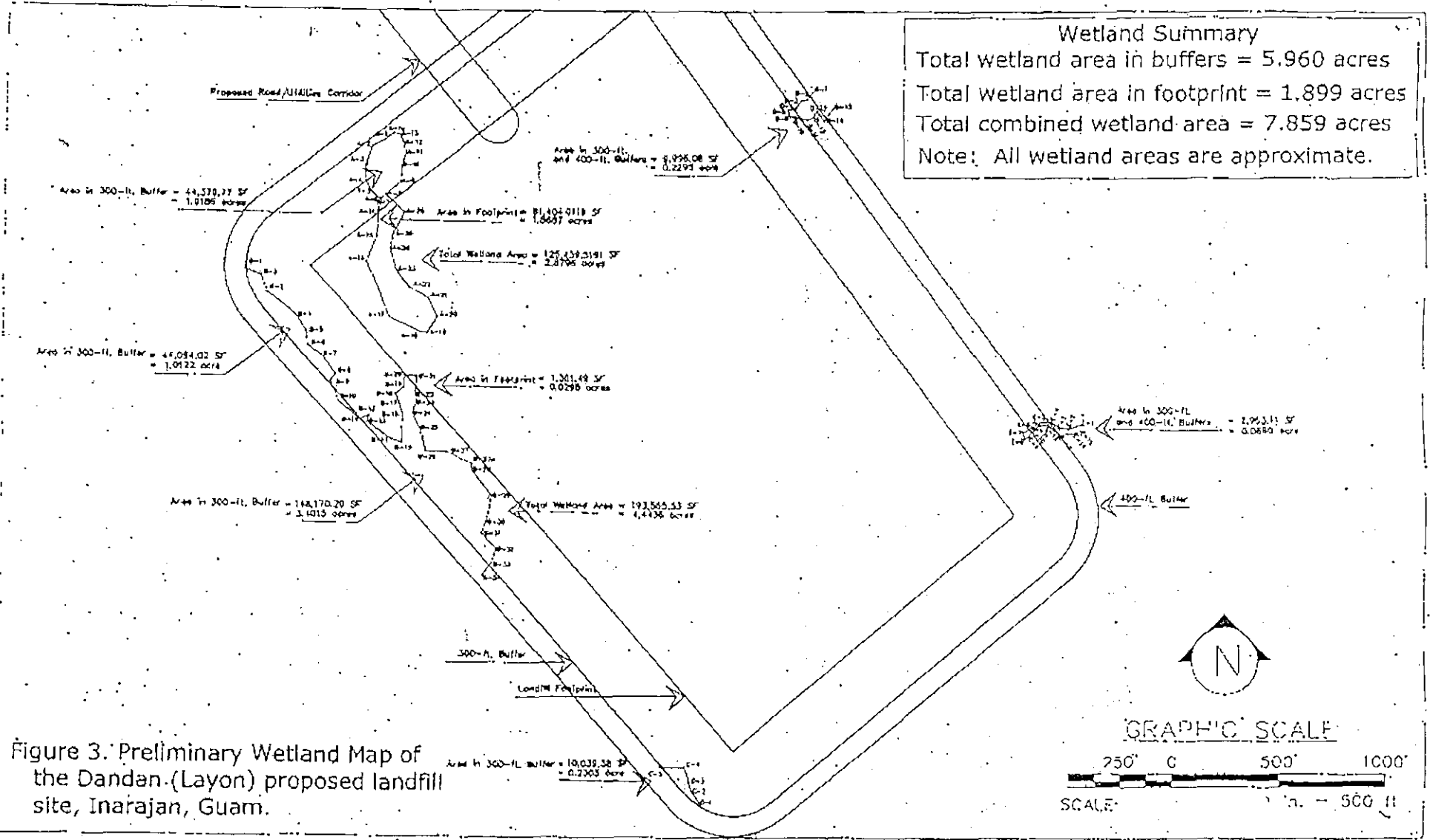
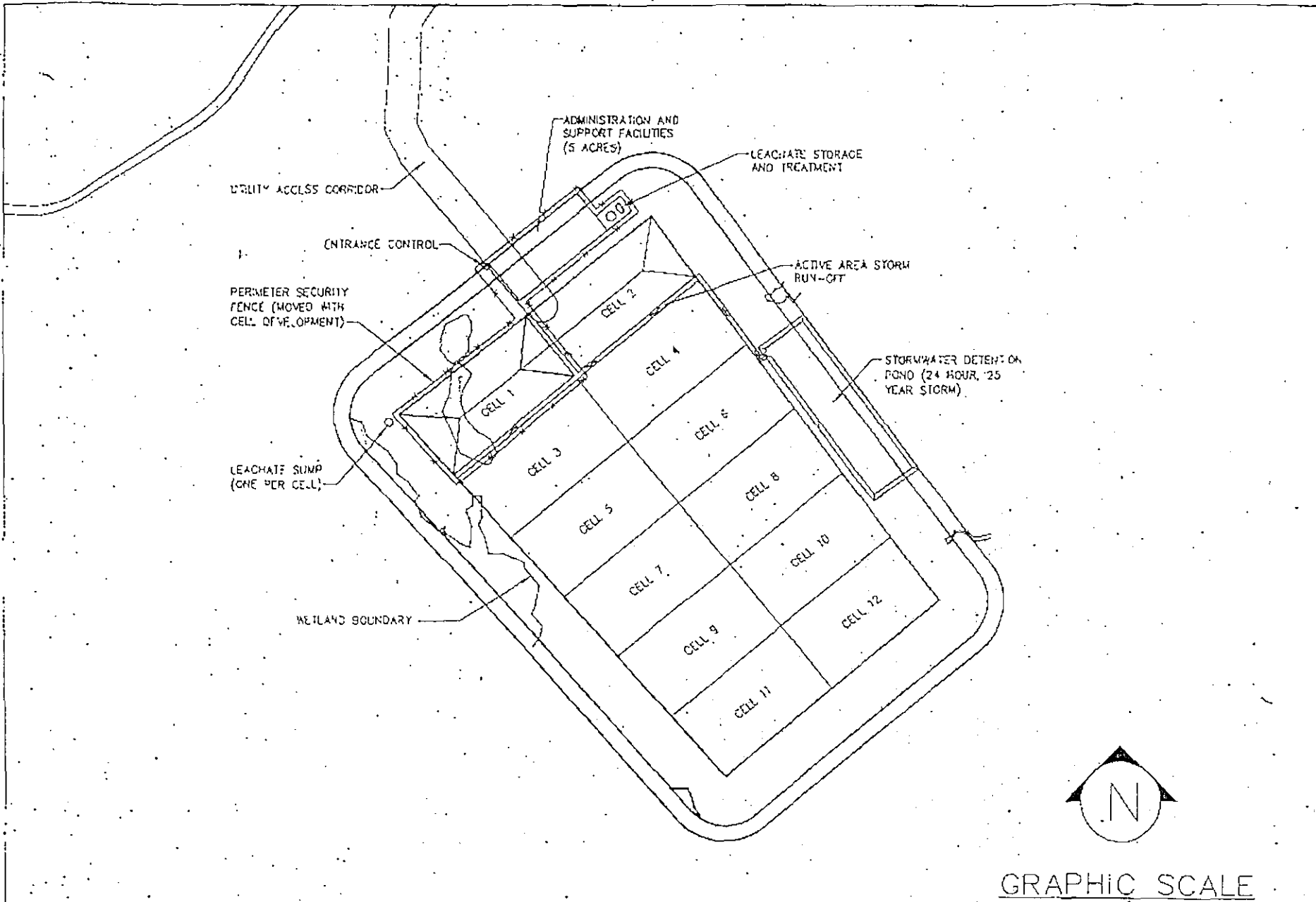


Figure 3. Preliminary Wetland Map of the Dandan (Layan) proposed landfill site, Inarajan, Guam.

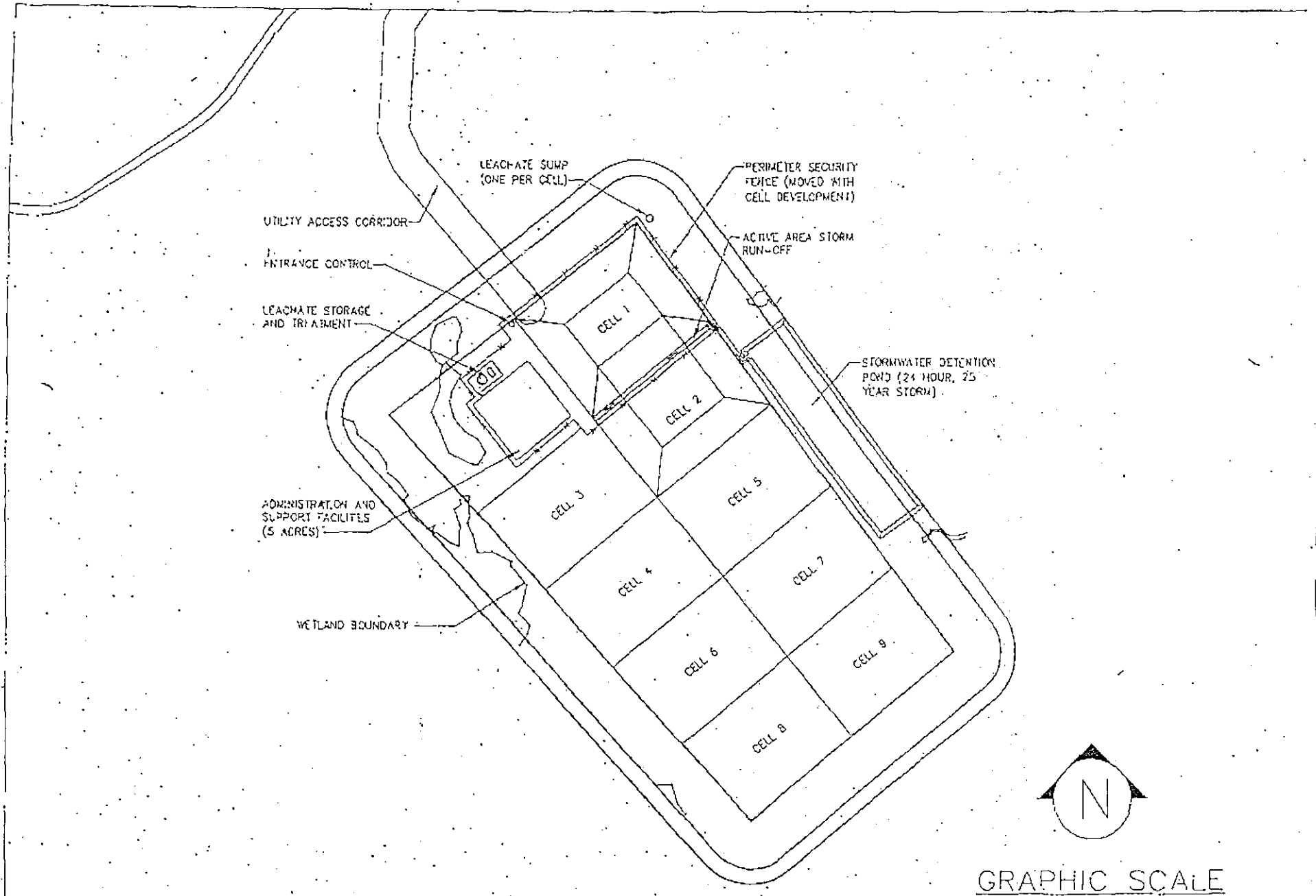


GRAPHIC SCALE



SCALE: 1 in. = 800 ft

Figure 4. Proposed landfill layout Option 1.



GRAPHIC SCALE

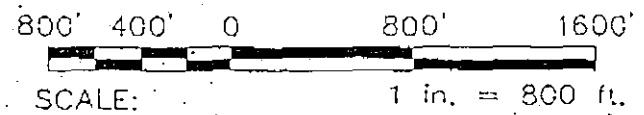
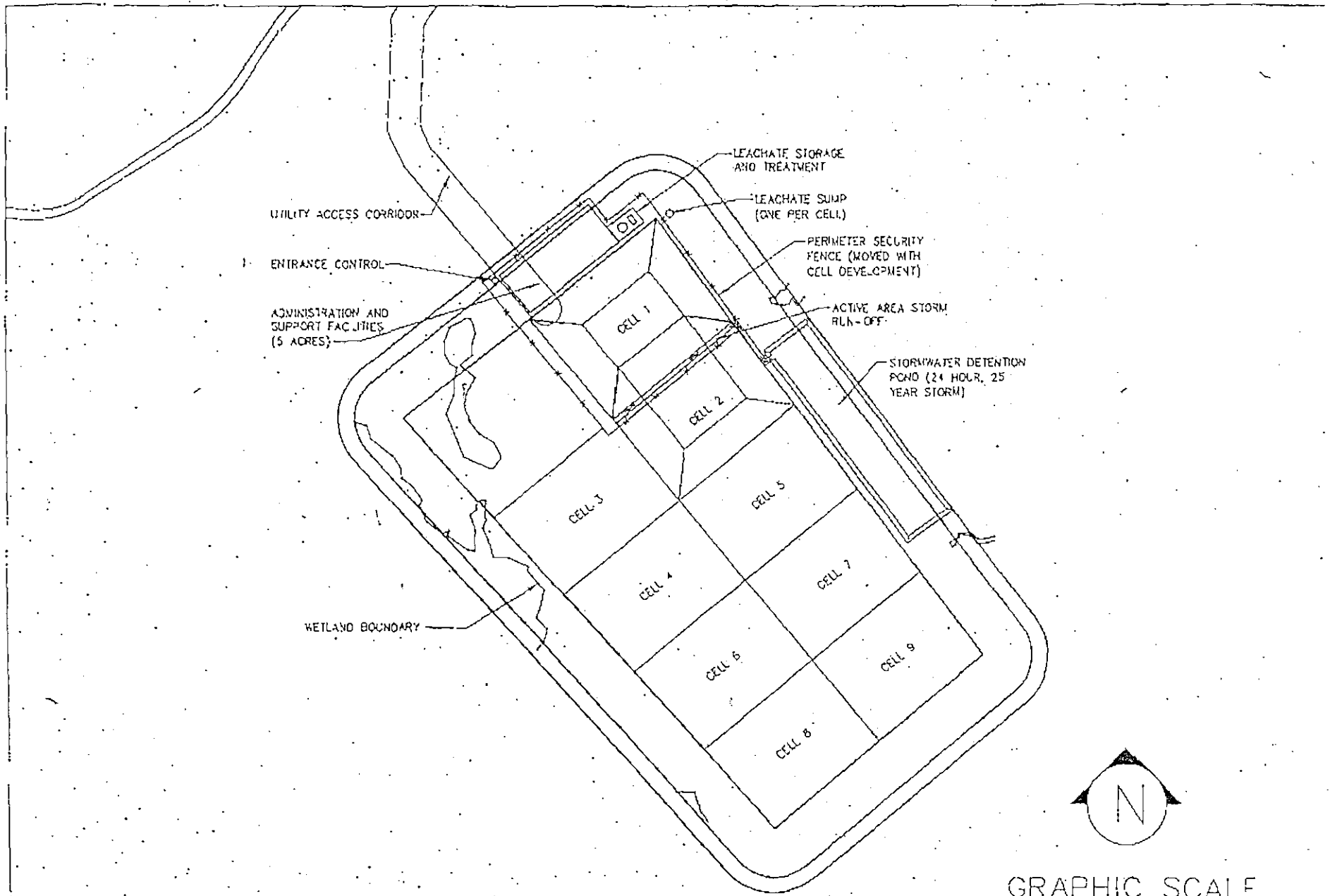


Figure 5. Proposed landfill layout Option 2.



GRAPHIC SCALE



SCALE: 1 in. = 800 ft

Figure 6. Proposed landfill layout Option 3.

May 25, 2005

Mr. Celestino Aguon
Acting Chief
Division of Aquatic and Wildlife Resources
Department of Agriculture
192 Dairy Road
Mangilao, Guam 96913

Dear Mr. Aguon:

TRANSMITTAL OF ONE (1) COPY OF THE DRAFT SUPPLEMENTAL EIS FOR
THE SITING OF A MUNICIPAL SOLID WASTE LANDFILL FACILITY, GUAM

Enclosed for your review is an electronic copy of the Draft Supplemental Environmental Impact Statement (SEIS) for the siting of a municipal solid waste landfill facility (MSWLF) in the Layon area of Dandan, Inarajan, Guam. The Layon, Dandan landfill site was selected by the Government of Guam, on January 31, 2005 and approved by the U.S. Environmental Protection Agency on February 14, 2005. The enclosed SEIS evaluates three alternatives for the site layout and development of a MSWLF at Layon, as well as the no action alternative. The document also prescribes mitigation for significant impacts from the preferred alternative site layout.

The public comment period ends on June 16, 2005. Written comments may be submitted to Duenas & Associates, Inc. by mail at the following address: 155 E.T. Calvo Memorial Parkway, Suite 200, Tamuning, Guam 96913. Comments may also be sent by facsimile to 646-6315. Please contact me at 646-7991 if you have any questions or need further information.

Sincerely,

Claudine Camacho

Claudine Camacho
Environmental Services Division

Enclosure (1)

RECEIVED

MAY 26 2005

DAWR

DUEÑAS & ASSOCIATES

Inc.

Website: www.dnaguam.com
E-mail: dna@dnaguam.com

May 25, 2005

Ms. Lynda B. Aguon
Guam (State) Historic Preservation Officer
Historic Resources Division
Department of Parks & Recreation
Government of Guam
P.O. Box 2950
Hagatna, Guam 96932

MAY 26 2005
at

Dear Ms. Aguon:

TRANSMITTAL OF ONE (1) COPY OF THE DRAFT SUPPLEMENTAL EIS FOR
THE SITING OF A MUNICIPAL SOLID WASTE LANDFILL FACILITY, GUAM

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Sincerely,

Claudine Camacho

Claudine Camacho
Environmental Services Division

Enclosure (1)

**DUEÑAS &
ASSOCIATES**
Inc.

RECEIVED

MAY 26 '05

Department of Land Management

Time: 10:57 Initial: MJ

Website: www.dnaguam.com
E-mail: dna@dnaguam.com

May 25, 2005

Mr. Joseph M. Borja
Director
Department of Land Management
P.O. Box 2950
Hagatna, Guam 96932

Dear Mr. Borja:

TRANSMITTAL OF ONE (1) COPY OF THE DRAFT SUPPLEMENTAL EIS FOR
THE SITING OF A MUNICIPAL SOLID WASTE LANDFILL FACILITY, GUAM

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Sincerely,

Claudine Camacho

Claudine Camacho
Environmental Services Division

Enclosure (1)

DUEÑAS & ASSOCIATES Inc.

Website: www.dnaguam.com
E-mail: dna@dnaguam.com

May 26, 2005

Mr. Frank Dayton
Guam Regulatory Branch
U.S. Army Corps of Engineers
PSC 455, Box 188
FPO AP 96540-1088

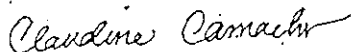
Dear Mr. Dayton:

TRANSMITTAL OF ONE (1) COPY OF THE DRAFT SUPPLEMENTAL EIS FOR THE SITING OF A MUNICIPAL SOLID WASTE LANDFILL FACILITY, GUAM

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Sincerely,



Claudine Camacho
Environmental Services Division

Enclosure (1)

DUEÑAS & ASSOCIATES Inc.

Website: www.dnaguam.com
E-mail: dna@dnaguam.com

May 25, 2005

Mr. David Limtiaco
Chief
Forestry and Soil Resources Division
Department of Agriculture
192 Dairy Road
Mangilao, Guam 96913

Dear Mr. Limtiaco:

TRANSMITTAL OF ONE (1) COPY OF THE DRAFT SUPPLEMENTAL EIS FOR THE SITING OF A MUNICIPAL SOLID WASTE LANDFILL FACILITY, GUAM

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Sincerely,

Claudine Camacho

Claudine Camacho
Environmental Services Division

Enclosure (1)

RECEIVED

DATE: 05-26-05

J. Andrade

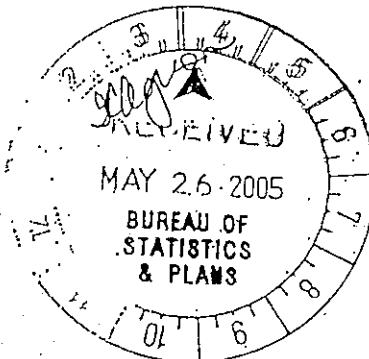
DUEÑAS & ASSOCIATES

Inc.

Website: www.dnaguam.com
E-mail: dna@dnaguam.com

May 25, 2005

Mr. Anthony P. Sanchez
Acting Director
Bureau of Statistics and Plans
Government of Guam
P.O. Box 2950
Hagatna, Guam 96932



Dear Mr. Sanchez:

TRANSMITTAL OF ONE (1) COPY OF THE DRAFT SUPPLEMENTAL EIS FOR THE SITING OF A MUNICIPAL SOLID WASTE LANDFILL FACILITY, GUAM

Enclosed for your review is an electronic copy of the Draft Supplemental Environmental Impact Statement (SEIS) for the siting of a municipal solid waste landfill facility (MSWLF) in the Layon area of Dandan, Inarajañ, Guam. The Layon, Dandan landfill site was selected by the Government of Guam on January 31, 2005 and approved by the U.S. Environmental Protection Agency on February 14, 2005. The enclosed SEIS evaluates three alternatives for the site layout and development of a MSWLF at Layon, as well as the no action alternative. The document also prescribes mitigation for significant impacts from the preferred alternative site layout.

The public comment period ends on June 16, 2005. Written comments may be submitted to Duenas & Associates, Inc. by mail at the following address: 155 E.T. Calvo Memorial Parkway, Suite 200, Tamuning, Guam 96913. Comments may also be sent by facsimile to 646-6315. Please contact me at 646-7991 if you have any questions or need further information.

Sincerely,

Claudine Camacho

Claudine Camacho
Environmental Services Division

Enclosure (1)

BUREAU OF STATISTICS AND PLANS
(Bureau of Planning)
Government of Guam



Felix Perez Camacho
Governor of Guam

Kaleo Scott Moylan
Lieutenant Governor

P.O. Box 2950 Hagåtña, Guam 96932
Tel: (671) 472-4201/3
Fax: (671) 477-1812

Anthony P. Sanchez
Acting Director

JUN 16 2005

Ms. Claudine Camacho
Environmental Services Division
Duenas & Associates, Inc.
155 E.T. Calvo Memorial Parkway, Suite 200
Tamuning, Guam 96913

Dear Ms. Camacho:

The Bureau of Statistics and Plans has completed its review of the Draft Supplemental Environmental Impact Statement (DSEIS) for the Siting of a Municipal Solid Waste Landfill Facility for Guam.

As stated in the DSEIS, the Department of Public Works (DPW) and the Guam Environmental Protection Agency (GEPA) is proposing to construct a Municipal Solid Waste Landfill Facility to manage Guam's solid waste generated by the island community. This project is needed since the current Ordot Dump is in violation of the Clean Water Act and the Ordot Consent Decree requires DPW to cease discharge of leachate from the Ordot Dump to the Lonfit River. The purpose of the Supplemental Environmental Impact Statement (SEIS) is to analyze the potential environmental impacts of the proposed action and recommend appropriate mitigation of those impacts.

There were three sites for the landfill that were considered (Dandan, located in Inarajan Sabanan Batea, located in Yona and Lonfit, located in Asan). The Dandan, Layon area was selected as the site for the municipal solid waste landfill facility. Layon is located in the higher badland areas on the west side of the Dandan parcel, southwest of the former NASA tracking station. The landfill is envisioned as a mounded landfill that would be excavated approximately 15 ft. below existing grade to provide cover soils.

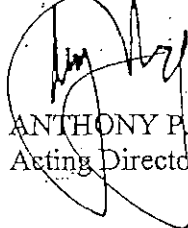
The DSEIS addresses three alternatives for the site layout and the No Action Alternative. Layout Alternative 1 requires twelve (12) cells, approximately 10.5 acres with 5 acres that will be reserved for the support facilities within the buffer area of the landfill. The treated storm water from the detention pond would be discharged to the wetlands located east of the landfill. Layout Alternative 2 is redesigned to avoid wetlands located within the cells and buffer area of the landfill. It requires nine (9) cells, approximately 14 acres. As in Layout Alternative 1, the treated storm water from the detention pond would be discharged to the wetlands located east of the landfill. Layout Alternative 3 is redesigned to allow more distance between the wetlands and the support facilities. It requires nine (9) cells, approximately 14 acres. As in Layout Alternative 1 and 2, the treated storm

water from the detention pond would be discharged to the wetlands located east of the landfill. The No Action Alternative would continue to use the existing Ordot Dump for disposal of solid wastes.

The Bureau has no major objections on the DSEIS at this time. We will be reviewing the proposed project in more detail as it goes through the design phases and a complete review on the federal consistency determination assessment once it is submitted. Please note that an Army Corp of Engineers permit will also be needed for any filling of wetlands, present on the site.

Thank you for the opportunity to review and comment on the DSEIS. Should you have any questions, please contact the Guam Coastal Management Program at 474-4201-3.

Si Yu'os Ma'ase',



ANTHONY P. SANCHEZ
Acting Director

cc: DPW
GEPA

May 26, 2005

Ms. Gina Schultz
Acting Field Supervisor
Pacific Islands Office
U.S. Fish and Wildlife Service
300 Ala Moana Blvd.
P.O. Box 50088
Honolulu, HI 96850-0001

Dear Ms. Schultz:

**SECTION 7 CONSULTATION FOR THE SITING OF A MUNICIPAL SOLID
WASTE LANDFILL FACILITY, INARAJAN, GUAM**

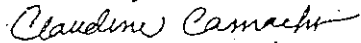
As a follow-up to our previous correspondence to your agency on March 29, 2005, I am enclosing an electronic copy of the Draft Supplemental Environmental Impact Statement (SEIS) for the siting of a municipal solid waste landfill facility (MSWLF) in the Layon area of Dandan, Inarajan, Guam. The enclosed SEIS evaluates three alternatives for the site layout and development of a MSWLF at Layon, as well as the no action alternative. The document also prescribes mitigation for significant impacts from the preferred alternative site layout.

Since the previous correspondence, additional wetland areas were identified in the northeastern sector of the landfill footprint. Alternative layouts 2 and 3 were modified to completely avoid these and any other wetlands. Alternative layout 1 would impact approximately 2.41 acres of wetlands. The Draft SEIS determined that Alternative layout 3 was the preferred alternative since it provides even greater separation than Alternative layout 2 between landfill facilities and wetlands. The federally-listed endangered Mariana common moorhen (*Gallinula chloropus guami*) was not detected in the landfill footprint and buffer area during our field investigations; however, Takano (2003) observed a single moorhen in the Tinago River and in the Assupian pond to the northeast of the landfill footprint during her 2001 survey.

The public comment period ends on June 16, 2005. Written comments may be submitted to Duenas & Associates, Inc. by mail at the following address: 155 E.T. Calvo Memorial Parkway, Suite 200, Tamuning, Guam 96913. Comments may also be sent by facsimile to 646-6315. Please contact me at 646-7991 or via e-mail (env@dnaguam.com) if you have any questions or need further information.

May 26, 2005

Sincerely,



Claudine Camacho
Environmental Services Division

Enclosure (1)

Reference cited:

Takano, L. 2003. Seasonal movement, home range, and abundance of the Mariana Common Moorhen (*Gallinula chloropus guami*) on Guam and the Northern Mariana Islands. Unpublished Masters of Science Thesis, Oregon State University. 96 pp.