Value Engineering Report

Ordot Dump Closure, Guam

December 2005

Conducted by

TG Engineers, P.C. and Value Management Strategies, Inc.

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EXECUTIVE SUMMARY

INTRODUCTION

This Value Engineering (VE) Report summarizes the VE Study conducted by Value Management Strategies, Inc., October 24–28, 2005, for the Guam Department of Public works (DPW). The subject of the study was the 100% design submittal Closure Plan and Post-Closure Plan for the closure of the Ordot Dump, Guam.

The purpose of the VE Study was to identify viable alternatives to enhance the project's value and functionality.

PROJECT DESCRIPTION

The Ordot Dump Closure Project is located in Ordot, Guam. The closure of this active municipal waste dump site will be performed in accordance with Title 22, Division 4, Chapter 23, Article 6 (§23601) of the Rules and Regulations for the Guam Environmental Protection Agency (GEPA) Solid Waste Disposal and Part IV of the Solid Waste Management Facility Permit Application, Landfill, at the request of the Government of Guam, Department of Public Works (DPW).

The starting date for the use of the site as a dump is not documented, but it is known that the Ordot Dump was in use during World War II. The dump was used as a disposal area by the Japanese during the Japanese occupation of Guam from December 8, 1941 to July 21, 1944. Following the liberation of Guam, the U.S. Navy continued to use the site as a disposal area. Ownership of the Ordot Dump was transferred from the United States Naval Government of Guam to the Government of Guam in 1950 under the Organic Act. Since then, the Government of Guam, specifically the DPW, has been operating the Ordot Dump as a municipal solid waste disposal facility.

The Dump is located approximately 2.5 miles south of Guam's capital, Hagatna, and about one mile west of the Route 4/Dero Drive intersection. The area surrounding the Dump is a dense brush, wooded area with scattered residences. The nearest residences are approximately 200 feet from the Dump. The Dump is situated in a ravine that is a tributary to the Lonfit River, located approximately 500 feet to the south of the site.

The Dump occupies and borders property of the Government of Guam on the northeast, east, south, and southwest boundary lines of the Dump. The north and west limits of the Dump border public land in the form of a road and privately owned land, respectively.

The Dump waste footprint area, based on the 2004 limits of waste delineation performed by Dueñas & Associates, Inc. and projected filling footprint per the Operations Plan (Dueñas & Associates Project Team (DPT, 2005a), has been estimated to be 46.8 acres. This waste footprint area will be reduced to approximately 45.8 acres during closure construction, as waste will be relocated from the western edge of the Dump and consolidated behind a mechanically stabilized earth (MSE) wall (DPT, 2005b). The precise limits of waste will be defined as a part of the Dump closure construction. The final waste volume of the Dump at the time of closure will be approximately 4.4 million cubic yards (DPT, 2005a).

The Dump is an unlined disposal facility and has few to no control systems to manage landfill gas, leachate, surface water, erosion and sedimentation, or vectors.

The Dump closure design includes the following construction elements:

- Final grading and layout of the Dump, including provision of access roads and surface drainage features, constructed over the final cover area
- A final cover system, constructed over an approximately 45.8-acre footprint area
- A leachate management system
- A surface water management system that intercepts clean surface water runoff from the closed area and conveys it to the on-site sedimentation ponds
- Erosion and sedimentation control facilities
- An active landfill gas (LFG) management system

The cost estimate for the project, as developed by URS Corporation, is $22,398,925.

CONSENT DECREE SUMMARY

The Ordot Consent Decree of February 11, 2004, signed by the Government of Guam and the United States of America (U.S. Environmental Protection Agency), mandates that Guam must implement an Ordot Closure Plan, close the Ordot Dump, and open a new municipal solid waste landfill by September 2007. The consent decree does not identify a specific location for the new landfill site. Rather, the decree requires the Government of Guam to prepare a detailed analysis, with public input, of at least three potential sites before it identifies its preferred alternative for the landfill site.

In a 45-month period, the consent decree requires the Government of Guam to:

- Complete an environmental impact statement analyzing at least three potential new landfill locations
- Complete design, permitting, and construction for the selected landfill location
- Begin operations at the new landfill
- Properly and permanently close the Ordot Dump

The Government of Guam will also complete a $1 million dollar supplemental environmental project to develop an island household hazardous waste diversion and management program. In addition, the Government of Guam will pay $200,000 to resolve the United States' claims.

PROJECT CONSTRAINTS

The VE team identified the following constraint to be considered with the development of possible alternatives to improve the project:

- Design in accordance with Rules and Regulations of GEPA Solid Waste Disposal, Title 22, Division 4, Chapter 23, Article 6

PROJECT ISSUES

The VE team identified a number of issues to be considered with the development of possible alternatives to improve the project. These issues include:

- Meet requirements specified in Consent Decree of February 11, 2004, Civil Case No. 02-00022
- Need to meet the requirements of the draft permit for continued use of Ordot during closure construction
- Needs of Operations takes precedence over all aspects of closure work
- Coordination with ongoing landfill operations
- Provision of adequate anchorage for barrier against wind and water penetration; exposure of geomembrane on steep slopes to potential wind-generated uplift forces
- Limit seepage height and ensure that cover soil is not saturated
- Provision for adequate time for manufacturers to produce and deliver materials to Guam; it is imperative to the construction schedule that manufacturing and shipping delays be minimized
- Piping may be subject to clogging from biological growth, siltation, and chemical growth
- Minimize gas migration offsite and into atmosphere
- Impacts of significant storm events and annual rainfall
- Construction scheduling to avoid wet season problems
- Adequate airspace for final placement of material at Ordot and to meet the schedule for the new landfill
- Discharge of pollutants to the Lonfit River is the issue dictated by the consent decree rather than protection of groundwater
- Fire prevention
- Protection/encroachment to wetlands and private property
- Adequacy of prediction of leachate production volumes and rates, and assumptions made to HELP model
- Need for Environmental Compliance Officer
- Maximum allowable bench height and slopes
- Performance of covered dump under seismic forces
- Magnitude of future settlement of waste
- Public safety liability if access to the closed landfill is permitted

PROJECT ANALYSIS

The VE team used VE tools to analyze the project. The results of these analyses clarified the Ordot Dump Closure Project and identified *Protect Environment and Health* as the basic function, with key secondary functions of *Satisfy (CERCLA D) Regulations,* and *Satisfy Consent Decree* as other critical project functions that have a significant impact on the decisions that affect the project design decisions and costs.

The cost model developed clearly showed the cost drivers for the project, and it was used to guide the VE team during the VE Study. The general cost drivers were:

- Capping Systems = $7,848,105 (38.6%)
- Surface Water Systems = $44,038,920 (19.9%)
- MSE Wall System = $3,303,565 (16.3%)
- Mobilization and Miscellaneous Allowances = $2,126,500 (10.5%)

These items account for ~85% of the project cost. Looking deeper into the cost estimate, the following subcategories are found to be the key significant cost drivers:

- Capping System
  - Geocomposite = $2,301,845 (10.3%)
  - HDPE Geomembrane = $1,989,375 (8.9%)
  - Geogrid = $1,301,025 (5.8%)
  - Native Fill = $1,473,180 (6.6%)
- Surface Water Systems
  - Berms = $1,574,200 (7.0%)
  - Bench Ditches = $1,157,200 (5.2%)
- MSE Wall Systems
  - Waste Excavation & Replacement Relocation = $1,354,500 (6.0%)
  - Waste Excavation & Replacement = $1,006,000 (4.5%)
- Mobilization and Miscellaneous Allowances
  - Mobilization = $2,000,000 (8.9%)

These key items account for ~63% of the project cost.

Performance Considerations

The VE team identified five key performance considerations for this project. Listed below is a narrative of how the Original Concept satisfies each of the performance measures.

Operational Impacts (OI). Operational impacts involve how an alternative idea might interfere with the normal daily operations of the landfill at the same time that closure construction is occurring. The objective is to avoid or at least minimize such impacts, or to suggest ways to improve existing operations, recognizing that landfill operations take precedent.

Materials Availability (MA). Because of the difficulties associated with obtaining materials on Guam, provision for adequate time for manufacturers to produce and deliver materials to Guam is essential. Any alternative idea that creates the potential for greater difficulties procuring materials from on- and off-

island would not be preferred. In addition, any idea that allows the use of Guam resources without having to go off-island, would be preferred.

Schedule (S). In order to meet the requirements contained in the consent decree, it is imperative that the construction schedule be met. Manufacturing and shipping delays should be minimized. Impacts of significant storm events and annual rainfall, as they relate to construction during the wet season, should also be minimized or avoided. Any alternative idea that can avoid these risks, optimize use of available airspace, and/or accelerate the construction schedule would be preferred.

Construction Process (CP). Construction complexity that will assess specific areas of construction difficulty, including planned process of installation, risk reduction, and the potential for change orders, claims and work stoppages; logistics; materials availability; adverse geotechnical conditions, etc. Any option that simplifies the construction process while reducing risks is preferred.

Environmental Impacts (EI). The closure design, including post-closure operations and maintenance, for the dump, should take steps to improve and/or protect the existing environment, including existing wetlands, the Lonfit River, and groundwater, in addition to monitoring for future fires. Any idea that acts to improve environmental conditions of the immediate area and groundwater would be preferred.

VE ALTERNATIVES

The VE team developed nineteen alternatives for improvement of the project. Thirteen of these alternatives improve cost and maintain or improve functionality, three alternatives add cost to improve functionality of the project, and three alternatives were found not to significantly influence the project costs, but were important to improving performance. Forty-two design suggestions were also developed to improve the project—the cost impact of these items being either insignificant or not possible to be quantified. In addition, three Estimate Corrections were documented to address items that were not adequately included in the initial cost estimate. Summary lists of the VE alternatives and design suggestions are in a following report section; descriptions the VE alternatives are given below. The alternative numbers reference the significant project function identified by the VE team: MF = Manage Fluid, ED = Enclose Dump, MS = Meet Schedule, and GI = General Ideas.

Alternative Number	Description	Initial / *LCC* Savings Potential
MF-5	**In lieu of Large Detention Pond, Use Smaller Independent Desiltation System in Various Areas (e.g., Distributive Flow)** The proposed distribution system will result in smaller, more flexible systems. It also eliminates the need for the large detention pond. It is anticipated that such an approach would provide better distribution of water to adjacent wetlands prior to reaching the Lonfit River. This would support the wetlands and also provide the desired filtration of any remnant sediment prior to reaching the river. In addition, by not constructing the detention pond, a large area of wetlands is preserved.	$23,000

Alternative Number	Description	Initial / LCC Savings Potential
MF-6	**Put Gas Collection Headers and Piping Above Barrier Layer, but Below Grade** Revise the design to install the LFG header and lateral collection pipes above the barrier layer (but below grade where appropriate). Access to the LFG header and collection pipes is essential during the 30-year post-closure period, particularly in areas that are subject to differential settlement. By placing the LFG collection pipes above the barrier layer, they will be readily accessible for future modification and/or repair.	$26,000
MF-7	**Utilize a Passive Gas Collection System** The current design is for an active gas extraction system with gas wells, underground collection piping, headers, pump, landfill gas leachate collection, and flare. The aboveground parts of an active landfill gas system are subject to typhoon damage. Replace with a passive landfill gas system that vents directly to the atmosphere, which will be a much simpler system with less piping, gas condensate production, and monitoring.	$994,000
MF-10	**Treat Leachate Through a Constructed Wetland** The current design does not address removal of leachate from the storage tank. This assumes that the leachate will be removed from collection tanks and trucked to the sewer system. An Industrial wastewater discharge permit will be required, with testing for disposal into the sewer system. This alternative recommends feeding collected leachate into constructed wetland or a packaged wetland system for treatment. Strength and volume of the leachate will affect the choice. Monitoring and long-term operations are required. An NPDES will be required. NPDES will already be required for stormwater discharges from the site.	$280,000/ *$7,082,000*
MF-12	**Utilize Pipeline to Convey Leachate to Sanitary Sewer System** The justification for the concept to construct a piping system for the leachate from the Ordot Dump centered on finding a more cost-effective and environmentally acceptable means, other than trucking over public highways. The costs issues focused on trucking equipment, operations and maintenance, and their availability—meaning having an ample number of trucks with enough capacity for the daily haul. The need to transport the leachate without having large numbers of trucks constantly traveling the highways loaded with waste liquids was also a driving point to use piping. The potential for spills and accidents further exposing the leachate to the public needed to be minimized. If a piping system is installed, the initial costs are incurred in the construction and then forgotten. There may be periodic maintenance cleanout	$90,000/ *$7,241,000*

Alternative Number	Description	Initial / LCC Savings Potential
MF-14	**Eliminate Leachate Drainage Layer (Geocomposite) on Top Deck**	$29,000
	The design calls for native fill above a geogrid, which is on top of a geocomposite. Underneath the geocomposite is a geomembrane, which overlays a second geocomposite that is underlain by at least six inches of a soil layer. The alternative design calls for the removal of the second geomembrane that lies just beneath the geomembrane on the top deck. There is no other change to the original design within this detail.	
MF-15	**Replace Articulated Block Mattress with Asphalt**	$1,183,000
	The current design will construct a stormwater collection system by using articulated block mattress (ABM). This alternative will use asphalt in place of ABM. Using asphalt will be advantageous, considering not only the initial cost but maintenance cost as well. Asphalt is readily available on the island, easy to repair, and maintenance cost is minimal.	
MF-27	**Reevaluate Input Parameters to HELP Model for Site-Specific Reasonableness to Ordot**	N/A
	The existing HELP Model for the Ordot Dump Closure was provided with results for leachate generation. The VE team recommends that another HELP Model calculation be conducted using the latest version, which requires input of more accurate and representative data. A more accurate model will lead to a more accurate and efficient design, which will better protect the environment.	
MF-28	**Hydroseed Slopes and Benches (with Tacking Compound) Early in the Construction Process to Eliminate Detention Pond**	$2,163,000
	The design calls for a large detention pond at the bottom (south side of landfill) of the existing dump. The alternative calls for hydroseeding the slopes and benches with seeds and a tactifying agent early on in the construction process, which is expected to eliminate the detention pond at the south edge of the site.	
ED-1	**Use Prescribed Cover**	$6,314,000
	The current design calls for an 80-mil HDPE cap to close the Ordot Dump waste mass. The Ordot Dump is an unlined solid waste disposal facility in an area of 100 inches of rainfall. Maintenance cost for a synthetic cover is higher than for a soil cover. This alternative replaces the complex multilayered design cover with a prescribed cover in accordance with Federal rule, 40CFR. The prescribed cover consists of a 6-inch erosion layer over an 18-inch 10E-5 cm/sec barrier layer, without needing any geo-synthetic layers. The side slopes will need to be regraded in the range of 2 to 1 in order to maintain stability of the prescribed cover. The prescribed cover is completely acceptable, in accordance with the regulations, for the Ordot Dump. This application appears feasible and should be given very serious consideration.	

Alternative Number	Description	Initial / LCC Savings Potential
ED-2	**Change Site Geometry with Benches at a Height of 45 to 50 Feet (or Less, as Appropriate) as in California**	$1,722,000
	By flattening the side slopes, the barrier layer may be revised from the designed HDPE geo-membrane and replaced with a soil layer. The benefits of a soil layer are significant with regard to both capital cost and long-term post closure maintenance (see ED-1). The savings related to replacing the HDPE geomembrane with soil is included in ED-1. The net effect of this change is to create a simpler, more efficient design, similar to those done for landfills in California, which further enhance the application of a Prescriptive Cover described in ED-1.	
ED-4	**Replace MSE Wall at Toe of West Edge with Shorter Soldier Beam and Concrete Lagging Wall**	$4,149,000
	The un-named drainage meanders along the westerly edge of the dump. In one location, the waste encroaches on the un-named stream. The proposed project is simply to remove the waste back from the stream, approximately 15-20 feet, prevent the waste from going back into the stream, and prevent the stream from carrying waste away from the toe of the dump. This is accomplished by placing a soldier beam and concrete lagging wall about 15-20 feet from the stream's edge. The wall will protrude approximately 15 feet above the stream's elevation, it will retain the waste, and it will improve the geometry of the slope by flattening the slope. This approach removes the necessity of installing a very costly MSE wall. In addition to a significant capital cost savings, the safety of the project is improved. The 20- to 45-foot high portions of the MSE wall pose a long-term safety risk as an attractive nuisance to the government.	
ED-5 and ED-6	**Relocate No-Name Brook on West Side Further West**	$3,280,000
	The design will construct an MSE wall (approximately 700 feet long, 20 to 45 feet high) to reduce the extent of waste footprint in order to (1) remove waste from un-named drainage and provide a setback from the un-named drainage and (2) support the waste fill embankment, which rests on the existing materials that are to be removed in Item 1 above. The alternative will relocate the un-named drainage west, further away from the toe of the existing waste toe, thereby allowing construction of an earthen embankment to support the waste fill slopes. This approach removes the necessity of installing a very costly MSE wall. In addition to a significant capital cost savings, the safety of the project is improved by eliminating the MSE wall.	

Alternative Number	Description	Initial / LCC Savings Potential
ED-5 and ED-7	**Convey No-Name Brook Through Culvert or Pipe**	$3,350,000

The design will construct an MSE wall (approximately 700 feet long, 20 to 45 feet high) to reduce the extent of waste footprint in order to (1) remove waste from un-named drainage and provide a setback from the un-named drainage and (2) support the waste fill embankment, which rests on the existing materials that are to be removed in Item 1 above. This alternative will redirect the un-named drainage using a culvert or pipe in a region near the existing toe of waste, thereby allowing construction of an earthen embankment to support upper waste fill slopes on the west side of the dump. Eliminate MSE wall. One disadvantage of installing a pipe beneath the fill embankment is that the inlet to the pipe will require maintenance. This approach also removes the necessity of installing a very costly MSE wall. In addition to a significant capital cost savings, the safety of the project is improved by eliminating the MSE wall.

ED-9	**Replace HDPE with Geosynthetic Clay Liner on Top Deck**	$105,000

For the top deck of the site (where the slope is relatively flat and where the barrier layer is covered with soil), the design includes an HDPE geomembrane as the barrier layer throughout the site. The alternative will consider replacing the HDPE product by using a geosynthetic clay liner (GCL) as the barrier layer. GCLs are very easy to install and repair during the post-closure period when penetrating the barrier layer is necessary.

ED-13	**Use Other Flexible Material Liners in lieu of HDPE**	$1,782,000

The current design uses an HDPE geomembrane product as the barrier layer. The alternative will consider other flexible material liners as the barrier layer, such as low-density HDPE, very-low density HDPE, PVC, or geosynthetic clay liner

MS-13	**Satisfy Clean Water Issues Now (Stop Discharges of Leachate to River) and Request Modification Schedule in Consent Decree**	($286,000)

The design will wait for the closure process to correct leachate discharges from the Ordot Dump to Lonfit River, as directed under the Consent Decree. The alternative calls for acting at the earliest possible date to the first known discharge of leachate to the Lonfit River with correction effected *prior* to the effective date in the Consent Decree. This is the pollution discharge item resulting in the Consent Decree and placement on the National Pollution Levels (NPL) list. This alternative will allow removal of Ordot Dump from open dump status.

Alternative Number	Description	Initial / LCC Savings Potential
GI-7	**Monitor/Investigate for Internal Fires Prior to and After Post-Closure** Currently, design report information is qualitative based on last known history, which is incomplete. The alternative is to collect regular qualitative and quantitative monitoring data for analysis by knowledgeable technical personnel for accurate determination of underground fire conditions and fire mitigation actions within the landfill. This would enable early and accurate control of response action	($33,000)
GI-9	**Replace Candlestick Flare with Enclosed Flare** The current design employs an open candlestick flare as the destruction device for landfill gases (LFG), which does not protect the flame from the surrounding environment (i.e., prevailing winds). This alternative will install an enclosed flare as the destruction device for LFG. The enclosed flare retains the flame for a specified amount of time. As the flame rises in the enclosed flare stack, various control devices may be included, such as thermocouples that monitor the performance of the flare. These devices increase the assurance that the gases are properly destructed.	($161,000)

Four key VE Design Suggestions are given below:

Design Suggestion Number	Description
ED-24	**Negotiate Purchase Option of Soil from Property Owner to the North** There is a plan by the Department of Public Works to purchase soil from the owner of Lot No. 3390-2NEW-R2, which is located north of the Ordot Dump. There was also a soil investigation report issued by Geo-Engineering conducted on January 18, 1994, which states that the clayey silty soil is a cohesive and relatively impermeable material and would be suitable for use as fill for the Ordot dump area. Estimates by the VE Team indicate roughly 200,000 cubic yards of suitable cover soil may be present on this property. The plan to negotiate a deal from the lot owner at this time is highly recommended, in order to protect this source (for several years) from being sold to other buyer by initiating a "Contract to Purchase." The prospective fill site in its proximity to the dump area will decrease the construction cost significantly for fill materials. Upon confirmation of the "Contract to Purchase" between DPW and the lot owner, DPW could then specify in the bid documents that field materials from the site of specified quantity (Quantity to Be Determined by DPW) shall be available for contractor's use. Material cost for the fill materials from this site shall not be included in the contractors' prospective bid.

MS-2 **Open/Regular Communication/Meetings Among All Stakeholders**

Whenever public projects are planned and the process proceeds forward from the start, there will be a myriad of interests that will affect the project before, during, and after. The effect will be ongoing from beginning to end. The primary reason is that there are multiple stakeholders that all have interests in the project, and they all do not necessarily agree in the interest of the outcome. The Ordot Dump Closure project, particularly, has a greater sensitivity to all stakeholders because of the nature of the project. The Dump has been in existence for over 60, years and its effect on the community has been more negative than positive. Ironically, the service the Dump provides makes public lives more convenient in that it provides a place to dispose of our waste. The Ordot Dump Closure project has become more controversial because of scheduling, costs, and environmental impacts that have been ongoing for years.

The VE Team has discussed a need that can go a long way to help meet schedules vital for the project's success. This need requires that meaningful open and regular communication and meetings among *ALL* stakeholders be conducted on a regular basis.

From a simple and basic point-of-view, human nature will always have its conflicts; however, all stakeholders must develop relationships such that they can all "agree-to-disagree." The advantage and positive outcome to regular, open communications and meetings of stakeholders is that they can provide flexibility in the closure process. The numerous interests, as mentioned earlier, tend to have needs that may come in conflict with those or other interests just as important to the process. If meetings and communications among stakeholders occur, chances are that information exchange can lead to a better understanding amongst the interests, which can lead to solutions. It takes genuine effort on the part of all stakeholders to understand this relationship and work toward making it happen, versus fearing hidden agendas and simmering mistrust. Personal feelings, especially those disguised as "business only and nothing personal," will need to be left at the door in order to move forward and prove that open and productive meetings and communications will lead to a "win-win" solution. Given this, the advantages are:

- Provides flexibility in the closure process
- Enhances the potential for success
- Supports the interests of Guam residents
- Will be in the best interest for all schedules
- Creates common interest and goals

MS-19 **Combine Dandan and Ordot as a Single Privatized Contract (Construct/Operate/Maintain)**

This conceptual function will attract qualified operator contractors because the project will have the potential to meet private business return on investment. The combination of operating two projects will provide for a bigger contract. In addition, DPW will be relieved of direct obligations to maintain, close, and provide post-closure care.

As noted in MS-15, privatization of the Ordot Dump operations and closure, and MS-18, dedicating an Environmental Compliance Officer, the involvement and the potential to turn over operations to a private interest can go a long way toward obtaining schedule flexibility and meeting the milestones. Combining the new landfill project in Dandan with the Ordot Dump operations and closure can potentially attract interest from private parties, which in turn can open up other avenues for funding/financing the initial project effort.

MS-23 **Create Separate Solid Waste Authority to Manage and Finance Landfill Closure and Operations**

An autonomous, independent solid waste authority could be more efficient in providing funding, since it would not have to respond to the whims of politicians or other self-interested parties. It would have the authority to raise funds through various taxes and/or fees in a simpler and more straightforward manner. The disadvantage, however, is that it creates, by its very existence, a new level of bureaucracy within the government.

Detailed documentation of these key alternatives, as well as the remaining ones not described above, is in the VE Alternatives section of this report. The VE Job was followed to: gather information and perform a site visit,

VE TEAM AND PROCESS

The five-day study was performed during the period of October 24-28, 2005 on Guam. Ron Tanenbaum, CVS, of Value Management Strategies, Inc., led the VE Study. The VE team members are listed below:

Ron Tanenbaum, CVS	Value Management Strategies, Inc.	Facilitator
Rico Arceo	TG Engineers, PC	Cost Estimator
Tor Gudmundsen	TG Engineers, PC	Team Coordinator
Joseph Hernandez	Latte Inc.	Hydrology, Landfill Gas
Tim Raibley	Brown, Vence, & Associates	Civil Design
Gary Siu	State of Hawaii - DOH	Permitting, Regulatory Issues, Landfill Design
Fred Otte	Otte Consultants	Geotechnical Engineering, Environmental

Throughout the VE session, several members of Guam Department of Public Works and the Guam Environmental Protection Agency supported the VE team.

The VE Job was followed to gather information and perform a site visit, create and evaluate ideas for change, and develop and present alternatives to the project team. The study concluded with an informal presentation of the VE alternatives and design suggestions to the agency managers.

VE Alternatives

VE ALTERNATIVES AND DESIGN SUGGESTIONS

INTRODUCTION

The results of this study are presented as individual alternatives to the original concept. In addition, design suggestions for improving the project are included for consideration by the stakeholders.

VE ALTERNATIVES

Each alternative consists of a summary of the original concept, a description of the suggested change, a cost comparison, a listing of its advantages and disadvantages, and a brief narrative comparing the original design with the alternative. Sketches, calculations, and benefits are also presented. The cost comparisons reflect the comparable level of detail as the original estimate. A life cycle benefit-cost analysis for major alternatives is included where appropriate. Design suggestions are written summaries of partially developed ideas without supporting documentation. A summary of the VE Alternatives and Design Suggestions follow this page and precedes the documentation of each alternative. The process by which the VE team decided which ideas would be developed as alternatives and suggestions, and which would be dropped from further discussion, is presented in Section 7 of this report.

EVALUATION OF ALTERNATIVES

The alternatives presented by the VE team represent viable alternatives to the current design, which represent items the VE Team would suggest to their own clients based on the information available at the time of the VE Study. The project stakeholders are encouraged to evaluate all VE alternatives based on their individual merit, selecting the ones, in whole or in part, to be implemented to further improve the project. The documentation provided as part of the VE alternative is structured to provide the rationale and justification for each alternative.

DESIGN SUGGESTIONS

The VE team also developed a series of design suggestions. These suggestions present ideas generated by the team that are felt to add value to the project. The VE team encourages the design team and stakeholders to carefully review these suggestions for opportunities to improve the quality of the project. The reader may also find that a review of the suggestions presented herein will awaken new and/or modified ideas that they may wish to investigate further or implement.

Presented later in this section, in the general order in which they appear in the Idea Evaluation form found in the Idea Evaluation section of this report, are the value engineering alternatives and design suggestions put forth by the VE Team. They are numbered sequentially, with the speculation idea numbers also presented in parentheses for clarity. It should be noted that, where commonality of thought prevails, speculation ideas have been combined into a single alternative or comment. They are also grouped according to the major function category under which they fall – Manage Fluids (MF), Enclose Dump (ED), Meet Schedule (MS), and General Ideas (GI). These function categories were established by the VE team during the Function Analysis phase of the study. With the development of the Function Analysis System Techniques (FAST) Diagram (see Project Analysis section of this report). In tandem with the VE team's assessment of the budget and major cost drivers.

It is the recommendation of the VE team that the reviewer assess all 62 of the constructibility recommendations and suggestions to determine which should be implemented, which may be set aside, and what combination of value engineering recommendations and/or suggestions will best serve this project.

SUMMARY OF VE ALTERNATIVES AND SETS

VE sets are established by the VE team as their "best value" solutions, based on improved performance, likelihood of implementation, least community impact, cost savings, or any combination of criteria. A VE set may contain one or more alternatives, and each set is typically mutually exclusive of other sets (i.e., implementing VE Set 1 precludes implementation of VE Set 2, VE Set 3 and/or VE Set 4).

VE sets are selected alternatives combined from mutually exclusive groups that can compete in whole, or in part, against the original design concept. This requires additional performance rating and totaling of costs for the sets.

The VE team developed four sets of alternatives to illustrate potential combinations that may be chosen for implementation. The alternatives included in the sets are those deemed by the team to represent the best value when considering the alternatives' impact on project performance and cost. All four VE sets have the following general components:

- Eliminate detention pond and discharge stormwater as districuted flow (MF-5)
- Discharge leachate into treated wetlands (MF-10)
- Close dump using a prescribed cover (ED-1)
- Change geometry to flatten slopes and reduce benches (ED-2)
- Satisfy clean water issues now (MS-13)

VE Sets 1 and 2 also have the following general components:

- Replace MSE wall at the toe of the west edge with a shorter soldier beam and concrete lagging wall, eliminating MSE wall (ED-4)

VE Sets 3 and 4 also have the following general components:

- On the west side, shift the toe of slope further west and relocate the no-name brook on the west side further west (ED-5 and ED-6)

VE Sets 1 and 3 also have the following general components:

- Gas collection piping above barrier layer (MF-6)
- Replace candlestick flare with enclosed flare (GI-9)

VE Sets 2 and 4 also have the following general components:

- Utilize a passive gas collection system (MF-7)

The VE Sets described above are summarized at the end of the table on the following pages.

SUMMARY OF VE ALTERNATIVES & DESIGN SUGGESTIONS *Ordot Dump Closure, Guam*			
Alt. No.	**Description**	**Potential Cost Savings Initial /*LCC***	**Change in Performance**
	MANAGE FLUIDS		
MF-1	Divert Stormwater Around Landfill	Design Suggestion	
MF-2	Collect Storm Water in Drains and Chutes and Take Off Landfill – Before Closure Activities	Design Suggestion	
MF-4	Regrade Existing Top Deck to Better Shed Fluid	Design Suggestion	
MF-5	In lieu of Large Detention Pond, Use Smaller Independent De-Siltation System in Various Areas (e.g., Distributive Flow)	$23,000	+21.7%
MF-6	Put gas collection headers and piping above barrier layer, but below grade	$26,000	0%
MF-7	Utilize a Passive Gas Collection System	$994,000	+8.5%
MF-10	Treat Leachate Through a Constructed Wetland	$280,000 *$7,082,000*	+7.5%
MF-11	Treat leachate through an aerate system	Design Suggestion	
MF-12	Utilize Pipeline to Convey Leachate to Sanitary Sewer System	$90,000 *$7,214,000*	+7.5%
MF-14	Eliminate Leachate Drainage Layer (Geocomposite) on Top Deck	$29,000	0%
MF-15	Replace Articulated Block Mat with Asphalt	$1,183,000	+8.5%
MF-17	Replace Articulated Block Mat geotextile erosion mat/vegetation	Design Suggestion	
MF-18	Replace concrete chutes (Articulate Block Mat) with galvanized metal chutes	Design Suggestion	
MF-24	Put shingle tarps on surface	Design Suggestion	

SUMMARY OF VE ALTERNATIVES & DESIGN SUGGESTIONS *Ordot Dump Closure, Guam*			
Alt. No.	**Description**	**Potential Cost Savings Initial /*LCC***	**Change in Performance**
MF-26	Put a water quality monitoring system in place for leachate and surface water	Design Suggestion	
MF-27	Reevaluate Input Parameters to HELP Model for Site-Specific Reasonableness to Ordot	Not Applicable	+15.1%
MF-28	Hydroseed Slopes and Benches (with Tacking Compound) Early in the Construction Process to Eliminate Detention Pond	$2,163,000	+6.6%
	ENCLOSE DUMP		
ED-1	Use Prescribed Cover	$6,314,000	+49.0%
ED-2	Change Site Geometry with Benches at 45- to 50-Foot Height (or Less as Appropriate) as in California	$1,722,000	+18.9%
ED-4	Replace MSE Wall at Toe of West Edge with Shorter Soldier Beam and Concrete Lagging Wall	$4,149,000	+8.5%
ED-5	On West Side, Shift Toe of Slope Further West	Included in ED-6 & ED-7	
ED-6	Relocate No-Name Brook on West Side Further West	$3,280,000	+1%
ED-7	Convey No-Name Brook Through Culvert or Pipe	$3,350,000	+1%
ED-8	Lay west slope back	Design Suggestion	
ED-9	Replace HDPE with Geosynthetic Clay Liner on Top Deck	$105,000	0%
ED-13	Use Other Flexible Material Liners in lieu of HDPE	$1,782,000	0%
ED-16	Utilize green waste as a layer in the final cap	Design Suggestion	
ED-17	Use Navy dredge spoils as cover material	Design Suggestion	
ED-23	Mandate all grading projects deliver excess clean material be delivered to Ordot for cover use as daily cover	Design Suggestion	

SUMMARY OF VE ALTERNATIVES & DESIGN SUGGESTIONS *Ordot Dump Closure, Guam*			
Alt. No.	**Description**	**Potential Cost Savings Initial /*LCC***	**Change in Performance**
ED-24	Negotiate Purchase Option of Soil from Property Owner to the North	Design Suggestion	
ED-25	Assure safety associated with exposed waste slope created during MSE wall construction	Design Suggestion	
ED-26	Relocate residents west of dump during MSE wall construction	Design Suggestion	
	MEET SCHEDULE		
MS-1	Knowingly violate with notice	Design Suggestion	
MS-2	Open/Regular Communication/Meetings Among All Stakeholders	Design Suggestion	
MS-3	Add incentive clause to contractor to accelerate schedule	Design Suggestion	
MS-4	Stop receipt of waste by October 2007	Design Suggestion	
MS-10	Modify schedule to make it more realistic	Design Suggestion	
MS-11	Accelerate development of first Dandan cell (including access road)	Design Suggestion	
MS-13	Satisfy Clean Water Issues Now (Stop Discharges of Leachate to River) and Request Modification Schedule in Consent Decree	($286,000)	+15.1%
MS-14	Clarify poorly defined areas in Consent Decree that makes it difficult to meet requirements	Design Suggestion	
MS-15	Privatize remaining life of Ordot	Design Suggestion	
MS-17	Institute regular environmental compliance monitoring program, immediately	Design Suggestion	
MS-18	Bring environmental compliance officer on board as part of interim operations and through closure	Design Suggestion	
MS-19	Combine Dandan and Ordot as a Single Privatized Contract (Construct/Operate/Maintain)	Design Suggestion	

SUMMARY OF VE ALTERNATIVES & DESIGN SUGGESTIONS *Ordot Dump Closure, Guam*			
Alt. No.	**Description**	**Potential Cost Savings Initial /*LCC***	**Change in Performance**
MS-21	Get all government agencies to comply with executive order, with penalties, mandating that processing of all documents relating to consent decree occur within 5 days	Design Suggestion	
MS-22	Explore other funding mechanisms such as import taxes, tourist taxes, real estate taxes, etc.	Design Suggestion	
MS-23	Create Separate Solid Waste Authority to Manage and Finance Landfill Closure and Operations	Design Suggestion	
	GENERAL IDEAS		
GI-1	Develop public outreach/education program	Design Suggestion	
GI-3	Don't permit future public park	Design Suggestion	
GI-4	Make site safe for public access and use	Design Suggestion	
GI-5	Develop training program for staff	Design Suggestion	
GI-6	Install complete perimeter fence	Design Suggestion	
GI-7	Monitor/Investigate for Internal Fires Prior to and After Post-Closure	($33,000)	+7.5%
GI-8	Obtain reliable heavy equipment to serve site	Design Suggestion	
GI-9	Replace Candlestick Flare with Enclosed Flare	($161,000)	+7.5%
GI-10	Assure that adequate redundancy exists in design	Design Suggestion	
GI-11	Identify off site location of temporary waste storage stockpile areas associated with planned MSE wall construction	Design Suggestion	
GI-14	Define procedures for following the filling plan to assure that work is staying within plan and matches the final grading plan	Design Suggestion	
GI-15	Confirm adequacy of guardrail design as anchored into MSE fill	Design Suggestion	

SUMMARY OF VE ALTERNATIVES & DESIGN SUGGESTIONS *Ordot Dump Closure, Guam*			
Alt. No.	**Description**	**Potential Cost Savings Initial /*LCC***	**Change in Performance**
GI-16	Make Navy responsible partner in closure process and funding	Design Suggestion	
GI-17	Encourage future political candidates to state position and plans associated with closure	Design Suggestion	
GI-18	Permit conditions outside of 40CFR258 are not applicable/clarify draft permit	Design Suggestion	

SUMMARY OF VE SETS

Set No.	Description	Cost Savings Initial	Change in Performance	Change in Value
1	Gas Collection Headers Above HDPE & Replace MSE Wall (Creative Ideas MF-5, MF-6, MF-10, ED-1, ED-2, ED-4, MS-13 and GI-9)	$12,041,000	+31%	+219%
2	Passive Gas Collection System and Replace MSE Wall (Creative Ideas MF-5, MF-7, MF-10, ED-1, ED-2, ED-4, and MS-13)	$13,196,000	+18%	+211%
3	Gas Collection Headers Above HDPE and Shift West Toe Slope Further West (Creative Ideas MF-5, MF-6, MF-10, ED-1, ED-2, ED-5/ED-6, MS-13 and GI-9)	$11,172,000	+30%	+206%
4	Passive Gas Collection System and Shift West Toe Slope Further West (Creative Ideas MF-5, MF-7, MF-10, ED-1, ED-2, ED-5/ED-6, and MS-13)	$12,327,000	+15%	+195%

PERFORMANCE ATTRIBUTES RATING AND PARAMETER SCALES

In the course of developing each VE alternative, the team evaluated the effect of the VE alternative on overall project performance (see the Performance Measures form included with each alternative). The rating scales associated with the 1 to 10 ratings used by the team are shown below.

This analysis is accomplished by asking the study participants to decide the relative importance of each attribute. For example, in this case, Operational Impacts was considered more important than Materials Availability; Schedule was deigned more important that either Operational Impact or Materials Availability; Construction Process was considered less important than Schedule or Materials Availability, but of equal importance to Operational Impact; and, finally, Environment was considered more important than the other four attributes. These decisions are then mathematically weighted to produce the results in the matrix.

Attribute	Definition	Rating Scale	Unit of Measure/Quantification
Operational Impacts	The impact of the idea in terms of interference in the normal daily landfill operations during closure construction	10	Significantly improves and reduces interference with daily operations when compared to existing design
		9	Greatly improves and reduces interference with daily operations when compared to existing design
		8	Moderately improves and/or reduces interference with daily operations when compared to existing design
		7	Slightly improves and/or reduces interference with daily operations when compared to existing design
		6	Operational impacts are comparable to existing design
		5	Slightly degrades operational impact when compared to existing design
		4	Moderately degrades operational impact when compared to existing design
		3	Frequently interferes with facility operations than might occur with the existing design
		2	Can be operated only intermittently or with considerable resource expenditures
		1	Facility cannot be operated during construction

Attribute	Definition	Rating Scale	Unit of Measure/Quantification
Materials Availability	Refers to the ability of manufacturers to produce and ship required materials to Guam in a timely manner, so as not to delay construction.	10	Significantly improves and eases the time needed to produce and ship materials compared to existing design
		9	Greatly improves and eases the time needed to produce and ship materials compared to existing design
		8	Moderately improves and eases the time needed to produce and ship materials compared to existing design
		7	Slightly improves and eases the time needed to produce and ship materials compared to existing design
		6	The time needed to produce and ship materials are comparable to existing design
		5	Slightly degrades and increases the time needed to produce and ship materials compared to existing facility
		4	Moderately degrades and increases the time needed to produce and ship materials compared to existing design
		3	Frequently increases the time needed to produce and ship materials compared to existing design
		2	Delays in production and shipping cause severe impacts on closure construction
		1	Delays cannot be tolerated

Attribute	Definition	Rating Scale	Unit of Measure/Quantification
Schedule	An approximation of how the schedule may be impacted by implementing the alternative idea, with the preferred result to shorten the construction schedule and avoid delaying impacts of inclement weather conditions	10	>50% reduction in schedule
		9	36-50% reduction in schedule
		8	21-35% reduction in schedule
		7	11-20% reduction in schedule
		6	1-10%
		5	Current schedule
		4	1-10% increase in schedule
		3	11-20% increase in schedule
		2	21-35% increase in schedule
		1	>35% increase in schedule
Construction Process	An approximation of construction difficulty, risk reduction, and potential for change orders, claims, and work stoppages; issues related to logistics and adverse geotechnical conditions.	10	No direct or indirect impacts.
		9	No direct and minor indirect impacts.
		8	Minor direct impacts.
		7	Minor direct and indirect impacts.
		6	Construction process comparable to existing design.
		5	Minor direct and indirect impacts.
		4	Minor direct impacts.
		3	Moderate direct or indirect impacts.
		2	Moderate direct and indirect impacts.
		1	Major direct and indirect impacts.

Criteria	Definition	Rating Scale	Unit of Measure/Quantification
Environmental Impacts	An approximation of the concept's overall effect on the surrounding environment. This criterion includes the following areas: ♦ Water quality of Lonfit River and tributary brook ♦ Landfill fires ♦ Wetlands encroachment ♦ Groundwater quality	10	Major improvement upon existing environmental conditions
		9	Minor improvement upon existing environmental conditions
		8	No environmental impacts
		7	Negligible degradation (i.e., does not require mitigation)
		6	Minor degradation (i.e., requires limited mitigation)
		5	Moderate degradation (i.e., requires significant mitigation in one area or limited mitigation in two)
		4	Moderate degradation (i.e., requires significant mitigation in two areas or limited mitigation in three)
		3	Major degradation (i.e., requires substantial mitigation in one area and limited/ significant mitigation in others)
		2	Major degradation (i.e., requires substantial mitigation in two areas and limited/significant mitigation in others)
		1	Severe degradation (i.e., requires substantial mitigation in multiple areas)

Performance Attribute Matrix

The following matrix analysis is used to compare each of the performance measures to each other to establish a weighted rating for each measure that can be used to calculate the performance value.

PERFORMANCE ATTRIBUTE MATRIX *Ordot Dump Closure, Guam*						VMS, Inc.	
						TOTAL	**%**
Operational Impacts	**A**	a	c	a/d	e	1.5	15%
Materials Availability	**B**		c	b	e	1.0	10%
Schedule	**C**			c	e	3.0	30%
Construction Process	**D**				e	0.5	5%
Environment	**E**					4.0	40%

a	More Important
a/b	Equal Importance

10.0	100%

With this matrix, the VE team completed its evaluation of the original design as it relates to the performance measures defined above. The rationale for the rating selected was developed and is presented on the next page, with the numerical rating shown in bold print.

Performance Attribute	Rationale
Operational Impacts	This requires that closure activities occurring during final operations of the dump not interfere with those operations.
Materials Availability	Materials and skilled labor needed for construction of the final closure of the dump come from on-island and off-island and, as the delay in the manufacture and delivery of materials may impede construction, this design considers what is required to produce and procure materials for the closure in a timely manner.
Schedule	The current mandate is to meet the schedule dates mandated in the Consent Decree, which is tied directly to the opening of the new landfill at Dandan. The construction schedule must stay on track and not be impeded by outside factors, principally weather-related conditions from normal storms during the wet season or significant storm events.
Construction Process	The construction process carries inherent risks of potential contractor claims and changes orders related to weather delays, handling of sophisticated materials, delays due to avoiding impacts to operations, the inability to obtain off-island materials, and find adequately skilled labor on island. The impacts of the proposed construction process should allow construction to occur in a manner that will reduce the risks associated with the potential for change orders, work stoppages, and contractor claims.
Environmental Impacts	The current dump footprint encroaches on wetlands and contributes leachate to the Lonfit River. Natural ground underlying the dump is considered an aquiclude retarding movement down into groundwater; however, monitoring of groundwater quality has been spotty at best and leachate impacts to groundwater cannot be verified. The dump runs the risk of internal fire development following closure. The proposed closure design addresses closure by relocating waste along the western edge and constructing an MSE wall. Additional protection of groundwater below an unlined dump cannot be provided, and a monitoring program is proposed. Monitoring for internal fires is not provided for in the design. Environmental impacts carry over to post-closure operations and maintenance.

Performance Rating Matrix

When the weighted percentage and the numerical ratings are combined to determine the total performance value, the results can be presented graphically for the original design. The VE Team, in reviewing the alternatives and VE sets, assess how each set may alter the value of the performance criteria (increase or decrease) as related to the entire project. These assessments can then be compared to the original design.

The project cost for the VE sets is determined by adding up all of the cost savings (and losses if appropriate) for the alternatives contained in the set, and subtracting the savings from the original project cost to find the total cost for the set. By calculating the total performance for the original design and VE set, and dividing the total performance by the total cost, the value index may be determined. An increase in the value index indicates potential improvement to the project design. This improvement can be represented as a percent. For the alternative sets developed in this workshop by the VE team, VE Sets 1, 2, 3, and 4 were estimated to provide a 219%, 211%, 206% and 195% value improvement to the project design, respectively. This information is summarized graphically on the following page.

It should be noted that a reconciled cost estimate of about $29,800,000 was used in this analysis. A reconciled estimate was developed by the VE team during the study, the basis of which is discussed in Project Analysis, Cost Model section of this report.

PERFORMANCE RATING MATRIX *Ordot Dump Closure, Guam*	**VMS, Inc.**

Attribute	Attribute Weight	Concept	Performance Rating										Total Performance
			1	2	3	4	5	6	7	8	9	10	
Operational Impacts	15	Original Concept						6					90
		VE Set 1						6					90
		VE Set 2						6					90
		VE Set 3						6					90
		VE Set 4						6					90
Materials Availability	10	Original Concept						6					60
		VE Set 1								8			80
		VE Set 2									9		90
		VE Set 3								8			80
		VE Set 4								8			80
Schedule	30	Original Concept					5						150
		VE Set 1								7			210
		VE Set 2								7			210
		VE Set 3									8		240
		VE Set 4									8		240
Construction Process	5	Original Concept						6					30
		VE Set 1							7				35
		VE Set 2							7				35
		VE Set 3								8			40
		VE Set 4								8			40
Environment	40	Original Concept					5						200
		VE Set 1							7				280
		VE Set 2					5						200
		VE Set 3						6					240
		VE Set 4				4							160

OVERALL PERFORMANCE	Total Performance	% Perf. Improve.	Total Cost ($ Mil.)	Value Index (Performance / Cost)	% Value Improvement
Original Concept	530		29.8	17.79	
VE Set 1 - Gas Headers Above HDPE + Replace MSE Wall	695	31%	17.8	39.04	219%
VE Set 2 - Passive Gas Collection + Replace MSE Wall	625	18%	16.6	37.65	211%
VE Set 3 - Gas Headers Above HDPE + Shift Toe West	690	30%	18.8	36.70	206%
VE Set 4 - Passive Gas Collection + Shift Toe West	610	15%	17.6	34.66	195%

DESIGN SUGGESTIONS

The VE Team developed 42 Design Suggestions that are submitted to Guam DPW for their review and consideration. The Design Suggestions are presented below.

Divert off-site stormwater around landfill (Creative Idea No. MF-1)

The benefits of diverting off-site stormwater away from the waste area and around the site are significant. If surface water comes into contact with waste or its associated liquids, the surface water becomes contaminated. Consequently, it is important to prevent off-site surface water from entering the waste area.

Surface water can be directed away from the waste area by improving an existing but overgrown ditch on the north side of Dero Drive. This existing ditch should be cleaned of its vegetation, improved where necessary, and maintained to assure conveyance of surface waters away from the site.

Collect stormwater in drains and chutes, and take off landfill before closure activities (Creative Ida No. MF-2)

Collect stormwater in drains and chutes and route off landfill with action completed before closure activities are even initiated. In other words—do it now. This action will reduce leachate production and supports early compliance. Stormwater management activity impacts to daily operations can be minimized with advance planning by knowledgeable staff. Stormwater management during the active life of the landfill is a required component of the RCRA D operations criteria to reduce leachate production. Ordot is presently being operated as an open dump, which is prohibited. This early stormwater collection system will need to be reconstructed during the closure and is subject to NPDES.

Regrade existing cover to improve drainage (Creative Idea No. MF-4)

The benefits of reducing the infiltration of water into the waste prism are significant. If water comes into contact with waste or its associated liquids, additional leachate is generated. The presence of water also accelerates decomposition of waste, generation of methane gas, and accelerated settlement. Consequently, it is important to prevent off site surface water from entering the waste.

The top deck of the site should be graded to promote positive drainage of surface water off of the site. Existing low areas that allow water to pond should be filled. Assuming the operators follow proper waste fill sequencing, waste placement protocol, and placement of cover soils, there is no additional cost associated with this activity. Immediate action in this regard will be an excellent step toward demonstrating that the Guam DPW is taking positive action to operate the dump correctly and proceed to closure.

Treat leachate through an aerate system (Creative Idea No. MF-11)

Treat leachate through an aeration system using biological methods. Biological methods are especially applicable for organic-type contaminates, and monitoring data is needed for method qualification. Aeration methods can eliminate the need for a sewer conveyance system (pipes and pumps) and simplify the industrial discharge process, as treated effluent may be released to the environment, provided discharge standards are met.

The applicability of method depends on the strength and composition of the leachate. Depending on the leachate strength and volume of flow, a pond or package plant may be used. For a package plant, the process is more complex and requires electricity, but it can handle larger flows and leachate strengths. Stopping the uncontrolled discharge of pollutants to the Lonfit River is the major goal of the Consent Decree.

Replace ABM with erosion mat (Creative Idea No. MF-17)

Articulated Block Mat (ABM) is a useful but expensive erosion-resistant surface applied to the surface of various drainage ditches and chutes. Depending upon the speed of the water traveling in the drainageway, other erosive protection materials could be used. For this application, ABM provides a highly durable wear surface, in addition to being somewhat flexible to accommodate landfill settlement.

However, a wide variety of manufactured Erosion Mats have been developed which, if appropriate, could provide significant savings. Erosion mats are also flexible and may provide appropriate erosion resistance, depending upon the scouring affect of the water being transmitted. The designer should evaluate the design speed of various portions of the collection ditches. Where appropriate, the use of Erosion Mat materials should be employed.

Replace ABM-lined chutes with metal-lined chutes (Creative Idea No. MF-18)

As described in MF-17 above, the use of ABM where necessary protects drainage ditches from erosive water scour. Down chutes collect surface water from tributary berms on the top and sides of the site and convey the water to the bottom of the site. The volume and velocity of water in these chutes is very high. Many landfill operators in the US employ a pre-manufactured metal chute for this purpose. The metal chutes are significantly less costly. However, the metal-lined chutes require additional maintenance and may deteriorate (rust) in the marine environment of Guam. The designer should evaluate the benefits and limitations of metal-lined chutes and revise the design as appropriate.

Use tarps to shed water from the site (Creative Idea No. MF-24)

As described in MF 4 above, the benefits of reducing the infiltration of water into the waste prism are significant. If water comes into contact with waste or its associated liquids, additional leachate is generated. The presence of water also accelerates decomposition of waste, generation of methane gas, and accelerated settlement. Consequently, it is important to prevent off-site surface water from entering the waste.

If cover soils are not available, the uncovered portions of the site should be covered with tarps to promote positive drainage of surface water off of the site. Tarps can be secured to the site using waste tires, sand bags, etc. The use of tarps should be limited to a temporary application only and are generally equal to grading the site to promote surface drainage (MF 4).

Put a water quality monitoring system in place for leachate, stormwater, surface water, and groundwater (Creative Idea No. MF-26)

The current operations at Ordot Dump do not perform any water quality monitoring for leachate, stormwater, surface water bodies (i.e., rivers, streams, wetlands, etc), or groundwater. This lack of historical data precludes the evaluation of water quality conditions at and around the dump. Immediately establishing a consistent and approved water quality monitoring program will help to qualify and quantify current impacts to water quality, which will allow for appropriate revisions to minimize post-closure requirements. It will also demonstrate positive action by Guam DPW toward establishing acceptable operating procedures and progress toward closure while beginning to assemble essential data needed to manage the closed facility.

Lay west slope back (Creative Idea No. ED-8)

The un-named drainage meanders along the westerly edge of the dump. In one location, the drainage encroaches near the toe of the dump boundary. A variety of solutions to this condition are described (ED-4, ED-5&6, and ED-5&7). As an alternative, the slope above the drainage could be cut (lowered or laid back) thereby removing the steep sloping portions of waste above the drainage. The current design includes an excavation slope very similar to this alternative (see temporary excavation slope on the west side of the site, sheet C-2).

Unfortunately, the excavated waste will need to be relocated onto other portions of the site. This will consume valuable airspace that is needed for waste placement until the new landfill site is constructed and ready to receive wastes.

Once the drainage has been relocated, an earthen embankment may be installed to support a portion of the westerly toe of the dump. This approach removes the necessity of installing a very costly MSE wall. In addition to a significant capital cost savings, the safety of the project is improved. The 20-to 45-foot high portions of the MSE wall pose a long-term safety risk as an attractive nuisance to the government.

Utilize green waste as a layer in the final cap (Creative Idea No. ED-16)

The VE team had discussed alternative ideas to enclose the landfill dump with a variety of materials possible for use. The use of green waste was suggested as a possible alternative to liner or soil, although soil would more than likely be mixed in and be part of the cover material. The green waste reduces the volume of soil needed, as it is expected there would be a consistent and ample amount of green waste material available for disposal. Using green waste as cover to enclose the dump will also be taking up airspace, while at the same time acting as the cover layer. It is referred to as “revenue-generating-cover.”

Green waste could be brought to the dump in specified sizes such that it can be spread and compacted to meet the cover layering format on the surface. Obviously, large, bulky, sizes not able to be spread can be further reduced through mulching, chipping, or cutting so that the size is reduced for ease of spread by landfill equipment.

There have been similar experiences on the use of green waste as cover material at other sites, such as the West Hawaii Landfill (although soil was also mixed in to obtain the needed effect.). The green waste was brought in by the disposer, placed and then heavy equipment compacted and broke down the material further. The effort eventually evolved into stabilizing the tipping area. Other sites, such as the Bradley Landfill used green waste as an alternative intermediate cover. The waste was chipped and mulched to obtain the desired, specified size for use.

In summary, green waste can be used as a substitute for soil on an on-going basis when the opportunity presents itself. As an ideal and completely permanent substitute, green waste will need to be processed into a specified size and also be available in ample amount to be able to meet the cover material requirement. Approval from the local regulatory agency for an alternative cover material will also have to be obtained first.

Use Navy dredge spoils as cover material (Creative Idea No. ED-17)

There is a potential source of daily cover that is in short supply at this point in time. The dredged soil may be appropriate for providing cover; however, the actual soil needs to be assessed for suitability. If the contractor needs to find a place for the dredged material, this could actually generate revenue or at least be a no-cost solution for DPW. It should be noted, however, that the soil/sediment may be contaminated from harbor activities over the past 60 years and that watertight trucks will be needed to transport the soil if the material is not dried out prior to transport.

Mandate that all grading projects deliver excess soil material to the Ordot Dump for use as cover material (Creative Idea No. ED-23)

The Ordot Dump's primary source of cover material is located at the Dededo quarry. Consistently transporting this material is costly and inefficient due to DPW's lack of resources, which results in large areas of uncovered waste and environmental non-compliance. Establishing an executive order that mandates all excess, clean material generated from grading projects be delivered to Ordot Dump for use as cover material will assist dump operators by providing one of the most essential resources for efficient and effective dump operations. Daily soil cover facilitates environmental compliance by reducing vectors, odors, and leachate generation, and improving aesthetics.

Negotiate purchase option of soil from property owner to the north (Creative Idea No. ED-24)

There is a plan by the Department of Public Works to purchase soil from the owner of Lot No. 3390-2NEW-R2, which is located north of the Ordot Dump. There was also a soil investigation report issued by Geo-Engineering conducted on January 18, 1994 which states that the clayey silty soil is a cohesive and relatively impermeable material and would be suitable for use as fill for the Ordot dump area. Estimates by the VE Team indicate roughly 200,000 cubic yards of suitable cover soil may be present on this property.

The plan to negotiate a deal from the lot owner at this time is highly recommended in order to protect this source (for several years) from being sold to another buyer by initiating a "Contract to Purchase." The prospective fill site in its proximity to the dump area will decrease the construction cost significantly for fill materials.

Upon confirmation of the "Contract to Purchase" between DPW and the lot owner, DPW could then specify in the bid documents that field materials from the site of specified quantity (Quantity to Be Determined by DPW) shall be available for contractor's use. Material cost for the fill materials from this site shall not be included in the contractor's prospective bid.

Assure public safety and health associated with exposed waste slope created during MSE wall construction (Creative Idea Nos. ED-25 and ED-26)

During the construction of the proposed MSE walls, and of the entire dump closure project, safety measures should be undertaken to prevent accidents, save lives, and avoid penalties from OSHA for safety violations. Specifically, the construction of MSE walls would generate an exposed slope of approximately 38 feet high, which would require workers' protection from falls. The placement and compaction of waste towards the MSE wall is also a hazard for personnel and equipment. The construction of scaffolds and other safety measures required, as well as the preparation of a safety plan, should be implemented prior to start of any construction activity. Part of the safety plan should be the appointment of a full-time safety manager to implement the safety program for this project.

In addition, residents to the west of the dump should be relocated during the construction of MSE walls, as the exposed waste will generate vectors and bad odors within the vicinity.

Knowingly violate with notice (Creative Idea No. MS-1)

Knowingly violating the Consent Decree schedule with notice may be the only remaining option if available planning time has been expended. This may be the only way to provide scheduling flexibility and must be done with proper notice to Guam EPA. Operational improvements to remove Ordot from open dump status must be completed to enable this step to be successful. Written confirmation of removal from open dump status will increase success.

The notice of knowingly violating the Consent Decree Schedule must be justified with regular update reports on an agreed-upon schedule. The reports should provide the required Consent Decree schedule, a revised up-to-date schedule, task items, and explanations of task item delays, including resource limitations.

Consent Decree violations are subject to penalties. The Ordot dump is presently operated as an open dump. The operator must take steps to meet RCRA D operational criteria and manage the leachate seeps along the base of the landfill. Qualified technical staff, operations staff, and advance planning must be integrated to successfully meet operations criteria. Measures must be taken to stop pollution discharges from affecting the wetlands and reaching the Lonfit River.

Immediate steps to meet operational criteria include off-site/on-site stormwater management, daily cover, access controls, and an all-weather road to the workface, including a turnaround area. Failure to meet these minimum standards would mean that the landfill continues to operate as an open dump, which is prohibited.

Open/regular communication/meetings among all stakeholders (Creative Idea No. MS-2)

Whenever public projects are planned and the process proceeds forward from the start, there will be a myriad of interests that will affect the project before, during, and after. The effect will be ongoing from beginning to end. The primary reason is that there are multiple stakeholders that all have interests in the project, and they all do not necessarily agree in the interest of the outcome.

The Ordot Dump Closure project, particularly, has a greater sensitivity to all stakeholders because of the nature of the project. The Dump has been in existence for over 60 years, and its effect on the community has been more negative than positive. Ironically, the service the Dump provides makes public lives more convenient in that it provides for a place to dispose of our waste. The Ordot Dump Closure project has become more controversial because of scheduling, costs, and environmental impacts that have been ongoing for years.

The Value Engineering team has discussed a need that can go a long way to help meet schedules vital for the project's success. This need requires that meaningful open and regular communication and meetings among ALL stakeholders be conducted on a regular basis.

From a simple and basic point-of-view, human nature will always have its conflicts; however, all stakeholders must develop relationships such that they can all "agree-to-disagree". As mentioned earlier, the advantage and positive outcome to regular, open communications and meetings of stakeholders is it can provide flexibility in the closure process. The numerous interest as mentioned earlier, tend to have needs that may come in conflict with those or other interests just as important to the process. If meeting and communicating among stakeholders occur, chances are that information exchange can lead to a better understanding amongst the interests and can lead to solutions. It takes genuine effort on the part of all stakeholders to understand this relationship and work towards making it happen versus fearing hidden agendas and simmering mistrust. Personal feelings and especially those disguised as "business only and nothing personal" will need to be left at the door in order to move forward and prove that open and productive meetings and communications will lead to a "win-win" solution. Given this, the advantages are:

- Provides flexibility in closure process
- Enhances potential for success
- Supports interests of Guam residents
- Will be in the best interest for all schedules
- Creates common interest and goals

Add incentive clause to contractor to accelerate schedule (Creative Idea No. MS-3)

The contractor would be incentivized (depending on the incentive) to be more efficient and to increase the rate of site work. These activities and other creative ideas resulting from the incentive may well advance the schedule enough to meet the consent decree. A clause regarding the fact that safety must not be compromised in order to accelerate the schedule needs to be included in any incentive scheme.

Stop receipt of waste by October 2007 (Creative Idea No. MS-4)

Guam DPW would stop receipt of waste by October 2007 as a milestone to satisfy the Consent Decree, with notice to the governing agency that remaining capacity exists in a defined interim area. The governing agency has the option to extend the final closure date. If approved, this will allow more time to complete the final closure of the facility. Operations in the interim area must meet operations criteria. Outside of the interim area, intermediate cover that manages stormwater would need to be completed and maintained. A stakeholders meeting between all affected parties will need to be held to work out the details of the steps to be taken. The practical capability of Government Guam should be a consideration.

An extension of the closure date cannot be approved if operations at Ordot continue as an open dump. Operations in the defined interim area must meet the operations criteria without the release of pollutants to the environment. Operational criteria on which to focus include covering the active workface, stormwater management, leachate controls, and measures to control vectors.

Modify Consent Decree Schedule to make it more realistic (Creative Idea No. MS-10)

The Consent Decree (CD) schedule includes certain elements that pose challenges to implementing the Ordot closure improvements. For example, the new landfill at Dandan will not be operational until late September 2007. Yet, the CD requires the closure improvements to be complete one month later (October 2007). Insomuch as there is no other location waste may be managed on Guam, it is highly unlikely that landfill closure improvements can be completed while ongoing waste receipt and placement activities occur. As another example, the CD did not include certain necessary functions that must be completed prior to implementation of the project (securing necessary funds, acquiring property, securing easements, complying with local land use permit issues, etc.).

The Guam Department of Public Works (DPW) has expended considerable time and effort in recent months developing an alternative schedule that reflects the estimated schedule of various elements of the project. The revised schedule was submitted to the US EPA for consideration. The US EPA rejected the schedule, stating that the current CD reflected years of analysis and negotiation.

Aside from the unproductive conclusion of this effort, it remains advisable for Guam DPW to request clarification of certain undefined aspects of the CD. The key issues that should be clarified include, but not limited, to the following:

- Cease receiving waste
- Completion of the closure improvements
- Cease discharges to the Lonfit River

Accelerate development of first Dandan cell (including access road) (Creative Idea No. MS-11)

In order to better meet the project schedule, the VE Team recommends that the development of the first waste cell at the new proposed landfill in Dandan be accelerated. The notion behind this recommendation was to provide options and be in a better position that would assure the consent decree schedule can be met. It will also accelerate the time when the Ordot Dump will stop receiving waste.

Upon further review on the aspect of the closure project schedule and the consent decree requirements schedule, some flexibility appears to be needed. Estimates of timing for accomplishing milestones in the schedule and the reality of the work to be done and what time they need to get it done may conflict. The acceleration of the first cell development will afford a greater opportunity to modify the schedule. It would put DPW in a better position to review and pursue flexibility in meeting the schedule.

The development of the first cell and efforts to accelerate the schedule to accomplish it may meet hurdles from stakeholders and also from sufficiency of funds present. The process of modifying local land use zoning and acquiring the land can further delay any optimism for the cell development.

Clarify poorly defined area in Consent Decree that makes it difficult to meet requirements (Creative Idea No. MS-14)

There are some areas in the Consent Decree that require special attention. The intent of the Consent Decree is to stop pollution from discharging to the Lonfit River, and to close the Ordot dump in-order to prevent future discharges. The Consent Decree is a combined Clean Water and RCRA D action that must be satisfied.

The practical capability of the Government of Guam and resource limitations especially funding represent significant barriers that should be considered in negotiations with Guam EPA. At the present time, involved agencies appear to be having great difficulty communicating. The continued receipt of waste at Ordot remains in the public interest until the new landfill is constructed and starts operations. However, the Government of Guam is also responsible for taking reasonable action to stop the discharges of pollution to the Lonfit River and meet RCRA D operational controls.

Both parties need to negotiate with the goal of understanding each other's positions so that progress can be made. Technically knowledgeable staff is recommended for the Government of Guam with the authority for decision-making.

Privatize remaining life of Ordot (Creative Idea No. MS-15)

Privatizing the operations for the remaining life of the Ordot Dump was suggested. This idea relied on the proven experience that if operations of the Ordot Dump were to be privatized, the private operator would be better capable of running the landfill operations in a compliant nature and invest in resources to meet schedules required of them. The setup can be more efficient in that there would be one responsible party, which would eliminate multiple operators and any conflicts that can arise from having more than one entity operating the dump.

The current schedule and time allowed for privatizing may not provide ample time to make the privatization process complete. There is also the concern from any private entity seeking interest in the operations that any liability associated with the current operations may be inherited. From a business standpoint, the current schedule, any privatization conversion timeline, and the remaining site life may not meet the potential private entity's return on investment estimates.

Institute regular environmental compliance monitoring program, immediately (Creative Idea No. MS-17)

An ongoing environmental compliance monitoring program would greatly reduce the chance for Notice of Violations and fines due to non-compliance, and it would build up trust between the DPW and GEPA by being able to show compliance in the continued operations at the dump. Trust that DPW is doing the right thing (and documenting it) will lead to more flexibility in the regulatory relationship. A proactive stance in this area would go a long way in building confidence and trust between the agencies.

Bring an Environmental Compliance Officer on board as part of interim operations and through closure (Creative Idea No. MS-18)

The concept to create, designate, and assign a compliance officer to the Ordot Dump project and dedicate their responsibility was suggested. The Environmental Compliance Manager (ECM) will be able to oversee all compliance issues, and meet and communicate with regulatory agencies and perhaps other stakeholders. The ECM will also be tasked to assist in operational needs, such as train operations and develop programs that can nurture a culture within the operations of the Dump to a higher level of compliance and responsibility.

With the ECM in place, a respectable track record developed showing that Operations is operating efficiently and is compliant, and that open communications are ongoing, the facility can be in a better position to appeal for scheduling flexibility and perhaps show regulatory and public interests that the facility deserves consideration.

DPW may have to contend with another position to fill. If the operations are privatized, then the issue of an extra employee goes away.

Combine Dandan and Ordot as a single privatized contract (construct/operate/maintain) (Creative Idea No. MS-19)

This conceptual function will attract qualified operator contractors because the project will have the potential to meet private business return on investment. The combination of operating two projects will provide for a bigger contract. In addition, DPW will be relieved of direct obligations to maintain, close, and provide for post-closure care.

As noted in MS-15, privatization of the Ordot Dump operations and closure, and MS-18, dedicating an Environmental Compliance Officer, the involvement and the potential to turn over operations to a private interest can go a long way toward obtaining schedule flexibility and meeting the milestones. Combining the new landfill project in Dandan with the Ordot Dump operations and closure can potentially attract interest from private parties which, in turn, opens up other avenues for funding/financing the initial project effort.

Get all government agencies to comply with a recent executive order, with penalties, mandating that processing of all documents relating to Consent Decree occur within 5 days (Creative Idea No. MS-21)

This function recommended relates to MS-2, having open and regular communications and meetings with all stakeholders, but it is specific to the bureaucratic and political stakeholders. Like any project that concerns the public and tends to be controversial, politics and government can be obstacles. All stakeholders in the project will acknowledge this belief.

In order to better meet schedules in the Ordot Dump Closure project, these specific stakeholders need to do their part and comply with existing orders to process and administrate project documents, specifically relating to the Consent Decree, in the mandated timeline. If not, an enforceable penalty should be administered, in a timely manner, in order to effect results.

Everyone should do their part. Efficient administration should be a nurtured culture in government and politics. This function also has a mandated executive order. It should be enforceable.

The advantages to pursuing this function would be that progress can be accomplished for the Consent Decree schedule. Any delays can be avoided concerning the CD. The downside to this is that it will take political will and great effort not to stumble over bureaucratic hurdles.

Explore other funding mechanisms such as import taxes, tourist taxes, real estate taxes, etc. (Creative Idea No. MS-22)

Although many of these additional funding mechanisms have already been explored, some funding sources have not been fully explored. It would be worthwhile to spend some time ranking the most promising sources, investigate the possibilities with bureaucrats and politicians, and then create a list of those funding sources that are most likely to be acted upon *and* will also bring in the most money to the dump closure project.

Create separate Solid Waste Authority to manage and finance landfill closure and operations (Creative Idea No. MS-23)

An autonomous, independent solid waste authority could be more efficient in providing funding, since it would not have to respond to the whims of politicians or other self-interested parties. It would have the authority to raise funds through various taxes and/or fees in a simpler and more straightforward manner. The disadvantage, however, is that it creates, by its very existence, a new level of bureaucracy within the government.

Develop public outreach/education program (Creative Idea No. GI-1)

The public community interests are important stakeholders in the Ordot Dump Closure project, and communicating and keeping them up-to-date through outreach programs and educational forums is essential for the project's success.

There is a tendency to separate the public as though it is a standalone entity as a stakeholder when, in fact, we are all the public. We are only separated in terms of specific interests and agendas in relationship to the project. The community, as defined, includes those that will be affected by the process, and most likely will be everyone who will be impacted by the project.

An outreach program will need to be developed through educational forums and media. Provisions to allow for a two-way interchange of thinking and voicing concerns in a civilized manner need to be provided. This will help to facilitate understanding and to educate all those wanting to understand the project and its progress or impacts.

An outreach program can be as simple as periodic meetings, such as town hall meetings, that can present a forum for discussion. Education media, such as commercials, TV ads, radio talk show programs, and brochures, can all work towards conveying the project's details, process, and updates. These programs should be neutral and structured to inform only.

Other forms of outreach programs can be tours of the site during and after closure. In terms of the new landfill, a structured and formal tour of the site along, with all its operations and impacts, can be envisioned. Those responsible for the project should also create ongoing dialogue and schedule meetings periodically, as a forum to updating those in the surrounding areas who are directly impacted by the presence of the site.

Delete future plans for public use of Ordot (Creative Idea No. GI-3)

As designed, the Ordot site is not conducive to public access. For example, the outer edges of the benches are constructed with a four-foot drop (MSE edge wall). Also, there are very steep slopes (1.5:1) between each of the benches. To reduce risk, the design includes a guardrail along the primary access roads. However, access to various regions of the site is not prohibited (particularly the 30-foot + high MSE wall).

In addition to the risk of falling, the site will be equipped with gas collection wells, valves, and other devices to collect and destroy these gases. Landfill gas is explosive and can contain toxic and carcinogenic materials. Also, leachate (landfill liquid) potentially contains toxic or carcinogenic materials.

Taken as a whole, the expectation of allowing public access to the site immediately after closure is not advisable. Legislation and/or policy should be revisited to restrict public access to the site.

Make the site safe for the public (Creative Idea No. GI-4)

As described in GI-3 above, the site as designed will not be conducive for public access. This alternative addresses a brief review of the changes that need to be performed to make the site safe for public access. The changes for public access could be categorized into the following groups:

- Geometry safety issues
- Exposure to toxic, explosive or caustic materials

In order to make the site safe with respect to its site geometry, the following needs to be accomplished. The site design grades need to be flattened to prevent risk of falling. Vertical features (i.e., MSE walls) need to either be removed or secured to prevent public access. Roadways where the public are allowed to drive on the site need to be widened to allow two-way access.

In order to make the site safe with respect to exposure to toxic, explosive, or caustic materials, the following needs to be accomplished. The gas collection devices (wells, valves, pipes, etc.) need to be secured from public access. The leachate collection system (pipes, pumps, etc.) need to be secured from public access. The site will settle over time. As the site settles, the condition of the cap, gas collection system, and liquids management system will deteriorate, potentially exposing toxic, explosive, or caustic materials. A monitoring plan would need to be developed and implemented that evaluates the condition of the site prior to public access. The monitoring plan would need to identify, isolate, secure, and remove those areas from public access where emissions of gases or liquids could be exposed the public.

Develop training program for staff (Creative Idea No. GI-5)

One of the primary ways to enhance successful compliance and perform efficient operational activities is to develop a training program for those personnel directly involved in the daily operation and maintenance of the dump. A highly qualified maintenance or operation trainer should be hired to ensure proper and adequate training for the personnel involved. The hiring of a qualified trainer will be an additional cost, especially if hired from off island; however, the cost savings on a long-term basis will be significant. In addition, it is anticipated that this step will get a good reception from the public when improved, efficient operations of the dump are demonstrated by Guam DPW.

Install complete perimeter fence at dump (Creative Idea No. GI-6)

Site security is essential to prevent all access to the closed dump. The steep slopes in the current design are not safe for the public. In addition, feral animals (dogs, pigs, deer, and caribou) can damage the final cover system and greatly increase maintenance requirements.

Obtain reliable heavy equipment to serve site (Creative Idea No. GI-8)

The acquisition of reliable heavy equipment during operation will contribute to the efficient operation of the dump during closure. This will definitely increase the cost upfront, but with proper maintenance, the long-term cost benefit will be significant. Commonly used spare parts for this equipment should also be purchased and replenished on a regular basis to avoid disruption of operations.

Assure that adequate redundancy exists in design (Creative Idea No. GI-10)

In order to avoid disruption of services, standby equipment such as heavy equipment, generators, pumps, etc., should be acquired or ready for use in case of breakdowns. With continuous operation, the public health is being safeguarded and, possibly, public complaints would be minimized. This purchase of standby equipment will increase cost.

Identify off-site location of temporary waste storage stockpile areas associated with planned MSE wall construction (Creative Idea No. GI-11)

The cost estimate states a four-mile round trip for temporary storage of wastes during MSE wall construction. This implies the use of an off-site storage area. No further discussion of this off-site storage area is provided in the documents.

The identification of a suitable off-site location for the excavated waste resulting from the MSE wall construction is a critical path issue. The site not only needs to be physically located and approved by GEPA, but a Solid Waste Storage Permit needs to be obtained from GEPA. The siting and permitting issues are potentially long-lead items that need to be addressed as soon as possible, if the MSE wall construction is approved as a final design component.

Define procedures for following the filling plan to assure that work is staying within plan and matches the final grading plan (Creative Idea No. GI-14)

Define procedures for following a filling plan that directs sequential disposal activities on the top deck, which matches the final grading plan. This will minimize additional work during closure and ensure that positive drainage grades prevent the ponding of stormwater on the top deck. This will result in more effective operations and an efficient closure.

Confirm Guardrail design is appropriate for MSE wall (Creative Idea No. GI-15)

The current design includes a four-foot high MSE wall along the primary access route that is equipped with guardrails (guardrail alignment per sheet C-4). The guardrail details (sheet C-38) demonstrate a 2-foot 6-inch deep support set in a 12-inch sonatube, backfilled with concrete. However, the Typical Bench Cover Section (sheet C-12) does not show the guardrail. The bench detail has a reinforced edge (four-foot high MSE wall) with geogrid Type 3 imbedded four feet behind the face of the wall.

It is unclear how the guardrail post will be installed with respect to interfering with the geogrid textiles. It is recommended that the designer evaluate these two details and clarify how these features should be properly constructed. The clarification should include an analysis of the anticipated resistance the guardrail post will provide in the event of a lateral load, insomuch as the post is located immediately adjacent to a nearly vertical four-foot drop (that presumably does not provide resistance if impacted by a lateral load).

Make Navy responsible partner in closure process and funding (Creative Idea No. GI-16)

Make the Navy and Air Force responsible partners in the closure process and funding. The financial and practical capability of Gov Guam is limited. With a small population of 160,000 residents, the tax-base is limited. Of special concern are financial limits due to a primary tourist and service economy. The military has been a major, historic user of the Ordot dump bearing some responsibility for its contents, and will rely on the new landfill when it comes into service. The military must recognize that they are major stakeholders in the successful management of solid waste in Guam.

A responsible partnership should extend beyond seeking financial assistance. Other assistance may include technical, manpower, equipment, and material resources. The Government of Guam should include all major commercial and industrial parties in the solution. Assistance for materials, especially cover soils, should be requested.

Encourage future political candidates to state position and plans associated with closure (Creative Idea No. GI-17)

As recommended, all stakeholders need to make the effort to encourage our elected and future candidates for public office to make their position and understanding of these projects clear. Currently, future candidates seeking public office need to make it clear of their position on the Closure project. They should also strive to provide ideas toward productive processes that they can make happen for the success of the closure. With this function in mind and brought to realization, our political stakeholders can help in the process and account for their part in making the closure project a success. The project then will continue to be on the front burner and not be dragged on or ignored, which would not be in the best interest of anyone.

Permit conditions outside 40CFR258 are not applicable/clarify draft permit (Creative Idea No. GI-18)

The Ordot dump is an NPL site, under CERCLA. The CERCLA September 2002 Five-Year Review report makes a no-action determination, deferring corrective action to closure under RCRA D. The draft permit is designed to implement necessary environmental controls and close the dumpsite by October 2007. The Ordot dump has been in operation since the 1940s. It continues to be operated with minimal environmental controls, which qualifies it as an open dump. Open dumps are prohibited under RCRA D.

The draft RCRA D permit should be viewed as applying environmental controls under the RCRA D operations criteria that will correct the discharge of pollutants to the Lonfit River. The final goal of the draft permit is the timely final closure of Ordot dump.

The compliance history and the lack of trained knowledgeable personnel are causing Guam EPA to request privatization of the remaining life of the Ordot dump. The use of third-party technical assistance may be more effective if DPW provides a technically capable Environmental Compliance Officer counterpart. This Environmental Compliance Officer would be the appropriate staff to interface with Guam EPA. Third party assistance can provide training within DPW on the proper methods for planning and operating a solid waste landfill under RCRA D criteria. The Environmental Compliance Officer must have a technical background and decision-making authority in order to have a successful relationship with the regulatory agency. This relationship should start with the initial first step being regular delivery of sufficient soil to cover the active workface at the end of each week. The Environmental Compliance Officer should be involved with all solid waste facilities. Management, technical, and operations staff will need to be integrated within the same solid waste unit to be effective in providing the coordination for meeting the permit conditions.

Groundwater monitoring should be implemented during the permit period, and a remedial investigation of off-site contamination should be planned under EPA with input from Guam EPA. Past operations of the Ordot dump have resulted in wetlands encroachment.

VALUE ENGINEERING ALTERNATIVE *Ordot Dump Closure*		
FUNCTION:	Manage Fluids	**IDEA NO.** MF-5
TITLE:	In lieu of Large Detention Pond, Use Smaller Independent De-Siltation System in Various Areas (e.g., Distributive Flow)	**PAGE NO.** 1 of 6

ORIGINAL CONCEPT:

The present plan collects stormwater from the entire site through a site-wide collection system into one large de-siltation pond, with a point discharge into the Lonfit River.

ALTERNATIVE CONCEPT:

Use a distributive flow system consisting of multiple discrete collection/de-siltation collectors around the dump to manage stormwater.

ADVANTAGES:

- Eliminates wetland impact on south side
- Improves recharge to existing wetlands on west side
- Simplifies construction process
- Eliminates complex structure and outlet works
- Should be simpler to maintain

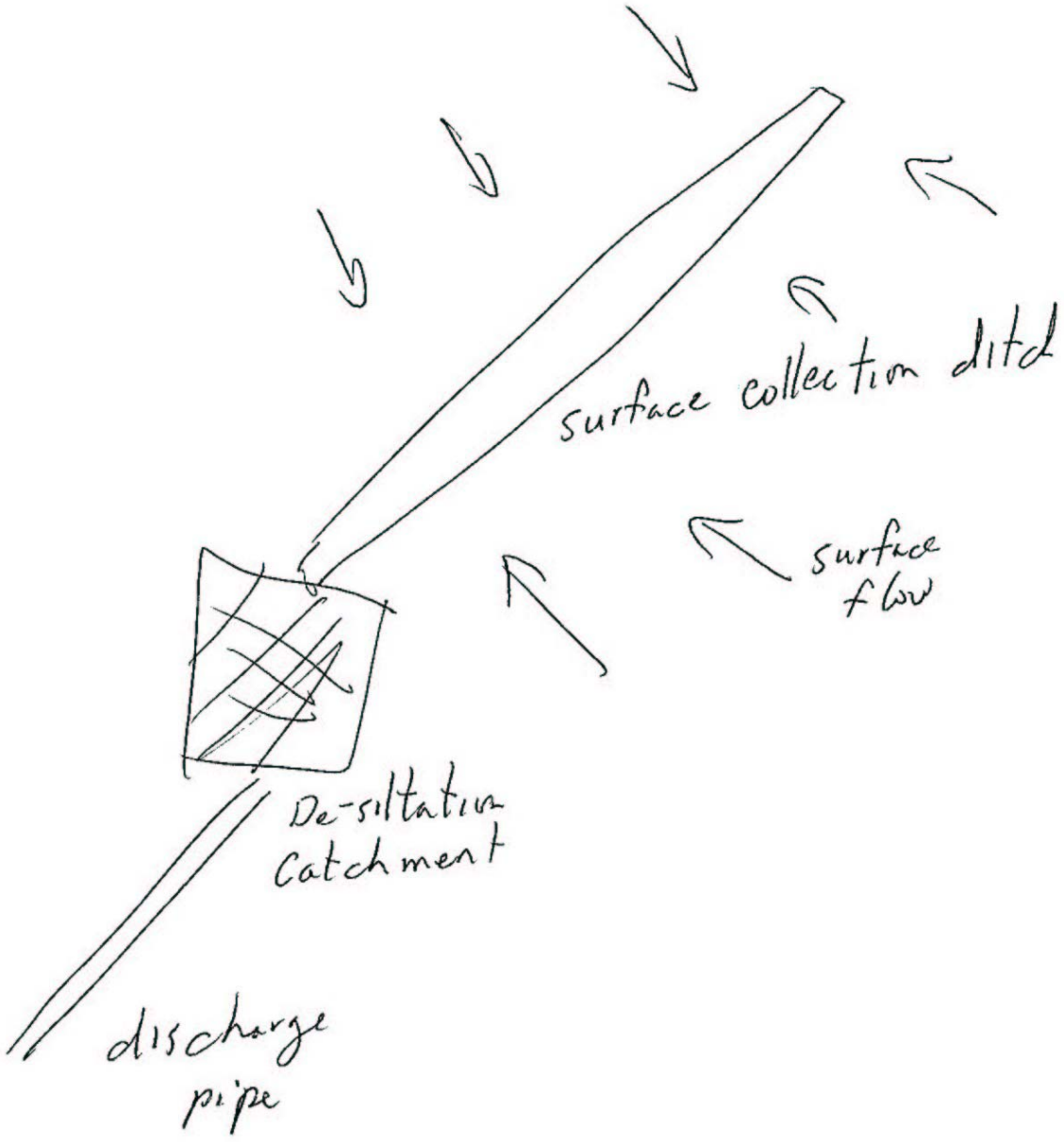
DISADVANTAGES:

- May complicate NPDES
- May need 401 and 404 permits

COST SUMMARY	INITIAL COST	O&M COST	LIFE CYCLE COST
ORIGINAL CONCEPT	**$** 163,000	**$** 0	**$** 163,000
ALTERNATIVE CONCEPT	**$** 140,000	**$** 0	**$** 140,000
SAVINGS	**$** 23,000	**$** 0	**$** 23,000

DISCUSSION / JUSTIFICATION:

The distribution system proposed will result in smaller, more flexible systems. It also eliminates the need for the large detention pond. It is anticipated that such an approach would also provide better distribution of water to adjacent wetlands prior to reaching the Lonfit River. This would support the wetlands and also provide the desired filtration of any remnant sediment prior to reaching the river. In addition, by not constructing the detention pond, a large area of wetlands is preserved.


surface collection ditch
surface flow
De-siltation Catchment
discharge pipe

PERFORMANCE MEASURES *Ordot Dump Closure*			
TITLE: In lieu of Large Detention Pond, Use Smaller Independent De-Siltation System in Various Areas (e.g., Distributive Flow)		**NUMBER** MF-5	**PAGE NO.** 4 of 6
CRITERIA and RATING RATIONALE for ALTERNATIVE	**Performance**	**Original**	**Alternative**
Operational Impacts No significant impact.	Rating	6	6
	Weight	15	15
	Contribution	90	90
Materials Availability No significant impact.	Rating	6	6
	Weight	10	10
	Contribution	60	60
Schedule Will help accelerate the schedule.	Rating	5	6
	Weight	30	30
	Contribution	150	180
Construction Process Simpler method of installation, less risk.	Rating	6	7
	Weight	5	5
	Contribution	30	35
Environmental Impacts Distribution system is more environmentally friendly to surrounding wetlands.	Rating	5	7
	Weight	40	40
	Contribution	200	280
	Rating		
	Weight		
	Contribution		
	Rating		
	Weight		
	Contribution		
	Rating		
	Weight		
	Contribution		
Total Performance:		**530**	**645**
Net Change in Performance:			**+21.7%**

Assume 20 small detention pond/distribution systems at $5,000/system to replace the large detention pond.

INITIAL COSTS

Ordot Dump Closure, Guam

TITLE	NUMBER	PAGE NO.
In lieu of Large Detention Pond, Use Smaller Independent De-Siltation System in Various Areas (e.g., Distributive Flow)	MF-5	6 of 6

CONSTRUCTION ELEMENT		ORIGINAL CONCEPT			ALTERNATIVE CONCEPT		
Description	**Unit**	**Quantity**	**Cost/Unit**	**Total**	**Quantity**	**Cost/Unit**	**Total**
Detention Pond Earthwork	ls	1	$33,000	$33,000			$0
Detention Pond Structure	ls	1	$36,000	$36,000			$0
Detention Pond Liner	sy	9	$5,100	$47,430			$0
Small Detention Ponds	ea			$0	20	$5,000	$100,000
SUB-TOTAL				$116,430			$100,000
PROJECT MARK-UPS	40%			$46,572			$40,000
TOTAL				$163,002			$140,000
TOTAL (Rounded)				$163,000			$140,000
						SAVINGS	$23,000

VALUE ENGINEERING ALTERNATIVE *Ordot Dump Closure*		
FUNCTION:	Manage Fluids	**IDEA NO.** MF-6
TITLE:	Put Gas Collection Headers and Piping Above Barrier Layer, but Below Grade	**PAGE NO.** 1 of 6

ORIGINAL CONCEPT:

The current design has a landfill gas (LFG) header and lateral collection pipes below the barrier layer.

ALTERNATIVE CONCEPT:

Revise the design to install the LFG header and lateral collection pipes above the barrier layer (but below grade where appropriate).

ADVANTAGES:

- Improves ease of post-closure maintenance when accessing LFG headers, particularly in areas where differential settlement occurs, necessitating access to the LFG header
- Do not need to repair the barrier as a result of maintenance activities
- If the HDPE barrier layer (current design) remains intact, removes necessity of specialized equipment and personnel to repair the barrier layer

DISADVANTAGES:

- LFG pipes would be exposed on slopes and subject to typhoon damage (for current design only, where no vegetation soil layer is included on steep slopes)
- Is mostly applicable where vegetation soil layer is used above the barrier layer

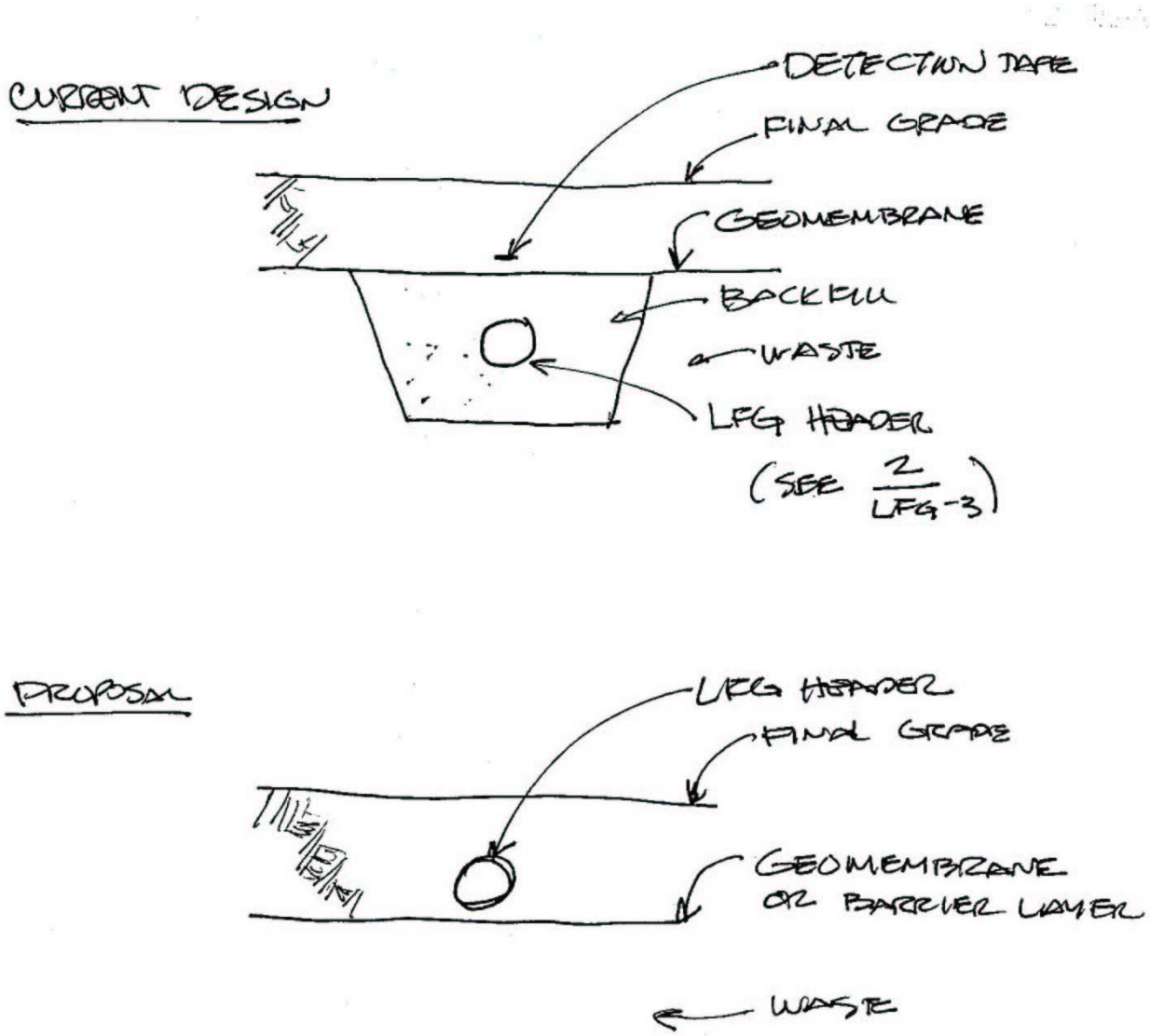
COST SUMMARY	INITIAL COST	O&M COST	LIFE CYCLE COST
ORIGINAL CONCEPT	**$** 0	**$** 26,000	**$** 26,000
ALTERNATIVE CONCEPT	**$** 0	**$** 0	**$** 0
SAVINGS	**$** 0	**$** 26,000	**$** 26,000

DISCUSSION / JUSTIFICATION:

Access to the LFG header and collection pipes is essential during the 30-year post-closure period, particularly in areas that are subject to differential settlement. By placing the LFG collection pipes above the barrier layer, they will be readily accessible for future modification and/or repair.

The current design employs a detection tape to be placed above the barrier layer as a tool for identification of the pipe alignment during post-closure. Although the detection tape may identify the proper location, the barrier layer will need to be penetrated to gain access to the LFG header. Penetrating the HDPE layer will require specialized equipment and trained personnel to restore the barrier layer. The specialized equipment and personnel are not readily available in Guam. Consequently, the equipment and personnel will need to be secured from off-island whenever access to the LFG pipes beneath the header is needed. By implementing this change, the post-closure maintenance activities are simplified, and the use of specialized equipment/personnel to repair the geomembrane layer is avoided.

SKETCHES *Ordot Dump Closure*			
TITLE:	Put Gas Collection Headers and Piping Above Barrier Layer, but Below Grade	**NUMBER** MF-6	**PAGE NO.** 3 of 6



PERFORMANCE MEASURES *Ordot Dump Closure*			
TITLE: Put Gas Collection Headers and Piping Above Barrier Layer, but Below Grade		**NUMBER** MF-6	**PAGE NO.** 4 of 6
CRITERIA and RATING RATIONALE for ALTERNATIVE	**Performance**	**Original**	**Alternative**
Operational Impacts No change.	Rating	6	6
	Weight	15	15
	Contribution	90	90
Materials Availability No change.	Rating	6	6
	Weight	10	10
	Contribution	60	60
Schedule No change.	Rating	5	5
	Weight	30	30
	Contribution	150	150
Construction Process Accelerates construction slightly, but no significant change.	Rating	6	6
	Weight	5	5
	Contribution	30	30
Environmental Impacts No change.	Rating	5	5
	Weight	40	40
	Contribution	200	200
	Rating		
	Weight		
	Contribution		
	Rating		
	Weight		
	Contribution		
	Rating		
	Weight		
	Contribution		
Total Performance:		**530**	**530**
Net Change in Performance:			**0%**

ASSUMPTIONS

This approach is most applicable where the design includes a vegetation soil layer above the barrier layer. As currently designed, there is no vegetation soil layer where steep side slopes (1.5:1, horizontal to vertical) are included.

For cost estimating purposes, assume repair of cap to gain access to the LFG header is needed every five years during the 30-year post-closure period. The cost of repair includes mobilizing HDPE repair personnel and equipment to make the necessary repairs.

No calculations necessary.

LIFE CYCLE COSTS

Ordot Dump Closure, Guam

Title: Put Gas Collection Headers and Piping Above Barrier Layer, But Below Grade

Alternative No. MF-6

Page No. 6 of 6

Life Cycle Period 30 Years

Interest 5.5 %

	ORIGINAL	ALTERNATIVE
A. INITIAL COST		
INITIAL COST SAVINGS:		
B. RECURRENT COSTS		
Total Annual Costs:		
Present Value Factor (P/A):		
PRESENT VALUE OF RECURRENT COSTS:		

C. SINGLE EXPENDITURES	Year	Amount	PV Factor	Present Value	Present Value
Repair of geomembrane barrier to gain access to LFG header during post-closure period	5	$ 10,000	0.765134354	$7,651	
Repair of geomembrane barrier to gain access to LFG header during post-closure period	10	$ 10,000	0.585430579	$5,854	
Repair of geomembrane barrier to gain access to LFG header during post-closure period	15	$ 10,000	0.447933048	$4,479	
Repair of geomembrane barrier to gain access to LFG header during post-closure period	20	$ 10,000	0.342728963	$3,427	
Repair of geomembrane barrier to gain access to LFG header during post-closure period	25	$ 10,000	0.262233704	$2,622	
Repair of geomembrane barrier to gain access to LFG header during post-closure period	30	$ 10,000	0.200644016	$2,006	
PRESENT VALUE OF SINGLE EXPENDITURES:				$26,041	
D. TOTAL RECURRENT COSTS & SINGLE EXPENDITURES (B+C)				$26,041	
E. SALVAGE VALUE					
F. TOTAL PRESENT VALUE COST (A+D+E)				$26,041	
TOTAL LIFE CYCLE SAVINGS:					$26,041

VALUE ENGINEERING ALTERNATIVE *Ordot Dump Closure*	
FUNCTION: Manage Fluids	**IDEA NO.** MF-7
TITLE: Utilize a Passive Gas Collection System	**PAGE NO.** 1 of 5

ORIGINAL CONCEPT:

Active gas extraction system with gas wells, underground collection piping, headers, pump, landfill gas leachate collection, and flare.

ALTERNATIVE CONCEPT:

Replace with a passive system that vents directly to the atmosphere.

ADVANTAGES:

- Much simpler system that uses surface trenches and shallow gas wells to allow for landfill gas flow
- Minimal operations and maintenance needed—procedures for severe weather conditions would need to be included

DISADVANTAGES:

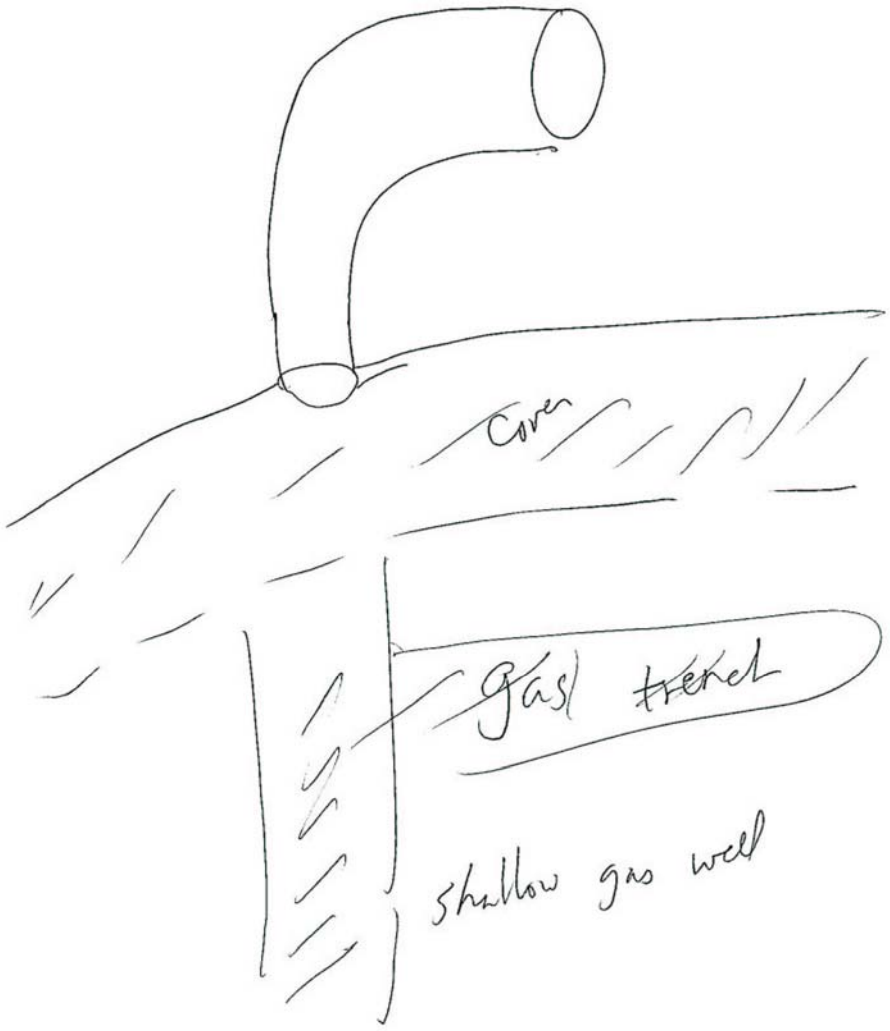
- May not qualify under Title 5 clean air rules
- Need to resist typhoon forces or allow for a breakaway hinge to secure prior to high-wind events
- Aesthetically unpleasing, but can be worked into an open space design

COST SUMMARY	INITIAL COST	O&M COST	LIFE CYCLE COST
ORIGINAL CONCEPT	$ 1,353,000	$ 0	$ 1,353,000
ALTERNATIVE CONCEPT	$ 359,000	$ 0	$ 359,000
SAVINGS	$ 994,000	$ 0	$ 994,000

DISCUSSION / JUSTIFICATION:

The current design is for an active gas extraction system with gas wells, underground collection piping, headers, pump, landfill gas leachate collection, and flare. The aboveground parts of an active landfill gas system are subject to typhoon damage.

A passive system, provided for the landfill, is below the size requirement for active gas extraction. A passive landfill gas system will be a much simpler system with less piping, gas condensate production, and monitoring. A passive system consists mainly of gas extraction trenches/shallow wells and aboveground surface vents. A passive system would have no moving parts, would be simpler to maintain, and would need little monitoring. High winds from typhoons may require design and repair consideration.


Cover
gas trench
shallow gas well

PERFORMANCE MEASURES *Ordot Dump Closure*			
TITLE: Utilize a Passive Gas Collection System	**NUMBER** MF-7		**PAGE NO.** 4 of 5
CRITERIA and RATING RATIONALE for ALTERNATIVE	**Performance**	**Original**	**Alternative**
Operational Impacts None apparent.	Rating	6	6
	Weight	15	15
	Contribution	90	90
Materials Availability No flare required.	Rating	6	7
	Weight	10	10
	Contribution	60	70
Schedule Less construction required.	Rating	5	6
	Weight	30	30
	Contribution	150	180
Construction Process Simple to build.	Rating	6	7
	Weight	5	5
	Contribution	30	35
Environmental Impacts More gas released to atmosphere, but no significant change.	Rating	5	5
	Weight	40	40
	Contribution	200	200
	Rating		
	Weight		
	Contribution		
	Rating		
	Weight		
	Contribution		
	Rating		
	Weight		
	Contribution		
Total Performance:		**530**	**575**
Net Change in Performance:			**+8.5%**

INITIAL COSTS

Ordot Dump Closure, Guam

TITLE	NUMBER	PAGE NO.
Utilize a Passive Gas Collection System	MF-7	5 of 5

CONSTRUCTION ELEMENT		ORIGINAL CONCEPT			ALTERNATIVE CONCEPT		
Description	**Unit**	**Quantity**	**Cost/Unit**	**Total**	**Quantity**	**Cost/Unit**	**Total**
LFG Monitoring Probes	ea	5	$12,000	$60,000			$0
LFG Interceptor	lf	6,405	$20	$128,100			$0
LFG Valve Station	ea	35	$2,500	$87,500			$0
LFG Extraction Wells	lf	1,870	$105	$196,350	1,870	$105	$196,350
LFG Headers	lf	7,630	$32	$244,160			$0
LFG Fire Station	ls	1	$250,000	$250,000			$0
Surface Vent	ea			$0	20	$3,000	$60,000
SUB-TOTAL				$966,110			$256,350
PROJECT MARK-UPS	40%			$386,444			$102,540
TOTAL				$1,352,554			$358,890
TOTAL (Rounded)				$1,353,000			$359,000
						SAVINGS	$994,000

VALUE ENGINEERING ALTERNATIVE *Ordot Dump Closure*	
FUNCTION: Manage Fluids	**IDEA NO.** MF-10
TITLE: Treat Leachate Through a Constructed Wetland	**PAGE NO.** 1 of 9

ORIGINAL CONCEPT:

Remove leachate from collection tanks and truck or pipe to sewer system.

ALTERNATIVE CONCEPT:

Feed collected leachate into constructed wetland or a packaged wetland system to treat.

ADVANTAGES:

- Proven technology for leachate disposal
- Considered a "Green" solution—environmentally friendly
- Supports wetland development

DISADVANTAGES:

- Applicability depends on the composition of the leachate
- May have public opposition
- Requires monitoring of water quality

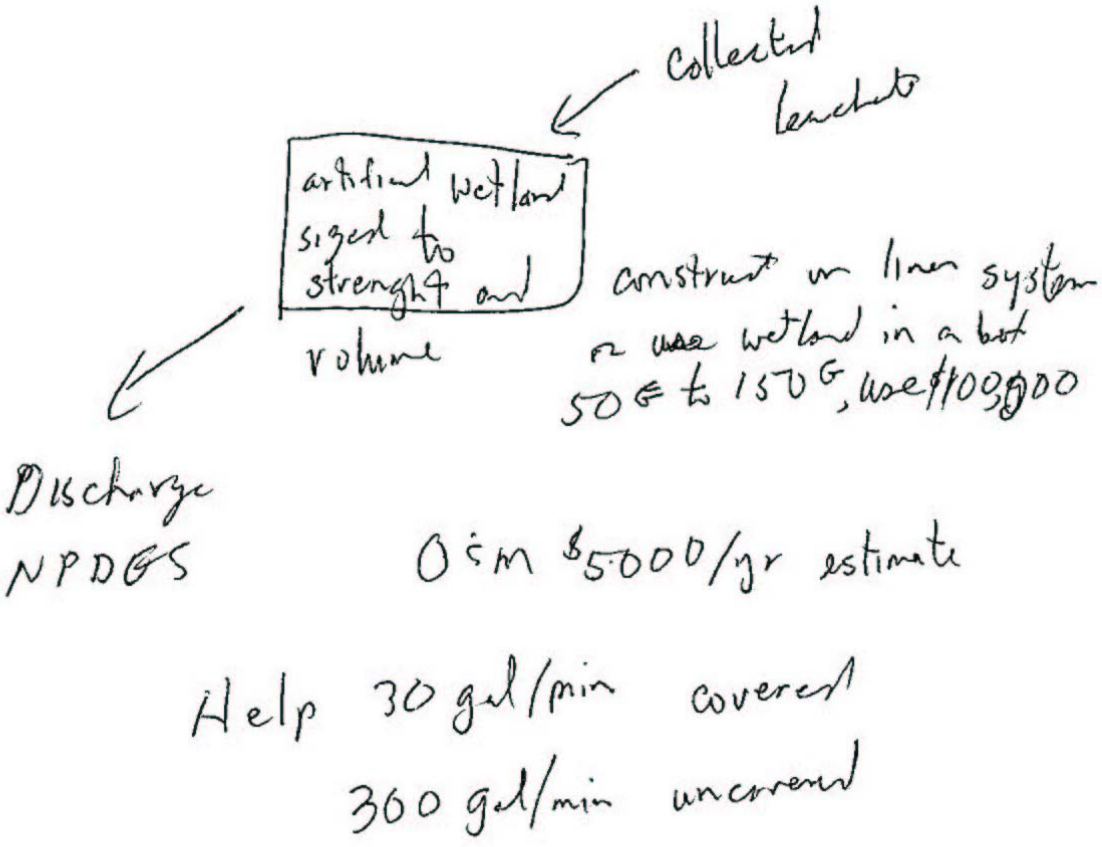
COST SUMMARY	INITIAL COST	O&M COST	LIFE CYCLE COST
ORIGINAL CONCEPT	Trucks: $448,000 Pipe: $358,000	Trucks: $7,214,000 Pipe: $0	Trucks: $7,662,000 Pipe: $358,000
ALTERNATIVE CONCEPT	Trucks: $168,000 Pipe: $168,000	Trucks: $132,000 Pipe: $73,000	Trucks: $300,000 Pipe: $241,000
SAVINGS	Trucks: $280,000 Pipe: $190,000	Trucks: $7,082,000 Pipe: $(73,000)	Trucks: $7,362,000 Pipe: $117,000

DISCUSSION / JUSTIFICATION:

The current design does not address removal of leachate from the storage tank. This alternative assumes that the leachate will be removed from collection tanks and trucked to the sewer system. An Industrial Wastewater Discharge Permit will be required, with testing for disposal into the sewer system.

This alternative recommends feeding collected leachate into constructed wetland or a packaged wetland system to treat. Strength and volume of leachate will affect choice. Monitoring and long-term operations is required. An NPDES will also be required. NPDES will already be required for stormwater discharges from site.

SKETCHES *Ordot Dump Closure*	VMS	
TITLE: Treat Leachate Through a Constructed Wetland	**NUMBER** MF-10	**PAGE NO.** 3 of 9



PERFORMANCE MEASURES *Ordot Dump Closure*			
TITLE: Treat Leachate Through a Constructed Wetland	**NUMBER** MF-10		**PAGE NO.** 4 of 9
CRITERIA and RATING RATIONALE for ALTERNATIVE	**Performance**	**Original**	**Alternative**
Operational Impacts Not occurring on-site.	Rating	6	6
	Weight	15	15
	Contribution	90	90
Materials Availability None off island.	Rating	6	6
	Weight	10	10
	Contribution	60	60
Schedule No effect.	Rating	5	5
	Weight	30	30
	Contribution	150	150
Construction Process No effect.	Rating	6	6
	Weight	5	5
	Contribution	30	30
Environmental Impacts Recycle leachate.	Rating	5	6
	Weight	40	40
	Contribution	200	240
	Rating		
	Weight		
	Contribution		
	Rating		
	Weight		
	Contribution		
	Rating		
	Weight		
	Contribution		
Total Performance:		**530**	**570**
Net Change in Performance:			**+7.5%**

Handling and disposal costs have not been analyzed for the project.

Assume this alternative will be compared to a four-truck system to move the leachate.

A second analysis was performed, comparing this alternative to piping the leachate to the sanitary sewer.

INITIAL COSTS

Ordot Dump Closure, Guam

TITLE	NUMBER	PAGE NO.
Treat Leachate Through a Constructed Wetland	MF-10	6 of 9

CONSTRUCTION ELEMENT		ORIGINAL CONCEPT			ALTERNATIVE CONCEPT		
Description	**Unit**	**Quantity**	**Cost/Unit**	**Total**	**Quantity**	**Cost/Unit**	**Total**
Purchase New Trucks	ea	4	$80,000	$320,000			$0
Construct New Packaged Leachate Wetland Treatment System On Site	ls			$0	1	$120,000	$120,000
Note: The original concept represents trucking leachate to sewage manhole.							
SUB-TOTAL				$320,000			$120,000
PROJECT MARK-UPS	40%			$128,000			$48,000
TOTAL				$448,000			$168,000
TOTAL (Rounded)				$448,000			$168,000
						SAVINGS	$280,000

LIFE CYCLE COSTS

Ordot Dump Closure, Guam

Title: Treat Leachate Through a Constructed Wetland

Alternative No. MF-10

Page No. 7 of 9

Life Cycle Period 30 Years

Interest 5.5 %

		ORIGINAL	ALTERNATIVE
A.	**INITIAL COST**	$448,000	$168,000
	INITIAL COST SAVINGS:		$280,000
B.	**RECURRENT COSTS**		
	Equipment and operator cost @ 313 days a year at $1,400 per day	$438,200	
	O & M cost	$50,000	
	Wetland operations and maintenance		$5,000
	Total Annual Costs:	$488,200	$5,000
	Present Value Factor (P/A):	14.5337	14.5337
	PRESENT VALUE OF RECURRENT COSTS:	$7,095,374	$72,669

C. SINGLE EXPENDITURES	Year	Amount	PV Factor	Present Value	Present Value
Truck replacement	7	$ 80,000	0.687	$54,960	$27,480
Truck replacement	14	$ 80,000	0.473	$37,840	$18,920
Truck replacement	21	$ 80,000	0.325	$26,000	$13,000

	PRESENT VALUE OF SINGLE EXPENDITURES:	$118,800	$59,400
D.	**TOTAL RECURRENT COSTS & SINGLE EXPENDITURES (B+C)**	$7,214,174	$132,069
E.	**SALVAGE VALUE**		
F.	**TOTAL PRESENT VALUE COST (A+D+E)**	$7,662,174	$300,069
	TOTAL LIFE CYCLE SAVINGS:		$7,362,106

INITIAL COSTS

Ordot Dump Closure, Guam

TITLE	NUMBER	PAGE NO.
Treat Leachate Through a Constructed Wetland	MF-10	8 of 9

CONSTRUCTION ELEMENT		ORIGINAL CONCEPT			ALTERNATIVE CONCEPT		
Description	**Unit**	**Quantity**	**Cost/Unit**	**Total**	**Quantity**	**Cost/Unit**	**Total**
Install Pipe	lf	3,200	$80	$256,000			$0
Construct New Packaged Leachate Wetland Treatment	ls			$0	1	$120,000	$120,000
SUB-TOTAL				$256,000			$120,000
PROJECT MARK-UPS	40%			$102,400			$48,000
TOTAL				$358,400			$168,000
TOTAL (Rounded)				$358,000			$168,000
						SAVINGS	$190,000

LIFE CYCLE COSTS

Ordot Dump Closure, Guam

Title: Treat Leachate Through a Constructed Wetland

Alternative No. MF-10

Page No. 9 of 9

Life Cycle Period 30 Years

Interest 5.5 %

				ORIGINAL	ALTERNATIVE
A.	**INITIAL COST**			$358,000	$168,000
			INITIAL COST SAVINGS:		$190,000
B.	**RECURRENT COSTS**				
	Wetland operations and maintenance				$5,000
			Total Annual Costs:		$5,000
			Present Value Factor (P/A):	14.5337	14.5337
			PRESENT VALUE OF RECURRENT COSTS:		$72,669
C.	**SINGLE EXPENDITURES**	**Year**	**Amount**	**PV Factor**	**Present Value**	**Present Value**
				PRESENT VALUE OF SINGLE EXPENDITURES:		
D.	**TOTAL RECURRENT COSTS & SINGLE EXPENDITURES (B+C)**					$72,669
E.	**SALVAGE VALUE**					
F.	**TOTAL PRESENT VALUE COST (A+D+E)**				$358,000	$240,669
				TOTAL LIFE CYCLE SAVINGS:		$117,331

VALUE ENGINEERING ALTERNATIVE *Ordot Dump Closure*	
FUNCTION: Manage Fluids	**IDEA NO.** MF-12
TITLE: Utilize Pipeline to Convey Leachate to Sanitary Sewer System	**PAGE NO.** 1 of 7

ORIGINAL CONCEPT:

Have the leachate collection and recovery system convey and collect leachate into a storage tank and pump out as needed into a pump truck. The stored leachate will then be transported to the sanitary sewer system for treatment and then discharged.

ALTERNATIVE CONCEPT:

This VE alternative will construct a pipeline from the site so that the leachate can be pumped directly into the sewer system without being stored, pumped into trucks, and transported.

ADVANTAGES:

- Lower life cycle costs
- No labor or equipment required
- Less disruption or need for additional surface facilities
- No maintenance or operations

DISADVANTAGES:

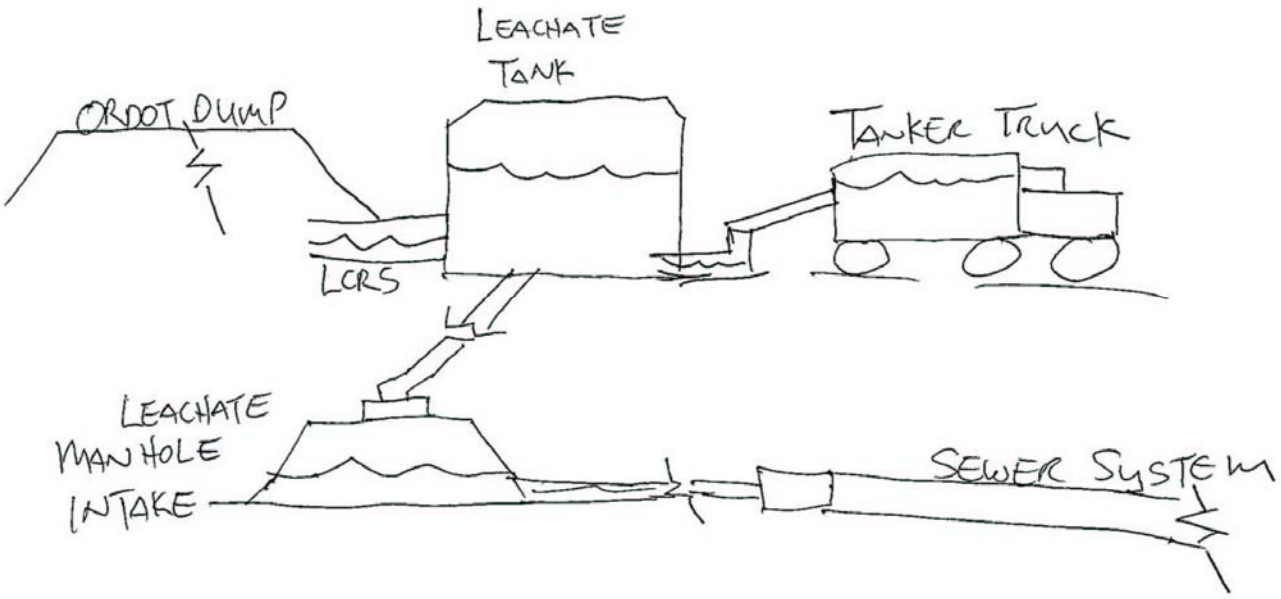
- None apparent

COST SUMMARY	INITIAL COST	O&M COST	LIFE CYCLE COST
ORIGINAL CONCEPT	$ 448,000	$ 7,214,000	$ 7,662,000
ALTERNATIVE CONCEPT	$ 358,000	$ 0	$ 358,000
SAVINGS	$ 90,000	$ 7,214,000	$ 7,304,000

DISCUSSION / JUSTIFICATION:

The justification for the concept of constructing a piping system for the leachate from the Ordot Dump centered on finding a more cost-effective and environmentally acceptable means, other than trucking over public highways. The cost issues focused on trucking equipment, operations and maintenance, and their availability—meaning having an ample number of trucks with enough capacity for the daily haul. The need to transport the leachate without having large numbers of trucks constantly traveling the highways loaded with waste liquids was also a driving point to use piping. The potential for spills and accidents further exposing the leachate to the public needed to be minimized.

If a piping system is installed, then the initial costs are incurred in the construction and then forgotten. There may be periodic maintenance cleanout.


LEACHATE
TANK
ORDOT DUMP
TANKER TRUCK
LCRS
LEACHATE
MAN HOLE
INTAKE
SEWER SYSTEM

PERFORMANCE MEASURES *Ordot Dump Closure*			
TITLE: Utilize Pipeline to Convey Leachate to Sanitary Sewer System	**NUMBER** MF-12		**PAGE NO.** 4 of 7
CRITERIA and RATING RATIONALE for ALTERNATIVE	**Performance**	**Original**	**Alternative**
Operational Impacts No significant impacts, as the site will be closed and no active operations will be occurring.	Rating	6	6
	Weight	15	15
	Contribution	90	90
Materials Availability There is no impact from this performance measure. Piping work is not new in the islands, so materials are available for this work.	Rating	6	6
	Weight	10	10
	Contribution	60	60
Schedule Not an issue.	Rating	5	5
	Weight	30	30
	Contribution	150	150
Construction Process Piping work has no issues.	Rating	6	6
	Weight	5	5
	Contribution	30	30
Environmental Impacts Constructing and utilizing a piping system to transport the landfill leachate does minimize environmental impacts, as the leachate can be conveyed to the sewer system in a safer way than trucking over public highways, This alternative removes leachate from the site, which will further reduce discharges into the Lonfit River.	Rating	5	6
	Weight	40	40
	Contribution	200	240
	Rating		
	Weight		
	Contribution		
	Rating		
	Weight		
	Contribution		
	Rating		
	Weight		
	Contribution		
Total Performance:		**530**	**570**
Net Change in Performance:			**7.5%**

ASSUMPTIONS: TRUCKING COSTS

Original Concept for Trucking Leachate

Leachate generation @ 26 gpm @ 38,000 gpd under a covered site (HELP modeling).

Tanker truck @ 2,000 gallons capacity. $80,000/truck with $50/hour (equipment + operator).

7 hours/day, 4 trucks per hour/day

19 trucks per day to transport, add factor for safety @ 1.5 = 28 trucks/day to transport 38,000 gallons of leachate to sewer system plant.

Annual maintenance costs = $50,000.

Annual equipment and labor for 6 days/week.

ASSUMPTIONS: PIPING COSTS

Alternative Concept for Piping Leachate to Sewer System

1 truck pumping from tank and transporting to pipe into the sewer system daily.

3,200 feet to closest sewer connection from the site.

$80 installed per linear feet for 12-inch pipe.

INITIAL COSTS

Ordot Dump Closure, Guam

TITLE

Utilize Pipeline to Convey Leachate to Sanitary Sewer System

NUMBER	**PAGE NO.**
MF-12	6 of 7

CONSTRUCTION ELEMENT		**ORIGINAL CONCEPT**			**ALTERNATIVE CONCEPT**		
Description	**Unit**	**Quantity**	**Cost/Unit**	**Total**	**Quantity**	**Cost/Unit**	**Total**
2,000-Gallon Truck @ Four Trucks	trucks	4	$80,000	$320,000			$0
Pipe Material Installed	pipes			$0	3,200	$80	$256,000
SUB-TOTAL				$320,000			$256,000
PROJECT MARK-UPS	40%			$128,000			$102,400
TOTAL				$448,000			$358,400
TOTAL (Rounded)				$448,000			$358,000
						SAVINGS	$90,000

LIFE CYCLE COSTS

Ordot Dump Closure, Guam

Title: Utilize Pipeline to Convey Leachate to Sanitary Sewer System

Alternative No. MF-12

Page No. 7 of 7

Life Cycle Period 30 Years

Interest 5.5 %

				ORIGINAL	ALTERNATIVE
A.	**INITIAL COST**			$448,000	$358,000
			INITIAL COST SAVINGS:		$90,000
B.	**RECURRENT COSTS**				
	Equipment and operator costs @ 313 days/year @ $1,400/day			$438,200	
	O&M costs			$50,000	
			Total Annual Costs:	$488,200	
			Present Value Factor (P/A):	14.5337	14.5337
			PRESENT VALUE OF RECURRENT COSTS:	$7,095,374	
C.	**SINGLE EXPENDITURES**	**Year**	**Amount** / **PV Factor**	**Present Value**	**Present Value**
	Truck replacement	7	$ 80,000 / 0.687	$54,960	
	Truck replacement	14	$ 80,000 / 0.473	$37,840	
	Truck replacement	21	$ 80,000 / 0.325	$26,000	
			PRESENT VALUE OF SINGLE EXPENDITURES:	$118,800	
D.	**TOTAL RECURRENT COSTS & SINGLE EXPENDITURES (B+C)**			$7,214,174	
E.	**SALVAGE VALUE**				
F.	**TOTAL PRESENT VALUE COST (A+D+E)**			$7,662,174	$358,000
			TOTAL LIFE CYCLE SAVINGS:		$7,304,174

VALUE ENGINEERING ALTERNATIVE *Ordot Dump Closure*	
FUNCTION: Manage Fluids	**IDEA NO.** MF-14
TITLE: Eliminate Leachate Drainage Layer (Geocomposite) on Top Deck	**PAGE NO.** 1 of 6

ORIGINAL CONCEPT:

The design calls for native fill above a geogrid, which is on top of a geocomposite. Underneath the geocomposite is a geomembrane, which overlays a second geocomposite that is underlain by at least six inches of a soil layer.

ALTERNATIVE CONCEPT:

The alternative design calls for the removal of the second geomembrane that lies just beneath the geomembrane on the top deck. There is no other change to the original design within this detail.

ADVANTAGES:

- Simplifies the final cover within the area where most of the operational activities are occurring

DISADVANTAGES:

- None apparent

COST SUMMARY	INITIAL COST	O&M COST	LIFE CYCLE COST
ORIGINAL CONCEPT	**$** 3,223,000	**$** 0	**$** 3,223,000
ALTERNATIVE CONCEPT	**$** 3,194,000	**$** 0	**$** 3,194,000
SAVINGS	**$** 29,000	**$** 0	**$** 29,000

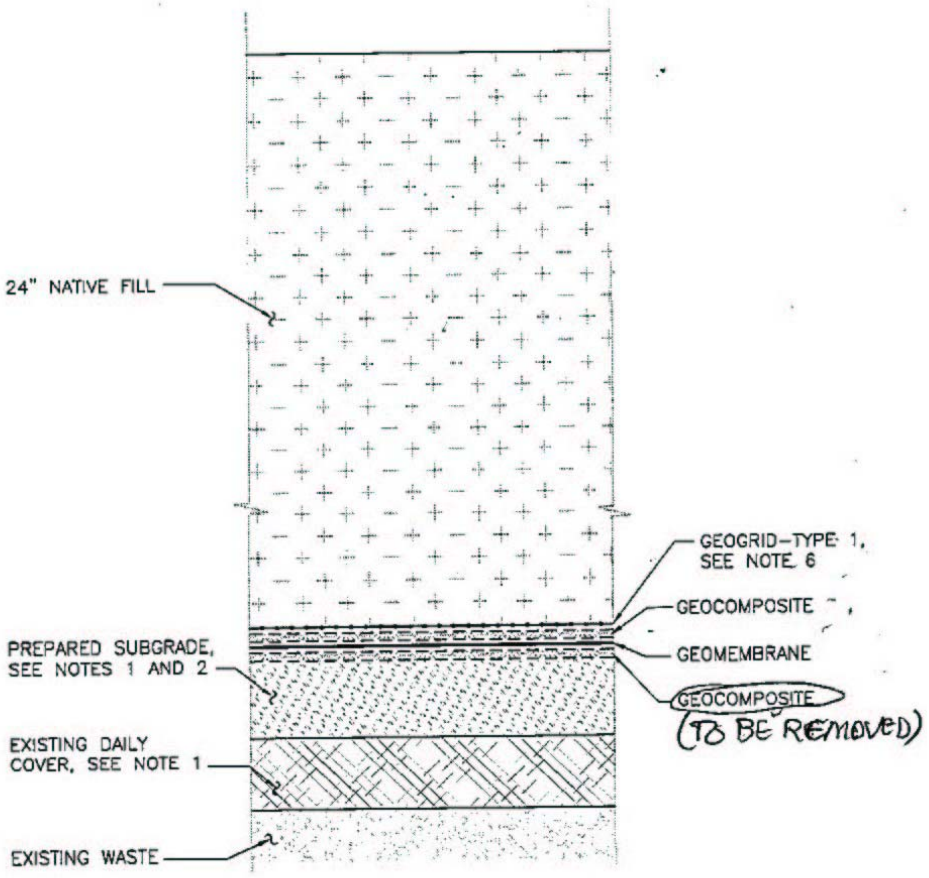
DISCUSSION / JUSTIFICATION:

This particular detail does not appear to provide additional value to the design at the *top deck* elevation. There are several reasons that support the removal of the geocomposite from underneath the geomembrane, as noted below. Keep in mind that the sole reason for the installation of a geocomposite is to wick away/transport fluids, such as leachate or water, to a collection point(s).

- No liquids will migrate from above the geomembrane into the geocomposite located below the geomembrane (geomembrane is blocking flow through it); therefore, the geocomposite below the geomembrane is not needed (there is no fluid to wick away).

- No liquids will come up from the trash/soil below to the geocomposite (capillary forces are not in effect); therefore, there is no need to wick away fluids.

See the following sketch.



SLOPE SOIL COVER DETAIL 1 C-17

NTS

PERFORMANCE MEASURES *Ordot Dump Closure*			
TITLE: Eliminate Leachate Drainage Layer (Geocomposite) on Top Deck		**NUMBER** MF-14	**PAGE NO.** 4 of 6
CRITERIA and RATING RATIONALE for ALTERNATIVE	**Performance**	**Original**	**Alternative**
Operational Impacts Some time is saved by not having to install the 3,100 yd^2 of geocomposite material. Since this is within the area where most of the operational activities are occurring, the operational impacts may be less, and therefore the rating is increased in this instance. Generally not significant.	Rating	6	6
	Weight	15	15
	Contribution	90	90
Materials Availability Do not have to order as much geocomposite, but it is such a small amount that is saved, the impact is insignificant.	Rating	6	6
	Weight	10	10
	Contribution	60	60
Schedule No significant impact.	Rating	5	5
	Weight	30	30
	Contribution	150	150
Construction Process No significant impact.	Rating	6	6
	Weight	5	5
	Contribution	30	30
Environmental Impacts No significant impact.	Rating	5	5
	Weight	40	40
	Contribution	200	200
	Rating		
	Weight		
	Contribution		
	Rating		
	Weight		
	Contribution		
	Rating		
	Weight		
	Contribution		
Total Performance:		**530**	**530**
Net Change in Performance:			**0%**

ASSUMPTIONS

1. No liquids will come vertically through the geomembrane to the geocomposite located below the geomembrane.

2. No liquids will come up from below to the geocomposite.

3. Only some leachate gas condensate may transmigrate up to the geocomposite.

4. If the geocomposite is removed, any gas will travel along the underside of the remaining geomembrane until it is collected in the leachate collection on the top slope.

CALCULATIONS

1. The total top deck area is 370 ft x (100 ft + 50 ft)/2 = 27,750 ft^2 or yd^2/9 ft^2 = 3,083 yd^2, say 3,100 yd^2.

2. The cost for the geocomposite layer is \$6.50/yd^2.

3. Total cost of the geomembrane within the design is 3,100 yd^2 x \$6.50/yd^2 = <u>\$20,150.</u>

INITIAL COSTS

Ordot Dump Closure, Guam

TITLE	NUMBER	PAGE NO.
Eliminate Leachate Drainage Layer (Geocomposite) on Top Deck	MF-14	6 of 6

CONSTRUCTION ELEMENT		ORIGINAL CONCEPT			ALTERNATIVE CONCEPT		
Description	**Unit**	**Quantity**	**Cost/Unit**	**Total**	**Quantity**	**Cost/Unit**	**Total**
Geocomposite Below Top Deck Only	yd^2	354,130	$7	$2,301,845	351,030	$7	$2,281,695
SUB-TOTAL				$2,301,845			$2,281,695
PROJECT MARK-UPS	40%			$920,738			$912,678
TOTAL				$3,222,583			$3,194,373
TOTAL (Rounded)				$3,223,000			$3,194,000
						SAVINGS	$29,000

VALUE ENGINEERING ALTERNATIVE *Ordot Dump Closure*	
FUNCTION: Manage Fluids	**IDEA NO.** MF-15
TITLE: Replace Articulated Block Mattress with Asphalt	**PAGE NO.** 1 of 5

ORIGINAL CONCEPT:

Construct stormwater collection system by using articulated block mattress (ABM).

ALTERNATIVE CONCEPT:

Construct stormwater collection system by using asphalt in place of ABM.

ADVANTAGES:

- Materials are locally available
- Installation could be done by local labor
- Minimal maintenance is required
- Easy to repair

DISADVANTAGES:

- Life cycle costs may increase due to exposure

COST SUMMARY	INITIAL COST	O&M COST	LIFE CYCLE COST
ORIGINAL CONCEPT	**$** 4,004,000	**$** 0	**$** 4,004,000
ALTERNATIVE CONCEPT	**$** 2,821,000	**$** 0	**$** 2,821,000
SAVINGS	**$** 1,183,000	**$** 0	**$** 1,183,000

DISCUSSION / JUSTIFICATION:

The use of asphalt in place of ABM would be advantageous, considering not only the initial cost but the maintenance cost as well. Asphalt is readily available on the island, easy to repair, and maintenance cost is minimal.

In comparison, ABM would be very costly to purchase and to maintain.

PERFORMANCE MEASURES *Ordot Dump Closure*			
TITLE: Replace Articulated Block Mat with Asphalt	**NUMBER** MF-15		**PAGE NO.** 3 of 5
CRITERIA and RATING RATIONALE for ALTERNATIVE	**Performance**	**Original**	**Alternative**
Operational Impacts No significant impact.	Rating	6	6
	Weight	15	15
	Contribution	90	90
Materials Availability Adequate soil is available locally and easily accessible.	Rating	6	7
	Weight	10	10
	Contribution	60	70
Schedule As earth material of sufficient quantity and quality is locally available, no off-site procurement is needed with long lead times.	Rating	5	6
	Weight	30	30
	Contribution	150	180
Construction Process Easier as an earthwork project—it is consistent with daily cover operations. Local material will easily meet quality requirements.	Rating	6	7
	Weight	5	5
	Contribution	30	35
Environmental Impacts Prescribed earth cover uses local natural material with no wasted excess. Earth cover provides for maximum flexibility in post-closure care period.	Rating	5	5
	Weight	40	40
	Contribution	200	200
	Rating		
	Weight		
	Contribution		
	Rating		
	Weight		
	Contribution		
	Rating		
	Weight		
	Contribution		
Total Performance:		**530**	**575**
Net Change in Performance:			**+8.5%**

1. The cost for the installation of ABM was based on the Pre-Final Engineers Estimate.

2. The cost for the installation of asphalt was based on local prevailing rates and added additional cost due to the sloping.

3. The cost for asphalt was computed per square yard and then converted to lineal feet for comparison to the unit of measurement on the Pre-Final Engineer's Estimate.

INITIAL COSTS

Ordot Dump Closure, Guam

TITLE	NUMBER	PAGE NO.
Replace Articulated Block Mattress with Asphalt	MF-15	5 of 5

CONSTRUCTION ELEMENT		ORIGINAL CONCEPT			ALTERNATIVE CONCEPT		
Description	**Unit**	**Quantity**	**Cost/Unit**	**Total**	**Quantity**	**Cost/Unit**	**Total**
ABM Perimeter Ditch	lf	4,000	$118	$472,000	4,000	$75	$300,000
Bench Ditches	lf	26,300	$43	$1,130,900	26,300	$35	$920,500
Chutes (Slope and Bench)	lf	3,630	$132	$479,160	3,630	$85	$308,550
Berms	lf	4,630	$168	$777,840	4,630	$105	$486,150
SUB-TOTAL				$2,859,900			$2,015,200
PROJECT MARK-UPS	40%			$1,143,960			$806,080
TOTAL				$4,003,860			$2,821,280
TOTAL (Rounded)				$4,004,000			$2,821,000
						SAVINGS	$1,183,000

VALUE ENGINEERING ALTERNATIVE *Ordot Dump Closure*		
FUNCTION:	Managing Fluids	**IDEA NO.** MF-27
TITLE:	Reevaluate Input Parameters to HELP Model for Site-Specific Reasonableness to Ordot	**PAGE NO.** 1 of 4

ORIGINAL CONCEPT:

The existing HELP Model for the Ordot Dump Closure was provided with results for leachate generation.

ALTERNATIVE CONCEPT:

The VE team recommends that another HELP Model calculation be conducted using the latest version, and to require more accurate and representative data be input.

ADVANTAGES:

- Essential for accurate design
- Optimizes operations

DISADVANTAGES:

- None apparent

COST SUMMARY	INITIAL COST	O&M COST	LIFE CYCLE COST
ORIGINAL CONCEPT	**$** N/A	**$** N/A	**$** N/A
ALTERNATIVE CONCEPT	**$** N/A	**$** N/A	**$** N/A
SAVINGS	**$** N/A	**$** N/A	**$** N/A

DISCUSSION / JUSTIFICATION:

The following comments were identified upon review of the current HELP Model for the Ordot Dump Closure:

The run-off number seems low compared with ones we have previously used in Hawaii and Guam. Our numbers were about 75 with 3 to 1 slopes. They used something about 54.6, which seems a bit conservative for a landfill with 2 to 1 slopes.

A slope of 1,600 feet with a 2% slope is way off. It should be the average slope at closure, not the worst possible case during operations with daily cover.

An evaporative zone depth of six inches is too conservative without supporting data. In Hawaii the average is much closer to 40 inches, based on soil moisture data that is real from soil sensors. This condition forces the maximum amount of water down to become leachate in the model.

They said they used the rainfall data from Guam, but adjusted the temperature data from Honolulu to Guam's mean monthly data. According to their HELP Model run, they synthetically generated the rainfall data from Tampa, Florida. It does not appear that they used Guam data. This is coming from the HELP Model run data.

They would have used the temperature data from Honolulu because it is easier than putting in the daily temperature data from Guam. According to their HELP Model run, they really synthetically generated the temperature data from Tampa, Florida. It does not appear that they used Guam data or even the Honolulu data.

The solar data was Honolulu adjusted to the latitude for Guam. If solar radiation data is not available, then this will have to work.

How was the trash placed at Ordot? They assumed that the waste was placed as 28 feet of trash with two feet of lateral drainage material, followed by two feet of soil. They did this because they had an old HELP Model that limited the number of layers that can be input. The newer model allows more input. The use of the older model also forces the landfill to leak out the side. This may not be accurate and may give a larger number for leachate than is real. They are modeling current conditions, not what should be occurring after closure with a prescriptive cover.

They gave days with no rainfall data, the average rainfall for the month. We normally look for data on either side of the missing data and average the data. This generally gives you a number that reflects the conditions at the time.

The growing season in Hawaii is 365 days a year. How come the growing season for Guam is only 161 days? This seems to be incorrect.

They did not put a cover soil top on the landfill when they did the HELP Model run. They left it with trash on top, and this is going to force a large volume of water into the landfill initially, and let the trash take on more water during the model run.

In most of the top layers the initial water content exceeds the field capacity. This causes the layer to drain immediately. This condition needs to be input during the run and is not done by the HELP Model itself. In some cases, the initial water content was the same as the porosity, which means the layer is totally saturated, like a full sponge draining on the counter. This is not going to be like real conditions. We have excavated into existing landfills, and even the ones that are generating large amounts of leachate are not saturated.

Continued…

DISCUSSION / JUSTIFICATION:

The layer one up from the bottom is a waste layer, but they put the layer in as a lateral drainage, which causes the waste to drain sideways instead of going down. This is not normally done.

The way the model is set up causes run-off to be less than 0.3%. This is way off. Under any normal kind of closure condition with a prescriptive cover, this should be in the 20% to 70% range or higher, depending on the landfill design.

Comments on HELP Model with Plastic Cover

The slope for the cover HELP Model run was done using 850 feet, not the 1,600 feet of the run without plastic. This will cause the run with plastic to take on less water.

The average slope angle was 30% on the plastic run, not the 2% of the run without cover. This allows the plastic run to shed much more water (i.e., a higher percent of run-off) and makes the run without plastic hold much more water than would be expected under normal conditions.

In this run, the rainfall and temperature data is synthetically generated from Guam and the solar radiation data is from Honolulu adjusted to the latitude of Guam. This is a more realistic set of weather parameters. It still has the problem of a short growing season (161 days), which will make a difference in the amount of evapotranspiration.

This is a simplified model that has only three layers: (1) a six-inch inch soil layer, (2) a plastic layer, and (3) a 125-foot thick waste layer). The design in places calls for a six-inch soil layer over plastic, which will be very difficult to construct and maintain.

Using the conditions specified in the HELP Model run with the plastic, the run has 56% run-off and 43% evaporation. This means that less than 1% of the rainfall goes through the plastic cover. If a prescriptive cover was used with the same conditions as the plastic cover run, similar run-off and evaporation percents would result.

PERFORMANCE MEASURES *Ordot Dump Closure*			
TITLE: Reevaluate Input Parameters to HELP Model for Site-Specific Reasonableness to Ordot		**NUMBER** MF-27	**PAGE NO.** 4 of 4
CRITERIA and RATING RATIONALE for ALTERNATIVE	**Performance**	**Original**	**Alternative**
Operational Impacts No significant impact.	Rating	6	6
	Weight	15	15
	Contribution	90	90
Materials Availability No significant change.	Rating	6	6
	Weight	10	10
	Contribution	60	60
Schedule No significant impact.	Rating	5	5
	Weight	30	30
	Contribution	150	150
Construction Process No significant impact.	Rating	6	6
	Weight	5	5
	Contribution	30	30
Environmental Impacts A more accurate model will lead to a more accurate and efficient design, which will better protect the environment.	Rating	5	7
	Weight	40	40
	Contribution	200	280
	Rating		
	Weight		
	Contribution		
	Rating		
	Weight		
	Contribution		
	Rating		
	Weight		
	Contribution		
Total Performance:		**530**	**610**
Net Change in Performance:			**+15.1%**

VALUE ENGINEERING ALTERNATIVE *Ordot Dump Closure*		
FUNCTION:	Manage Fluids	**IDEA NO.** MF-28
TITLE:	Hydroseed Slopes and Benches (with Tacking Compound) Early in the Construction Process to Eliminate Detention Pond	**PAGE NO.** 1 of 6

ORIGINAL CONCEPT:

The design calls for a large detention pond at the bottom (south side of landfill) of the existing dump. The function of the detention pond is to collect silt/sediment from any erosion on the slope benches via conveyance berms. See the sketch for the existing design.

ALTERNATIVE CONCEPT:

The alternative design calls for the hydroseeding of the slopes and benches, with seeds and a tactifying agent early on in the construction process. This is expected to eliminate the detention pond at the south edge of the site. Smaller and more accessible ponds at various points around the site can handle any sediment from bench run-off, although it is anticipated that any sediment would be nil after the vegetative cover matures. See the sketch for the alternative design change.

ADVANTAGES:

- Reduces soil erosion during initial growth of vegetation
- May eliminate need for a detention pond once vegetation is established

DISADVANTAGES:

- Most slopes are covered with flexible material liners (FML)
- May require replacement erosion control measures, such as several smaller ponds or other controls as necessary

COST SUMMARY	INITIAL COST	O&M COST	LIFE CYCLE COST
ORIGINAL CONCEPT	**$** 2,367,000	**$** 0	**$** 2,367,000
ALTERNATIVE CONCEPT	**$** 204,000	**$** 0	**$** 204,000
SAVINGS	**$** 2,163,000	**$** 0	**$** 2,163,000

DISCUSSION / JUSTIFICATION:

The large detention pond (300 feet x 100 feet) can be eliminated if hydroseeding with a tactifying agent is used to control the sediment from the slopes and benches. To be most effective, the hydroseeding would proceed as the construction work progresses.

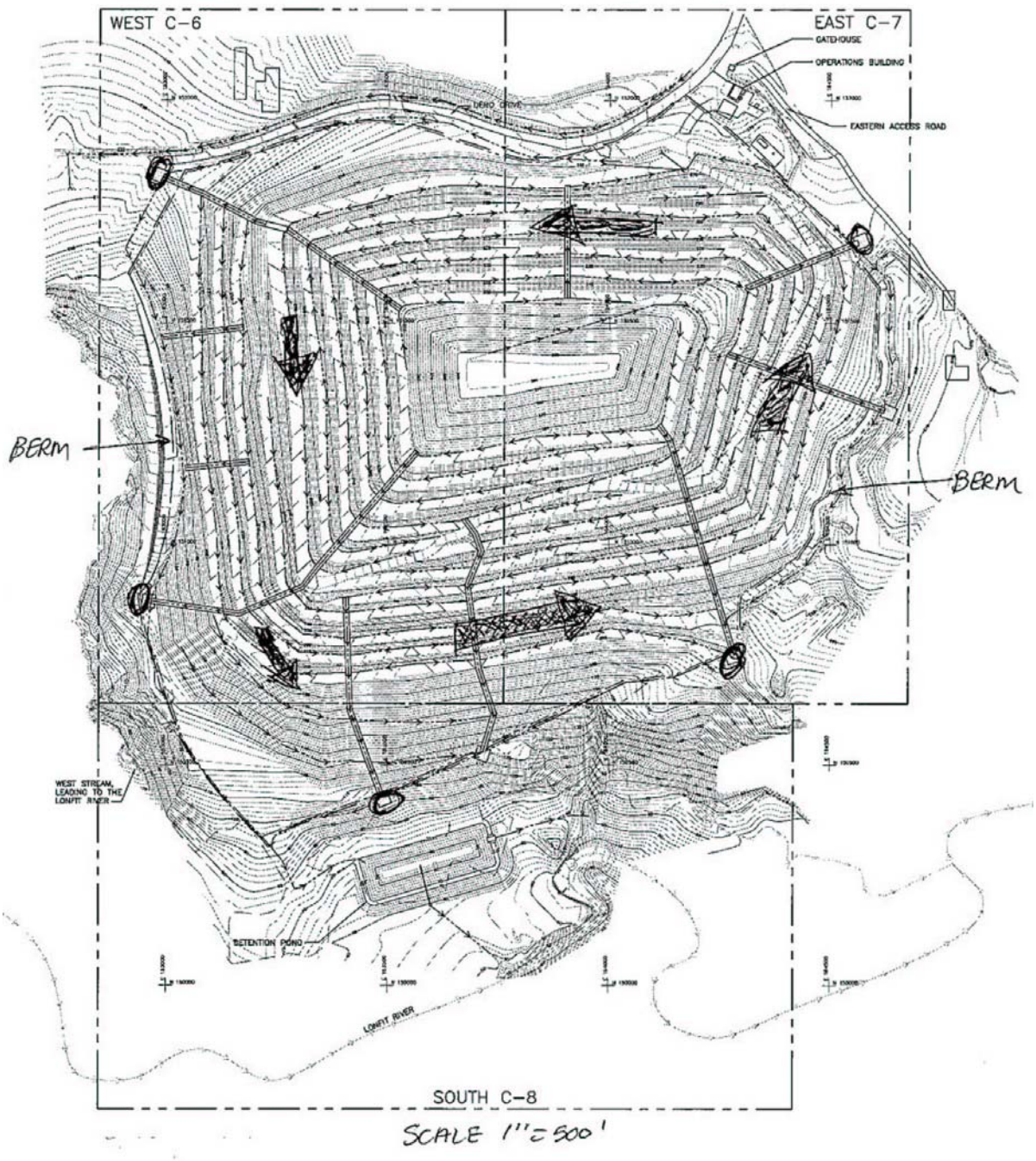
The pond can be eliminated from the project if two items are implemented:

1. Hydroseed all slopes and benches with a seeded tactifying agent to control any sediment from the slopes and benches.
2. Create several smaller ponds around the perimeter, to which bench drains are directed. These ponds will be smaller than the large detention pond at the south end and will be located in areas of easier access.

The cost savings for this project is significant if the "Berms" line item (from design Pre-Final Cost Estimate – Line 45), consisting of 4,630 lf is removed. Based on the supporting calculations, it appears that the "Berms" cost of $1.5 million is for large ditches to convey water to the large detention pond.

See the initial sketch of this issue.

SKETCHES *Ordot Dump Closure*			
TITLE:	Hydroseed Slopes and Benches (with Tacking Compound) Early in the Construction Process to Eliminate Detention Pond	**NUMBER** MF-28	**PAGE NO.** 3 of 6



PERFORMANCE MEASURES *Ordot Dump Closure*				VMS
TITLE:	Hydroseed Slopes and Benches (with Tacking Compound) Early in the Construction Process to Eliminate Detention Pond	**NUMBER** MF-28		**PAGE NO.** 4 of 6
CRITERIA and RATING RATIONALE for ALTERNATIVE		**Performance**	**Original**	**Alternative**
Operational Impacts Hydroseeding of the benches and slopes may cause some interference with the ongoing operations of the dump. However, this potential degradation in operations is outweighed by the decrease in slope and bench erosion; therefore, the performance rating will remain the same.		Rating	6	6
		Weight	15	15
		Contribution	90	90
Materials Availability No significant impact		Rating	6	6
		Weight	10	10
		Contribution	60	60
Schedule Hydroseeding the benches and slopes will immediately retard erosion, thus reducing/eliminating the need for a sedimentation pond. Therefore, the rating has been increased to 6, taking the entire project into consideration.		Rating	5	6
		Weight	30	30
		Contribution	150	180
Construction Process If a detention pond does not have to be constructed in a wet area or even a wetland, which takes even more time to permit, then the construction impact is reduced. For example, the risks incurred in using heavy equipment in soft, saturated areas are eliminated in this area, and construction difficulties are minimized. Therefore, the rating is increased to 7 on the overall project.		Rating	6	7
		Weight	5	5
		Contribution	30	35
Environmental Impacts No significant impact.		Rating	5	5
		Weight	40	40
		Contribution	200	200
		Rating		
		Weight		
		Contribution		
Total Performance:			**530**	**565**
Net Change in Performance:				**+6.6%**

ASSUMPTIONS

1. Tactifying agent will not break down before seeds fully germinate and the ground cover is mature.

2. Mature cover will be established within six months of hydroseeding.

3. Specifications for the tactifying agent will be robust enough to ensure mature cover is developed.

4. Force Majuere events—namely typhoons—do not occur prior to development of mature cover.

5. Based on the design drawings and calculations, it appears that the "Berms" line item (from design Pre-Final Cost Estimate – Line 45), consisting of 4,630 lf, is only necessary if the detention pond is constructed. If this is true, there is a significant savings; if not, there is no savings.

CALCULATIONS

A. Hydroseeding

1. Total area to be treated is approximately 45 acres x 1.15 (accounts for slopes) = 52 acres.

2. Hydroseeding costs are estimated at $2,800/acre.

3. Total cost for the hydroseeding is $145,600.

B. Detention Pond

1. Earthwork cost is a lump sum estimate of $33,000 (from design Pre-Final Cost Estimate).

2. Structures cost is a lump sum estimate of $36,000 (from design Pre-Final Cost Estimate).

3. Pond liner cost is $9.30/$yd^2$ x 5,100 yd^2 = $47,430 (from design Pre-Final Cost Estimate).

4. Total cost for alternative design = $116,430 + markup.

INITIAL COSTS

Ordot Dump Closure, Guam

TITLE	NUMBER	PAGE NO.
Hydro-Seed Slopes and Benches (with Tacking Compound) Early in the Construction Process to Eliminate Detention Pond	MF-28	6 orf 6

CONSTRUCTION ELEMENT		ORIGINAL CONCEPT			ALTERNATIVE CONCEPT		
Description	**Unit**	**Quantity**	**Cost/Unit**	**Total**	**Quantity**	**Cost/Unit**	**Total**
Hydro-Seeding of Slopes and Benches	acre			$0	52	$2,800	$145,600
Berms (to Convey Run-Off to Pond[s])	lf	4630	$340	$1,574,200			$0
Pond Eearthwork	ls	1	$33,000	$33,000			$0
Pond Structures	ls	1	$36,000	$36,000			$0
Pond Liner	yd^2	5,100	$9	$47,430			$0
SUB-TOTAL				$1,690,630			$145,600
PROJECT MARK-UPS	40%			$676,252			$58,240
TOTAL				$2,366,882			$203,840
TOTAL (Rounded)				$2,367,000			$204,000
						SAVINGS	$2,163,000

VALUE ENGINEERING ALTERNATIVE *Ordot Dump Closure*	
FUNCTION: Enclose Dump	**IDEA NO.** ED-1
TITLE: Use Prescribed Cover	**PAGE NO.** 1 of 6

ORIGINAL CONCEPT:

Provide an 80-mil HDPE cap to close the Ordot Dump waste mass.

ALTERNATIVE CONCEPT:

Utilize prescribed cover in accordance to Federal rule, 40CFR.

ADVANTAGES:

- Meets regulatory requirement under 40CFR258, Subpart D
- Easy to construct as an earthmoving project with CQA
- Easy to maintain, as soil cover is easy to inspect and repair
- Flexible – more forgiving
- Easier to address fires, as access and settlement can be easily addressed

DISADVANTAGES:

- Steep slopes make soil cover difficult without flattening the slopes
- Requires redesign of side slopes to provide needed surface stability

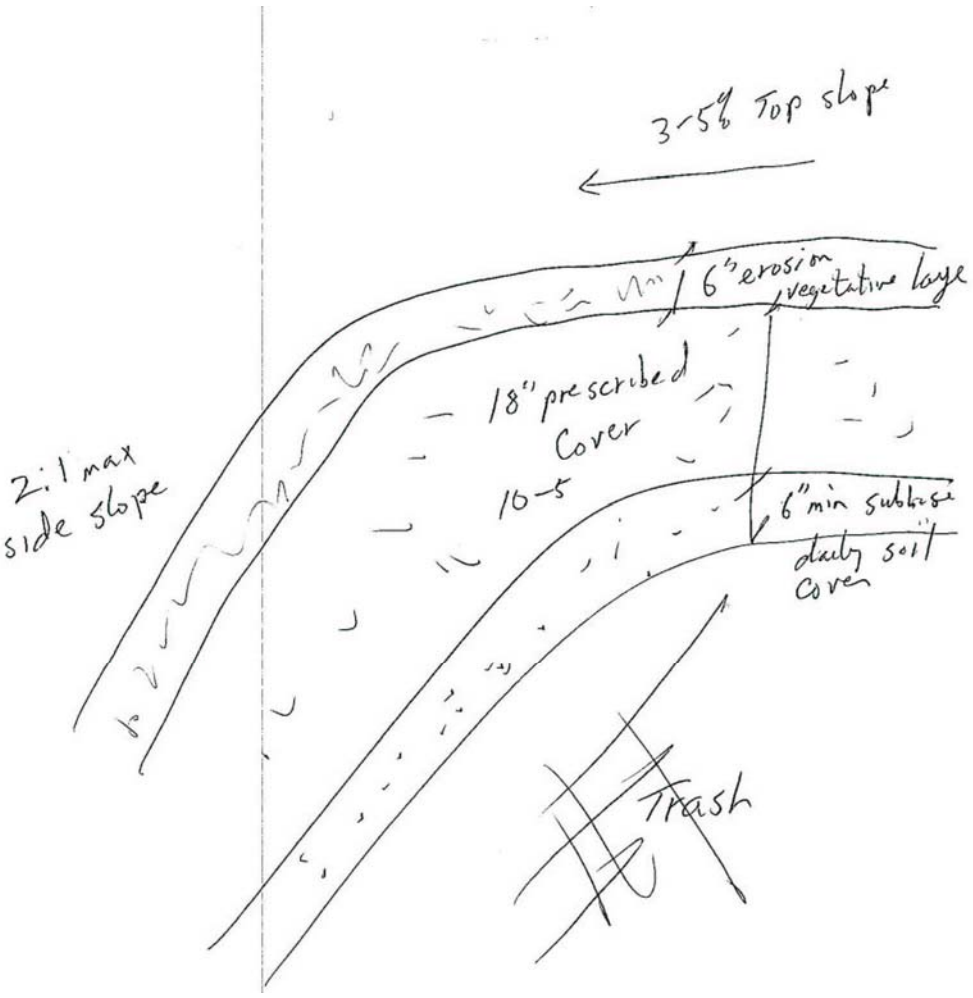
COST SUMMARY	INITIAL COST	O&M COST	LIFE CYCLE COST
ORIGINAL CONCEPT	**$** 10,987,000	**$** 0	**$** 10,987,000
ALTERNATIVE CONCEPT	**$** 4,673,000	**$** 0	**$** 4,673,000
SAVINGS	**$** 6,314,000	**$** 0	**$** 6,314,000

DISCUSSION / JUSTIFICATION:

Current design calls for an 80-mil HDPE cap to close the Ordot Dump waste mass. The Ordot Dump is an unlined solid waste disposal facility in an area of 100 inches of rainfall. Maintenance cost for a synthetic cover is higher than for a soil cover.

This alternative replaces the complex multi-layered design cover with a prescribed cover in accordance with Federal rule, 40CFR. The prescribed cover consists of a six-inch erosion layer over an 18-inch 10E-5 cm/sec barrier layer, without needing any geosynthetic layers. The side slopes will need to be regraded in the range of 2 to 1 in order to maintain stability of the prescribed cover.

The prescribed cover is completely acceptable, in accordance with the regulations, for the Ordot Dump. This application appears feasible and should be given very serious consideration.

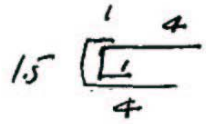

3-5% Top slope
6" erosion vegetative layer
18" prescribed Cover
10-5
2:1 max side slope
6" min subbase daily soil Cover
Trash

PERFORMANCE MEASURES *Ordot Dump Closure*			
TITLE: Use Prescribed Cover	**NUMBER** ED-1		**PAGE NO.** 4 of 6
CRITERIA and RATING RATIONALE for ALTERNATIVE	**Performance**	**Original**	**Alternative**
Operational Impacts Easier, as an earthwork project is consistent with daily cover operations. Local material will easily meet quality requirements.	Rating	6	9
	Weight	15	15
	Contribution	90	135
Materials Availability Adequate soil is available locally and is easily accessible.	Rating	6	9
	Weight	10	10
	Contribution	60	90
Schedule As earth material of sufficient quantity and quality is locally available, no off-site procurement is needed with long lead times.	Rating	5	8
	Weight	30	30
	Contribution	150	240
Construction Process Construction process of prescribed earth cover is involved and equipment intensive.	Rating	6	9
	Weight	5	5
	Contribution	30	45
Environmental Impacts Prescribed earth cover uses local natural material with no wasted excess. Earth cover provides for maximum flexibility in post-closure care period.	Rating	5	7
	Weight	40	40
	Contribution	200	280
	Rating		
	Weight		
	Contribution		
	Rating		
	Weight		
	Contribution		
	Rating		
	Weight		
	Contribution		
Total Performance:		**530**	**790**
Net Change in Performance:			**+49%**

MSE REINFORCING ALONG BENCHES
SHEET C4 - TAKE OFF OF BENCHES

20,650 L.F. OF BENCHES

GEOGRID TYPE 3



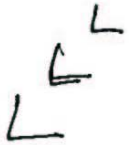
(4 + 1.5 + 1) 2 = 13' PER LIFT

13' / 26' PER L.F. OF BENCH.

20,650 × 26' = 536900 SF / 9 = 59655 SY

COST = 6 $/SY (PER COST EST.) = $358,000

WWF @ FACING



FACING = 1.5 + 1.5 + 1
= 4'

20,650 × 4' = 82,600 SF OF WWF

COST = 6 $/SF OF FACE PER COST EST. PG M-7

WWF = 82,600 · 6 = $495,600

MSE BENCH GEOTECH COSTS = GEO GRID + WWF = $853,600

INITIAL COSTS

Ordot Dump Closure, Guam

TITLE	NUMBER	PAGE NO.
Use Prescribed Cover	ED-1	6 of 6

CONSTRUCTION ELEMENT		ORIGINAL CONCEPT			ALTERNATIVE CONCEPT		
Description	**Unit**	**Quantity**	**Cost/Unit**	**Total**	**Quantity**	**Cost/Unit**	**Total**
CAPPING SYSTEM							
Geocomposite	sy	354,130	$6.50	$2,301,845			$0
HDPE Geomembrane - 80-Mil Textured	sy	265,250	$7.50	$1,989,375			$0
Geogrid - Type 1	sy	236,550	$5.50	$1,301,025			$0
Native Fill	cy	98,210	$15	$1,473,150			$0
Chain Link Fence	ls	1	$30,000	$30,000			$0
Infiltration Collector	lf	26,300	$21.70	$570,710			$0
Strip Drains	ls	1	$50,000	$50,000			$0
Anchor Trench	lf	22,000	$6	$132,000			$0
Erosion Vegetative Layer, Six Inches Thick	cy			$0	44,500	$15	$667,500
Prescribed Barrier Layer, 18 Inches Thick	cy			$0	133,500	$15	$2,002,500
Subbase, Six Inches	cy			$0	44,500	$15	$667,500
SUB-TOTAL				$7,848,105			$3,337,500
PROJECT MARK-UPS	40%			$3,139,242			$1,335,000
TOTAL				$10,987,347			$4,672,500
TOTAL (Rounded)				$10,987,000			$4,673,000
						SAVINGS	$6,314,000

VALUE ENGINEERING ALTERNATIVE *Ordot Dump Closure*		
FUNCTION:	Enclose Dump	**IDEA NO.** ED-2
TITLE:	Change Site Geometry with Benches at 45- to 50-Foot Height (or Less as Appropriate) as in California	**PAGE NO.** 1 of 6

ORIGINAL CONCEPT:

The geometry of the current design includes steep slopes (1.5:1) with benches every 15 vertical feet.

ALTERNATIVE CONCEPT:

Change geometry of the side slopes to reflect a horizontal bench every 45 to 50 vertical feet. By doing so, the slope inclination between benches flattens from 1.5:1 to 2:1 (horizontal to vertical).

ADVANTAGES:

- Allows flattening of slopes between benches
- Allows application of soil to slopes as part of barrier cover in lieu of flexible material liners (FML)
- Eliminates need for geogrid MSE walls shown on each bench (see sheet C12)
- Safer for public

DISADVANTAGES:

- Increases slope length between benches (and therefore needs to be evaluated relative to local practice)
- May impact available airspace (if flatter slopes are desired, but will not affect available airspace if a 2.4:1 slope between benches is employed)

COST SUMMARY	INITIAL COST	O&M COST	LIFE CYCLE COST
ORIGINAL CONCEPT	**$** 2,583,000	**$** 0	**$** 2,583,000
ALTERNATIVE CONCEPT	**$** 861,000	**$** 0	**$** 861,000
SAVINGS	**$** 1,722,000	**$** 0	**$** 1,722,000

DISCUSSION / JUSTIFICATION:

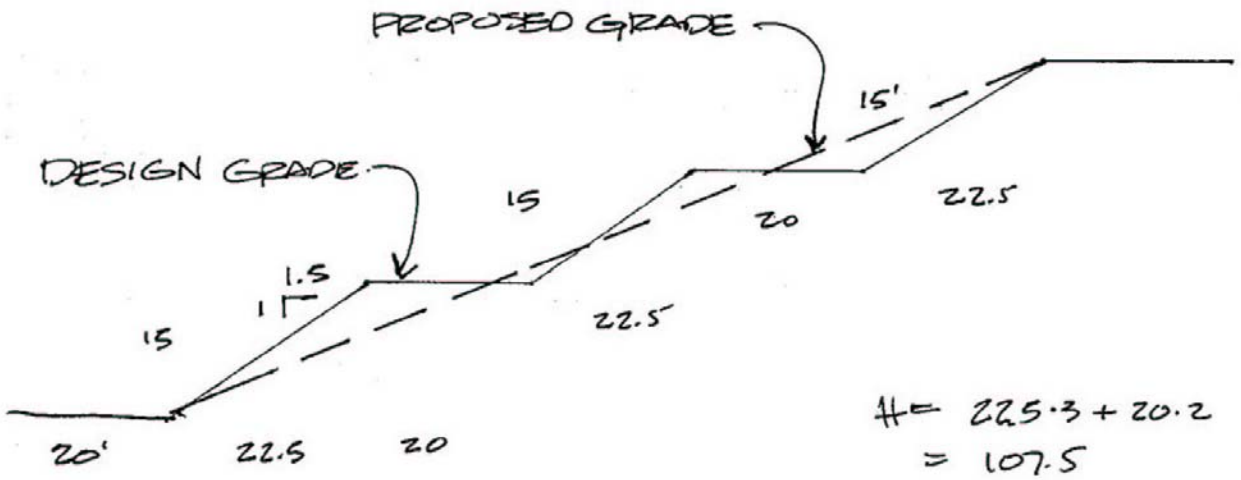
By changing the side slope geometry, particularly the vertical interval of horizontal benches from 15 feet to 45 feet (as specified in California Code of Regulations), the inclination of the slopes may be flattened. This equates to removing two of every three benches. By removing the benches, the slope inclination between the benches can be flattened from the current design of 1.5:1 to a lower slope of 2.4:1 (see sketch).

By flattening the side slopes, the barrier layer may be revised from the designed HDPE geomembrane and replaced with a soil layer. The benefits of a soil layer are significant with regard to both capital cost and long-term post-closure maintenance (see VE Alternative ED-1). The savings related to replacing the HDPE geomembrane with soil is included in VE Alternative ED-1.

In addition to replacing the HDPE geomembrane with a soil barrier, other potential capital cost savings include deleting the four-foot high MSE wall along each of the numerous benches. This can be accomplished because the steepness of the slopes allows a sloping soil embankment in lieu of the vertical wall overlying the steep slopes. By removing the four-foot high MSE wall along the benches, the safety of the site is significantly improved.

The net effect of this change is to create a simpler, more efficient design, similar to that done for landfills in California, which further enhances the application of a Prescriptive Cover described in VE Alternative ED-1.

REMOVE INTERMEDIATE BENCHES
& FLATTEN GRADE BETWEEN BENCHES



$H = 22.5 \cdot 3 + 20.2$
$= 107.5$

$V = 45$

$\frac{107.5}{45} = \boxed{2.4:1}$

PERFORMANCE MEASURES *Ordot Dump Closure*			VMS
TITLE: Change Site Geometry with Benches at 45- to 50-Foot Height (or Less as Appropriate) as in California		**NUMBER** ED-2	**PAGE NO.** 4 of 6
CRITERIA and RATING RATIONALE for ALTERNATIVE	**Performance**	**Original**	**Alternative**
Operational Impacts None apparent.	Rating	6	6
	Weight	15	15
	Contribution	90	90
Materials Availability Allows use of soil barrier layer in lieu of HDPE barrier.	Rating	6	9
	Weight	10	10
	Contribution	60	90
Schedule Accelerates schedule significantly by simplifying the construction protocol.	Rating	5	7
	Weight	30	30
	Contribution	150	210
Construction Process Simplifies construction process and reduces risk.	Rating	6	8
	Weight	5	5
	Contribution	30	40
Environmental Impacts None apparent.	Rating	5	5
	Weight	40	40
	Contribution	200	200
	Rating		
	Weight		
	Contribution		
	Rating		
	Weight		
	Contribution		
	Rating		
	Weight		
	Contribution		
Total Performance:		**530**	**630**
Net Change in Performance:			**+18.9%**

For conservative purposes, the cost assumptions reflect removal of the geogrid Type 3, and welded wire fabric is based on removal of two-thirds (two out of three benches) of the quantities of these materials. In actuality, all of these materials could be removed, thereby increasing the savings by approximately 33%.

A review of the cost estimate and detail backup calculations indicates the cost for constructing the MSE walls along the benches is not included. The attached cost estimate shows the estimated cost for the materials for both the current design and the proposed configuration. The following materials were not included in the original cost estimate:

- Geogrid Type 3, in two 18-inch high wraps that provide a total of 3-foot high MSE wall along the benches, each section consisting of a 4- foot long embedment, double wrapped.
- Welded wire fabric (consisting of two 18-inch high layers and one 12-inch high layer, which total a 4-foot high MSE wall along benches vertical facing materials).

It should be noted, however, that the Articulated Block Mattress (ABM) lined drainage ditches and hydroseeding was included in the engineer's cost estimate.

INITIAL COSTS

Ordot Dump Closure, Guam

TITLE	NUMBER	PAGE NO.
Change Site Geometry with Benches at 45- to 50-Foot Height (or Less as Appropriate) as in California	ED-2	6 of 6

CONSTRUCTION ELEMENT		ORIGINAL CONCEPT			ALTERNATIVE CONCEPT		
Description	**Unit**	**Quantity**	**Cost/Unit**	**Total**	**Quantity**	**Cost/Unit**	**Total**
Geogrid Type 3	*sy*	*59,655*	*$6*	*$357,930*	*19,885*	*$6*	*$119,310*
Welded Wire Fabric Facing	*sf*	*82,600*	*$6*	*$495,600*	*27,533*	*$6*	*$165,200*
Hydro-Seeding Face of Wall	sf	82,600	$1	$82,600	27,533	$1	$27,533
ABM-Lined Drainage Ditches	lf	20,650	$44	$908,600	6,883	$44	$302,867
Note: Italicized items were not included in the original estimate.							
SUB-TOTAL				$1,844,730			$614,910
PROJECT MARK-UPS	40%			$737,892			$245,964
TOTAL				$2,582,622			$860,874
TOTAL (Rounded)				$2,583,000			$861,000
						SAVINGS	$1,722,000

VALUE ENGINEERING ALTERNATIVE *Ordot Dump Closure*		
FUNCTION:	Enclose Dump	**IDEA NO.** ED-4
TITLE:	Replace MSE Wall at Toe of West Edge with Shorter Soldier Beam and Concrete Lagging Wall	**PAGE NO.** 1 of 6

ORIGINAL CONCEPT:

Construct MSE wall (approximately 700 feet long, 20 to 45 feet high) to provide two functions:

1. Reduces the extent of waste footprint in order to remove waste from un-named drainage, as well as providing a setback from the un-named drainage
2. Supports the waste fill embankment, which rests on the existing materials that are to be removed in Item 1 above.

ALTERNATIVE CONCEPT:

Place a soldier beam and concrete lagging wall approximately 10 feet to 15 feet east of the existing un-named stream to retain the waste. This wall will be much shorter in length and much less tall than the original design. Additionally, the amount of waste to be relocated would be significantly less.

ADVANTAGES:

- Much smaller wall
- Uses local skills and products
- Most of the wall is eventually buried under slope cover
- Equipment to install concrete beams and lagging is locally available

DISADVANTAGES:

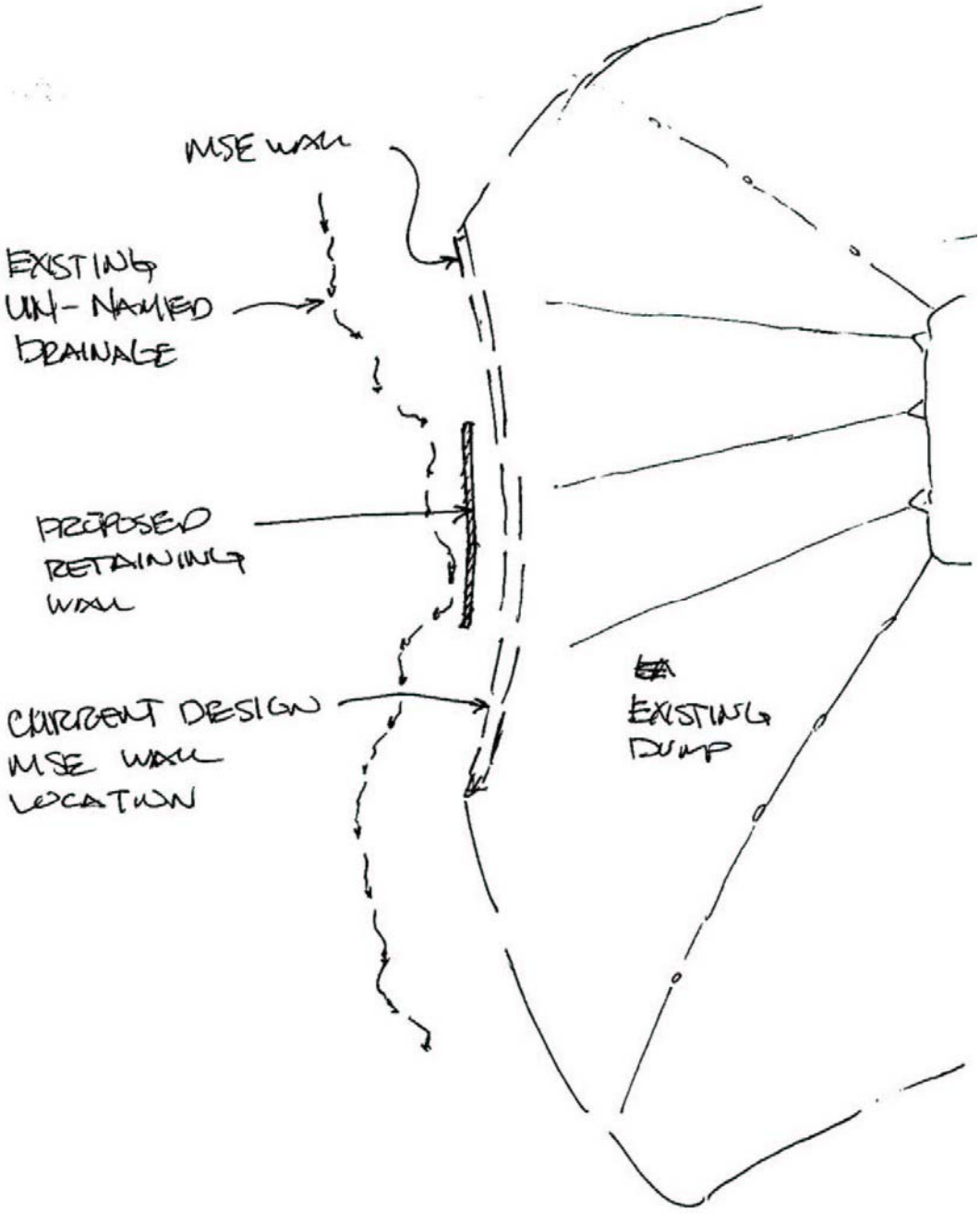
- May need riprap slope toe to resist scour from 25-year storm in stream

COST SUMMARY	INITIAL COST	O&M COST	LIFE CYCLE COST
ORIGINAL CONCEPT	**$** 4,583,000	**$** 0	**$** 4,583,000
ALTERNATIVE CONCEPT	**$** 434,000	**$** 0	**$** 434,000
SAVINGS	**$** 4,149,000	**$** 0	**$** 4,149,000

DISCUSSION / JUSTIFICATION:

The un-named drainage meanders along the westerly edge of the dump. In one location, the waste encroaches on the un-named stream. The proposed project is simply to remove the waste back from the stream approximately 15 feet to 20 feet, prevent the waste from going back into the stream, and prevent the stream from carrying waste away from the toe of the dump. This is accomplished by placing a soldier beam and concrete lagging wall about 15 feet to 20 feet from the stream edge. The wall will protrude approximately 15 feet above the stream's elevation, will retain the waste, and will improve the geometry of the slope by flattening the slope.

This approach removes the necessity of installing a very costly MSE wall. In addition to a significant capital cost savings, the safety of the project is improved. The 20-foot to 45-foot high portions of the MSE wall pose a long-term safety risk as an attractive nuisance to the government.


MSE WALL
EXISTING UN-NAMED DRAINAGE
PROPOSED RETAINING WALL
CURRENT DESIGN MSE WALL LOCATION
EXISTING DUMP

PERFORMANCE MEASURES *Ordot Dump Closure*				VMS
TITLE:	Replace MSE Wall at Toe of West Edge with Shorter Soldier Beam and Concrete Lagging Wall	**NUMBER** ED-4		**PAGE NO.** 4 of 6
CRITERIA and RATING RATIONALE for ALTERNATIVE		**Performance**	**Original**	**Alternative**
Operational Impacts No significant impact.		Rating	6	6
		Weight	15	15
		Contribution	90	90
Materials Availability By using local products (concrete and crane), this option removes the reliance on imported MSE materials and the associated time in shipping. This is a significantly positive impact to the project; therefore, an increase in the rating has been proposed.		Rating	6	7
		Weight	10	10
		Contribution	60	70
Schedule This alternative is a much simpler design that significantly accelerates the construction schedule, which merits an increase in the rating to an 8.		Rating	5	6
		Weight	30	30
		Contribution	150	180
Construction Process The alternative greatly simplifies the construction process by removing the complicated MSE wall construction. Therefore, the rating is increased to an 8.		Rating	6	7
		Weight	5	5
		Contribution	30	35
Environmental Impacts No significant impact.		Rating	5	5
		Weight	40	40
		Contribution	200	200
		Rating		
		Weight		
		Contribution		
		Rating		
		Weight		
		Contribution		
Total Performance:			**530**	**575**
Net Change in Performance:				**+8.5%**

ASSUMPTIONS

1. Those cost elements that are required to be performed, irrespective of the approach, are not included in the cost estimate. For example, the cost of clearing, grubbing, and site preparation is not included.

2. The cost elements to be removed were taken from the engineer's cost estimate.

3. A 200-foot long section of waste along the area where the waste is encroaching upon the stream will be held back approximately 10 feet to 15 feet from the stream by a soldier beam and concrete lagging wall.

4. Since the current design anticipates wastes will remain on properties adjacent to the westerly toe of the dump, no additional cost for the value of the land was included in this cost estimate.

5. Assume a 40-foot long soldier beam will be installed approximately 25 feet into the earth and leave approximately 15 feet above the stream grade.

CALCULATIONS

1. Concrete lagging is estimated to be 3-foot x 6-foot x .5-foot panels at a cost of $400/panel. Approximately 120 panels will be needed for a 200-foot wall at 5-foot interval spacing, with three panels per interval. This equates to an installed cost of 120 x $400 = $48,000.

2. Soldier beams are estimated to be 18 inches in diameter by 40 feet long. The installed cost is $150/lf, which equates to $150/lf x 40 feet x 40 beams = $240,000.

3. Relocation of the waste entails an estimated 200-foot (length) x 15-foot (wide) x 10-foot (deep)/27 ft^3 = 1,100 yd^3 of waste to be removed. The waste excavation and permanent relocation cost (from design Pre-Final Cost Estimate) is $10/$yd^3$. Total waste relocation cost is 1,100 yd^3 x $10/$yd^3$ = $11,000.

4. Total estimated cost of waste relocation and retaining wall installation is $434,000.

INITIAL COSTS

Ordot Dump Closure, Guam

TITLE	NUMBER	PAGE NO.
Replace MSE Wall at Toe of West Edge with Shorter Soldier Beam and Concrete Lagging Wall	ED-4	6 of 6

CONSTRUCTION ELEMENT		ORIGINAL CONCEPT			ALTERNATIVE CONCEPT		
Description	**Unit**	**Quantity**	**Cost/Unit**	**Total**	**Quantity**	**Cost/Unit**	**Total**
Waste Excavation and Permanent Relocation	yd^3	135,450	$10	$1,354,500	1,100	$10	$11,000
Waste Excavation and Replacement	yd^3	50,300	$20	$1,006,000			$0
Reinforced Backfill	yd^3	32,000	$15	$480,000			$0
Welded Wire Fabric	yd^2	2,415	$54	$130,410			$0
Geogrid Type 2	yd^2	36,120	$6	$216,720			$0
Geogrid Type 3	yd^2	15,680	$6	$86,240			$0
Concrete Lagging	panel			$0	120	$400	$48,000
Soldier Beams	ea			$0	40	$6,000	$240,000
Waste Excavation and Permanent Relocation	yd^3			$0	1,100	$10	$11,000
SUB-TOTAL				$3,273,870			$310,000
PROJECT MARK-UPS	40%			$1,309,548			$124,000
TOTAL				$4,583,418			$434,000
TOTAL (Rounded)				$4,583,000			$434,000
						SAVINGS	$4,149,000

VALUE ENGINEERING ALTERNATIVE *Ordot Dump Closure*	
FUNCTION: Enclose Dump	**IDEA NO.** ED-5 & ED-6
TITLE: Relocate No-Name Brook on West Side Further West	**PAGE NO.** 1 of 8

ORIGINAL CONCEPT:

Construct MSE wall (approximately 700 feet long, 20 to 45 feet high) to provide two functions:

1. Reduce extent of waste footprint in order to remove waste from un-named drainage, as well as providing a setback from the un-named drainage.
2. Supports the waste fill embankment which rests on the existing materials that are to be removed in Item 1 above.

ALTERNATIVE CONCEPT:

Relocate the un-named drainage west, further away from the toe of the existing waste toe, thereby allowing construction of an earthen embankment to support the waste fill slopes. Construct earthen fill embankment to support upper waste fill slopes on the west side of the dump. Eliminate the MSE wall.

ADVANTAGES:

- Allows flattening of slopes
- Supports use of prescriptive cover
- Improves safety
- Uses locally available materials and personnel to construct improvements

DISADVANTAGES:

- May need to purchase additional strip of land
- May require additional wetlands mitigation
- Need 401 and 404 permits

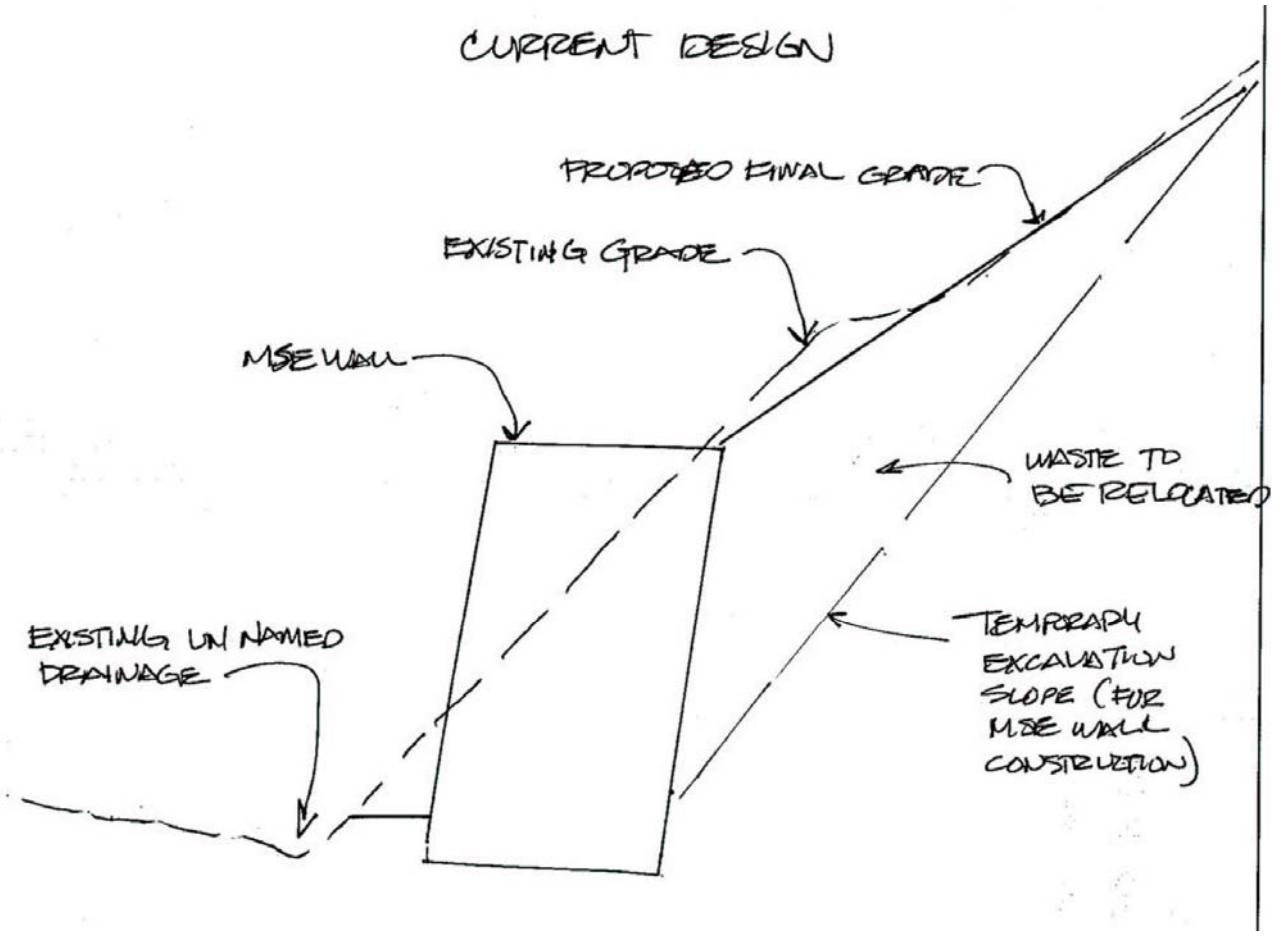
COST SUMMARY	INITIAL COST	O&M COST	LIFE CYCLE COST
ORIGINAL CONCEPT	**$** 4,583,000	**$** 0	**$** 4,583,000
ALTERNATIVE CONCEPT	**$** 1,303,000	**$** 0	**$** 1,303,000
SAVINGS	**$** 3,280,000	**$** 0	**$** 3,280,000

DISCUSSION / JUSTIFICATION:

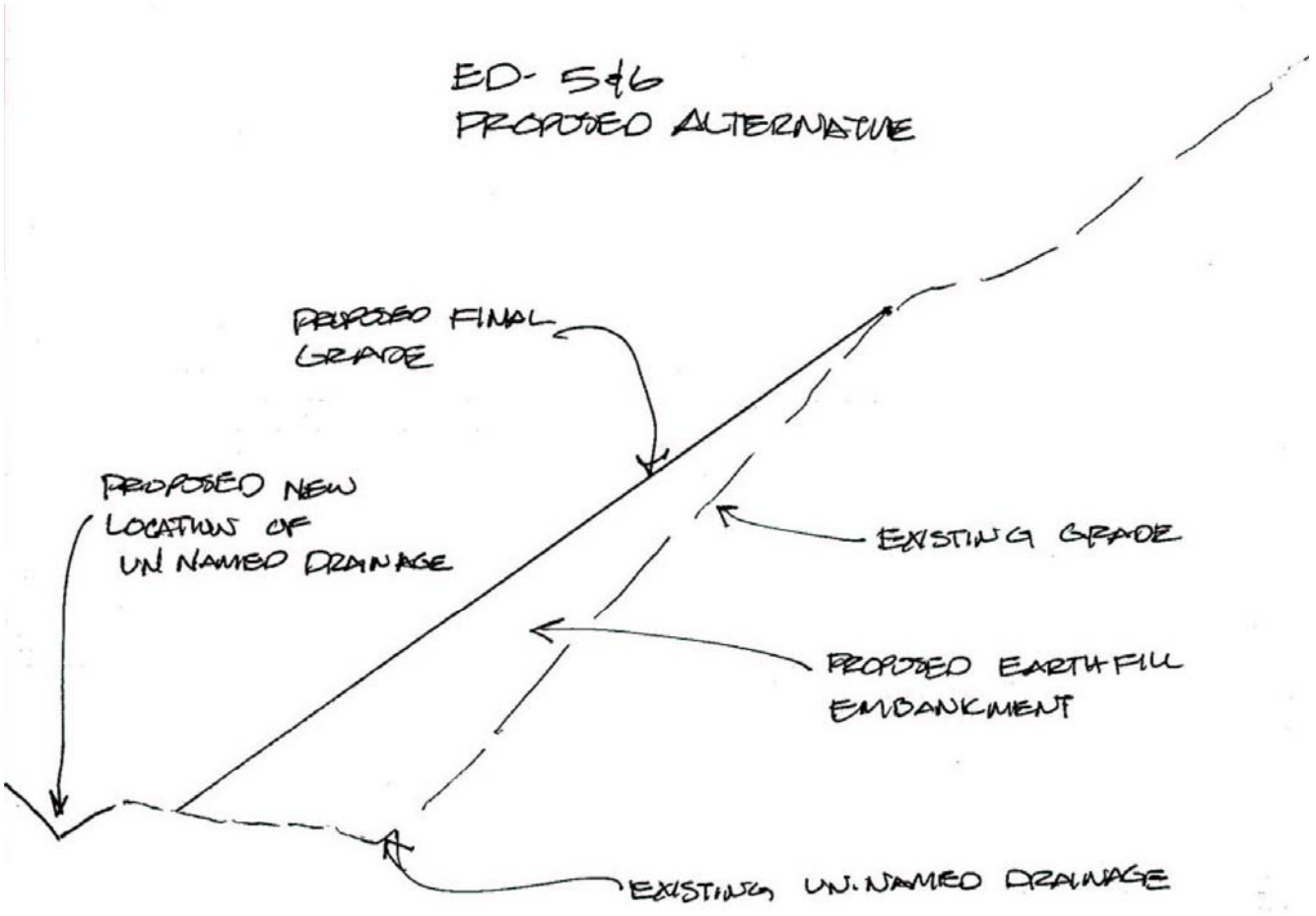
The un-named drainage meanders along the westerly edge of the dump. In one location, the drainage encroaches near the toe of the dump boundary. The proposed project is simply to straighten the drainage in the region where it meanders near the dump boundary. By straightening the drainage alignment, the ditch will be relocated approximately 80 to 100 feet west of its current location. Once the drainage has been relocated, an earthen embankment may be installed to support a portion of the westerly toe of the dump.

This approach removes the necessity of installing a very costly MSE wall. In addition to a significant capital cost savings, the safety of the project is improved. The 20-foot to 45-foot high portions of the MSE wall pose a long-term safety risk as an attractive nuisance to the government.

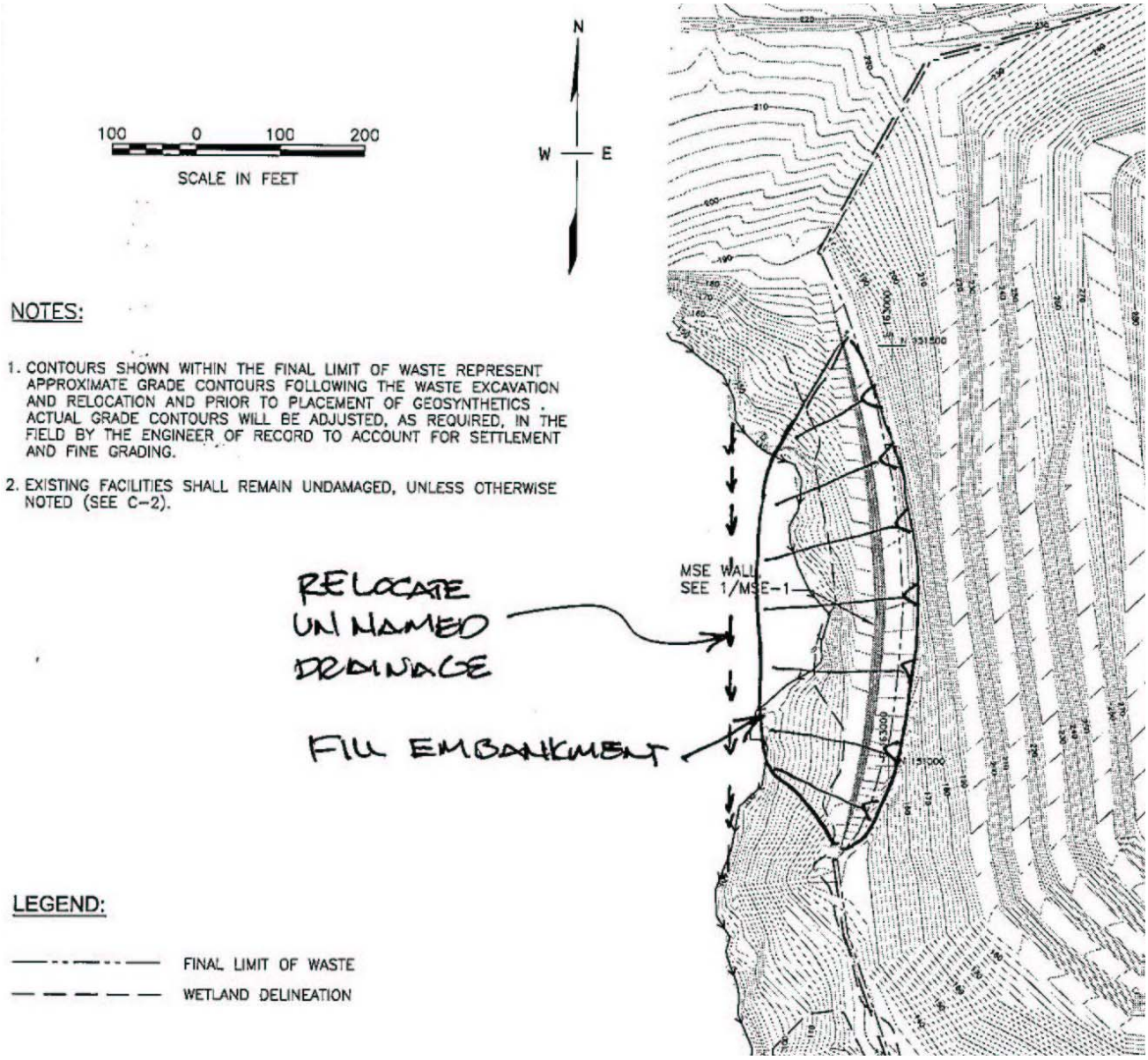
SKETCHES *Ordot Dump Closure*		
TITLE: Relocate No-Name Brook on West Side Further West	**NUMBER** ED-5 & ED-6	**PAGE NO.** 3 of 8



SKETCHES *Ordot Dump Closure*		
TITLE: Relocate No-Name Brook on West Side Further West	**NUMBER** ED-5 & ED-6	**PAGE NO.** 4 of 8



SKETCHES *Ordot Dump Closure*		
TITLE: Relocate No-Name Brook on West Side Further West	**NUMBER** ED-5 & ED-6	**PAGE NO.** 5 of 8



PERFORMANCE MEASURES *Ordot Dump Closure*			
TITLE: Relocate No-Name Brook on West Side Further West	**NUMBER** ED-5 & ED-6		**PAGE NO.** 6 of 8
CRITERIA and RATING RATIONALE for ALTERNATIVE	**Performance**	**Original**	**Alternative**
Operational Impacts None apparent.	Rating	6	6
	Weight	15	15
	Contribution	90	90
Materials Availability Removes reliance on imported MSE materials.	Rating	6	7
	Weight	10	10
	Contribution	60	70
Schedule Accelerates construction schedule.	Rating	5	6
	Weight	30	30
	Contribution	150	180
Construction Process Simplifies construction process by removing the complicated MSE wall.	Rating	6	7
	Weight	5	5
	Contribution	30	35
Environmental Impacts Impacts additional wetland area.	Rating	5	4
	Weight	40	40
	Contribution	200	160
	Rating		
	Weight		
	Contribution		
	Rating		
	Weight		
	Contribution		
	Rating		
	Weight		
	Contribution		
Total Performance:		**530**	**535**
Net Change in Performance:			**+1%**

ASSUMPTIONS

Those cost elements that are required to be performed, irrespective of the approach, are not included in the cost estimate. For example, the costs of clearing, grubbing, and site preparation are not included.

The cost elements to be removed were taken from the engineer's cost estimate.

A 500-foot long section of the un-named ditch requires relocation. For planning purposes, a cost of $200 per foot was used for the relocation cost.

An earthen embankment approximately 700 feet long and 35 feet high was calculated to support the dump fill slopes. The unit price of $15/cy is based on the engineers cost estimate.

The cost of securing the necessary creek relocation permits was estimated at $150,000.

Since the current design anticipates wastes will remain on properties adjacent to the westerly toe of the dump, no additional cost for the value of the land was included in this cost estimate.

INITIAL COSTS

Ordot Dump Closure, Guam

TITLE	NUMBER	PAGE NO.
Relocate No-Name Brook on West Side Further West	ED-5 & ED-6	8 of 8

CONSTRUCTION ELEMENT		ORIGINAL CONCEPT			ALTERNATIVE CONCEPT		
Description	**Unit**	**Quantity**	**Cost/Unit**	**Total**	**Quantity**	**Cost/Unit**	**Total**
Waste Excavation and Permanent Relocation	cy	135,400	$10	$1,354,000			$0
Waste Excavation and Replacement	cy	50,300	$20	$1,006,000			$0
Reinforced Backfill	cy	32,000	$15	$480,000			$0
Welded Wire Fabric	sy	2,415	$54	$130,410			$0
Geogrid Type 2	sy	36,120	$6	$216,720			$0
Geogrid Type 3	sy	15,680.0	$5.50	$86,240			$0
Creek Relocation	lf			$0	500	$200	$100,000
Imported Soil Embankment	cy			$0	45,370	$15	$680,556
Additional Regulatory Permits	ls			$0	1	$150,000	$150,000
SUB-TOTAL				$3,273,370			$930,556
PROJECT MARK-UPS	40%			$1,309,348			$372,222
TOTAL				$4,582,718			$1,302,778
TOTAL (Rounded)				$4,583,000			$1,303,000
						SAVINGS	$3,280,000

VALUE ENGINEERING ALTERNATIVE *Ordot Dump Closure*	
FUNCTION: Enclose Dump	**IDEA NO.** ED-5 & ED-7
TITLE: Convey No-Name Brook Through Culvert or Pipe	**PAGE NO.** 1 of 8

ORIGINAL CONCEPT:

Construct MSE wall (approximately 700 feet long, 20 to 45 feet high) to provide two functions:

1. Reduce the extent of the waste footprint in order to remove waste from the un-named drainage, as well as to provide a setback from the un-named drainage.
2. Supports the waste fill embankment, which rests on the existing materials that are to be removed in Item 1 above.

ALTERNATIVE CONCEPT:

Redirect the un-named drainage using a culvert or pipe in a region near the existing toe of waste, thereby allowing the construction of an earthen embankment to support the waste fill slopes. Construct earthen fill embankment to support upper waste fill slopes on the west side of the dump. Eliminate MSE wall.

ADVANTAGES:

- Allows flattening of slopes
- Supports use of prescriptive cover
- Improves safety
- Uses locally available materials and personnel to construct improvements

DISADVANTAGES:

- May need to purchase additional strip of land
- May require additional wetlands mitigation
- Need 401 and 404 permits
- May require additional maintenance for blockage

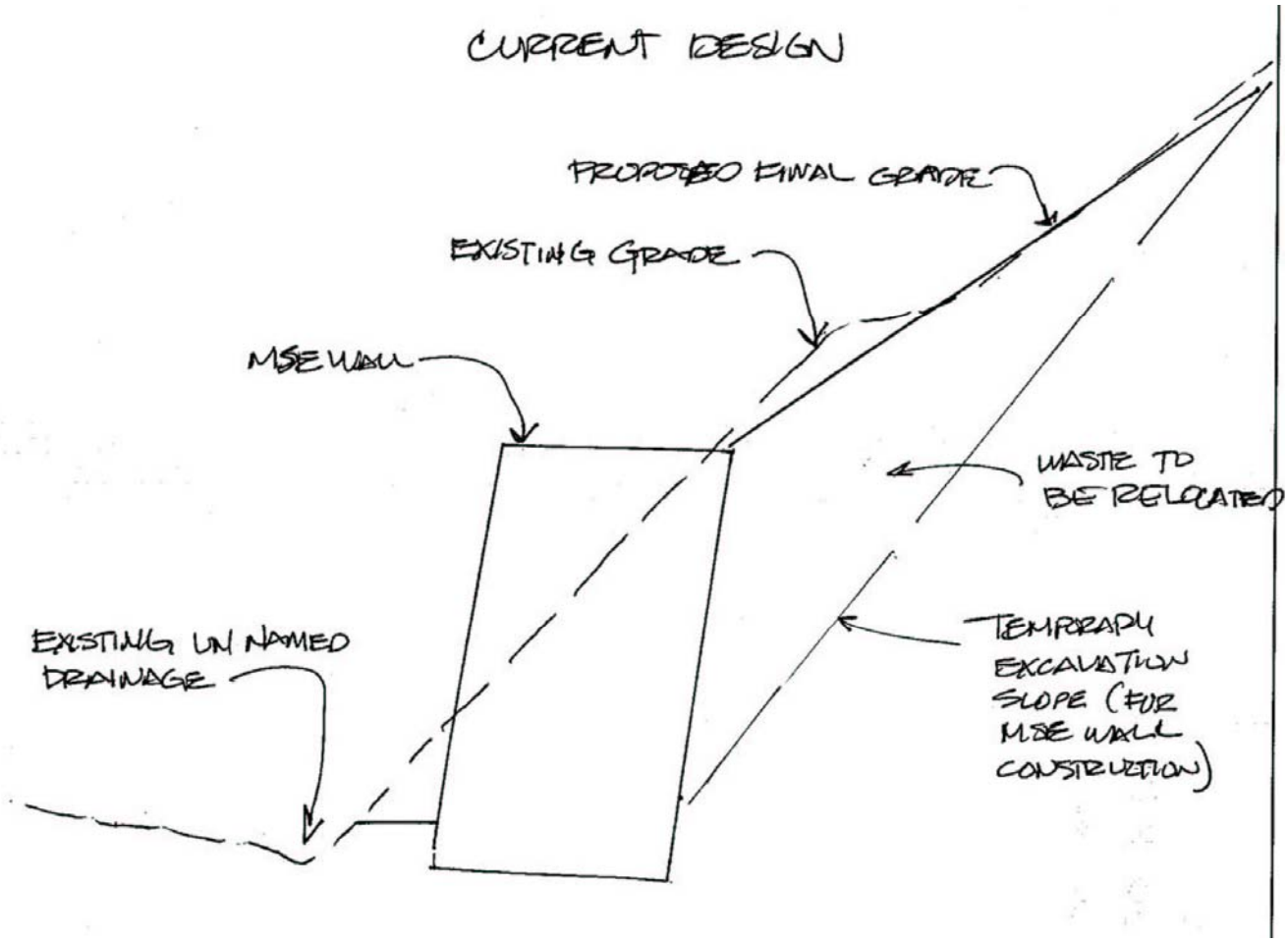
COST SUMMARY	INITIAL COST	O&M COST	LIFE CYCLE COST
ORIGINAL CONCEPT	**$** 4,583,000	**$** 0	**$** 4,583,000
ALTERNATIVE CONCEPT	**$** 1,233,000	**$** 0	**$** 1,233,000
SAVINGS	**$** 3,350,000	**$** 0	**$** 3,350,000

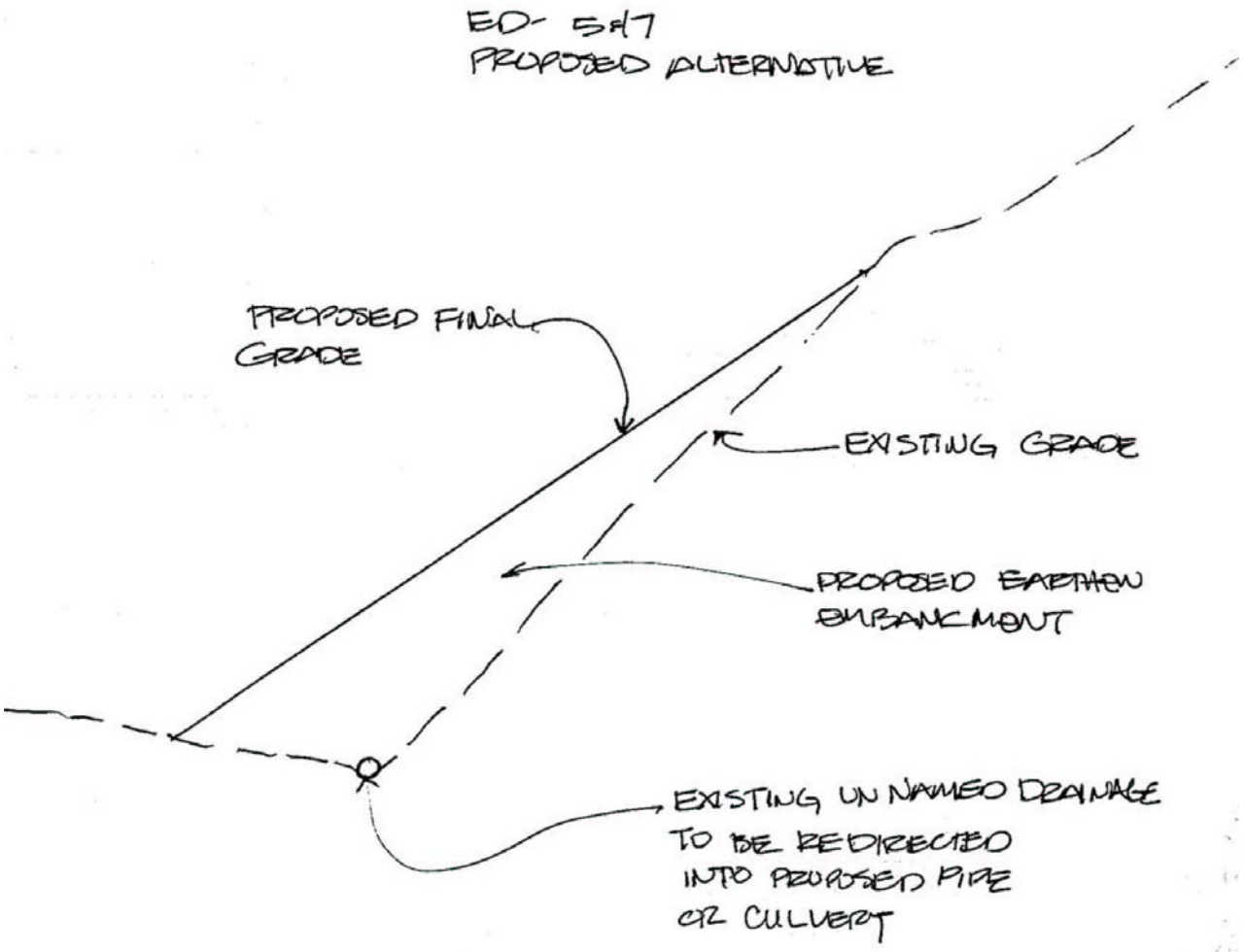
DISCUSSION / JUSTIFICATION:

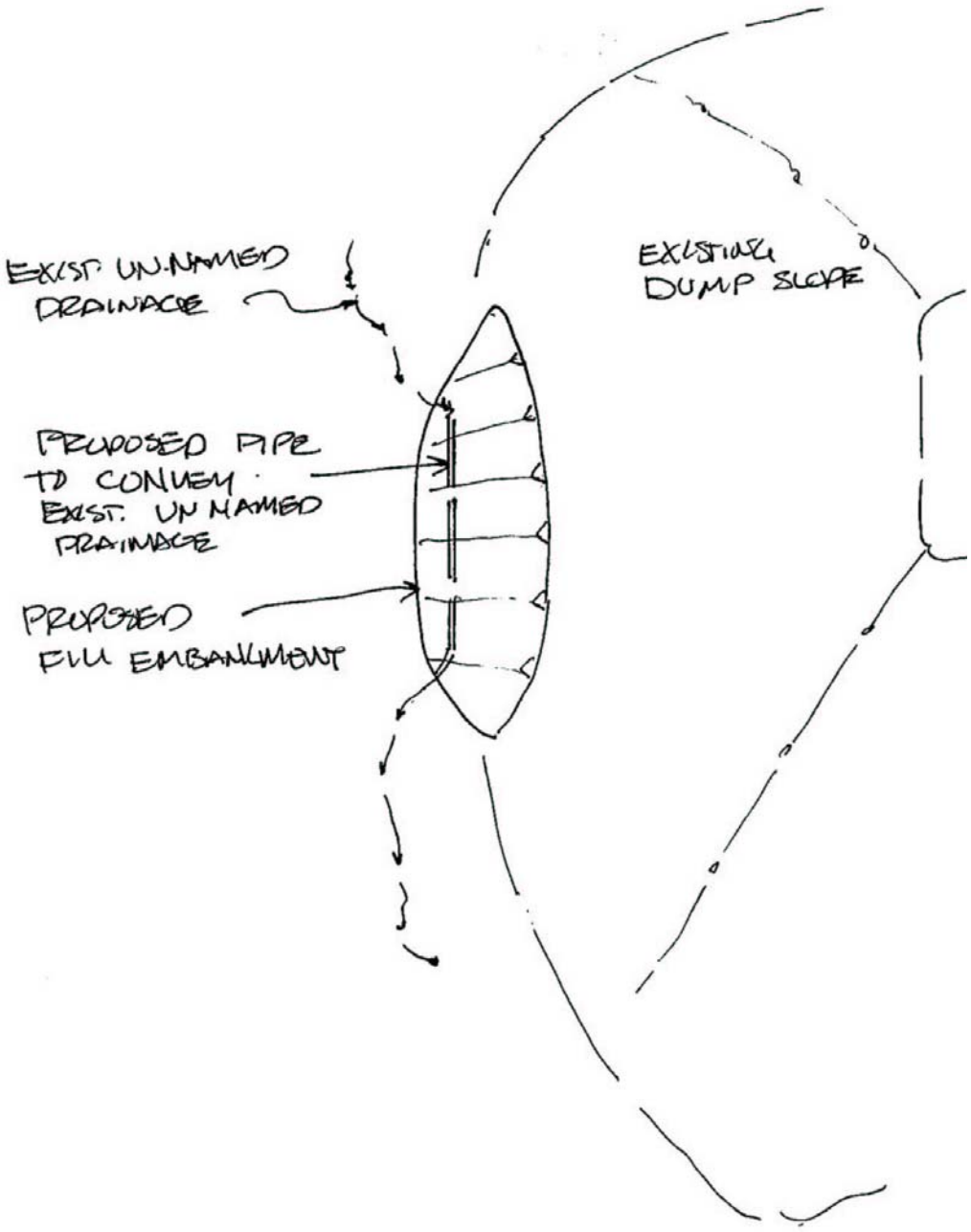
The un-named drainage meanders along the westerly edge of the dump. In one location, the drainage encroaches near the toe of the dump boundary. The proposed alternative is to direct the drainage in the region where it meanders near the dump boundary into a pipe or culvert, thereby conveying surface waters downstream. By placing a culvert in place of the existing drainage, fill materials may be placed over the existing drainage area. Once the culvert is installed, an earthen embankment may be installed to support a portion of the westerly toe of the dump.

However, one disadvantage of installing a pipe beneath the fill embankment is that the inlet to the pipe will require maintenance. Since the pipe is very remote, it will be somewhat difficult to maintain the pipe inlet. If the inlet is blocked, surface waters will back up behind the fill embankment, causing localized flooding and related damage to the pipe inlet region.

This approach removes the necessity of installing a very costly MSE wall. In addition to a significant capital cost savings, the safety of the project is improved. The 20-foot to 45-foot high portions of the MSE wall pose a long-term safety risk as an attractive nuisance to the government.


CURRENT DESIGN
PROPOSED FINAL GRADE
EXISTING GRADE
MSE WALL
WASTE TO BE RELOCATED
TEMPORARY EXCAVATION SLOPE (FOR MSE WALL CONSTRUCTION)
EXISTING UN NAMED DRAINAGE


ED- 5&7
PROPOSED ALTERNATIVE
PROPOSED FINAL GRADE
EXISTING GRADE
PROPOSED EARTHEN EMBANKMENT
EXISTING UN NAMED DRAINAGE TO BE REDIRECTED INTO PROPOSED PIPE OR CULVERT


EXIST. UN-NAMED DRAINAGE
PROPOSED PIPE TO CONVEY EXIST. UN NAMED DRAINAGE
PROPOSED FILL EMBANKMENT
EXISTING DUMP SLOPE

PERFORMANCE MEASURES *Ordot Dump Closure*			
TITLE: Convey No-Name Brook Through Culvert or Pipe	**NUMBER** ED-5 & ED-7		**PAGE NO.** 6 of 8
CRITERIA and RATING RATIONALE for ALTERNATIVE	**Performance**	**Original**	**Alternative**
Operational Impacts None apparent.	Rating	6	6
	Weight	15	15
	Contribution	90	90
Materials Availability Removes reliance on imported MSE materials.	Rating	6	7
	Weight	10	10
	Contribution	60	70
Schedule Accelerates construction schedule.	Rating	5	6
	Weight	30	30
	Contribution	150	180
Construction Process Simplifies construction process by removing complicated MSE wall.	Rating	6	7
	Weight	5	5
	Contribution	30	35
Environmental Impacts Impacts additional wetland area.	Rating	5	4
	Weight	40	40
	Contribution	200	160
	Rating		
	Weight		
	Contribution		
	Rating		
	Weight		
	Contribution		
	Rating		
	Weight		
	Contribution		
Total Performance:		**530**	**535**
Net Change in Performance:			**+1%**

ASSUMPTIONS

Those cost elements that are required to be performed, irrespective of the approach, are not included in the cost estimate. For example the costs of clearing, grubbing, and site preparation are not included.

The cost elements to be removed were taken from the engineers cost estimate.

A 500-foot long section of the un-named ditch requires a culvert. For planning purposes, a cost of $100 per foot was used for the culvert cost.

An earthen embankment approximately 700 feet long and 35 feet high was calculated to support the dump fill slopes. The unit price of $15/cy is based on the engineers cost estimate.

The cost of securing the necessary creek relocation permits was estimated at $150,000.

Since the current design anticipates wastes will remain on properties adjacent to the westerly toe of the dump, no additional cost for the value of the land was included in this cost estimate.

INITIAL COSTS

Ordot Dump Closure, Guam

TITLE	NUMBER	PAGE NO.
Convey No-Name Brook Through Culvert or Pipe	ED-5 & ED-7	8 of 8

CONSTRUCTION ELEMENT		ORIGINAL CONCEPT			ALTERNATIVE CONCEPT		
Description	**Unit**	**Quantity**	**Cost/Unit**	**Total**	**Quantity**	**Cost/Unit**	**Total**
Waste Excavation and Permanent Relocation	cy	135,450	$10	$1,354,500			$0
Waste Excavation and Replacement	cy	50,300	$20	$1,006,000			$0
Reinforced Backfill	cy	32,000	$15	$480,000			$0
Welded Wire Fabric	sy	2,415	$54	$130,410			$0
Geogrid Type 2	sy	36,120	$6	$216,720			$0
Geogrid Type 3	sy	15,680	$5.50	$86,240			$0
42-Inch Pipe or Culvert	lf			$0	500	$100	$50,000
Imported Soil Embankment	cy			$0	45,370	$15	$680,556
Additional Regulatory Permits	ls			$0	1	$150,000	$150,000
SUB-TOTAL				$3,273,870			$880,556
PROJECT MARK-UPS	40%			$1,309,548			$352,222
TOTAL				$4,583,418			$1,232,778
TOTAL (Rounded)				$4,583,000			$1,233,000
						SAVINGS	$3,350,000

VALUE ENGINEERING ALTERNATIVE *Ordot Dump Closure*	
FUNCTION: Enclose Dump	**IDEA NO.** ED-9
TITLE: Replace HDPE with Geosynthetic Clay Liner on Top Deck	**PAGE NO.** 1 of 5

ORIGINAL CONCEPT:

The current design uses an HDPE geomembrane product as the barrier layer throughout the site.

ALTERNATIVE CONCEPT:

Consider replacing the HDPE product and using a geosynthetic clay liner (GCL) as the barrier layer on the top deck.

ADVANTAGES:

- Self sealing (e.g., punctures seal on their own) when hydrated
- Easy to install
- No welding needed
- Very easy to repair
- 10E-11 cm/sec permeability

DISADVANTAGES:

- Subject to cation exchange
- Requires use of two flexible material liner (FML) materials

COST SUMMARY	INITIAL COST	O&M COST	LIFE CYCLE COST
ORIGINAL CONCEPT	**$** 225,000	**$** 0	**$** 225,000
ALTERNATIVE CONCEPT	**$** 120,000	**$** 0	**$** 120,000
SAVINGS	**$** 105,000	**$** 0	**$** 105,000

DISCUSSION / JUSTIFICATION:

For the top deck of the site (where the slope is relatively flat and where the barrier layer is covered with soil), the design includes an HDPE geomembrane. For this location, a GCL product could be installed in lieu of the HDPE barrier layer. GCLs are very easy to install. Also, GCLs are easy to repair during the post-closure period when penetrating the barrier layer is necessary.

PERFORMANCE MEASURES *Ordot Dump Closure*			
TITLE: Replace HDPE with Geosynthetic Clay Liner on Top Deck	**NUMBER** ED-9		**PAGE NO.** 3 of 5
CRITERIA and RATING RATIONALE for ALTERNATIVE	**Performance**	**Original**	**Alternative**
Operational Impacts None apparent.	Rating	6	6
	Weight	15	15
	Contribution	90	90
Materials Availability No change.	Rating	6	6
	Weight	10	10
	Contribution	60	60
Schedule No significant change.	Rating	5	5
	Weight	30	30
	Contribution	150	150
Construction Process Simpler than HDPE, but no overall significant change.	Rating	6	6
	Weight	5	5
	Contribution	30	30
Environmental Impacts No significant change.	Rating	5	5
	Weight	40	40
	Contribution	200	200
	Rating		
	Weight		
	Contribution		
	Rating		
	Weight		
	Contribution		
	Rating		
	Weight		
	Contribution		
Total Performance:		**530**	**530**
Net Change in Performance:			**0%**

For cost comparison, the cost of GCL is assumed to be $0.45 per square foot (which equates to $4/sy), installed in place.

No changes to the other geotextiles (geogrids, geocomposites, etc.) were considered.

No other environmental benefits or risks were considered.

The HDPE product is assumed to be equal with respect to providing environmental protection.

INITIAL COSTS

Ordot Dump Closure, Guam

TITLE	NUMBER	PAGE NO.
Replace HDPE with Geosynthetic Clay Liner on Top Deck	ED-9	5 of 5

CONSTRUCTION ELEMENT		ORIGINAL CONCEPT			ALTERNATIVE CONCEPT		
Description	**Unit**	**Quantity**	**Cost/Unit**	**Total**	**Quantity**	**Cost/Unit**	**Total**
80-Mil HDPE Geomembrane	sy	21,400	$7.50	$160,500			$0
GCL Barrier Layer	sy			$0	21,400	$4	$85,600
SUB-TOTAL				$160,500			$85,600
PROJECT MARK-UPS	40%			$64,200			$34,240
TOTAL				$224,700			$119,840
TOTAL (Rounded)				$225,000			$120,000
						SAVINGS	$105,000

VALUE ENGINEERING ALTERNATIVE *Ordot Dump Closure*	
FUNCTION: Enclose Dump	**IDEA NO.** ED-13
TITLE: Use Other Flexible Material Liners in lieu of HDPE	**PAGE NO.** 1 of 5

ORIGINAL CONCEPT:

The current design uses an HDPE geomembrane product as the barrier layer.

ALTERNATIVE CONCEPT:

Consider other flexible material liners (FML) as the barrier layer.

ADVANTAGES:

- Used LDPE in Hawaii
- Easier to handle
- Can get from Japan
- More flexible

DISADVANTAGES:

- Easier to penetrate
- May not meet environmental criteria (wind, etc.)

COST SUMMARY	INITIAL COST	O&M COST	LIFE CYCLE COST
ORIGINAL CONCEPT	**$** 2,785,000	**$** 0	**$** 2,785,000
ALTERNATIVE CONCEPT	**$** 1,003,000	**$** 0	**$** 1,000,000
SAVINGS	**$** 1,782,000	**$** 0	**$** 1,782,000

DISCUSSION / JUSTIFICATION:

The design includes an HDPE geomembrane, which is one of a variety of geomembrane materials available by manufacturers. Other varieties of geomembranes include:

- Low-density HDPE
- Very-low density HDPE
- PVC
- Geosynthetic clay liner

For purposes of comparison, this alternative reflects the cost of PVC.

PERFORMANCE MEASURES *Ordot Dump Closure*			
TITLE: Use Other Flexible Material Liners in lieu of HDPE	**NUMBER** ED-13		**PAGE NO.** 3 of 5
CRITERIA and RATING RATIONALE for ALTERNATIVE	**Performance**	**Original**	**Alternative**
Operational Impacts No significant impact.	Rating	6	6
	Weight	15	15
	Contribution	90	90
Materials Availability No significant change.	Rating	6	6
	Weight	10	10
	Contribution	60	60
Schedule No significant change.	Rating	5	5
	Weight	30	30
	Contribution	150	150
Construction Process No significant change.	Rating	6	6
	Weight	5	5
	Contribution	30	30
Environmental Impacts No significant change.	Rating	5	5
	Weight	40	40
	Contribution	200	200
	Rating		
	Weight		
	Contribution		
	Rating		
	Weight		
	Contribution		
	Rating		
	Weight		
	Contribution		
Total Performance:		**530**	**530**
Net Change in Performance:			**0%**

For cost comparison, the cost of PVC is assumed to be $0.30 per square foot (which equates to $2.70/sy), installed in place.

No changes to the other geotextiles (geogrids, geocomposites, etc.) were considered.

No other environmental benefits or risks were considered.

The PVC product is assumed to be equal with respect to providing environmental protection.

INITIAL COSTS

Ordot Dump Closure, Guam

TITLE	NUMBER	PAGE NO.
Use Other Flexible Membrane Liners in lieu of HDPE	ED-13	5 of 5

CONSTRUCTION ELEMENT		ORIGINAL CONCEPT			ALTERNATIVE CONCEPT		
Description	**Unit**	**Quantity**	**Cost/Unit**	**Total**	**Quantity**	**Cost/Unit**	**Total**
80-Mil HDPE Geomembrane	sy	265,250	$7.50	$1,989,375			$0
40-Mil PVC Geomembrane	sy			$0	265,250	$2.70	$716,175
SUB-TOTAL				$1,989,375			$716,175
PROJECT MARK-UPS	40%			$795,750			$286,470
TOTAL				$2,785,125			$1,002,645
TOTAL (Rounded)				$2,785,000			$1,003,000
						SAVINGS	$1,782,000

VALUE ENGINEERING ALTERNATIVE *Ordot Dump Closure*		
FUNCTION:	Meet Schedule	**IDEA NO.** MS-13
TITLE:	Satisfy Clean Water Issues Now (Stop Discharges of Leachate to River) and Request Modification Schedule in Consent Decree	**PAGE NO.** 1 of 4

ORIGINAL CONCEPT:

Wait for closure process to correct leachate discharges from the Ordot Dump to Lonfit River, as directed under the Consent Decree.

ALTERNATIVE CONCEPT:

Act at the earliest possible date to first known discharge of leachate to the Lonfit River with correction effected prior to the effective date in the Consent Decree. This is the pollution discharge item resulting in the Consent Decree and placement on the National Pollution Levels (NPL) list. This will allow removal of Ordot Dump from open dump status.

Early installation of the south-side perimeter leachate collection system. Lower-side leachate collection in major accessible area.

ADVANTAGES:

- Satisfies main concern of the Consent Decree, which results in Ordot regulatory status being an open dump
- Protects environment at the earliest possible date, when leachate volumes are greatest due to active operations and prior to closure of overexposed waste
- More flexibility in inter-agency negotiations on decree and schedule if prompt action taken to when knowledge of discharge was first known
- Facilitate removal from open dump status and NPL list

DISADVANTAGES:

- Will accelerate schedule and expenditure of resources

COST SUMMARY	INITIAL COST	O&M COST	LIFE CYCLE COST
ORIGINAL CONCEPT	**$** 0	**$** 0	**$** 0
ALTERNATIVE CONCEPT	**$** 286,000	**$** 0	**$** 286,000
SAVINGS	**$** (286,000)	**$** 0	**$** (286,000)

DISCUSSION / JUSTIFICATION:

In accordance with the Consent Decree, the Ordot Dump is to meet a 1,350-day schedule to complete closure and cease the acceptance of waste at the Ordot Dump from February 11, 2003 in order to cease discharge of pollutants into the waters of the United States.

Ordot Dump continues to not meet RCRA D criteria in effect since October 1991 and qualifies as an open dump. Numerous violation actions have been filed since 1983. The Ordot Dump was listed on the National Pollution Levels in 1982. As such, it may not qualify for a permit under present Guam RCRA D regulations, as its operation is prohibited. Clean water violations from the discharge of pollution from the dump have been established by the action of the Consent Decree 02-00022, US District Court, Territory of Guam.

The first step towards removal from the NPL list and open dump status would be corrective actions to cease discharges to the Lonfit River. Corrective actions would require effective off-site/on-site stormwater controls and the collection of leachate to prevent uncontrolled discharges.

Corrective actions would include partial regrading of the upper levels of the side-slopes, off-site and on-site stormwater management on the upper section of the landfill, leachate collection at the lower section to the extent possible, and appropriate leachate management. Leachate management would be justified by leachate monitoring data. An industrial wastewater discharge permit would be obtained.

PERFORMANCE MEASURES *Ordot Dump Closure*			
TITLE: Satisfy Clean Water Issues Now (Stop Discharges of Leachate to River) and Request Modification Schedule in Consent Decree	**NUMBER** MS-13		**PAGE NO.** 3 of 4
CRITERIA and RATING RATIONALE for ALTERNATIVE	**Performance**	**Original**	**Alternative**
Operational Impacts Not significant.	Rating	6	6
	Weight	15	15
	Contribution	90	90
Materials Availability No impact.	Rating	6	6
	Weight	10	10
	Contribution	60	60
Schedule No impact.	Rating	5	5
	Weight	30	30
	Contribution	150	150
Construction Process No impact.	Rating	6	6
	Weight	5	5
	Contribution	30	30
Environmental Impacts Should result in a significant reduction in leachate, along with reduced discharges to the Lonfit River.	Rating	5	7
	Weight	40	40
	Contribution	200	280
	Rating		
	Weight		
	Contribution		
	Rating		
	Weight		
	Contribution		
	Rating		
	Weight		
	Contribution		
Total Performance:		**530**	**610**
Net Change in Performance:			**+15.1%**

INITIAL COSTS

Ordot Dump Closure, Guam

TITLE	NUMBER	PAGE NO.
Satisfy Clean Water Issues Now (Stop Discharges of Leachate to River) and Request Modification Schedule in Consent Decree	MS-13	4 of 4

CONSTRUCTION ELEMENT		ORIGINAL CONCEPT			ALTERNATIVE CONCEPT		
Description	**Unit**	**Quantity**	**Cost/Unit**	**Total**	**Quantity**	**Cost/Unit**	**Total**
Leachate Conveyance Pipe	lf			$0	1,200	$10	$12,000
Leachate Storage Single Wall Tank	ea			$0	1	$87,000	$87,000
Secondary Containment Structure	ea			$0	1	$28,400	$28,400
Leachate Conveyance Pipe-to-Tank Connection	ls			$0	1	$500	$500
Outlet Pipe	ls			$0	1	$6,000	$6,000
Flow meter	ls			$0	1	$4,000	$4,000
Leachate Pump Station	ea			$0	1	$136	$136
South Leachate collection Trench	lf				1,100	$60	$66,000
Note: Early partial construction of south-side leachate collection system.							
SUB-TOTAL				$0			$204,036
PROJECT MARK-UPS	40%			$0			$81,614
TOTAL				$0			$285,650
TOTAL (Rounded)				$0			$286,000
						SAVINGS	($286,000)

VALUE ENGINEERING ALTERNATIVE *Ordot Dump Closure*		
FUNCTION:	General Idea	**IDEA NO.** GI-7
TITLE:	Monitor/Investigate for Internal Fires Prior to and After Post-Closure	**PAGE NO.** 1 of 5

ORIGINAL CONCEPT:

Currently, design report information is qualitative based on last known history, which is incomplete.

ALTERNATIVE CONCEPT:

Collect regular qualitative and quantitative monitoring data for analysis by knowledgeable technical personnel for accurate determination of underground fire conditions and fire mitigation actions.

ADVANTAGES:

- Accurately monitor fire conditions within landfill
- Enable early and accurate control of response action
- Need to develop fire mitigation plan with monitoring

DISADVANTAGES:

- Technical expertise is off-island

COST SUMMARY	INITIAL COST	O&M COST	LIFE CYCLE COST
ORIGINAL CONCEPT	$ 0	$ 0	$ 0
ALTERNATIVE CONCEPT	$ 33,000	$ 0	$ 33,000
SAVINGS	$ (33,000)	$ 0	$ (33,000)

DISCUSSION / JUSTIFICATION:

Qualitative information from operations and compliance information needs to be combined using regular up-to-date interviews. Current waste fire odors and steam have been reported in these interviews. Real time quantitative information needs to be collected by knowledgeable technical personnel for analysis. Knowledgeable technical knowledge with experience must be included in their qualifications.

PERFORMANCE MEASURES *Ordot Dump Closure*			
TITLE: Monitor/Investigate for Internal Fires Prior to and After Post-Closure	**NUMBER** GI-7	**PAGE NO.** 3 of 5	
CRITERIA and RATING RATIONALE for ALTERNATIVE	**Performance**	**Original**	**Alternative**
Operational Impacts None apparent.	Rating	6	6
	Weight	15	15
	Contribution	90	90
Materials Availability None apparent.	Rating	6	6
	Weight	10	10
	Contribution	60	60
Schedule None apparent.	Rating	5	5
	Weight	30	30
	Contribution	150	150
Construction Process None apparent.	Rating	6	6
	Weight	5	5
	Contribution	30	30
Environmental Impacts Some improvement in the environment if fires can be prevented.	Rating	5	6
	Weight	40	40
	Contribution	200	240
	Rating		
	Weight		
	Contribution		
	Rating		
	Weight		
	Contribution		
	Rating		
	Weight		
	Contribution		
Total Performance:		**530**	**570**
Net Change in Performance:			**+7.5%**

Monitor/investigate for internal fires prior to and after closure

I. Use temporary probes along edges of LF to read gases and temperature. Investigation

DPW provide labor

Technical person $500/day

Equipt + gas mont $150/day

5 days x 650 = 3250

Air/Hotel 5000

$8000

II analysis $10,000

III analysis results w/ Contingency 30,000

INITIAL COSTS

Ordot Dump Closure, Guam

TITLE	NUMBER	PAGE NO.
Monitor/Investigate for Internal Fires Prior to and After Post-Closure	GI-7	5 of 5

CONSTRUCTION ELEMENT		ORIGINAL CONCEPT			ALTERNATIVE CONCEPT		
Description	**Unit**	**Quantity**	**Cost/Unit**	**Total**	**Quantity**	**Cost/Unit**	**Total**
Technical Person	day			$0	5	$500	$2,500
Equipment	day			$0	5	$150	$750
Air/Hotel	ls			$0	1	$5,000	$5,000
Analysis	ls			$0	1	$15,000	$15,000
SUB-TOTAL				$0			$23,250
PROJECT MARK-UPS	40%			$0			$9,300
TOTAL				$0			$32,550
TOTAL (Rounded)				$0			$33,000
						SAVINGS	($33,000)

VALUE ENGINEERING ALTERNATIVE *Ordot Dump Closure*	
FUNCTION: General Idea	**IDEA NO.** GI-9
TITLE: Replace Candlestick Flare with Enclosed Flare	**PAGE NO.** 1 of 6

ORIGINAL CONCEPT:

The current design employs an open candlestick flare as the destruction device for landfill gases (LFG).

ALTERNATIVE CONCEPT:

Install an enclosed flare as the destruction device for LFG.

ADVANTAGES:

- Improves aesthetics
- More assurance of consistent destruction of contaminants

DISADVANTAGES:

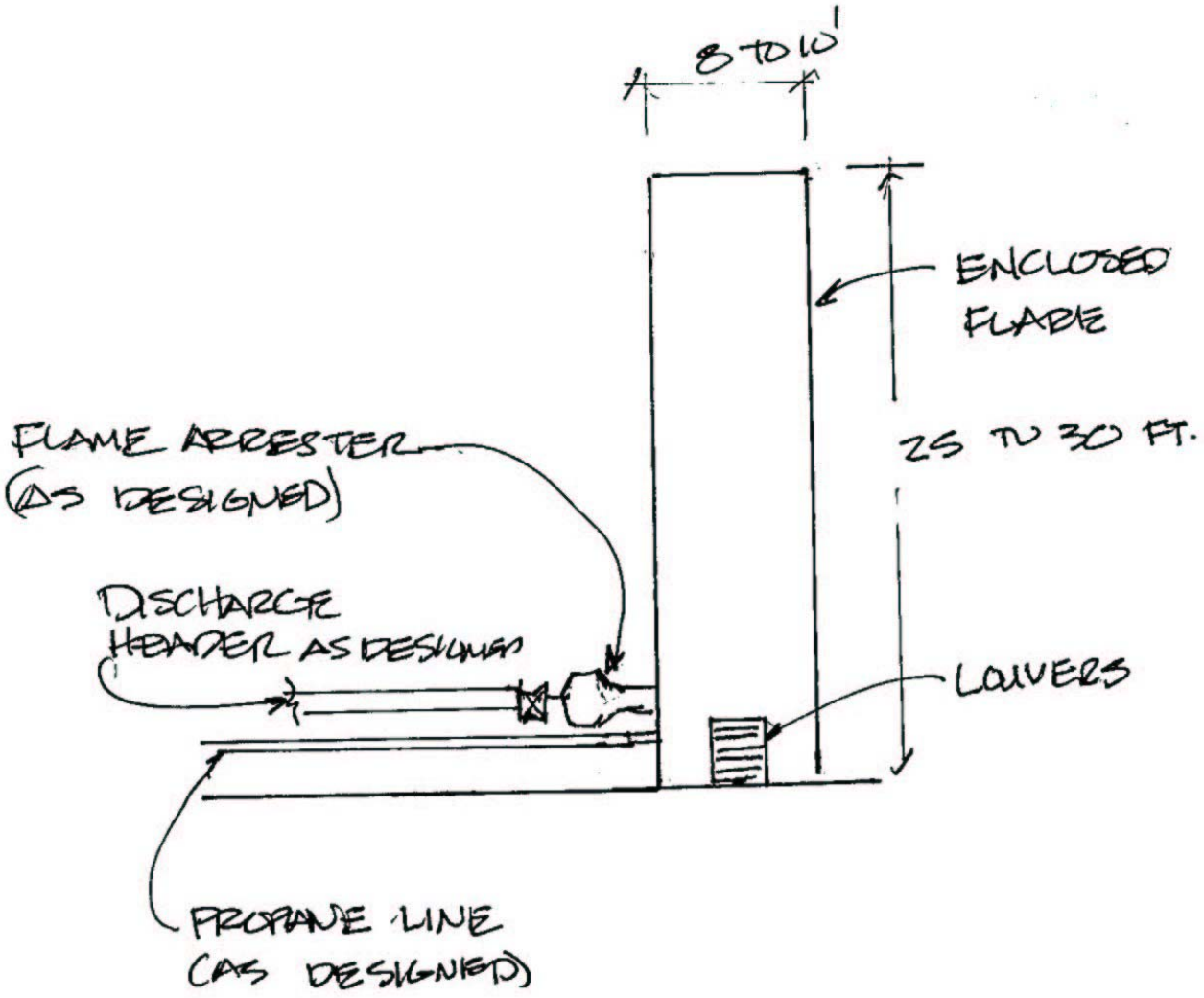
- None apparent

COST SUMMARY	INITIAL COST	O&M COST	LIFE CYCLE COST
ORIGINAL CONCEPT	$ 49,000	$ 0	$ 49,000
ALTERNATIVE CONCEPT	$ 210,000	$ 0	$ 210,000
SAVINGS	$ (161,000)	$ 0	$ (161,000)

DISCUSSION / JUSTIFICATION:

An enclosed flare provides many benefits with regard to environmental protection. An enclosed flare differs from a candlestick flare by providing protection of the flame in an enclosed stack. By providing an enclosure, the enclosed flare retains the flame for a specified amount of time. Further, as the flame rises in the enclosed flare stack, various control devices may be included, such as thermocouples that monitor the performance of the flare. These devices increase the assurance that the gases are properly destructed. The control devices are typically connected to a continuous monitoring device that adjusts the flare as the conditions vary. The control devices assure the gases are burned at the specified temperatures and retention time, thereby assuring the destruction efficiency of the gases. Consequently, most permanent LFG destruction devices in the U.S. are specified as enclosed.

In contrast, the current design includes a candlestick flare. A candlestick flare's flame is located at the tip of the flare, making it visible. Also, a candlestick flare does not protect the flame from the surrounding environment (i.e., prevailing winds). As a consequence, the destruction efficiency of a candlestick flare is typically less reliable than an enclosed flare.


8 TO 10'
ENCLOSED FLARE
25 TO 30 FT.
FLAME ARRESTER (AS DESIGNED)
DISCHARGE HEADER AS DESIGNED
LOUVERS
PROPANE LINE (AS DESIGNED)

PERFORMANCE MEASURES *Ordot Dump Closure*			
TITLE: Replace Candlestick Flare with Enclosed Flare	**NUMBER** GI-9		**PAGE NO.** 4 of 6
CRITERIA and RATING RATIONALE for ALTERNATIVE	**Performance**	**Original**	**Alternative**
Operational Impacts None apparent.	Rating	6	6
	Weight	15	15
	Contribution	90	90
Materials Availability No different than the original design—both candlestick flare and enclosed flare will need to be imported.	Rating	6	6
	Weight	10	10
	Contribution	60	60
Schedule No change.	Rating	5	5
	Weight	30	30
	Contribution	150	150
Construction Process No change.	Rating	6	6
	Weight	5	5
	Contribution	30	30
Environmental Impacts An enclosed flare improves the assurance of the destruction efficiency of the gases.	Rating	5	6
	Weight	40	40
	Contribution	200	240
	Rating		
	Weight		
	Contribution		
	Rating		
	Weight		
	Contribution		
	Rating		
	Weight		
	Contribution		
Total Performance:		**530**	**570**
Net Change in Performance:			**+7.5%**

The current engineer's estimate does not provide cost for the candlestick flare. The entire flare station is estimated to be $250,000. For this calculation, we estimate the candlestick flare to cost $35,000, installed. We assumed the enclosed flare would cost $150,000, installed.

INITIAL COSTS

Ordot Dump Closure, Guam

TITLE	NUMBER	PAGE NO.
Replace Candlestick Flare with Enclosed Flare	GI-9	6 of 6

CONSTRUCTION ELEMENT		ORIGINAL CONCEPT			ALTERNATIVE CONCEPT		
Description	**Unit**	**Quantity**	**Cost/Unit**	**Total**	**Quantity**	**Cost/Unit**	**Total**
Candlestick Flare	ea	1	$35,000	$35,000			$0
Enclosed Flare	ea			$0	1	$150,000	$150,000
SUB-TOTAL				$35,000			$150,000
PROJECT MARK-UPS	40%			$14,000			$60,000
TOTAL				$49,000			$210,000
TOTAL (Rounded)				$49,000			$210,000
						SAVINGS	($161,000)

Project Analysis

PROJECT ANALYSIS

SUMMARY OF ANALYSIS

The following tools were used to study the project and better understand where opportunities for improvement exist:

- Project Issues
- Cost Model
- Function Analysis (FAST Diagram)
- Reconciled Cost Estimate

PROJECT CONSTRAINTS AND ISSUES

Key constraints and issues affecting the project include:

Project Constraint

- Design in accordance with Rules and Regulations of GEPA Solid Waste Disposal, Title 22, Division 4, Chapter 23, Article 6

Critical Issues

- Meet requirements specified in Consent Decree of February 11, 2003, Civil Case No. 02-00022
- Need to meet the requirements of the draft permit for continued use of Ordot during closure construction
- Needs of Operations takes precedence over all aspects of closure work
- Coordination with ongoing landfill operations
- Provision of adequate anchorage for barrier against wind and water penetration, and exposure of geomembrane on steeps slopes to potential wind-generated uplift forces
- Limit seepage height and ensure that cover soil is not saturated
- Provision for adequate time for manufacturers to produce and deliver materials to Guam—it is imperative to construction schedule that manufacturing and shipping delays be minimized
- Piping may be subject to clogging from biological growth, siltation, and chemical growth
- Minimize gas migration offsite and into the atmosphere
- Impacts of significant storm events and annual rainfall
- Construction scheduling to avoid wet season problems
- Adequate airspace for final placement of material at Ordot and to meet the schedule for the new landfill
- Discharge of pollutants to the Lonfit River is the issue dictated by the consent decree rather than protection of groundwater
- Fire prevention
- Protection/encroachment to wetlands and private property
- Adequacy of prediction of leachate production volumes and rates, and assumptions made to HELP model
- Need for an Environmental Compliance Officer
- Maximum allowable bench height and slopes
- Performance of covered dump under seismic forces
- Magnitude of future settlement of waste
- Public safety liability if access to closed landfill is permitted

COST MODEL

The VE team leader prepared a cost model from the designer's cost estimate. The model is organized to identify major construction elements or trade categories, the designer's estimated costs, and the percent of total project cost for the significant cost items.

This cost model clearly showed the cost drivers for the project and was used to guide the VE team during the VE Study. The key cost drivers were:

- Capping Systems = $7,848,105 (38.6%)
- Surface Water Systems = $44,038,920 (19.9%)
- MSE Wall System = $3,303,565 (16.3%)
- Mobilization and Miscellaneous Allowances = $2,126,500 (10.5%)

These items account for ~85% of the project cost.

Looking deeper into the cost estimate, the following subcategories are found to be the key significant cost drivers:

- Capping System
  - Geocomposite = $2,301,845 (10.3%)
  - HDPE Geomembrane = $1,989,375 (8.9%)
  - Geogrid = $1,301,025 (5.8%)
  - Native Fill = $1,473,180 (6.6%)
- Surface Water Systems
  - Berms = $1,574,200 (7.0%)
  - Bench Ditches = $1,157,200 (5.2%)
- MSE Wall Systems
  - Waste Excavation & Replacement Relocation = $1,354,500 (6.0%)
  - Waste Excavation & Replacement = $1,006,000 (4.5%)
- Mobilization and Miscellaneous Allowances
  - Mobilization = $2,000,000 (8.9%)

These key items account for ~63% of the project cost.

The VE team evaluated the estimate and suggested changes to bring it more in line as to what would be anticipated for this project. This reconciliation consisted of the following missing items and mark-ups, without altering the unit costs used to create the estimate:

1. Building Permit/Plan Checking Fee, which is a requirement from the Department of Public Works (DPW), was not include in the Engineer's Estimate. The Building Permit Fee is

determined as $5,025 for the first $1 million, plus $2.75 for each additional $1,000 or fraction thereof, of the direct costs. The Plan Checking Fee is then 65% of the Building Permit Fee.

2. The drawings depict MSE walls on each bench. The cost for these walls could not be found in the estimate provided. The VE Team developed an estimate for the bench MSE walls of $833,530 and included this in the total cost of the project.

3. The following are not specifically mentioned as part of the estimate:

   - Contractor's Overhead = 10%
   - Contractor's Profit = 15%
   - Contingency = 5%

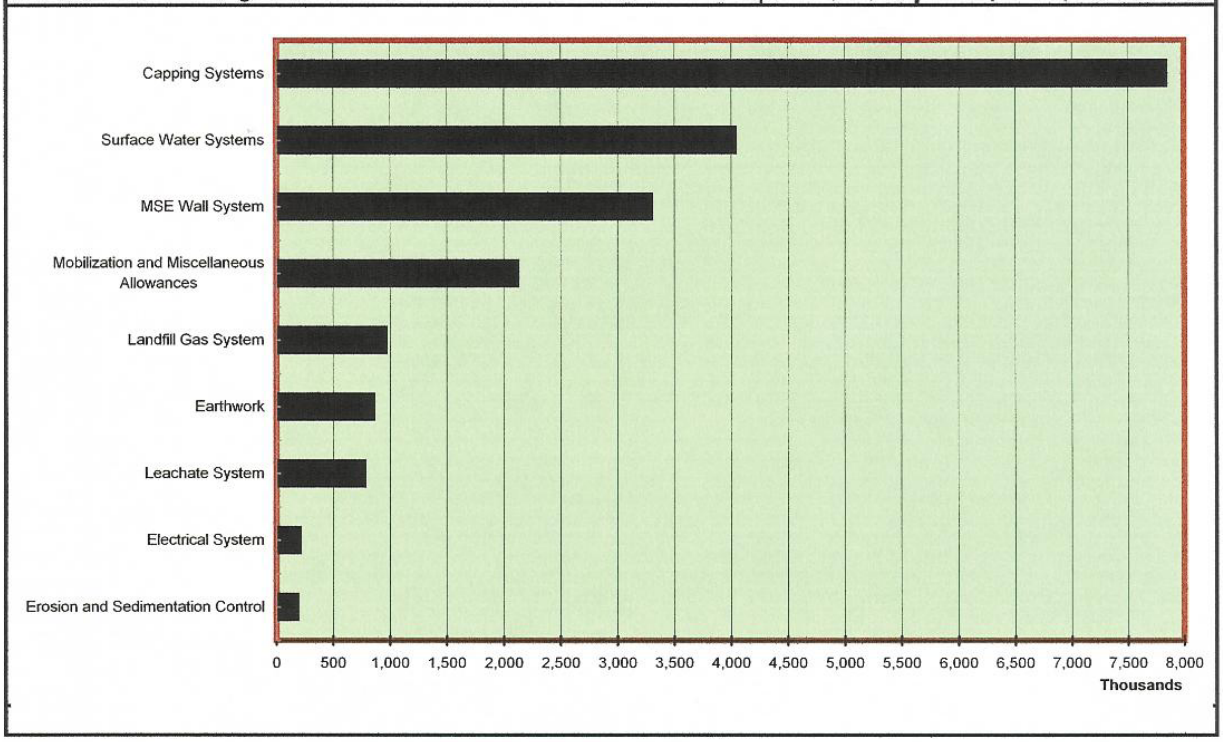
The resulting reconciled cost estimate raises the total project cost from the $22,398,925 given in the cost estimate to $29,797,912 which the VE team used in assessing the various alternatives.

The specific relationships of the major cost elements, as reconciled, are depicted in the following chart.

COST HISTOGRAM- Project Cost

PROJECT: Ordot Dump Closure

PROJECT ELEMENT		COST	PERCENT	CUMULATIVE PERCENT
Capping Systems		7,848,105	36.94%	36.94%
Surface Water Systems		4,038,920	19.01%	55.94%
MSE Wall System		3,303,565	15.55%	71.49%
Mobilization and Miscellaneous Allowances		2,126,500	10.01%	81.50%
Landfill Gas System		966,110	4.55%	86.05%
Earthwork		857,190	4.03%	90.08%
Leachate System		779,550	3.67%	93.75%
Electrical System		210,008	0.99%	94.74%
Erosion and Sedimentation Control		188,380	0.89%	95.63%
Construct MSE Benches		833,530	3.92%	99.55%
Building Permit and Plan Checking Fee		95,940	0.45%	96.08%
	Subtotal	**$ 21,247,798**	**100.00%**	
Gross Receipt Tas	**4%**	**$ 849,912**		
Cost Escalation due to Inflation Over 2 Years	**6%**	**$ 1,325,863**		
Protection of Existing Facilities	**0%**	**$ -**		
Contingency for Construction	***5%***	***$ 1,062,390***		
Miscellaneous Markups (O&P)	***25%***	***$ 5,311,950***		
		$ -		
***Italicised items not in original cost estimate**	**TOTAL**	**$ 29,797,912**	**Comp Mark-up:**	40%

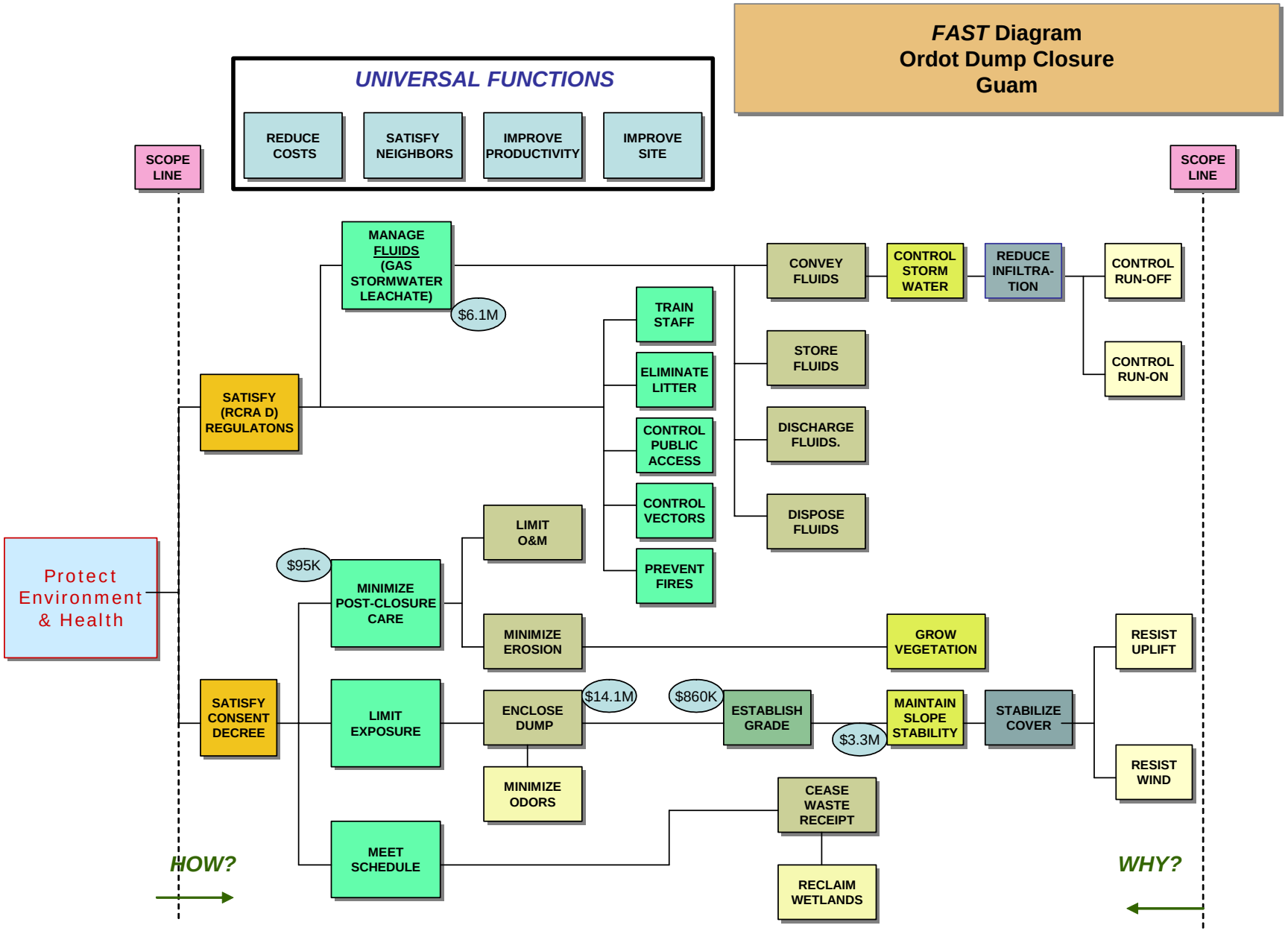


The detailed costs estimates produced by Dueñas & Associates with support by URS Corporation follow:

FUNCTION ANALYSIS

Function analysis was performed, which revealed the key functional relationships for the project. This analysis provided a greater understanding of the total project and how the issues, project cost, and function requirements are related.

The Function Analysis identified *Protect Environment and Health* as the basic function, with key secondary functions of *Satisfy (CRCLA D) Regulations* and *Satisfy Consent Decree* as other critical project functions that have a significant impact on the decisions that affect the project design decisions and costs. Following is a Function Analysis System Technique (FAST) diagram of the project prepared by the VE team.


FAST Diagram
Ordot Dump Closure
Guam
UNIVERSAL FUNCTIONS
REDUCE COSTS
SATISFY NEIGHBORS
IMPROVE PRODUCTIVITY
IMPROVE SITE
SCOPE LINE
SCOPE LINE
Protect Environment & Health
SATISFY (RCRA D) REGULATONS
SATISFY CONSENT DECREE
MANAGE FLUIDS (GAS STORMWATER LEACHATE)
$6.1M
TRAIN STAFF
ELIMINATE LITTER
CONTROL PUBLIC ACCESS
CONTROL VECTORS
PREVENT FIRES
CONVEY FLUIDS
CONTROL STORM WATER
REDUCE INFILTRA-TION
CONTROL RUN-OFF
CONTROL RUN-ON
STORE FLUIDS
DISCHARGE FLUIDS.
DISPOSE FLUIDS
$95K
MINIMIZE POST-CLOSURE CARE
LIMIT O&M
MINIMIZE EROSION
GROW VEGETATION
RESIST UPLIFT
LIMIT EXPOSURE
ENCLOSE DUMP
$14.1M
MINIMIZE ODORS
$860K
ESTABLISH GRADE
$3.3M
MAINTAIN SLOPE STABILITY
STABILIZE COVER
RESIST WIND
MEET SCHEDULE
CEASE WASTE RECEIPT
RECLAIM WETLANDS
HOW?
WHY?

Project Description

PROJECT DESCRIPTION

INTRODUCTION

This Value Engineering (VE) Report summarizes the VE Study conducted by Value Management Strategies, Inc., October 24–28, 2005, for the Guam Department of Public works (DPW). The subject of the study was the 100% design submittal Closure Plan and Post-Closure Plan for the closure of the Ordot Dump, Guam.

The purpose of the VE Study was to identify viable alternatives to enhance the project's value and functionality.

PROJECT DESCRIPTION

The Ordot Dump Closure Project is located in Ordot, Guam. The closure of this active municipal waste dump site will be performed in accordance with Title 22, Division 4, Chapter 23, Article 6 (§23601) of the Rules and Regulations for the Guam Environmental Protection Agency (GEPA) Solid Waste Disposal (Appendix A) and Part IV of the Solid Waste Management Facility Permit Application, Landfill, at the request of the Government of Guam, Department of Public Works (DPW).

The starting date for the use of the site as a dump is not documented, but it is known that the Ordot Dump was in use during World War II. The dump was used as a disposal area by the Japanese during the Japanese occupation of Guam from December 8, 1941 to July 21, 1944 (Juan C. Tenorio & Associates, Inc. 1993). Following the liberation of Guam, the U.S. Navy continued to use the site as a disposal area. Ownership of the Ordot Dump was transferred from the United States Naval Government of Guam to the Government of Guam in 1950 under the Organic Act. Since then, the Government of Guam, specifically the DPW, has been operating the Ordot Dump as a municipal solid waste disposal facility.

The Dump is located approximately 2.5 miles south of Guam's capital, Hagatna, and about one mile west of the Route 4/Dero Drive intersection. The area surrounding the Dump is a dense brush, wooded area with scattered residences. The nearest residences are approximately 200 feet from the Dump. The Dump is situated in a ravine that is a tributary to the Lonfit River, located approximately 500 feet to the south of the site.

The Dump occupies and borders property of the Government of Guam on the northeast, east, south, and southwest boundary lines of the Dump. The north and west limits of the Dump border public land in the form of a road and privately owned land, respectively.

The Dump waste footprint area, based on the 2004 limits of waste delineation performed by Dueñas & Associates, Inc. and projected filling footprint per the Operations Plan (Dueñas & Associates Project Team (DPT, 2005a), has been estimated to be 46.8 acres. This waste footprint area will be reduced to approximately 45.8 acres during closure construction, as waste will be relocated from the western edge of the Dump and consolidated behind a mechanically stabilized earth (MSE) wall (DPT, 2005b). The precise limits of waste will be defined as a part of the Dump closure construction. The final waste volume of the Dump at the time of closure will be approximately 4.4 million-cubic yards (DPT, 2005a).

The Dump is an unlined disposal facility and has few to no control systems to manage landfill gas, leachate, surface water, erosion and sedimentation, or vectors.

The Dump closure design includes the following construction elements:

- Final grading and layout of the Dump, including provision of access roads and surface drainage features, constructed over the final cover area;
- A final cover system, constructed over an approximately 45.8-acre footprint area;
- A leachate management system;
- A surface water management system that intercepts clean surface water runoff from the closed area and conveys it to the on-site sedimentation ponds;
- Erosion and sedimentation control facilities; and
- An active landfill gas (LFG) management system.

The cost estimate for the project, as developed by URS Corporation, is $22,398,925.

ESTIMATED COST

The reconciled cost estimate for this project is about $29.8 million. This does not include all of the items anticipated to be needed and required by Guam DPW for their end use. A copy of the URS Corporation cost estimate follows.

The VE Team's review of the estimate identified and questioned a number of additional items that are either underestimated or missing. A more detailed presentation of these items can be found in the Project Analysis section of this report.

Ordot Dump Closure
Pre-Final Cost Estimate

Item	Description	Unit	Unit Rate	Quantity	Cost	Source/Justification
	Mobilization and Miscellaneous Allowances					
1	Mobilization	LS	2,000,000.00	1	$ 2,000,000	Approximately 10% of total construction cost.
2	Temporary Erosion and Sediment Control Plan	LS	7,500.00	1	$ 7,500	Based on engineer's estimate.
3	Traffic Control Plan	LS	3,000.00	1	$ 3,000	Based on engineer's estimate.
4	Safety Program	LS	5,000.00	1	$ 5,000	Based on engineer's estimate.
5	Road Sweeping	LS	50,000.00	1	$ 50,000	Based on engineer's estimate.
6	Groundwater Monitoring Wells	EA	12,000.00	4	$ 48,000	Based on previous comparable project.
7	Odor and Fugitive Emissions Control Plan	LS	3,000.00	1	$ 3,000	Based on engineer's estimate.
8	NPDES Permit During Construction	LS	10,000.00	1	$ 10,000	Based on engineer's estimate.
	Mobilization and Miscellaneous Allowances Subtotal				**$ 2,126,500**	
	Earthwork					
9	Stripping	AC	3,000.00	60.0	$ 180,000	Unit rate based on previous comparable project winning bid. Quantity based on entire closure area + area of detention pond.
10	Prepared Subgrade	AC	3,000.00	55.0	$ 165,000	Unit rate based on previous comparable project winning bid. Quantity based on entire closure area.
11	Over-excavation	CY	20.00	200	$ 4,000	Unit rate based on RS Means, assumed excavation in common earth using hydraulic backhoe with 1 CY bucket, backfill from existing stockpile, and compaction.
12	Paved roadways	LF	62.50	7900	$ 493,750	Unit rate based on vendor quotes, including shipping and installation. Unit rate includes 3" A.C., 16" of base course, 4" depth geo-cell, and geo-textile.
13	Quarry Spalls	TN	30.00	108	$ 3,240	Unit rate based on quote from Hawaiian Rock for material cost including delivery. Quantity based on 6 culverts with 2 outlets each.
14	Provide for Trench Excavation Safety Systems	LF	2.00	5600	$ 11,200	Unit rate based on previous comparable project winning bid. Quantity based on length of leachate collector trench Type 1 & Type 2.
	Earthwork Subtotal				**$ 857,190**	
	Landfill Gas System					
15	LFG Monitoring Probes	EA	12,000.00	5	$ 60,000	Based on engineer's estimate. Includes drill; dispose spoils; pipe/fittings; bentonite seal
16	LFG Interceptor	LF	20.00	6,405	$ 128,100	Unit rate based on previous comparable project winning bid. Includes trench; haul/dispose of spoils; geotextile; perforated CPE pipe/fittings; restore surface.
17	LFG Valve Station	EA	2,500.00	35	$ 87,500	Based on engineer's estimate. Includes trench; haul/dispose spoils; geotextile; HDPE pipe & fittings; valves; backfill; bentonite; boots.
18	LFG Extraction Wells	LF	105.00	1,870	$ 196,350	Based on engineer's estimate. Includes drill; dispose spoils; pipe/fittings for casing; gravel; bentonite seal; boot; wellhead' valve station.
19	LFG Headers	LF	32.00	7,630	$ 244,160	Based on engineer's estimate. Includes 6", 8", 10" HDPE pipe & fittings; trenching; haul/dispose spoils
20	LFG Flare Station	LS	250,000.00	1	$ 250,000	Based on engineer's estimate. Includes flare skid, blower skid; connect to site electrical & piping; concrete slabs; gravel surfacing; security fencing.
	Landfill Gas System Subtotal				**$ 966,110**	
	Leachate System					
21	Leachate Collector Trench - Type 1	LF	64.00	4,400	$ 281,600	Unit rate based on RS Means and vendor quote. Includes drain gravel, HDPE geomembrane, geotextile, 12" CPE pipe, 4" HDPE pipe, and 12" HDPE pipe.
22	Leachate Collector Trench - Type 2	LF	80.00	1,200	$ 96,000	Unit rate based on RS Means and vendor quote. Includes HDPE geomembrane, drain rock, geotextile, and 12" HDPE pipe.
23	Leachate Infiltration Trench	LF	3.50	26,300	$ 92,050	Unit rate based on RS Means and vendor quotes. Includes geotextile, geocomposite, and grain gravel.
24	Leachate Collector Cleanout	EA	2,000.00	9	$ 18,000	Unit rate based on previous comparable project winning bid.
25	Leachate Conveyance Pipe	LF	10.00	1,200	$ 12,000	Unit rate based on vendor's quote. Includes 4" HDPE pipe, installation, and delivery. Excavation and backfill is addressed in the "Leachate Trench" costs.
26	Leachate Storage Single-Wall Tank	EA	87,000.00	1	$ 87,000	Unit rate based on vendor's quote. Includes steel tank, delivery, fittings, and installation.
27	Secondary Containment Structure	EA	26,400.00	1	$ 26,400	Unit rate based on RS Means. Includes tank foundation and containment wall. All concrete assumed to be reinforced.
28	Leachate Conveyance Pipe to Tank Connection	LS	500.00	1	$ 500	Based on engineer's estimate.
29	Outlet Pipe	LS	6,000.00	1	$ 6,000	Unit rate based on vendor's quote.
30	Flowmeter	LS	4,000.00	1	$ 4,000	Unit rate based on previous comparable project.
31	Leachate Pump Station	EA	136,000.00	1	$ 136,000	Unit rate based on vendor quote. (Pump Trench Inc.)
32	Temporary Leachate Diversion	LS	20,000.00	1	$ 20,000	Based on engineer's estimate.
	Leachate System Subtotal				**$ 779,550**	
	Capping System					
33	Geocomposite	SY	6.50	354,130	$ 2,301,845	Unit rate based on quote from GSE including shipping and installation. Quantity based on entire site + 2nd layer on areas with 2.8:1 or shallower slopes.
34	HDPE Geomembrane - 80 mil textured	SY	7.50	265,250	$ 1,989,375	Unit rate based on quote from GSE for double sided texture HDPE. Quote includes delivery and installation.
35	Geogrid - Type 1	SY	5.50	236,550	$ 1,301,025	Unit rate based on vendor quote. Quantity is the entire site minus (top deck and lower areas with 2.8:1 or shallower slopes)
36	Native Fill	CY	15.00	98,210	$ 1,473,150	Unit rate based on soil being imported from Limitiaco Property and hauling cost based on RS Means.
37	Chain Link Fence	LS	30,000.00	1	$ 30,000	Unit rate based on RS Means, assuming 6' high, 9 gauge wire, aluminized steel, and two double gates. Quantity based on fence surrounding Dump on north side.
38	Infiltration Collector	LF	21.70	26,300	$ 570,710	Unit rate based on vendor quotes and RS Means. Includes drain gravel, geotextile, and 4" CPE pipe.
39	Strip Drains	LS	50,000.00	1	$ 50,000	Lump sum based on previous comparable project.
40	Anchor Trench	LF	6.00	22,000	$ 132,000	Unit rate based on RS Means and vendor quotes. Includes native fill and geomembrane . Quantity based on perimeter and downslopes anchor trenches.
	Capping System Subtotal				**$ 7,848,105**	
	Surface Water Systems					
41	ABM Perimeter Ditch	LF	135.00	4,000	$ 540,000	Unit rate based on RS Means and vendor quote. Includes ABM and excavation.
42	TRM Perimeter Ditch	LF	33.00	2900	$ 95,700	Unit rate based on RS Means and vendor quote. Includes turf reinforcement matting and excavation. Quantity based on north perimeter ditch and ditch on north side of Dero Drive.
43	Bench Ditches	LF	44.00	26,300	$ 1,157,200	Unit rate based on vendor quote and RS Means. Includes ABM excavation.
44	Chutes (Slope and Bench)	LF	153.00	3,630	$ 555,390	Unit rate based on vendor quote and RS Means. Includes ABM excavation.
45	Berms	LF	340.00	4,630	$ 1,574,200	Unit rate based on RS Means. Includes ABM, native fill, and ECM.
46	Detention Pond Earthwork	LS	33,000.00	1	$ 33,000	Unit rate based on RS Means for excavation and relocation of soil surrounding berms.
47	Detention Pond Structures	LS	36,000.00	1	$ 36,000	Based on engineer's estimate. Including spillway, inlet, outlet, manhole, surrounding erosion control blanket-type 1, and boulder weirs.
48	Detention Pond Liner	SY	9.30	5,100	$ 47,430	Unit rate based on vendor quote including HDPE geomembrane and geotextile.
	Surface Water Systems Subtotal				**$ 4,038,920**	

Ordot Dump Closure
Pre-Final Cost Estimate

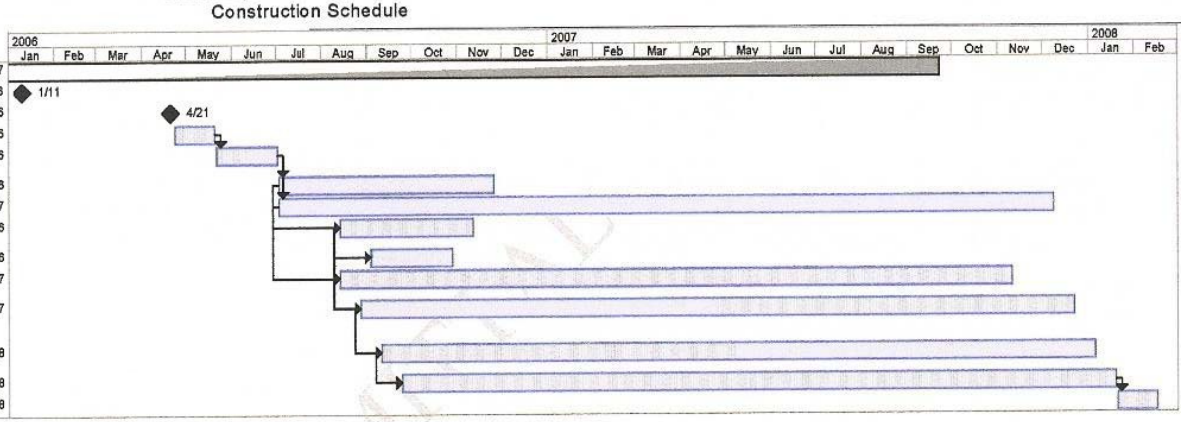
	Mechanically Stabilized Earth (MSE) Wall System					
49	Waste Excavation & Permanent Relocation	CY	10.00	135,450	$ 1,354,500	Unit rate based on RS Means assuming backhoe with 3 CY bucket, loading onto dump truck , and transporting waste to top of landfill.
50	Waste Excavation & Replacement	CY	20.00	50,300	$ 1,006,000	Unit rate based on RS Means assuming 12 CY dump truck, transportation to and from temporary stockpile, placement, and compaction.
51	Reinforced Backfill	CY	15.00	32,000	$ 480,000	Unit rate based on RS Means assuming soils from Guam International Airport.
52	Welded Wire Fabric	SY	54.00	2,415	$ 130,410	Unit rate based on vendor quote for face area of wall.
53	Geogrid - Type 2	SY	6.00	36,120	$ 216,720	Unit rate based on vendor quote from Tensar for material, shipping, and installation. Quantity includes 2.5% material waste factor.
54	Geogrid - Type 3	SY	5.50	15,680	$ 86,240	Unit rate based on vendor quote from Tensar for material, shipping, and installation. Includes 2.5% waste material.
55	Erosion Control Blanket - Type 1	SY	1.80	6,600	$ 11,880	Unit rate based on vendor quote (ACF West).
56	Seeding	SY	1.00	2,415	$ 2,415	Unit rate based on RS Means. Assume slope mix, hydro or air seeded with mulch and fertilizer.
57	Topsoil	CY	22.00	700	$ 15,400	Unit rate based on quote from Hawaiian Rock for material cost including delivery. Based on RS Means for installation.
	MSE Wall System Subtotal				**$ 3,303,565**	Reduction due to shortening wall length and decrease in wall height.
	Erosion and Sedimentation Control					
58	Silt Fence	LF	2.00	18,000	$ 36,000	Unit rate based on RS Means assuming polypropylene, 3' high, adverse condition. Quantity based on silt fence surrounding Dump. Estimated 12' wide Dero Drive ditch and streams. Fence placed every 100 ft for ditch and west stream. Placed at 2 locations each for both streams on south side.
59	Planting	AC	3,000.00	30	$ 90,000	Unit rate based on RS Means , assuming hydro seeding, with mulch and fertilizer. Quantity based on all bench areas and deck.
60	Geogrid Planting	AC	1,850.00	30	$ 55,500	Unit rate based on RS Means. Quantity based on slope areas
61	Temporary Soil Stabilization	LS	6,000.00	1	$ 6,000	Based on engineer's estimate. Including sand bags, sand bag berms, plastic sheeting, bonded fiber matrix, straw matting, etc.
62	Temporary Silt Fence Check Dam	EA	40.00	22	$ 880	Unit rate based on vendors quote.
	Erosion and Sedimentation Control Subtotal				**$ 188,380**	
	Electrical System					
63	Seductive Demolition, Operations Building	EA	8,375.00	1	$ 8,375	Based on engineer's estimate including core drilling and removal of existing electrical conduits, and patchwork.
64	Utility Service Charge / pad-mounted transformer	EA	5,500.00	1	$ 5,500	Based on engineer's estimate.
65	Transformer Pad, RC 6'x6'x8"	CY	431.00	1	$ 431	Unit rate based on 2005 Means Electrical Cost Data. Assumes: Foundation Mat under 10 CY. Includes: forms, reinforcing steel & finishing.
66	Generator Pad, RC 10'x5'x8"	CY	431.00	2	$ 862	Unit rate based on 2005 Means Electrical Cost Data. Assumes: Foundation Mat under 10 CY. Includes: forms, reinforcing steel & finishing.
67	Pull Box , 24"x16"x15" HDPE	EA	1,038.00	10	$ 10,380	Unit rate based on 2005 Means Electrical Cost Data. Assumes: fiberglass, wall mount, and quick release door.
68	Saw-cut Existing Pavement	SY	9.00	14	$ 126	Unit rate based on 2005 Means Electrical Cost Data.
69	Trenching, Excavation, & Backfill	LF	5.00	100	$ 500	Unit rate based on 2005 Means Electrical Cost Data. Assumes: 3/8 CY Backhoe, 2' wide, 3' deep, backfill and load spoil from stockpile, compaction, and removal of excess spoil.
70	Chain Link Fencing	LF	47.00	52	$ 2,444	Unit rate based on 2004 Means Heavy Construction Cost Data. Assumes: 6 gauge wire, 2.5" line posts, galvanized, set in concrete, 3-strands barb wire & 8' high.
71	Chain Link Gate	EA	230.00	2	$ 460	Unit rate based on 2004 Means Heavy Construction Cost Data. Assumes: 8' high.
72	Pavement Restoration	SY	66.00	34	$ 2,244	Unit rate based on 2004 Means Heavy Construction Cost Data. Assumes: 8" thick asphalt-concrete.
73	Grounding, Transformer	EA	1,000.00	1	$ 1,000	Based on engineer's estimate . Includes ground rods, connections, copper wire, and over-excavation.
74	Grounding, Generator	EA	1,200.00	1	$ 1,200	Based on engineer's estimate . Includes ground rods, connections, copper wire, and over-excavation.
75	Grounding, Service	EA	900.00	1	$ 900	Based on engineer's estimate . Includes ground rods, connections, copper wire, and over-excavation.
76	Conduit, 4" PVC	LF	25.00	100	$ 2,500	Unit rate based on 2005 Means Electrical Cost Data. Does not include trench excavation or backfill. Excavation and backfill will be addressed separately.
77	Conduit, 4" RGS	LF	73.00	20	$ 1,460	Unit rate based on 2005 Means Electrical Cost Data.
78	Conduit 2" PVC	LF	11.00	2,800	$ 30,800	Unit rate based on 2005 Means Electrical Cost Data. Does not include trench excavation or backfill. Excavation and backfill will be addressed separately.
79	Conduit, 2" RGS	LF	27.00	50	$ 1,350	Unit rate based on 2005 Means Electrical Cost Data.
80	Conduit, 1" PVC	LF	7.00	100	$ 700	Unit rate based on 2005 Means Electrical Cost Data. Does not include trench excavation or backfill. Excavation and backfill will be addressed separately.
81	Conduit, 1" RGS	LF	16.00	30	$ 480	Unit rate based on 2005 Means Electrical Cost Data.
82	Conduit, 3/4" RGS	LF	13.00	100	$ 1,300	Unit rate based on 2005 Means Electrical Cost Data.
83	Wire, 3/0 copper	CLF	464.00	116	$ 53,824	Unit rate based on 2005 Means Electrical Cost Data. Material assumed to be 600 volt type, THW, stranded, #14
84	Wire, 2/0 copper	CLF	387.00	7	$ 2,709	Unit rate based on 2005 Means Electrical Cost Data. Material assumed to be 600 volt type, THW, stranded, #14
85	Wire, 4 awg copper	CLF	178.00	28	$ 4,984	Unit rate based on 2005 Means Electrical Cost Data. Material assumed to be 600 volt type, THW, stranded, #14
86	Wire, 6 awg copper	CLF	136.00	4	$ 544	Unit rate based on 2005 Means Electrical Cost Data. Material assumed to be 600 volt type, THW, stranded, #14
87	Wire, 12 awg copper	CLF	68.00	4	$ 272	Unit rate based on 2005 Means Electrical Cost Data. Material assumed to be 600 volt type, THW, stranded, #14
88	Meterbase, 480V, 200A	EA	842.00	1	$ 842	Unit rate based on 2005 Means Electrical Cost Data. Assume double position, 4 terminal and 200A
89	Main circuit breaker, 200A, NEMA 1 enclosure	EA	2,056.00	1	$ 2,056	Unit rate based on 2005 Means Electrical Cost Data. Material assumed to be 600V, 3 pole, 225A
90	ATS, 200 A	EA	6,101.00	1	$ 6,101	Unit rate based on 2005 Means Electrical Cost Data. Assume: enclosed 480V, 3 pole, & 225A
91	Panelboard, 480V with 3 feeder CBs, 200A	EA	10,545.00	1	$ 10,545	Unit rate based on 2005 Means Electrical Cost Data. Assume: 400A Main, 42 circuits, with three 3-pole CB's.
92	Mini-power zone, 25 kVA	EA	6,530.00	1	$ 6,530	Based on engineer's estimate.
93	Diesel engine generator set, 100 kW	EA	46,719.00	1	$ 46,719	Unit rate based on 2005 Means Electrical Cost Data. Estimate includes battery, charger, muffler, automatic transfer switch and day tank.
94	Sub-base fuel tank, 330 gallons	EA	1,870.00	1	$ 1,870	Based on engineer's estimate. 350 gallon tank $1,100 (generatorjoe.net), assumed above ground, single wall, horizontal cylindrical shape. Multiplied by 1.7 to account for shipping and installation labor.
	Electrical System Subtotal				**$ 210,008**	
	Subtotal				**$ 20,318,328**	
	Gross Receipt Tax @ 4%				$ 812,733	
	Total with Territorial Taxes				**$ 21,131,061**	
	Cost Escalation Due to Inflation over 2 Years @ 6%				$ 1,267,864	
	Total Estimated Project Cost				**$ 22,398,925**	This value is +/- 10$ at this time.

ESTIMATED SCHEDULE

A schedule for the proposed construction of the closure of the Ordot Dump was provided to the VE Team and is reproduced on the following page. It calls for contractor mobilization in April 2006, with construction completion by February 2008.

Ordot Dump Closure
Guam Department of Public Works
Construction Schedule

ID	Task Name	Duration	Start	Finish
1	Landfill Receiving Waste	692 days	Fri 7/8/05	Sat 9/22/07
2	Advertise for Bids	0 days	Wed 1/11/06	Wed 1/11/06
3	Award Contract	0 days	Fri 4/21/06	Fri 4/21/06
4	Contractor Mobilization	24 days	Mon 4/24/06	Sat 5/20/06
5	Site Preparation (Staging Areas, Roads, Construction ESC, Pond)	36 days	Mon 5/22/06	Sat 7/1/06
6	Waste Excavation and Relocation	126 days	Mon 7/3/06	Sat 11/25/06
7	Grading	450 days	Mon 7/3/06	Sat 12/8/07
8	Leachate Collection System (Perimeter Trenches, Manholes, Pump Station, Tank)	78 days	Mon 8/14/06	Sat 11/11/06
9	MSE Wall	48 days	Mon 9/4/06	Sat 10/28/06
10	LFG System (Interceptors, Headers, Wells, Probes, Flare Station)	390 days	Mon 8/14/06	Sat 11/10/07
11	Cover System (Infiltration Trenches, Geosynthetics, Cover Soils, Infiltration Collection)	414 days	Mon 8/28/06	Sat 12/22/07
12	Surface Water Management System (Chutes, Ditches, Berms)	414 days	Mon 9/11/06	Sat 1/5/08
13	Vegetation and Final ESC	414 days	Mon 9/25/06	Sat 1/19/08
14	Contractor Demobilization	24 days	Mon 1/21/08	Sat 2/16/08



Date: Fri 7/8/05 | Active Waste Receipt | Task | Milestone

Notes:
1. Duration reflects working days, based on 6 working days per week.
2. Construction Schedule does not account for delays caused by significant storm events. Not-To-Extend date should have buffer to accomodate such events.

Idea Evaluation

IDEA EVALUATION

INTRODUCTION

The creative ideas generated by the VE team are carefully evaluated, and project-specific criteria are applied to each idea to assure an objective evaluation.

EVALUATION PROCESS

The VE team, as a group, generated and evaluated ideas on how to perform the various functions. The idea list was grouped by function. Ideas were evaluated by the team as a group.

The team compared each of the ideas with the original concept for each of the key performance attributes to determine whether it was better than, equal to, or worse than the original concept. The team reached a consensus on the ranking of the idea. High-ranked ideas would be developed further; low-ranked ones would be dropped from further consideration.

The key performance attributes considered during the evaluation process included:

- Operational Impacts
- Materials Availability
- Schedule
- Construction Process
- Environmental Impacts

IDEA EVALUATION FORMS

All of the ideas that were generated during the creative phase using brainstorming techniques were recorded on the following Idea Evaluation forms.

All readers are encouraged to review the creative idea list, because even the low-ranked ideas may suggest additional ideas that can be applied to the design.

IDEA EVALUATION *Ordot Dump Closure, Guam*											VMS
Ideas		**Performance Criteria**					**Advantages**	**Disadvantages**	**$**	**Rank**	
No.	**Function**	**OI**	**MA**	**S**	**CP**	**EI**					
MANAGE FLUIDS (MF)											
MF-1	Divert stormwater around landfill	0	0	0	0	+1	• Reduces run-on • Reduces leachate generation • Satisfies one operational criteria • Effectively separates leachate from stormwater	• None apparent	0	3	
MF-2	Collect stormwater in drains and chutes and take off landfill – before closure activities	-1	0	0	0	+1	• Reduce leachate production prior to closure • Supports early compliance	• Impacts daily operations • Needs to be reconstructed during closure	0	3	
MF-3	Create dump fires to drive off moisture									1	

Ranking Scale:	**5 = Cost and Performance Improvement** **2 = Cost and Performance Reduction**	**4 = Cost or Performance Improvement** **1 = Does Not Meet Project Purpose and Need**	**3 = Minor Improvements** **BD = Being Done**
Evaluation Criteria:	**Significant Improvement +2, +1, 0, -1, -2 Significant Degradation**		
Performance Attributes:	**OI = Operational Impacts** **CP = Construction Process**	**MA = Materials Availability** **EI = Environmental Impacts**	**S = Schedule**

IDEA EVALUATION
Ordot Dump Closure, Guam

Ideas		Performance Criteria					Advantages	Disadvantages	$	Rank
No.	**Function**	**OI**	**MA**	**S**	**CP**	**EI**				
MF-4	Regrade existing top deck to better shed fluid	0	0	+1	0	+1	• Eliminates ponding • Reduces infiltration • Reduces leachate production • Helps prepare for closure construction • Improves housekeeping • Satisfies operational criteria	• Requires dedication of some manpower and equipment	0	3
MF-5	In lieu of large detention pond, use smaller independent desiltation system in various areas (e.g., distributive flow)	0	0	+1	+1	+1	• Eliminates wetland impact on south side • Improves recharge to existing wetlands on west side • Simplifies construction process • Eliminates complex structure and outlet works • Should be simpler to maintain	• May complicate NPDES • May need 401 and 404 permits	+1	4

Ranking Scale: **5 = Cost and Performance Improvement** **4 = Cost or Performance Improvement** **3 = Minor Improvements**
2 = Cost and Performance Reduction **1 = Does Not Meet Project Purpose and Need** **BD = Being Done**

Evaluation Criteria: **Significant Improvement +2, +1, 0, -1, -2 Significant Degradation**

Performance Attributes: **OI = Operational Impacts** **MA = Materials Availability** **S = Schedule**
CP = Construction Process **EI = Environmental Impacts**

IDEA EVALUATION *Ordot Dump Closure, Guam*										
Ideas		**Performance Criteria**					**Advantages**	**Disadvantages**	**$**	**Rank**
No.	**Function**	**OI**	**MA**	**S**	**CP**	**EI**				
MF-6	Put gas collection headers and piping above barrier layer, but below grade	0	0	0	0	0	• Improves post-closure maintenance • Do not need to repair barrier as a result of maintenance activities • Reduces life cycle costs for maintenance	• Would be exposed on slopes and subject to typhoon damage	+1	4
MF-7	Utilize a passive gas collection system	0	0	+1	0	-1	• Much simpler system • Minimal operations and maintenance needed	• May not qualify under Title 5 rules • Need to resist typhoon forces • Aesthetically unpleasing	+1	4
MF-8	Install gas to energy system							• Already shown not to be cost effective		2

Ranking Scale:	**5 = Cost and Performance Improvement**	**4 = Cost or Performance Improvement**	**3 = Minor Improvements**
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Performance Attributes:	**OI = Operational Impacts**	**MA = Materials Availability**	**S = Schedule**
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IDEA EVALUATION *Ordot Dump Closure, Guam*										
Ideas		**Performance Criteria**					**Advantages**	**Disadvantages**	**$**	**Rank**
No.	**Function**	**OI**	**MA**	**S**	**CP**	**EI**				
MF-9	Collect and remove landfill gas condensate in lieu of returning to waste	0	-1	0	0	+1	• Reduces amount of leachate • Reduces degradation of leachate composition	• Increases volume of fluid disposal • Additional operational and maintenance process	-1	2
MF-10	Treat leachate through a constructed wetland						• Proven technology for leachate disposal • Considered a "Green" solution • Supports wetland development	• Applicability depends on the composition of the leachate • May have public opposition • Requires monitoring of water quality	+1	4
MF-11	Treat leachate through an aerate system	0	-1	0	0	+1	• Eliminates need for sewer conveyance system (pipes and pumps) • Simplifies industrial discharge process	• Applicability depends on the composition of the leachate • NEEDS pond or package plant electricity, etc. • Process is complex	0	3

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IDEA EVALUATION
Ordot Dump Closure, Guam

Ideas		Performance Criteria					Advantages	Disadvantages	$	Rank
No.	Function	OI	MA	S	CP	EI				
MF-12	Utilize pipeline to convey leachate to sanitary sewer system	0	0	0	0	+1	• Better LCC • No labor or equipment required • Less disruption or need for additional surface facilities • No maintenance or operations	• None apparent	+1	5
MF-13	Use leachate for bioreactor	0	0	0	0	+1	• Accelerates decomposition of waste • Productive use of leachate • Eliminates piping, storage, and pumping of leachate • Eliminates sanitary sewer connection • Proven technology	• May not be acceptable to regulatory agencies (unlined dump) • Need to demonstrate no negative hydrogeologic impacts • Too expensive and difficult to permit	-2	2
MF-14	Eliminate leachate drainage layer (geocomposite) on top deck	+1	+1	0	0	0	• Simplifies cover	• None apparent	+1	4

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Ideas		**Performance Criteria**					**Advantages**	**Disadvantages**	**$**	**Rank**
No.	**Function**	**OI**	**MA**	**S**	**CP**	**EI**				
MF-15	Replace ABM with asphalt	0	+1	0	0	0	• Easy to repair • Can use local labor to install and maintain • Does not need to be imported	• Life cycle maintenance may increase due to exposure	+1	4
MF-16	Replace ABM with gunite	0	+1	0	0	0	• Can use local labor to install and maintain • Does not need to be imported	• Brittle, requiring crack repair (may need welded wire or other reinforcement) • Life cycle maintenance may increase due to exposure • Subject to scour	+1	2

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Ideas		**Performance Criteria**					**Advantages**	**Disadvantages**	**$**	**Rank**
No.	**Function**	**OI**	**MA**	**S**	**CP**	**EI**				
MF-17	Replace ABM geotextile erosion mat/vegetation	0	+1	0	0	0	• Available on island • Easy to install	• May require replacement after severe weather • May not handle high velocities unless anchored on sides	+1	3
MF-18	Replace concrete chutes (ABM) with galvanized metal chutes	0	0	0	0	0	• Easy to install • Common application to landfills • Easy to repair	• May not be stable in high winds • May be subject to corrosion over time	+1	3
MF-19	Replace concrete chutes with PVC pipe	-1	+1	-1	-1	0	• None apparent	• Big pipe or multiple pipes needed	-1	2
MF-20	Replace concrete chutes with shot rock surface	0	0	0	0	0	• Easy to install • Locally available materials	• May be limited by velocity • Can be undermined • Production could be costly	0	2

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Ideas		**Performance Criteria**					**Advantages**	**Disadvantages**	**$**	**Rank**
No.	**Function**	**OI**	**MA**	**S**	**CP**	**EI**				
MF-21	Replace ABM with coral cobbles	0	+1	0	0	0	• Easy to install • Locally available materials	• May be limited by velocity • Can be undermined • May not be durable enough (higher LCC)	-1	2
MF-22	Select/plant vegetation that will increase evapotranspiration of fluids									BD
MF-23	Apply spray-on compound (tactify) to surface	0	-1	0	0	+1	• Reduces dusting • Increases runoff/reduce infiltration • Reduces erosion • Easy to apply	• Costly • May have to be reapplied	-1	2

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Ideas		**Performance Criteria**					**Advantages**	**Disadvantages**	**$**	**Rank**
No.	**Function**	**OI**	**MA**	**S**	**CP**	**EI**				
MF-24	Put shingle tarps on surface	-1	0	0	0	+1	• Temporary cover to reduce infiltration during closure (alternative daily cover) • Reduces vectors	• Hard to hold on steep slopes, especially in high wind • Labor intensive • High maintenance needed	0	3
MF-25	Put leachate treatment plant on site and discharge treated leachate to the environment	0	-1	0	-1	+1	• Does not go to sanitary sewer	• Requires space to locate • Requires special skills to operate and maintain	-1	2
MF-26	Put a water quality monitoring system in place for leachate and surface water	0	0	0	0	+1	• Needed, but may being done in post-closure	• None apparent	-1	3
MF-27	Reevaluate input parameters to HELP Model for site-specific reasonableness to Ordot	0	0	0	0	+2	• Essential for accurate design • Optimizes operations	• None apparent	0	4

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IDEA EVALUATION *Ordot Dump Closure, Guam*										
Ideas		**Performance Criteria**					**Advantages**	**Disadvantages**	**$**	**Rank**
No.	**Function**	**OI**	**MA**	**S**	**CP**	**EI**				
MF-28	Hydroseed slopes and benches (with tacking compound) early in construction process to eliminate detention pond	-1	0	+1	+1	0	• Reduces soil erosion during initial growth of vegetation • May eliminate need for detention pond once vegetation is established	• Most slopes covered with FML • Requires additional erosion control measures (e.g., silt fences or coite rolls)	+1	4

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Ideas		**Performance Criteria**					**Advantages**	**Disadvantages**	**$**	**Rank**
No.	**Function**	**OI**	**MA**	**S**	**CP**	**EI**				
ENCLOSE DUMP (ED)										
ED-1	Use prescribed cover	+1	+2	+2	+2	0	• Meets regulatory requirement • Easy to construct • Easy to maintain • Flexible – more forgiving • Easier to address fires	• Steep slopes make soil cover difficult without flattening the slopes • Requires redesign	+2	5
ED-2	Change site geometry with benches at 45- to 50-foot height (or less as appropriate) as in California	0	+1	+1	+1	0	• Allows flattening of slopes between benches • Allows application of soil to slopes as part of barrier cover in lieu of FML • Eliminates need for geogrid MSE walls shown on each bench (see sheet C12) • Safer for public	• Needs to be evaluated relative to local practice • May impact available airspace	+1	5
ED-3	Eliminate MSE wall									2

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IDEA EVALUATION
Ordot Dump Closure, Guam

Ideas		Performance Criteria					Advantages	Disadvantages	$	Rank
No.	Function	OI	MA	S	CP	EI				
ED-4	Replace MSE wall at toe of west edge with shorter soldier beam and concrete lagging wall	0	+2	+1	+2	0	• Much smaller wall • Uses local skills and products • Most of wall eventually buried under slope cover	• May need riprap slope toe to resist scour from 25-year storm in brook	+2	5
ED-5	On west side, shift toe of slope further west (with ED-6 and ED-7)	0	+2	+1	+1	-1	• Allows flattening of slopes • Supports use of prescriptive cover • Improves safety	• May need to purchase additional strip of land • May require additional wetlands mitigation • Need 401 and 404 permits	+2	5
ED-6	Relocate No-name brook on west side further west	0	+2	+1	+1	-1	• Allows flattening of slopes • Supports use of prescriptive cover • Improves safety	• May need to purchase additional strip of land • May require additional wetlands mitigation • Need 401 and 404 permits	+2	5

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IDEA EVALUATION *Ordot Dump Closure, Guam*										
Ideas		**Performance Criteria**					**Advantages**	**Disadvantages**	**$**	**Rank**
No.	**Function**	**OI**	**MA**	**S**	**CP**	**EI**				
ED-7	Convey no-name brook through culvert or pipe	0	+2	+1	+1	-1	• Allows flattening of slopes • Supports use of prescriptive cover • Improves safety	• May need to purchase additional strip of land • May require additional wetlands mitigation • Need 401 and 404 permits • May require additional maintenance for blockage	+2	4
ED-8	Lay west slope back	0	+2	+1	+1	0	• Allows flattening of slopes • Supports use of prescriptive cover • Improves safety	• Lose airspace • Need to relocate waste • May have fatal flaw, depending on amount of waste to move into available airspace	+1	3

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IDEA EVALUATION
Ordot Dump Closure, Guam

Ideas		Performance Criteria					Advantages	Disadvantages	$	Rank
No.	**Function**	**OI**	**MA**	**S**	**CP**	**EI**				
ED-9	Replace HDPE with GCL on top deck	0	0	+1	+1	0	• Self-sealing (e.g., punctures seal on their own) when hydrated • Easy to install • No welding needed • Very easy to repair • 10E-11 cm/sec permeability • Much less than CQA needed during post-closure	• Subject to cation exchange • Requires use of two FML materials	+2	4
ED-10	Replace HDPE with asphalt	0	+1	0	+1	0	• Increases runoff • Easy to repair	• Increases runoff • Oil-based products are costly	0	2
ED-11	Reduce 80-mil HDPE to 60-mil HDPE	0	0	0	0	0	• None apparent	• Cost cutting option • May not resist high winds and uplift	+1	2
ED-12	Use white HDPE where exposed on side slopes									1

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Ideas		**Performance Criteria**					**Advantages**	**Disadvantages**	**$**	**Rank**
No.	**Function**	**OI**	**MA**	**S**	**CP**	**EI**				
ED-13	Use other FMLs in lieu of HDPE	0	0	0	0	0	• Used LDPE in Hawaii • Easier to handle • Can get from Japan • More flexible	• Easier to penetrate	+1	4
ED-14	Use a monolithic cap in lieu of layered cap							• Not enough room • Would be very thick • Would not be approved		2
ED-15	Amend high permeability soils with bentonite							• Not practical in this application		2
ED-16	Utilize green waste as a layer in the final cap	0	0	-1	0	+1	• Reduces need for some soil • Utilizes space-occupying waste • Reduces erosion	• Needs shredding	0	3

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Ideas		**Performance Criteria**					**Advantages**	**Disadvantages**	**$**	**Rank**
No.	**Function**	**OI**	**MA**	**S**	**CP**	**EI**				
ED-17	Use Navy dredge spoils as cover material	0	+1	0	-1	-1	• May be low permeability material • Could generate revenue from supplier needing to dispose of material	• May be contaminated • May be odorous • Needs to dry before use	0	3
ED-18	Purchase additional land to facilitate geometry of closure (see ED-6 and ED-7)									BD
ED-19	Compact landfill mass in situ using deep dynamic compaction							• Not practical		2
ED-20	Mine the waste							• Not practical		2
ED-21	Relocate sufficient waste to facilitate geometry	0	+1	-1	-1	-1	• Allows prescriptive cover without land purchase • Achieve more stable geometry	• Other sites may not be available	-1	2

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Ideas		**Performance Criteria**					**Advantages**	**Disadvantages**	**$**	**Rank**
No.	**Function**	**OI**	**MA**	**S**	**CP**	**EI**				
ED-22	Design landfill for bioreactive process (see MF-13)								-2	2
ED-23	Mandate all grading projects deliver excess clean material to Ordot for use as daily cover	+1	0	0	0	+1	• Efficient use of excess material from grading projects • Could be cost effective, reducing volume of purchased cover • Assists in meeting operational criteria	• Unknown origin, quality, contamination potential	+1	3
ED-24	Negotiate purchase option of soil from property owner to the north	0	+1	+1	+1	0	• Good soil is readily available next door • Protects source for several years from being sold to other buyer	• Requires legal support	+1	3

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Ideas		**Performance Criteria**					**Advantages**	**Disadvantages**	**$**	**Rank**
No.	**Function**	**OI**	**MA**	**S**	**CP**	**EI**				
ED-25	Assure safety associated with exposed waste slope created during MSE wall construction	0	0	0	0	0	• Eliminates risk of very tall slope	• None apparent	0	3
ED-26	Relocate residents west of dump during MSE wall construction	0	0	0	0	+1	• May be needed regardless • Protects public health and safety	• Public satisfaction would be difficult to achieve	-1	3

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IDEA EVALUATION *Ordot Dump Closure, Guam*								VMS		
Ideas		**Performance Criteria**					**Advantages**	**Disadvantages**	**$**	**Rank**
No.	**Function**	**OI**	**MA**	**S**	**CP**	**EI**				
MEET SCHEDULE (MS)										
MS-1	Knowingly violate with notice	0	0	-1	0	0	• Provides schedule flexibility	• Get Notice of Violations • Possible fine associated with Consent Decree	0	3
MS-2	Open/regular communication/meetings among all stakeholders	0	0	+1	0	0	• Provides flexibility in closure process • Enhances potential for success • Supports interests of Guam residents • Creates common interest and goals	• None apparent	0	3
MS-3	Add incentive clause to contractor to accelerate schedule	0	0	+1	0	0	• Might advance schedule to meet consent decree	• None apparent	+1	3

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Ideas		**Performance Criteria**					**Advantages**	**Disadvantages**	**$**	**Rank**
No.	**Function**	**OI**	**MA**	**S**	**CP**	**EI**				
MS-4	Stop receipt of waste by October 2007	-1	0	+1	0	0	• May allow more time to complete work— managing facility with intermittent cover until final cover is in place	• Incorrect, as it may not meet closure criteria; e.g., completed construction of closure improvements • Needs clarification from USEPA as to what complete closure means	0	3
MS-5	Stop receipt of waste by October 2007 and divert later waste to Marpi							• Not practical except in emergency		2
MS-6	Stop receipt of waste by October 2007 and divert later waste to military landfills							• Military landfills are in the process of closing and will not accept outside waste • Not practical		2

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Ordot Dump Closure, Guam

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No.	**Function**	**OI**	**MA**	**S**	**CP**	**EI**				
MS-7	Incinerate waste							• Not enough tonnage • Big, expensive project		2
MS-8	Return RCRA approved state status to USEPA for them to close dump						• Transfers responsibility from Guam EPA to USEPA	• None apparent		1
MS-9	Use MSE composting in lieu of landfilling	0	0	0	0	+1	• Saves future airspace • Ordot no longer operated as active dump, but continued to use as composting facility	• Need to deal with residue • Still need to close	-1	2
MS-10	Modify schedule to make it more realistic	0	+1	+1	0	-1	• Cut costs and get job done • Easier to build if more time is allowed	• May generate fines	0	3

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No.	**Function**	**OI**	**MA**	**S**	**CP**	**EI**				
MS-11	Accelerate development of first Dandan cell (including access road)	0	+1	+1	0	0	• Better assures meeting consent decree schedule • Cease receiving waste at Ordot sooner • Greater opportunity to modify schedule	• Availability of sufficient funds • Local land use rezoning • Need to acquire property	-1	3
MS-12	Leave dump deck as interim landfill as part of closure and put in permit							• Requires agreement/ cooperation between regulatory bodies and DPW		1
MS-13	Satisfy clean water issues now (stop discharges of leachate to river) and request modification schedule in consent decree	+1	+1	+1	0	+2	• Protects environment earlier • More flexibility in interagency negotiations on decree and schedule	• Will accelerate schedule and expenditure of resources	0	4

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No.	**Function**	**OI**	**MA**	**S**	**CP**	**EI**				
MS-14	Clarify poorly defined areas in Consent Decree that makes it difficult to meet requirements	0	0	0	0	0	• Can redo schedule • Can define "complete closure" • More time to establish funding	• Difficult to convince agencies and could create ill will	0	3
MS-15	Privatize remaining life of Ordot	+1	0	0	+1	0	• One responsible party • Eliminates conflicts of DPW and contractor trying to operated at same time	• Short term may make this a difficult sell • Contractor may not want liability associated with operations	0	3
MS-16	Delay until typhoon allows turning responsibility over to FEMA									1

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IDEA EVALUATION *Ordot Dump Closure, Guam*										
Ideas		**Performance Criteria**					**Advantages**	**Disadvantages**	**$**	**Rank**
No.	**Function**	**OI**	**MA**	**S**	**CP**	**EI**				
MS-17	Institute regular environmental compliance monitoring program immediately	0	0	0	0	+1	• Proactive and adds flexibility • Meet immediate operational requirements • Starts building information data base	• None apparent	+1	3
MS-18	Bring Environmental Compliance Officer on board as part of interim operations and through closure	0	0	0	0	+1	• Proactive and adds flexibility • Meet immediate operational requirements	• Adds staff to DPW	0	3
MS-19	Combine Dandan and Ordot as a single privatized contract (construct/operate/ maintain)	0	0	0	0	0	• Attracts qualified contractors/operators • Relieves DPW of direct obligations to maintain and post close facility • Provides funding stream to front end project	• May not be economical in the long term	-1	3

Ranking Scale:	**5 = Cost and Performance Improvement**	**4 = Cost or Performance Improvement**	**3 = Minor Improvements**
	2 = Cost and Performance Reduction	**1 = Does Not Meet Project Purpose and Need**	**BD = Being Done**
Evaluation Criteria:	**Significant Improvement +2, +1, 0, -1, -2 Significant Degradation**		
Performance Attributes:	**OI = Operational Impacts**	**MA = Materials Availability**	**S = Schedule**
	CP = Construction Process	**EI = Environmental Impacts**	

IDEA EVALUATION
Ordot Dump Closure, Guam

Ideas		Performance Criteria					Advantages	Disadvantages	$	Rank
No.	Function	OI	MA	S	CP	EI				
MS-20	Impose liquidated damages on contractor for failing to meet schedule						• Protects schedule	• Could add cost		BD
MS-21	Get all government agencies to comply with executive order, with penalties, mandating that processing of all documents relating to consent decree occur within five days	0	0	+1	0	0	• Gets things moving along • Reduces delays that impact ability to meet the Decree	• Requires political will to accomplish	0	3
MS-22	Explore other funding mechanisms such as import taxes, tourist taxes, real estate taxes, etc.						• Essential to success of project			3
MS-23	Create separate Solid Waste Authority to manage and finance landfill closure and operations	0	0	0	0	0	• More efficient in funding • Autonomous • Independent agency • Authority to raise funding	• New level of bureaucracy	-1	3

Ranking Scale: **5 = Cost and Performance Improvement** **4 = Cost or Performance Improvement** **3 = Minor Improvements**
2 = Cost and Performance Reduction **1 = Does Not Meet Project Purpose and Need** **BD = Being Done**

Evaluation Criteria: **Significant Improvement +2, +1, 0, -1, -2 Significant Degradation**

Performance Attributes: **OI = Operational Impacts** **MA = Materials Availability** **S = Schedule**
CP = Construction Process **EI = Environmental Impacts**

IDEA EVALUATION
Ordot Dump Closure, Guam

Ideas		Performance Criteria					Advantages	Disadvantages	$	Rank
No.	**Function**	**OI**	**MA**	**S**	**CP**	**EI**				
GENERAL IDEAS (GI)										
GI-1	Develop public outreach/education program	0	0	0	0	+1	• Essential for project success	• None		3
GI-2	Prohibit construction/demolition/green waste (unless shredded), etc. in Ordot						• C and D already being done			BD
GI-3	Don't permit future public park	0	0	0	0	0	• Will not be ready for public use for decades • Site lacks protection for public safety	• Public is clamoring for use of property	0	3
GI-4	Make site safe for public access and use	0	0	0	0	0	• Will allow eventual use by public	• Current geometry makes this difficult to accomplish	-1	3

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Performance Attributes:	**OI = Operational Impacts**	**MA = Materials Availability**	**S = Schedule**
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IDEA EVALUATION *Ordot Dump Closure, Guam*										
Ideas		**Performance Criteria**					**Advantages**	**Disadvantages**	**$**	**Rank**
No.	**Function**	**OI**	**MA**	**S**	**CP**	**EI**				
GI-5	Develop training program for staff	0	0	0	0	+1	• Enhances success of compliance • Better equipped to conduct operational activities	• Lack of resources • Candidates should have some minimum level of scientific expertise	-1	3
GI-6	Install complete perimeter fence	0	0	0	0	0	• Supports site safety by limiting unauthorized access • Minimizes malicious use by trespassers • Helps with keeping pigs out	• Not needed due to isolation • Additional maintenance	-1	3
GI-7	Monitor/investigate for internal fires prior to and after post closure	0	0	0	0	+1	• Catch it early and mitigate • Need to develop fire mitigation plan	• None apparent	0	4
GI-8	Obtain reliable heavy equipment to serve site	+2	0	0	0	0	• Will enhance ability to complete closure construction	• Short timeframe to accomplish • Funding not available	-1	3

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IDEA EVALUATION
Ordot Dump Closure, Guam

Ideas		Performance Criteria					Advantages	Disadvantages	$	Rank
No.	Function	OI	MA	S	CP	EI				
GI-9	Replace candlestick flare with enclosed flare	0	0	0	0	+1	• More aesthetic • Better destruction of contaminants	• None apparent	-1	4
GI-10	Assure that adequate redundancy exists in design	0	0	0	0	+1	• Avoids problems associated with system/equipment failure • Higher probability of continued regulatory compliance	• Adds components and equipment to facility • Adds maintenance	-1	3
GI-11	Identify off-site location of temporary waste storage stockpile areas associated with planned MSE wall construction	+1	0	0	+1	+1	• Avoids expecting contractor to make this selection during construction • Supports intent of design • Less temporary storage on-site, improving operations	• Public resistance • Need to consider environmental impacts of new site	0	3

Ranking Scale: **5 = Cost and Performance Improvement** **4 = Cost or Performance Improvement** **3 = Minor Improvements**
2 = Cost and Performance Reduction **1 = Does Not Meet Project Purpose and Need** **BD = Being Done**

Evaluation Criteria: **Significant Improvement +2, +1, 0, -1, -2 Significant Degradation**

Performance Attributes: **OI = Operational Impacts** **MA = Materials Availability** **S = Schedule**
CP = Construction Process **EI = Environmental Impacts**

IDEA EVALUATION
Ordot Dump Closure, Guam

Ideas		Performance Criteria					Advantages	Disadvantages	$	Rank
No.	Function	OI	MA	S	CP	EI				
GI-12	Identify optional onsite location for temporary waste storage stockpile areas associated with MSE wall construction									BD
GI-13	Process trash that needs to be relocated so it can be used as daily cover									
GI-14	Define procedures for following the filling plan to assure that work is staying within the plan and matches the final grading plan	+1	0	0	+1	0	• More efficient closure	• None apparent	0	3
GI-15	Confirm adequacy of guardrail design as anchored into MSE fill	0	0	0	0	0	• Defines an issue that is currently missing from drawings	• None apparent	0	3
GI-16	Make Navy responsible partner in closure process and funding	0	0	0	0	0	• Provides potential funding source	• Difficult to convince them that their participation is significant or required	+1	3

Ranking Scale: **5 = Cost and Performance Improvement** **4 = Cost or Performance Improvement** **3 = Minor Improvements**
2 = Cost and Performance Reduction **1 = Does Not Meet Project Purpose and Need** **BD = Being Done**

Evaluation Criteria: **Significant Improvement +2, +1, 0, -1, -2 Significant Degradation**

Performance Attributes: **OI = Operational Impacts** **MA = Materials Availability** **S = Schedule**
CP = Construction Process **EI = Environmental Impacts**

IDEA EVALUATION *Ordot Dump Closure, Guam*										
Ideas		**Performance Criteria**					**Advantages**	**Disadvantages**	**$**	**Rank**
No.	**Function**	**OI**	**MA**	**S**	**CP**	**EI**				
GI-17	Encourage future political candidates to state position and plans associated with closure	0	0	0	0	0	• Keeps project on the front burner	• None apparent	0	3
GI-18	Permit conditions outside of 40CFR258 are not applicable/clarify draft permit	+1	0	0	0	0	• A clear permit is implementable • Now is the time for this input	• None apparent	0	3

Ranking Scale:	**5 = Cost and Performance Improvement**	**4 = Cost or Performance Improvement**	**3 = Minor Improvements**
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VE Process

VALUE ENGINEERING PROCESS

GENERAL

This report section describes the procedures used during the Value Engineering Study. It is followed by separate write-ups and conclusions concerning the topics noted below:

- VE Study Agenda
- VE Study Participants and Daily Attendance Sheets

A systematic approach was used in the VE study and the key procedures followed were organized into three distinct parts: (1) pre-study preparation, (2) VE study, and (3) post-study procedures.

PRE-STUDY PREPARATION

In preparation for the VE study, the facilitator (CVS) and VE team members attended an Orientation Meeting. At this meeting the Agency representatives presented an overview of the project, decisions that have influenced the development of the project, and its current status. This included an overview of the project and its operational requirements, which enhanced the VE team's knowledge and understanding of the project. This was followed by a site trip.

In the weeks between the Orientation Meeting and the start of the VE study, the VE team reviewed documents provided by the designer to become better prepared for the study.

VE STUDY

This value engineering study was a five-day study effort. The VE job plan was followed to guide the teams in the search of high cost areas in the design and in developing alternative solutions for consideration. The job plan phases are:

- Information Phase
- Function Analysis Phase
- Creative Phase
- Evaluation Phase
- Development Phase
- Presentation Phase

Information Phase

At the beginning of the VE study, the design team presented a more detailed review of the design and the various systems. This included an overview of the project and its operational requirements, which further enhanced the VE team's knowledge and understanding of the project. Guam DPW officials answered questions posed by the VE team regarding the design.

Function Analysis Phase

Key to the VE process are the function analysis techniques used during the Function Analysis Phase. Analyzing the functional requirements in a project design is key to assuring an owner that the project has been designed to meet the stated criteria. The analysis of these functions in terms of cost and design is a primary element in a VE study, and is used to develop alternatives without removing necessary items. This procedure is beneficial to the VE team, as it forces the participants to think in terms of functions and their related worth, and ensures that all the team members agree on the project scope. This facilitates a comprehensive analysis of the project design.

Creative Phase

This VE study phase involves identifying and listing creative ideas. During this phase, the VE team participates in a brainstorming session to identify as many means as possible to provide the necessary functions within the project. Judgment of the ideas is not permitted at this point. The VE team looks for a large quantity of ideas and association of ideas. The idea list is grouped by category.

The creative idea worksheets listing all ideas suggested during the study are provided in this report. These ideas should be reviewed, since they may contain ideas that are worthy of further evaluation and may be used as the design develops. These ideas could also help stimulate additional ideas by others.

Evaluation Phase

The purpose of the evaluation phase is to systematically reduce the large number of ideas generated during the creative phase to a number of concepts that appear promising in meeting the project objectives. The key criteria against which the ideas need to be evaluated were identified as cost, schedule, agency impact, and public impact. Each idea was tested with respect to these criteria to determine if it added or removed value from the original concept. Once each idea is fully evaluated, it is given a total rating number. This is based on a scale of 1 to 5, as indicated by the following rating index:

5 Improves Cost & Performance—the project will benefit greatly. Significant cost and/or significant functional improvements.

4 Improves Cost or Performance—will improve the project. Some cost and/or other functional improvements.

3 Technically Feasible— but will require additional analysis to verify if cost and/or functional improvements are possible. May challenge design criteria. Needs further development.

2 Scope Reduction—will reduce cost, but at the expense of project performance.

1 Significant disadvantages – drop from consideration.

Based upon the total rating, ideas rated positively were developed further and documented on the Value Engineering Alternative forms. Those rated as 4 or 5 were developed into alternatives. Those rated as as 3 were developed as suggestions. The balance were dropped from further consideration.

Development Phase

During the development phase, each idea was expanded into a workable solution. The development consisted of the recommended design, life cycle cost comparisons, and a descriptive evaluation of the advantages and disadvantages of the proposed alternatives. Each alternative was written with a brief narrative to compare the original design to the proposed change. Sketches and design calculations, where appropriate, were also prepared during this part of the study. The VE alternatives are included in the VE Alternatives section of this report.

Presentation Phase

The VE study concludes with a preliminary presentation of the VE alternatives that have been developed. This provides others impacted by the results of the study with an opportunity to preview the alternatives and develop an understanding of the rationale behind them.

POST-STUDY PROCEDURES

The post-study portion of the VE study includes the preparation of this Draft Value Engineering Study Report incorporating a description of the VE study and the alternatives developed for consideration. The report will be reviewed by Guam Department of Public Works (DPW), and comments will be incorporated into the Final Value Engineering Study Report. An optional implementation meeting via teleconference may be scheduled with the DPW, if requested. The VE Team Leader will participate to help clarify any VE recommendations and assist in the resolution of the VE alternatives.

The proposed schedule for post-study procedures follows.

- Receive Draft Report ..... November 11, 2005
- MWD Review Report and Comments to VE Team..... November 25, 2005
- Final VE Report .....December 13, 2005

REFERENCES

The post-study portion of the VE study includes the preparation of this Draft Value Engineering Study

- Dueñas Project Team (DPT), 2005a Ordot Dump Operations Plan, May 2005
- Dueñas Project Team (DPT), Ordot Dump Closure, Final Environmental Baseline Survey, 2005
- USEPA Code of Federal Regulations, 1998, Title 40, Chapter 7, Parts 51, 52, and 60
- Title 22, Division 4, Chapter 23, Article 6 (§23601) of the Rules and Regulations for the Guam Environmental Protection Agency (GEPA) Solid Waste Disposal

Day 1 – Monday, October 24, 2005

8:00-8:15	Introductions (All)
8:15-8:45	Brief Overviews of the VE Agenda and Process (Ron Tanenbaum)
8:45-9:15	Agency Comments: Issues, Objectives and Constraints (Guam DPS, Stakeholders)
9:15-11:30	Project Overview (Detailed Presentation by Designer Project Manager and Engineers)
11:30-12:00	Identify Performance Attributes and Rate Baseline (All)
12:00-1:00	Lunch
1:00-3:00	Site Visit
3:00–5:00	Identify Observations made on Site Visit, Critical Issues, Project Constraints

Day 2 – Tuesday, October 25, 2005

8:00-8:30	Recap of First Day/Additional Information Review
8:30-9:00	Cost Model – Review/Modification of Cost Estimate
9:00-10:00	Function Analysis/FAST Diagram – Cost/Function
10:00-12:00	Team Creativity – Generation of Ideas
12:00-1:00	Lunch
1:00-4:00	Team Creativity – Generation of Ideas
4:00–5:00	Evaluation of Ideas

Day 3 – Wednesday, October 26, 2005

8:00-11:00	Evaluation of Ideas
11:00-12:00	Team Assignments for Development, Review Alternative Development Process, Forms and Spreadsheets
12:00-1:00	Lunch
1:00-5:00	Alternative Development

Day 4 – Thursday, October 27, 2005

8:00-12:00	Alternative Development
12:00-1:00	Lunch
1:00-5:00	Alternative Development

Day 5 – Friday, October 28, 2005

8:00-10:00	Complete Alternative Development/Documentation
10:00-10:30	Finalize Team Review of VE Alternatives
10:30-11:30	Group Review, Ranking VE Alternatives/Sets, and Presentation Preparation
11:30-3:00	Lunch – sponsored by Guam DPW *Presentation of VE Alternatives Meeting (Presentation of VE Study Results to Management, Designers, Agencies, and Stakeholders)*
3:00-4:30	Study Closeout and Incorporation of Comments from Presentation

VALUE ENGINEERING STUDY PARTICIPANTS

The following pages include the VE study attendance lists for the VE Study.

MEETING ATTENDEES
Ordot Dump Closure, Guam

2005 October					NAME	ORGANIZATION	POSITION	TELEPHONE		FAX
24	25	26	27	28				E-MAIL		
X	X	X	X	X	Ron Tanenbaum, PE, PhD, CVS	Value Management Strategies, Inc.	Facilitator	858	204-7942	
								ron@vms-inc.com		
X	X	X	X	X	Rico Arceo	TG Engineers, PC	Cost Estimator	671	647-0808	647-0886
								ricoa@tg-engr.com		
X	X	X		X	Tor Gudmundsen	TG Engineers, PC	Project Manager	671	647-0808	647-0886
								tor@guam.net		
X	X	X	X	X	Joseph Hernandez	Latte Inc.	Landfill Operations & Management	808	674-0526	
								latteinc@hotmail.com		
X	X	X	X	X	Tim Raibley	Brown, Vence, & Associates	Civil Design	916	652-2014	786-2438
								traibley@brownvence.com		
X	X	X	X	X	Gary Siu	State of Hawaii – DOH (Unofficial Status)	Permit Engineer	808	586-4244	
								gsiu@ehs.health.state.hi.us		
X	X	X	X	X	Fred Otte	Otte Associates	Geotechnical, Environmental	671	653-5100	653-5102
								otte@guam.net		
X					Marc Gagarin	Guam DPW	Chief Engineer			

MEETING ATTENDEES

Ordot Dump Closure, Guam

2005 October					NAME	ORGANIZATION	POSITION	TELEPHONE		FAX
24	25	26	27	28				E-MAIL		
X				X	Jesse Garcia	Guam DPW	Chief Operating Officer			
X	X	X		X	Erwin Cruz	Guam DPW	Project Engineer	671	646-3161	
								erwinc@mail.gov.gu		
X	X			X	Dominic Muna	Guam DPW	Solid Waste Superintendent	671	888-3789	
								dgmuna@gov.com @		
X	X			X	Cynthia Jackson	Guam DPW	Project Manager	671	646-3289	
								cujackson@mail.gov.gu		
X	X	X	X	X	Omar Damian	Guam EPA	CD Project Manager	671	475-1619	
								odamian@guamepa.govguam.net		
				X	Lawrence Perez	Guam DPW	Director	671	646-3131	649-6178
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Value Management Strategies, Inc.
Offices in Escondido and Alameda, California,
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