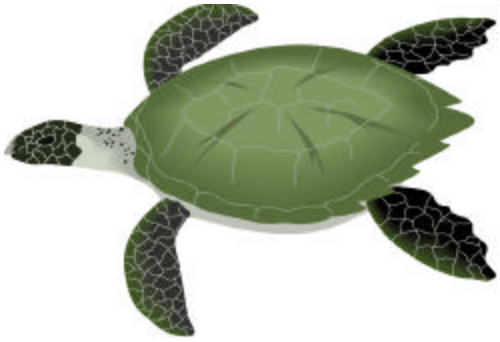
United States Air Force
15th Air Base Wing
Environmental Restoration Program

ENGINEERING EVALUATION/COST ANALYSIS (EE/CA) REPORT FOR SITE LF01

Operable Unit 1,
Bellows Air Force Station, Oahu, Hawaii



Attachment E

Review Comments and Responses on the Draft EE/CA Report for Site LF01

Attachment E: Review Comments and Responses on the Draft EE/CA Report for Site LF01

This attachment provides the comments made by reviewers of a draft of this EE/CA Report (CH2M HILL, March 2001) and the Air Force/contractor responses to those comments. The review comments, accompanied by the responses, are provided in the sequence in which they were submitted, as follows:

- Major E. Bryan MacDonald, 15 ABW/JA, U.S. Air Force (March 12, 2001)
- Stefan La Grow, Informatics Corporation (March 26, 2001)
- Teresita S. Salire, State of Hawaii Department of Health, Hazard Evaluation and Emergency Response Office (April 5, 2001)
- Lisa Ferentinos, Waimanalo Health Center (April 10, 2001)
- Jim Andrews, Bellows AFS Restoration Advisory Board (April 11, 2001)
- Randall Hu, U.S. Marine Corps (April 16, 2001)
- Additional comments by Teresita S. Salire, State of Hawaii Department of Health, Hazard Evaluation and Emergency Response Office (June 5, 2001)

This attachment concludes with a later dated June 7, 2001, in which the State of Hawaii Department of Health, Hazard Evaluation and Emergency Response Office states its concurrence with the comment responses and the recommended removal action for Site LF01.

REVIEW COMMENTS AND RESPONSES
Draft Engineering Evaluation/Cost Analysis (EE/CA) Report for Site LF01
Operable Unit 1, Bellows Air Force Station, Oahu, Hawaii
Reviewer: Major E. Bryan MacDonald, 15 ABW/JA, U.S. Air Force (12 March 2001)

ITEM	PAGE	SECTION	COMMENT	CONTRACTOR RESPONSE
1	Table 4 and pages ES-4, 4-8, 4-11, and 4-13	Table 4; Executive Summary; Sections 4.3 through 4.5	The costs of Alternatives 2 and 3 are inconsistent—see Table 4, and compare to pages ES-4, 4-8, 4-11, and 4-13. Also, there is an inconsistency between para. 4.4.3 and 4.5—alt. 2 is either seven or eight times as expensive as alt. 3.	1. Table 4 was not updated with the cost estimates shown in Attachment C. This inconsistency will be corrected in the draft final EE/CA. 2. Section 4.5 should read "seven" times as expensive as Alternative 3. This will be corrected in the draft final EE/CA. *[Please note: subsequent to the submittal and approval of this response, the estimated costs of Alternatives 2 and 3 were modified. In the final EE/CA Report, Alternative 2 is estimated to be six times as expensive as Alternative 3.]*
2	4-7	4.3.2.2	Subparagraph "Reduction in Toxicity, Mobility, or Volume Through Treatment." If the contaminants are removed with the landfill materials (as is stated under "long-term effectiveness and permanence"), I don't understand why this wouldn't reduce at least the volume and mobility of the contaminants *at the site*.	The intent of this section is to address reductions that occur due to treatment. Since the landfill material will be removed and not treated there would be no reduction through treatment.

REVIEW COMMENTS AND RESPONSES
Draft Engineering Evaluation/Cost Analysis (EE/CA) Report for Site LF01
Operable Unit 1, Bellows Air Force Station, Oahu, Hawaii
Reviewer: Stefan La Grow, Informatics Corporation (26 March 2001)

ITEM	PAGE	SECTION	COMMENT	CONTRACTOR RESPONSE
1	2-6, para. 2	Starting in Sec. 2.3.3.1 and throughout the report; Attach. A	Throughout the report (starting in Sec. 2.3.3.1), when mentioning PCBs, Pesticides, PAHs, Metals, etc., metrics of the samples are noted within the narratives without reference to the included tables in the Attachments. For a report of this size, it would be more user-friendly to reference the respective table. This way the reader can also note how much over or under the acceptable limits the metrics are referring to.	As suggested, the appropriate Appendix A table will be referenced at the beginning of each section describing nature and extent of contamination by media.
2	Table A-1, page 8 of 11	Attachment A	The bottom left of the page lists picograms per grams as an acronym. Since the acronym is misspelled as pg/p (should have read pg/g) and that particular unit of measurement is never used throughout the report, delete pg/p [from] the acronym list.	This correction will be made to the acronym list in Table A-1 in the final report.
3	Table A-2, pages 5 of 6 and 6 of 6	Attachment A	The units (mg/kg) have been omitted from the table. Insert units next to the CAS column to be consistent with other tables within the report.	The "Units" column will be added to the last two pages of Table A-2 in the final report.
4	Table A-3, all pages	Attachment A	Same as item #4.	The reviewer is referring to item #3 above. The "Units" column will be added to Table A-3 in the final report.
5	Table C-3	Attachment C	Towards the bottom of the table, report mentions "Total present worth costs of O&M and LTM for yrs 1-15 @ 3%, with 5% discount rate." The following pages include tables with a "Present Value Factor" which is meant to calculate the previously mentioned discount rate. However, the numbers in that category from Table C-4 through Table C-12 do not make sense. Example: Table C-7 states "Year 4 at 3%, with 5% net discount rate" equals the multiplying factor of 0.82. Please clarify tables C-4 through C-12 on how the multiplying factor is contrived.	To determine the Present Value Factor, the rate of return was assumed to be 8% and the inflation rate was assume to be 3% resulting in a net discount rate of 5%. The supporting information in the tables will be clarified. For example: Table C-7 *[Table C1-4 in the Final EE/CA Report]* currently states "Year 4 at 3%, with 5% net discount rate." The table will be revised to "Year 4 at 3% inflation rate, with 5% net discount rate."

REVIEW COMMENTS AND RESPONSES
Draft Engineering Evaluation/Cost Analysis (EE/CA) Report for Site LF01
Operable Unit 1, Bellows Air Force Station, Oahu, Hawaii
Reviewer: Teresita S. Salire, State of Hawaii Department of Health, Hazard Evaluation and Emergency Response Office (5 April 2001)

ITEM	PAGE	SECTION	COMMENT	CONTRACTOR RESPONSE
General			The Air Force should consider the following alternatives because of concerns raised by the community regarding hazardous materials in the landfill and future land use. 1. Selective removal of only the surface soil at DP17A should be an evaluated alternative. The landfill can then be turned over to the Operations and Maintenance program. 2. In-situ treatment of DP17A surface soil that will reduce mobility and toxicity of the metals should also be considered as an alternative. 3. An alternative to the two-foot soil cover should be considered. Substituting geosynthetic materials for natural materials may be more cost-effective. Soil cover weight, grading and compacting activities could disturb landfill materials and cause subsidence.	Each of the suggested alternatives were evaluated in detail. After this evaluation, Alternative 3 from the Draft EE/CA Report (Soil/Vegetative Cover with Long-Term Monitoring of Groundwater) remains the recommended alternative. Descriptions of the suggested alternatives and their estimated costs are attached. A summary of the rationale for not recommending the suggested alternatives is presented below: 1. An alternative was developed for evaluation (Alternative 4-Limited Surface Soil Excavation/Disposal with Long-Term Monitoring of Groundwater) that includes excavation and disposal of surface soil with elevated metals concentrations (in the DP17A area and in the central portion of the landfill at Site LF01) and placement of clean cover in those areas where landfill materials are exposed as a result of the surface soil removal. A description of Alternative 4 and its estimated cost are attached to these comment responses. This alternative is considered to be problematic for three reasons: (a) It does not meet the Removal Action Objective (RAO) to mitigate current and future site worker exposure to physical hazards in surface soil and landfill materials. (b) Any action required for the areas of the landfill not addressed by this alternative (i.e., those presenting physical hazards) would need to be managed and funded outside of the Air Force IRP program. The scope and timeframe for that action (if any) would be at the discretion of the managing entity. (c) The estimated cost for this alternative (approximately $2.4 million) is more than twice the cost for covering the entire landfill, which would meet all of the RAOs for the site. Therefore, given that (1) this alternative does not meet all of the RAOs, (2) it releases control of the main portion of the site from the IRP program, and (3) it costs twice as much as an existing alternative that meets all the RAOs, Alternative 4 is not the recommended removal action alternative.

REVIEW COMMENTS AND RESPONSES
Draft Engineering Evaluation/Cost Analysis (EE/CA) Report for Site LF01
Operable Unit 1, Bellows Air Force Station, Oahu, Hawaii
Reviewer: Teresita S. Salire, State of Hawaii Department of Health, Hazard Evaluation and Emergency Response Office (5 April 2001)

ITEM	PAGE	SECTION	COMMENT	CONTRACTOR RESPONSE
				2. An alternative was developed for evaluation (Alternative 5-Limited Phytoremediation with Long-Term Monitoring of Groundwater) that includes in-situ treatment (phytoremediation) of elevated metals concentrations in surface soil in the DP17A area and in the central portion of the landfill at Site LF01. A description of Alternative 5 and its estimated cost are attached to these comment responses. This alternative is considered to be problematic for the same reasons as Alternative 4, in terms of meeting the RAOs and site control. The cost for this alternative is estimated to be approximately $1.4 million; this is nearly half as much again as the estimated cost for covering the entire landfill, which would meet all of the RAOs for the site. Therefore, Alternative 5 is not the recommended removal action alternative. Note that other in-situ technologies (such as solidification/stabilization) have not been included because the costs of these technologies are substantial and disproportionate to the benefit they would provide in terms of risk reduction . 3. An alternative that includes an engineered cap (with geosynthetic materials) was not developed because it would be more expensive and would not provide sufficient extra benefit to justify the substantial cost. An evaluation of Air Force and CERCLA presumptive remedy criteria for landfill capping (refer to Section 4.1 and Tables 2 and 3) also indicated that Site LF01 did not meet the criteria for either case. With regard to concerns about soil cover weight, grading, and compacting, prior to the EE/CA field investigation at Bellows AFS OU1, the site was cleared and grubbed using grading equipment. Following trenching activities at the site, those portions trenched (the entire length of the main landfill, as well as a partial transverse trench) were also graded and compacted by the trackhoe used to excavate and then backfill the trench. No subsidence or settling has been observed since that time. Therefore, disturbance of landfill materials and subsidence are not considered to be problematic for Alternative 3 (Soil/Vegetative Cover with Long-Term Monitoring of Groundwater).

Alternative 4: Limited Surface Soil Excavation/Disposal with Long-Term Monitoring of Groundwater

Description

Under Alternative 4, surface soil containing elevated levels of metals in the DP17A area and in the central portion of the landfill at Site LF01 would be excavated and disposed of offsite. For the remaining portion of Site LF01 where surface soil excavation is not being performed, no action would be taken under this alternative. For cost estimating purposes, it is assumed that surface soil would be excavated in areas where lead concentrations exceed the U.S. EPA Region IX Industrial Preliminary Remediation Goal (PRG) of 750 mg/kg (Figure 7), and that the depth of the excavation would be approximately 3 feet. The area where surface soil would be excavated is shown in Figure 13. Prior to excavation, the site would be cleared of its vegetative cover.

It is assumed that approximately 1,600 cubic yards (2,400 tons) of surface soil would be excavated, and that the soil would be disposed of at an off-island hazardous waste landfill permitted for CERCLA waste. Following excavation, confirmatory soil samples would be collected to verify that chemical constituents have been removed. Then the areas excavated to native soil would be restored by the placement and grading of clean fill and topsoil and the planting of drought-resistant vegetation; the excavated areas where landfill materials were exposed following surface soil removal would be restored by the placement of a 2-foot soil cover, followed by the placement of topsoil and the planting of drought-resistant vegetation.

Following placement of the limited cover (i.e., the topsoil and vegetation placed over the excavated area), operation and maintenance (O&M) of the cover would be included as part of Alternative 4. O&M of the limited cover would include periodic inspection of the vegetation to assess whether it was adequately mitigating surface soil runoff. It is estimated that this inspection would be conducted once every 3 years for up to 15 years.

Alternative 4 would also involve long-term monitoring (LTM) of groundwater in the vicinity of Site LF01. LTM of groundwater for selected dissolved metals would be warranted because the soil and waste would be left in place under this alternative.[1] However, because of the uncertainty of groundwater flow direction, LTM of groundwater may also include analysis for a full suite of metals, VOCs, SVOCs, pesticides, PCBs, and herbicides. It is estimated that LTM of groundwater would be conducted annually for up to 5 years, at which time the data would be evaluated to determine whether further monitoring was necessary. The groundwater monitoring network would consist of eight existing wells to monitor upgradient, downgradient, and cross-gradient concentrations of constituents of concern; the locations of these wells are shown in Figure 12. Upon completion of LTM at the site, the eight monitoring wells (LF01-MW01, -MW03, and -MW05

[1] Specifically, analysis for cadmium, chromium, lead, and mercury would be warranted based on a conservative analysis of the results (using the "20 to 1" dilution rule), which indicates that soil and landfill materials have the potential to fail the TCLP criteria. Details of the analysis conducted to assess whether failure of the TCLP criteria is likely are provided in Attachment D.

through -MW10) would be abandoned in accordance with State of Hawaii Well Construction and Pump Installation Standards.

Effectiveness

Ability to Achieve RAOs. Alternative 4 would not meet the RAOs for Site LF01. Removal of the chemical hazards (i.e., elevated concentrations of metals) present in surface soil at Site LF01 would mitigate current concerns about potential exposure to these hazards at the landfill. Placement of a limited cover over the excavated area would also mitigate concerns about human exposure to physical hazards in shallow soil in the area. However, potential human exposure to physical hazards in shallow soil across the remainder of the landfill would not be mitigated as part of this alternative.

Alternative 4 would not impact adjacent operations and land uses during implementation of the removal action. In addition, LTM of groundwater would mitigate some of the future risks associated with leaving the landfill materials in place. However, Alternative 4 would limit current and reasonably anticipated future land uses (refer to "Land Use Considerations" under "Implementability" below). Alternative 4 would also impact vehicle traffic during implementation of the removal action.

Reduction in Toxicity, Mobility, or Volume Through Treatment. Alternative 4 includes no treatment actions that would reduce the toxicity, mobility, or volume of contaminants at Site LF01.

Compliance with ARARs. Alternative 4 is expected to comply with chemical-specific, location-specific, and action-specific ARARs for Site LF01.

Short-Term Effectiveness. The impacts to human health and the environment that could occur during construction include potential exposure of construction workers to contaminants through fugitive dust emissions, surface water runoff, and spillage during hauling. Implementation of Alternative 4 would have short-term impacts on vehicle traffic: i.e., approximately 50 truckloads may be required to transport the excavated soil/landfill materials from Bellows AFS for disposal.[2] In addition, approximately 150 truckloads may be required to transport clean fill and topsoil to Site LF01.[3] Alternative 4 would therefore require coordination between Hickam AFB, Bellows AFS, and the community of Waimanalo well in advance of implementation.

Long-Term Effectiveness and Permanence. Alternative 4 would have a moderate degree of long-term effectiveness for the area with elevated metals concentrations because surface soil containing elevated concentrations of metals would be excavated from Site LF01, and risks from exposure to chemicals at the site would thereby be minimized. A cover would also be placed over the excavated area and periodic O&M (for up to 15 years) would monitor the integrity of the limited cover.

[2] Based on transport of approximately 1,600 cubic yards of soil and landfill materials from the site at approximately 30 cubic yards per truckload.

[3] Based on transport of approximately 4,680 cubic yards of clean fill and topsoil to the site at approximately 30 cubic yards per truckload.

Under this alternative, the landfill materials would be left in place, and LTM of groundwater (up to 5 years) would be conducted annually. However, this alternative would not mitigate the potential for exposure to physical hazards at the site.

Implementation of Alternative 4 would not have a long-term impact on vehicle traffic, installation personnel, and the Bellows AFS and Waimanalo communities.

Limited removal of surface soil containing elevated concentrations of metals at Site LF01, followed by confirmatory sampling, would comply with NCP requirements.

Implementability

Technical Feasibility. Alternative 4 would have minimal environmental impacts and could be implemented in a relatively short period of time. No special techniques, materials, permits, or labor would be required. Excavation and removal is a widely used and well-developed remediation technique. Soil / vegetative covers have also been widely used. A soil / vegetative cover similar to the limited cover proposed for Alternative 4 has been implemented at the 18-hole Mamala Bay Golf Course on Hickam AFB, as well as at several other locations on Oahu including Sand Island Recreation Park and Kakaako Waterfront Park.

A staging area would be required because heavy equipment and trucks would be required to move, load, and haul soil. Temporary barrier fencing or flagging may need to be erected around the entire work area to limit access. However, these are familiar requirements that would need no special materials or expertise.

Administrative Feasibility. Implementation requirements for Alternative 4 would include processing of the Base Civil Engineer Work Clearance Report (Air Force Form 103) and consultation regarding Section 7 of the ESA and Section 106 of the NHPA. Waste to be transported to an off-island CERCLA hazardous waste landfill would require profiling and manifesting. In addition, coordination with installation operations would be required prior to conducting the work. Because there are no active facilities underground or overhead utilities in the area, implementation would require minimal permitting to control surface water runoff.

Because of the isolated location of Site LF01, implementation would not impact installation personnel or the Bellows AFS or Waimanalo communities. In addition, because Site LF01 is located on U.S. Marine Corps property, the Marines could control access and provide maintenance. However, vehicle traffic may be affected by the approximately 200 truckloads required for this alternative. In addition, any action required for the areas of the landfill not addressed by this alternative (i.e., those presenting physical hazards) would need to be managed and funded outside of the IRP program. The scope and timeframe for that action would be at the discretion of the managing entity.

Land Use Considerations. Alternative 4 would limit current land uses (i.e., military training exercises) and reasonably anticipated future land uses because the physical hazards present in shallow soil would not be addressed. In addition, if a land use change occurred that required the site to be re-graded, disruption of the limited soil / vegetative cover and / or

the contents of the remainder of the landfill would occur and provisions for the disposal of soil and landfill materials would be required. The Air Force could be additionally responsible for funding any future investigative / remediation efforts if the land use or ownership changed (U.S. EPA, June 1997).

Currently, environmental baseline surveys are required when a land use changes or new construction is proposed. As an additional safeguard, if the land use in a particular area changes, the Air Force requires that site data be reevaluated against appropriate screening criteria. This requirement ensures, for example, that if an area is changed from industrial to residential use, site data are reevaluated against residential rather than industrial screening criteria. Land use (deed) restrictions and O&M and LTM requirements would need to be specified in any future property excess or transfer. The deed restrictions would not specifically prohibit land use changes or construction, but would require property owners to address risks if land use changes or construction occurred.

Availability of Services and Materials. Except for PPE, no special personnel, technology, services, or materials would be required under Alternative 4. The materials and procedures are readily available and well established.

Monitoring. Alternative 4 would involve LTM of groundwater in the vicinity of Site LF01. Any new property owners would be responsible for continuing to implement the LTM unless a new removal decision was made and implemented based on a change in land use or ownership.

Operation and Maintenance. O&M would be required to periodically maintain the limited soil / vegetative cover at the site and to inspect surface soil conditions to mitigate runoff. Any new property owners would be responsible for continuing to maintain the cover unless a new removal decision was made and implemented based on a change in land use or ownership.

Cost

As indicated in Table C-4 in Attachment C, the cost of implementing Alternative 4 is estimated at $2,386,000.

Alternative 5: Limited Phytoremediation with Long-Term Monitoring of Groundwater

Description

Under Alternative 5, surface soil containing elevated levels of metals in the DP17A area and in the central portion of the landfill at Site LF01 would be treated in-situ using phytoremediation. For the remaining portion of Site LF01 where phytoremediation is not being performed, no action would be taken under this alternative.

Phytoremediation is an emerging remedial technology that relies upon the ability of certain plants to promote the removal, transfer, stabilization, or biodegradation of contaminants in environmental media, in this case soil. The effectiveness of phytoremediation in reducing

metals concentrations in surface soil is largely dependent on the identification of a successful plant species and site-specific conditions. For the removal of metals, the technology relies on mobilization of contaminants from soil to porewater for plant uptake using chelating agents. Chelating agents, such as ethylenediamine tetraacetic acid (EDTA), have been used to increase metals solubility and plant uptake (Blaylock, 2000; Elless and Blaylock, 2000).[4] Assessing the long-term effectiveness of this technology would require careful monitoring of porewater and groundwater to evaluate whether mobile contaminants were being adequately captured by the root systems of the selected plant species.

Because phytoremediation is an emerging technology, a literature search would be conducted to identify candidate plant species and chelating agents. A treatability study (greenhouse bench-scale testing) would then be performed to confirm the validity of the candidate plant species and chelating agents and to evaluate the appropriate dose of chelate to be applied to increase the relative mobility and plant uptake of the metals in soil.[5]

Following successful completion of the treatability study, the area targeted to undergo phytoremediation would be cleared of its existing vegetative cover and a temporary fence would be installed around the area. Based on existing data, the area where phytoremediation would be conducted is shown in Figure 14. Next, an organic amendment would be added to surface soil and selected plant species would be established in the amended soil. It is assumed that the plants may need to be irrigated until well established. Depending on the nature of the plants selected (annual or perennial), repeated plantings may be required. A chelating agent would be added to the soil to increase the mobility of metals for plant uptake; therefore, monitoring wells and lysimeters would be installed to monitor for the migration of metals in the saturated and unsaturated zones in the immediate vicinity of the phytoremediation project. The chelate dose would be carefully monitored to minimize leaching of mobilized metals. It is assumed that groundwater and porewater samples would be collected and analyzed monthly during the first year, then quarterly for the next 3 years, then twice a year for remainder of the project, which has been estimated at 7 years. It is also assumed that the selected species would be harvested approximately twice a year, and encroaching unwanted vegetation (e.g., *kiawe*, *hale koa*, California grass) would be removed at that time. In addition, it is assumed that approximately 10 tons of biomass per year would be disposed of at an on-island solid waste landfill. Some degree of re-planting may also be periodically required.

In addition to the extensive O&M associated with the phytoremediation (including planting, harvesting, and monitoring for up to 7 years), Alternative 5 would also involve LTM of groundwater in the vicinity of Site LF01. LTM of groundwater for selected dissolved metals would be warranted because the soil and waste would be left in place under this

[4] Michael J. Blaylock, "Field Demonstration of Phytoremediation of Lead-Contaminated Soils", in *Phytoremediation of Contaminated Soil and Water*, CRC Press LLC, 2000; M.P. Elless and M.J. Blaylock, "Amendment Optimization to Enhance Lead Extractability from Contaminated Soils for Phytoremediation", *International Journal of Phytoremediation*, vol. 2, no. 1, 2000, pp 75-89.

[5] Candidate species would be evaluated for uptake of lead, mercury, and zinc and would comply with state requirements regarding the introduction of plant species (i.e., native or naturalized species).

alternative.[6] However, because of the uncertainty of groundwater flow direction, LTM of groundwater may also include analysis for a full suite of metals, VOCs, SVOCs, pesticides, PCBs, and herbicides. It is estimated that LTM of groundwater would continue annually for up to 5 years, at which time the data would be evaluated to determine whether further monitoring was necessary. The groundwater monitoring network would consist of eight existing wells to monitor upgradient, downgradient, and cross-gradient concentrations of constituents of concern; the locations of these wells are shown in Figure 12. Upon completion of LTM at the site, the eight monitoring wells (LF01-MW01, -MW03, and -MW05 through -MW10) would be abandoned in accordance with State of Hawaii Well Construction and Pump Installation Standards.

Effectiveness

Ability to Achieve RAOs. Alternative 5 would not meet the RAOs for Site LF01. In-situ remediation of the chemical hazards (i.e., elevated concentrations of metals) present in surface soil at Site LF01 would mitigate current concerns about exposure to these hazards at the landfill. However, potential human exposure to physical hazards in shallow soil across the remainder of the landfill would not be mitigated as part of this alternative.

Alternative 5 would not impact adjacent operations and land uses during implementation of the removal action. In addition, LTM of groundwater would mitigate some of the future risks associated with leaving the landfill materials in place. However, Alternative 5 would limit current and reasonably anticipated future land uses (refer to "Land Use Considerations" under "Implementability" below).

Reduction in Toxicity, Mobility, or Volume Through Treatment. Alternative 5 would include phytoremediation that may, pending the results of the treatability study, reduce the volume of contaminants at Site LF01.

Compliance with ARARs. Alternative 5 is expected to comply with chemical-specific, location-specific, and action-specific ARARs for Site LF01.

Short-Term Effectiveness. The impacts to human health that could occur during construction include potential exposure of construction workers to contaminants through fugitive dust emissions and surface water runoff during soil preparation, planting, harvesting, and O&M. Impacts to the environment during phytoremedation could include elevated levels of metals in the plants during the project, which may need to be treated as a hazardous waste.

Long-Term Effectiveness and Permanence. Alternative 5 would have a low to moderate degree of long-term effectiveness because although contaminated surface soil would be treated onsite at Site LF01, phytoremediation is considered a developing technology and its effectiveness in reducing metals concentrations in surface soil is largely dependent on the identification of a successful plant species and site-specific conditions. The technology also

[6] Specifically, analysis for cadmium, chromium, lead, and mercury would be warranted based on a conservative analysis of the results (using the "20 to 1" dilution rule), which indicates that soil and landfill materials have the potential to fail the TCLP criteria. Details of the analysis conducted to assess whether failure of the TCLP criteria is likely are provided in Attachment D.

relies on mobilization of contaminants from soil to porewater for plant uptake using chelating agents. Assessing the long-term effectiveness of this technology would require careful monitoring to evaluate whether mobile contaminants were being adequately captured by the root systems of the selected plant species. This alternative would not mitigate the potential for exposure to physical hazards at the site.

Implementation of Alternative 5 would not have a long-term impact on vehicle traffic, installation personnel, and the Bellows AFS and Waimanalo communities.

Treatment of contaminated surface soil by phytoremediation at Site LF01, followed by confirmatory sampling, would comply with NCP requirements.

Implementability

Technical Feasibility. Alternative 5 includes a developing technology that would require a greenhouse treatability study and extensive O&M and monitoring. However, field and laboratory phytoremediation projects are currently in progress for a petroleum-hydrocarbon-contaminated site at Hickam AFB (the John Rodgers Tank Farm) and pesticide-contaminated groundwater in central Oahu. Lessons may be learned from those projects that might be applied to this project.

A temporary staging area and/or temporary barrier fencing or flagging may need to be erected around the work area to limit access during the phytoremediation project. However, these are familiar requirements that would need no special materials or expertise.

Administrative Feasibility. Implementation requirements for Alternative 5 would include processing of the Base Civil Engineer Work Clearance Report (Air Force Form 103) and consultation regarding Section 7 of the ESA and Section 106 of the NHPA. Disposal of the biomass generated during phytoremediation may require it to be transported to an off-island CERCLA hazardous waste landfill or to an on-island solid waste landfill, which would require profiling and manifesting. In addition, coordination with installation operations would be required prior to conducting the work. Because there are no active facilities underground or overhead utilities in the area, implementation would require minimal permitting to control surface water runoff.

Because of the isolated location of Site LF01, implementation would not impact installation personnel or the Bellows AFS or Waimanalo communities. In addition, because Site LF01 is located on U.S. Marine Corps property, the Marines could control access and provide maintenance. However, any action required for the areas of the landfill not addressed by this alternative (i.e., those presenting physical hazards) would need to be managed and funded outside of the IRP program. The scope and timeframe for that action would be at the discretion of the managing entity.

Land Use Considerations. Alternative 5 would limit current land uses (i.e., military training exercises) and reasonably anticipated future land uses because the physical hazards present in shallow soil would not be addressed. In addition, if a land use change occurred that required the site to be re-graded, provisions for the disposal of soil and landfill materials would be required. The Air Force could be additionally responsible for funding

any future investigative / remediation efforts if the land use or ownership changed (U.S. EPA, June 1997).

Currently, environmental baseline surveys are required when a land use changes or new construction is proposed. As an additional safeguard, if the land use in a particular area changes, the Air Force requires that site data be reevaluated against appropriate screening criteria. This requirement ensures, for example, that if an area is changed from industrial to residential use, site data are reevaluated against residential rather than industrial screening criteria. Land use (deed) restrictions and LTM requirements would need to be specified in any future property excess or transfer. The deed restrictions would not specifically prohibit land use changes or construction, but would require property owners to address risks if land use changes or construction occurred.

Availability of Services and Materials. Project personnel experienced with the application of phytoremediation in Hawaii would be required. Appropriate chelating agents would need to be identified as part of the greenhouse bench-scale testing and subsequently procured. Because of the remote location of Site LF01, a water truck would be required during the initial planting and plant establishment. As previously described, repeated planting and harvesting operations as well as watering for establishment may be required. In addition, the harvested biomass would require disposal.

Monitoring. Alternative 5 would involve LTM of groundwater in the vicinity of Site LF01. Any new property owners would be responsible for continuing to implement the LTM unless a new removal decision was made and implemented based on a change in land use or ownership. In addition, monitoring of groundwater, porewater, and soil would be conducted in the immediate vicinity of the phytoremediation project.

Operation and Maintenance. Extensive O&M would be required for phytoremediation. Monitoring, along with biomass harvest and disposal twice each year, removal of unwanted vegetation, and re-seeding / watering, would be required for up to 7 years. Any new property owners would be responsible for continuing this monitoring unless a new removal decision was made and implemented based on a change in land use or ownership.

Cost

As indicated in Table C-5 in Attachment C, the cost of implementing Alternative 5 is estimated at $1,443,100.

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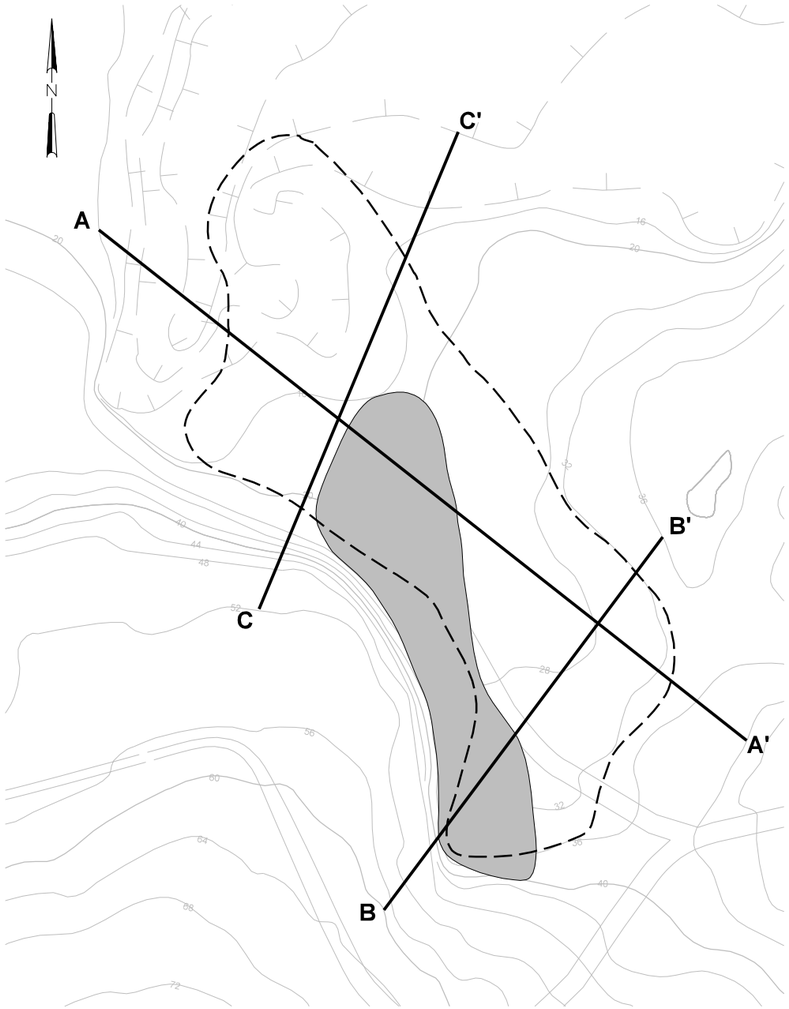
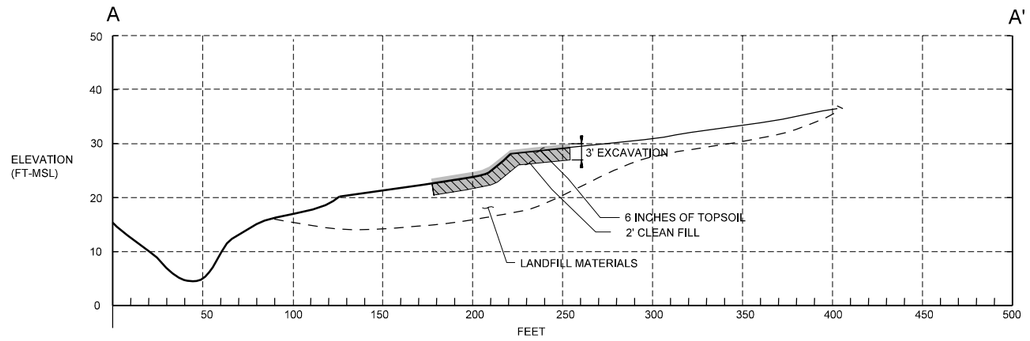


PLAN VIEW

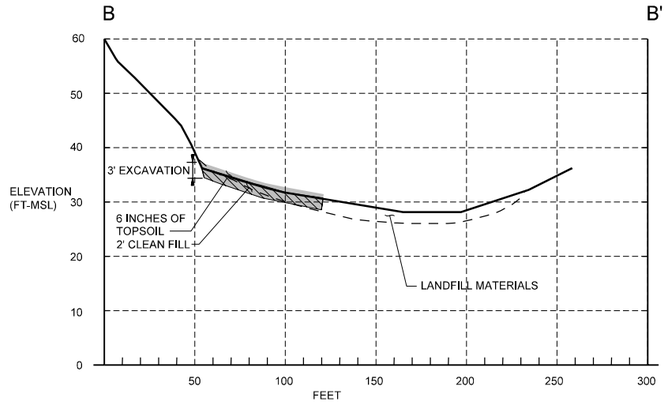
SCALE: IN FEET

LEGEND:

- APPROXIMATE EXTENT OF LANDFILL
- APPROXIMATE EXTENT OF SURFACE SOIL EXCAVATION



SECTION A-A'



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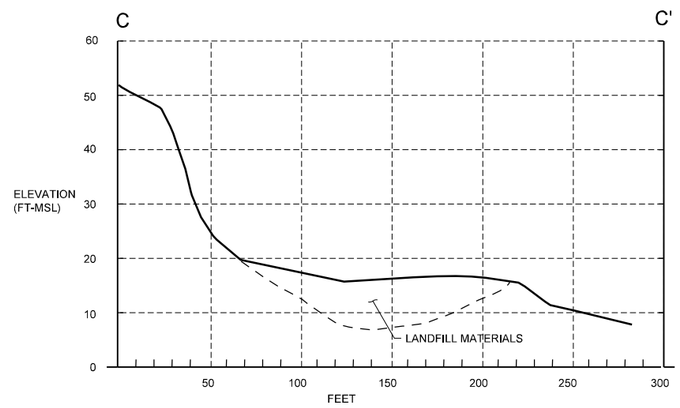

SECTION C-C'

NOTES:

1. SURFACE SOIL WITH ELEVATED LEVELS OF METALS WOULD BE EXCAVATED TO AN APPROXIMATE DEPTH OF 3 FEET BELOW GROUND SURACE. EXPOSED AREAS OF THE LANDFILL (AS A RESULT OF THIS EXCAVATION) WOULD BE RESTORED WITH A 2-FOOT CLEAN FILL COVER PLUS 6 INCHES OF TOPSOIL.
2. CLEAN FILL COVER WOULD BE COMPACTED TO 85% OF STANDARD PROCTOR.
3. TEMPORARY EROSION AND SEDIMENTATION CONTROLS WOULD BE IN PLACE UNTIL VEGETATION COVER WAS ADEQUATE.
4. FINAL DESIGN DRAWINGS WOULD BE DEVELOPED AND PRESENTED IN THE REMOVAL ACTION WORK PLAN.

GENERAL NOTES:

1. SITE LF01 INCLUDES THE AREA FORMERLY KNOWN AS SITE DP17A.
2. THIS ALTERNATIVE ALSO INCLUDES OPERATION AND MAINTENANCE OF THE LIMITED COVER AND LONG-TERM MONITORING OF GROUNDWATER.

Figure 13

Limited Surface Soil Excavation / Disposal with LTM of Groundwater (Alternative 4)

Bellows AFS OU1 EE/CA

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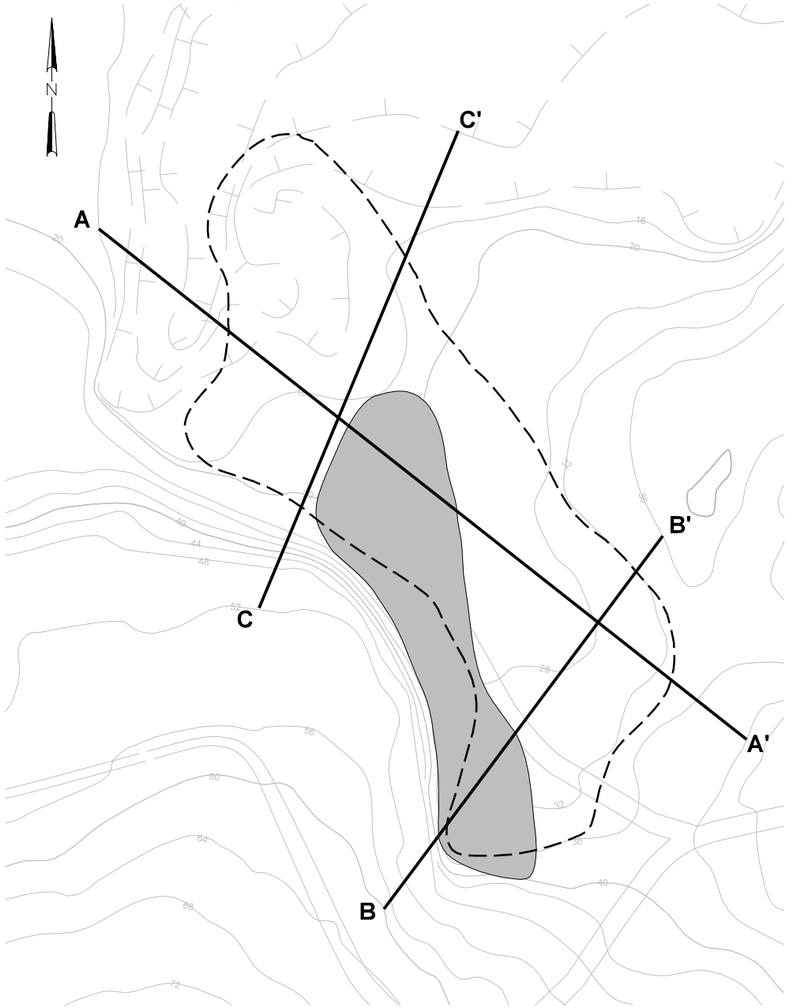
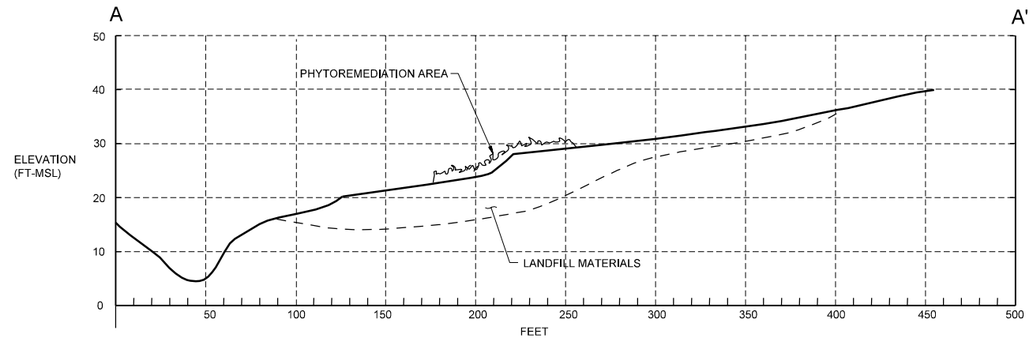


PLAN VIEW

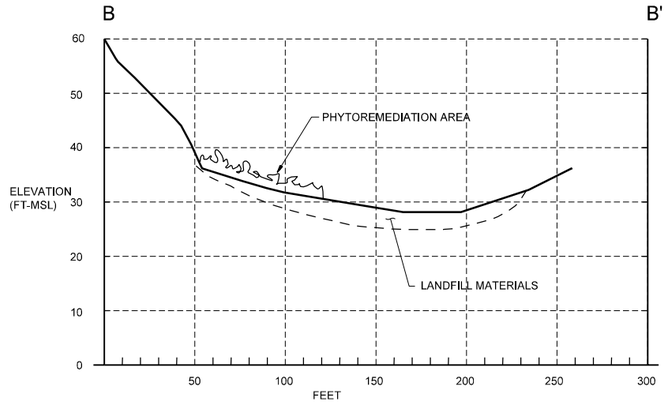
SCALE: IN FEET

LEGEND:

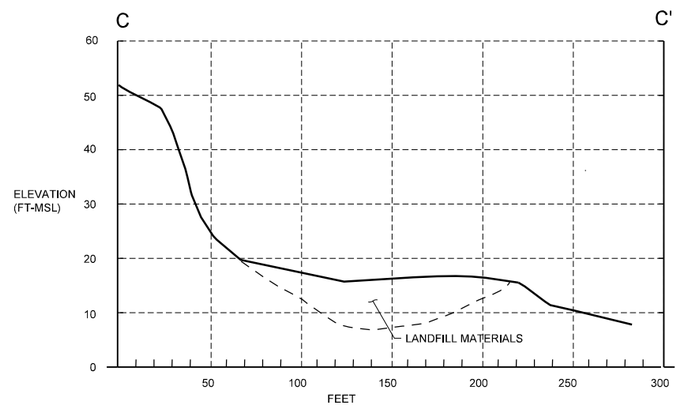
- APPROXIMATE EXTENT OF LANDFILL
- APPROXIMATE EXTENT OF PHYTOREMEDIATION PROJECT



SECTION A-A'



SECTION B-B'



SECTION C-C'

NOTES:

1. FOLLOWING A TREATABILITY STUDY TO IDENTIFY PLANT SPECIES AND CHELATING AGENTS TO PROMOTE LEAD UPTAKE, SURFACE SOIL WITH ELEVATED LEVELS OF METALS WOULD BE TARGETED FOR A PHYTOREMEDIATION PROJECT.
2. FINAL DESIGN DRAWINGS WOULD BE DEVELOPED AND PRESENTED IN THE REMOVAL ACTION WORK PLAN.

GENERAL NOTES:

1. SITE LF01 INCLUDES THE AREA FORMERLY KNOWN AS SITE DP17A.
2. THIS ALTERNATIVE ALSO INCLUDES LONG-TERM MONITORING OF GROUNDWATER.

Figure 14

Limited Phytoremediation of Surface Soil with LTM of Groundwater (Alternative 5)

Bellows AFS OU1 EE/CA

TABLE C-4

Order-of-Magnitude Cost Estimate

Alternative 4: Limited Surface Soil Excavation/Disposal with Long-Term Monitoring of Groundwater

EE/CA for Site LF01, Bellows AFS

k Items	Est. Quantity	Units	Estimated Cost per Unit	Extended Cost
Direct/Indirect				
Remedial Design/Remedial Action (Year 0)				
Work Plan/RD/UXO Hazard Avoidance Plan	1	Each	$75,000	$75,000
Community Relations Support	1	Each	$5,000	$5,000
Mobilization & Demobilization	1	Lump Sum	$5,100	$5,100
Site Clearing & Grubbing	1	Lump Sum	$10,000	$10,000
Temporary Erosion & Sedimentation Control	1	Lump Sum	$5,000	$5,000
Decon Station	1	Lump Sum	$10,000	$10,000
UXO Oversight	10	Person-Days	$1,000	$10,000
Excavation Subcontractor (excavate surface soil)	1,600	Cubic Yards	$15	$24,000
Surface Soil Transport to RCRA Landfill	2,400	Ton	$255	$611,385
Surface Soil Disposal - RCRA Landfill	2,400	Ton	$250	$600,000
Site Labor (oversight)	10	Person-Days	$1,000	$10,000
Field Equipment Costs	10	Days	$500	$5,000
Import Cover Material	520	Cubic Yards	$20	$10,400
Import Top Soil	260	Cubic Yards	$30	$7,800
Excavation Subcontractor (place clean fill and top soil)	780	Cubic Yards	$10	$7,800
Revegetation	14,000	Square Feet	$0.1	$1,400
Oversight Report	1	Lump Sum	$15,000	$15,000
Soil Disposal Profile Sampling (Year 0)				
Sampling and Analysis Plan, IDW, and H&S Plan	1	Each	$25,000	$25,000
Site Labor (2 person crew)	2	Person-Week	$3,500	$7,000
Field Equipment Costs	5	Days	$500	$2,500
Sample Shipping	120	pounds	$2	$240
Laboratory Analytical Costs (TCLP Metals)	15	Each	$200	$3,000
Data Management/Validation	1	Round	$5,000	$5,000
Reporting	1	Each	$10,000	$10,000
Confirmation Sampling (Year 0)				
Sampling and Analysis Plan, IDW, and H&S Plan	1	Each	$25,000	$25,000
Site Labor (2 person crew)	2	Person-Week	$3,500	$7,000
Field Equipment Costs	5	Days	$500	$2,500
Sample Shipping	80	pounds	$2	$160
Laboratory Analytical Costs (lead, mercury, and zinc)	10	Each	$100	$1,000
Data Management/Validation	1	Round	$5,000	$5,000
Reporting	1	Each	$10,000	$10,000
ERPIMS	1	Each	$6,000	$6,000
Initial O&M/LTM Planning/Implementation (Year 0)				
O&M Plan for Limited Cover (over excavated area)	1	Each	$15,000	$15,000
Sampling and Analysis Plan, IDW, and H&S Plan	1	Each	$15,000	$15,000
IDW Staging Area	1	Lump Sum	$1,000	$1,000
LTM of Groundwater (Year 0)				
Mobilization/Demobilization	1	LS	$2,000	$2,000
Site Labor (sample 8 wells)	1	Rounds	$10,000	$10,000
Field Equipment Costs	5	Days	$1,000	$5,000
Sample Shipping	300	pounds	$2	$600
Laboratory Analytical Costs (full suite)	10	Each	$1,500	$15,000
Data Management/Validation	1	Rounds	$5,000	$5,000
Annual Report	1	Each	$10,000	$10,000
ERPIMS	1	Each	$5,000	$5,000
Update Plans	1	Each	$2,000	$2,000
SUBTOTAL DIRECT/INDIRECT COSTS				**$1,553,285**
MAPs Update	1	Lump Sum	$500	$500
Administrative Record	1	Lump Sum	$1,000	$1,000
Project Management (10% of direct/indirect costs)				$155,328
Program Admin & Support (2% of direct/indirect costs)				$31,066
Contingency (20% of total direct/indirect costs)				$347,936
TOTAL DIRECT/INDIRECT COSTS				**$2,089,115**
O&M and LTM (Years 1 through 15)	[detailed costs will be provided in separate tables]			
Year 1 -- LTM of Groundwater				**$65,329**
Year 2 -- LTM of Groundwater				**$62,578**
Year 3 -- LTM of Groundwater				**$59,140**

TABLE C-4

Order-of-Magnitude Cost Estimate

Alternative 4: Limited Surface Soil Excavation/Disposal with Long-Term Monitoring of Groundwater

EE/CA for Site LF01, Bellows AFS

k Items	Est. Quantity	Units	Estimated Cost per Unit	Extended Cost
Year 3 -- O&M of Cover (over excavated area)				**$11,885**
Year 4 -- LTM of Groundwater				**$56,389**
Year 6 -- O&M of Cover (over excavated area)				**$10,365**
Year 9 -- O&M of Cover (over excavated area)				**$8,845**
Year 12 -- O&M of Cover (over excavated area)				**$7,739**
Year 15 -- O&M of Cover, Well Abandonment				**$14,617**
TOTAL PRESENT WORTH COSTS OF O&M AND LTM FOR YRS 1-15 @ 3% INFLATION RATE, with 5% NET DISCOUNT RATE				**$296,887**
TOTAL ESTIMATED PRESENT WORTH OF DIRECT/INDIRECT AND O&M/LTM COSTS				**$2,386,000**

Notes:

The cost estimate shown has been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final costs of the project will depend on actual labor and material costs, competitive market conditions, the final project scope, the final implementation schedule, and other variable factors. As a result, the final project costs will vary from the estimates presented herein. Unit prices are based on construction cost data (e.g., Means, 1998), quotes from vendors, and best professional judgment.

TABLE C-5

Order-of-Magnitude Cost Estimate

Alternative 5: Limited Phytoremediation with Long-Term Monitoring of Groundwater

EE/CA for Site LF01, Bellows AFS

k Items	Est. Quantity	Units	Estimated Cost per Unit	Extended Cost
Direct/Indirect				
Treatability Study (Year 0)				
Literature Review to Identify Candidate Species	20	Person-days	$1,250	$25,000
Work Plan, Sampling and Analysis Plan, IDW, and H&S Plan	1	Lump Sum	$50,000	$50,000
Greenhouse Treatability Study (Bench Scale)	1	Lump Sum	$150,000	$150,000
Specialist Subcontracting	10	Person-days	$1,250	$12,500
Laboratory Analyses	1	Lump Sum	$10,000	$10,000
Treatability Study Report	1	Lump Sum	$50,000	$50,000
Remedial Design (Year 0)				
Work Plan/Remedial Design	1	Each	$100,000	$100,000
Community Relations Support	1	Each	$5,000	$5,000
Initial LTM Planning/Implementation (Year 0)				
Sampling and Analysis Plan, IDW, and H&S Plan	1	Each	$15,000	$15,000
IDW Staging Area	1	Lump Sum	$1,000	$1,000
LTM of Groundwater (Year 0)				
Mobilization/Demobilization	1	LS	$2,000	$2,000
Site Labor (sample 8 wells)	1	Rounds	$10,000	$10,000
Field Equipment Costs	5	Days	$1,000	$5,000
Sample Shipping	300	pounds	$2	$600
Laboratory Analytical Costs (full suite)	10	Each	$1,500	$15,000
Data Management/Validation	1	Rounds	$5,000	$5,000
Annual Report	1	Each	$10,000	$10,000
ERPIMS	1	Each	$5,000	$5,000
Update Plans	1	Each	$2,000	$2,000
SUBTOTAL DIRECT/INDIRECT COSTS				**$121,000**
MAPs Update	1	Lump Sum	$500	$500
Administrative Record	1	Lump Sum	$1,000	$1,000
Project Management (10% of direct/indirect costs)				$12,100
Program Admin & Support (2% of direct/indirect costs)				$2,420
Contingency (20% of total direct/indirect costs)				$27,104
TOTAL DIRECT/INDIRECT COSTS				**$164,124**
O&M and LTM (Years 1 through 15)	[detailed costs will be provided in separate tables]			
Year 1 -- LTM of Groundwater				**$65,329**
Year 1 -- O&M of Phytoremediation				**$320,166**
Year 2 -- LTM of Groundwater				**$62,578**
Year 2 -- O&M of Phytoremediation				**$145,877**
Year 3 -- LTM of Groundwater				**$59,140**
Year 3 -- O&M of Phytoremediation				**$137,862**
Year 4 -- LTM of Groundwater				**$56,389**
Year 4 -- O&M of Phytoremediation				**$131,450**
Year 5 -- O&M of Phytoremediation				**$101,014**
Year 6 -- O&M of Phytoremediation				**$97,129**
Year 7 -- O&M of Phytoremediation/Well Abandonment				**$102,008**
TOTAL PRESENT WORTH COSTS OF O&M AND LTM FOR YRS 1-7 @ 3% INFLATION RATE, with 5% NET DISCOUNT RATE				**$1,278,941**
TOTAL ESTIMATED PRESENT WORTH OF DIRECT/INDIRECT AND O&M/LTM COSTS				**$1,443,100**

Notes:

The cost estimate shown has been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final costs of the project will depend on actual labor and material costs, competitive market conditions, the final project scope, the final implementation schedule, and other variable factors. As a result, the final project costs will vary from the estimates presented herein. Unit prices are based on construction cost data (e.g., Means, 1998), quotes from vendors, and best professional judgment.

REVIEW COMMENTS AND RESPONSES
Draft Engineering Evaluation/Cost Analysis (EE/CA) Report for Site LF01
Operable Unit 1, Bellows Air Force Station, Oahu, Hawaii
Reviewer: Lisa Ferentinos, Waimanalo Health Center (10 April 2001)

ITEM	PAGE	SECTION	COMMENT	CONTRACTOR RESPONSE
1		General	I was interested to know which plants have been found to be hyper accumulators of lead, even if they are from the mainland there may be some family or genus that would point us in the direction of certain Hawaiian plants.	The approach that has been most successful on the U.S. mainland is to use agricultural crops capable of somewhat elevated metals uptake. This method typically requires a soil amendment containing a chelating agent like ethylenediamine tetraacetic acid (EDTA) to be applied to the soil to increase the relative mobility of the metals. To date, a true hyperaccumulating species for lead has not been identified that doesn't require the addition of a soil amendment. The status of Hawaiian native species that are able to uptake/accumulate metals be will be further evaluated and presented in the Draft Final EE/CA Report. *[Please note: This evaluation was subsequently conducted as part of the development of a response to a comment on the draft EE/CA Report from the State of Hawaii Department of Health (HDOH). Therefore, the results of the evaluation are presented later in this Attachment E, rather than in the main text of the final EE/CA Report.]*
2		General	I would also be interested in knowing which native plants are being tried at Hickam for phytoremediation. Even if it's for hydrocarbons or other substances instead of lead.	Plants being evaluated at the Hickam site include milo, kou, tropic coral, kiawe, ironwood, false sandalwood, beach naupaka, and oleander. As you indicated, these plants are being evaluated for their ability to reduce hydrocarbons in soil. These same plants are being evaluated both in the field at Hickam and in the laboratory at the University of Hawaii. Dr. C.S. Tang (956-6718) at the Department of Molecular Biosciences and Biosystems Engineering, University of Hawaii may be contacted directly if you are interested in further information.
3		General	I was very encouraged by your interest in planting natives in the landfill site. What can the community do to further promote that alternative?	The Air Force is interested in promoting and implementing remedial approaches that are both cost effective and favorably affect the broader environment. The state of development of this technology for the reduction of metals concentrations in soil is such that this approach, while very appealing, may have a number of practical limitations in terms of overall effectiveness at Site LF01. These limitations include: the potential for the plants to

REVIEW COMMENTS AND RESPONSES
Draft Engineering Evaluation/Cost Analysis (EE/CA) Report for Site LF01
Operable Unit 1, Bellows Air Force Station, Oahu, Hawaii
Reviewer: Lisa Ferentinos, Waimanalo Health Center (10 April 2001)

ITEM	PAGE	SECTION	COMMENT	CONTRACTOR RESPONSE
				compromise the landfill cover integrity, the shallow rooting depth of most plants will not reach the depth of the elevated metals, and limited metals uptake by the plants. The Draft Final EE/CA Report will document a thorough evaluation of the advantages and disadvantages of implementing this approach at this site. If upon completion of this evaluation it does appear that a phytoremediation alternative should be included, it will be presented in the Draft Final EE/CA report for evaluation against the other alternatives. Interest by and support from the community does help make alternatives like phytoremediation a more acceptable alternative. *[Please note: An evaluation of phytoremediation was subsequently conducted as part of the development of a response to a comment on the draft EE/CA Report from the State of Hawaii Department of Health (HDOH). Therefore, the results of the evaluation are presented later in this Attachment E, rather than in the main text of the final EE/CA Report.]*
4		General	I would also be interested in knowing about any progress in discussions concerning the compaction versus noncompaction of the fill.	It is our understanding that this comment refers to Alternative 3 (Soil/Vegetative Cover with Long –Term Monitoring of Groundwater) in the Draft EE/CA Report. Under Alternative 3, approximately two feet of clean natural fill would be imported, laid over the top of the landfill at the site, and compacted to increase the soil density. The soil is then tested to determine the percent compaction; the soil should attain 85 percent of standard Proctor (a standard geotechnical test) following compaction. Six inches of topsoil would be imported, laid over the top of the compacted fill, and planted with drought-resistant vegetation. The fill is compacted to aid in the integrity of the cover by reducing cover settlement, permeability, and shrinkage. The topsoil would be minimally compacted, in order to discourage erosion and promote vegetative growth.

REVIEW COMMENTS AND RESPONSES
Draft Final Informal Technical Information Report (ITIR) for Site LF01
Engineering Evaluation/Cost Analysis for Operable Unit 1 (Sites LF01, DP17, SD22, and DP06), Bellows Air Force Station, Oahu, Hawaii
Reviewer: Jim Andrews, Community Co-Chair, Bellows AFS Restoration Advisory Board (RAB) (11 April 2001)

ITEM	PAGE	SECTION	COMMENT	CONTRACTOR RESPONSE
1		General; Volume 1, Section 5.0	Site LF01 is a former landfill (from WW2-1970), its content and its proximity to the Waimanalo Stream and the Waimanalo Bay are and should be of large concern regarding possible contamination of our community's water, now and in the future. Based on the report, many uncertainties [are] associated with the lack of screening levels for several detected chemicals such as DDT and Heptachlor. Without conclusive data and all risk factors included (rainfall, flood scenarios, stream flow currently low for the past 5 years, etc.), I feel the community to still be at risk, and that these results concluded in the report could underestimate that risk by not being more comprehensive and thorough in its ground water investigation. Since these sites are higher than Waimanalo Stream and are without current containment, I suggest that more testing of waters (Stream and Bay) and the interconnected relationship to this and other sites that have potential risk of contaminating the Stream and Bay be considered before conclusion.	Based on the passive soil gas surveys, geophysical surveys, and trenching at Site LF01, the contents of the landfill appear to contain mostly vehicle (scrap metal), construction (metal, wood, concrete), and what's been termed "recreation-center waste (pop, liquor, beer bottles). Transformers were found above ground at the site; however no PCBs were detected on either wipe tests from the transformers or in soil samples collected under and around the transformers. With the exception of a drum containing a small amount of tar-like material, no evidence was found indicating that the landfill was used to dispose of hazardous waste. Based on the risk screening evaluations that were conducted for site workers and ecological receptors using representative soil and groundwater data, with the exception of three metals in surface soil, constituent concentrations result in risks that are below acceptable levels. Hazard quotients for the three metals (lead, mercury, and zinc) were slightly above the action level of 1.0). These findings are considered to be reasonable in light of the materials known to be present in the landfill and the length of time the landfill materials (over 30 years) have been in place. Although constituents were detected in groundwater beneath and in the vicinity of the site, they were detected very infrequently and at very low concentrations and available data do not suggest that they are impacting Waimanalo Stream. Groundwater beneath the site is not suitable for drinking or other industrial uses (it is too saline) and based on a continuous water-level monitoring study conducted in the vicinity of Site LF01, the data indicate that groundwater flows predominantly away from, rather than discharging to Waimanalo Stream. In a separate study of Waimanalo Stream (conducted as part of the OU1 EE/CA project), the screening evaluation for human and ecological receptors concluded that while some constituents were detected in surface water, sediment, and

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Engineering Evaluation/Cost Analysis for Operable Unit 1 (Sites LF01, DP17, SD22, and DP06), Bellows Air Force Station, Oahu, Hawaii
Reviewer: Jim Andrews, Community Co-Chair, Bellows AFS Restoration Advisory Board (RAB) (11 April 2001)

ITEM	PAGE	SECTION	COMMENT	CONTRACTOR RESPONSE
				fish tissue from the stream, they were not found to pose unacceptable human health or ecological risk. It should be noted that very conservative assumptions were used for the human health evaluation of surface water and sediment in the stream, which assumed that children (ages 6 through 12) would be swimming 5 days a week for 6 years. Risks for recreational fishers using conservative estimates were also below target levels. The Air Force is in the process of evaluating remedial alternatives to mitigate the minor risks to ecological receptors (based on elevated metals concentrations) and also to mitigate risks in the form of physical hazards in the surface soil (broken glass, rebar, scrap metal) and potentially dangerous materials in the subsurface (e.g., pressurized gas cylinders).
2	Volume 1, Page 3-3	Volume 1, Section 3	Ground water is presumed not likely to be used for other uses, and [it is presumed] that future incidental contact with chemicals in groundwater is not likely to be expected unless excavation or construction were to take place in these areas. This reasoning is based on the fact that the Marines will retain this property, if so how long? How far into the future are we cleaning up for? Cleanup should not be based on whether the Military stays at Bellows or not.	Reasonably anticipated future land use changes have been considered for all project sites. The Bellows AFS is currently used as a military training and recreation facility and there are no known plans to change the status or land use of any of the subject sites. In addition, the Department of Defense (DOD) approach to managing its sites identifies procedures for further evaluating risk to human and ecological receptors if the future land use were to change: "The DOD has a policy, or review mechanism, to address the environmental aspects of future land use changes and land transfers. Land transfers within the DOD, or to entities outside of DOD (e.g., civilian, tribal or municipal), require an Environmental Baseline Survey (EBS) to be completed (USAF, 1994).[i] The EBS reviews all environmental studies related to the property and considers if the levels of contamination documented at the site pose unacceptable risk to human health and the environment."

REVIEW COMMENTS AND RESPONSES
Draft Final Informal Technical Information Report (ITIR) for Site LF01
Engineering Evaluation/Cost Analysis for Operable Unit 1 (Sites LF01, DP17, SD22, and DP06), Bellows Air Force Station, Oahu, Hawaii
Reviewer: Jim Andrews, Community Co-Chair, Bellows AFS Restoration Advisory Board (RAB) (11 April 2001)

ITEM	PAGE	SECTION	COMMENT	CONTRACTOR RESPONSE
3	Volume 1, Page 5-22	Volume 1, Section 5.4.5	Three metals have been detected at the LF01 site (lead, mercury, and zinc in surface soil) and have been identified as COCs and posing potential risk to current and future ecological receptors, but *what about community or potential civilian* (other than Marine trainees) receptors now and in the future of the site? Can we be sure these areas [are secure and will be] in the future?	Based on reasonably anticipated future land use for this site, military personnel were chosen receptor because this portion of the Base is currently and expected in future to be restricted to military personnel. Conservative exposure assumptions for the military personnel scenario assume, for example, that a marine trainee will ingest 50 milligrams of soil each day, 250 days per year, for 25 years, which very likely overestimates the actual exposure. Also, as noted in the response to comment 2, in the event of a change in land use status, site data will be re-evaluated.
4		General	In short, the final draft concludes with many uncertainties and admits to the lack of sufficient data in areas of ground water sampling, soil sampling (chemical contamination) specifically in relationship to community water concerns as well as future uses of Bellows AF[S].	Uncertainties related to assessing the nature of chemicals in groundwater and to evaluating groundwater flow are inherent to the site and risk characterization and processes. However, as stated in the conclusions to the ITIR, (1) the weight of available information does not support the conclusion of an interconnection between the site and Waimanalo Stream, and (2) a separate study of Waimanalo Stream concluded that the stream poses no unacceptable risk to human or ecological receptors (using very conservative assumptions). Please also refer to the responses to comments 1, 2, and 3.
5		General	I feel that funding not being a problem, the entire area should be excavated and all contents that were placed there while it was a landfill removed and [the area should be] restored to its original state.	Excavating the contents of the landfill is one of the alternatives under consideration by the Air Force for this site. However, funding is not the only consideration. Excavation and removal of the landfill materials could itself result in impacts to human health and the environment including potential exposure of construction workers to landfill materials during excavation, and to contaminants through fugitive dust emissions, surface water runoff, and spillage during both excavation and hauling. Removal of the landfill contents would also potentially disrupt the community (current estimates indicate that approximately 400 truckloads would

REVIEW COMMENTS AND RESPONSES
Draft Final Informal Technical Information Report (ITIR) for Site LF01
Engineering Evaluation/Cost Analysis for Operable Unit 1 (Sites LF01, DP17, SD22, and DP06), Bellows Air Force Station, Oahu, Hawaii
Reviewer: Jim Andrews, Community Co-Chair, Bellows AFS Restoration Advisory Board (RAB) (11 April 2001)

ITEM	PAGE	SECTION	COMMENT	CONTRACTOR RESPONSE
				be required to transport landfill materials away from Bellows AFS).
6		General	I feel more should be done to satisfy the community's concerns now and in the future, and therefore recommend additional site data to refine this final draft to a more conclusive report.	As stated earlier, uncertainties are always inherent in the risk characterization processes. These uncertainties are addressed by using health-conservative assumptions to estimate risk. The conclusions of this ITIR state that three metals were retained as chemicals of concern (based on a food-web model for the Hawaiian Owl), although calculated hazard quotients indicate risks are marginal. Although risks are considered marginal, the Air Force is evaluating several alternatives to mitigate risks to both human health and environmental receptors, several of which have been added based on input from both the Department of Health and the community. Please also refer to the responses for comments 1 and 3.
7		General	Finally, the point of occupancy of Bellows AF[S] land in the future is unknown, and to *eliminate the community as potential occupants seems* to have occurred in this report. Please let me remind you that while the various military branches now occupy the base, it's also shared with the community for recreation and resides in a native Hawaiian community which one day hopes to regain possession of their lands.	Again, reasonably anticipated future land use changes have been considered for all project sites, and those land uses for Site LF01 are limited to DOD use for the foreseeable future. However, DOD policy dictates that additional study would be required if the future land use were to change. Please also refer to the response for comment 2.

[i] **United States Air Force (Elaine Ross, OPR). 25 April 1994. Air Force Instruction (AFI) 32-7066**.

REVIEW COMMENTS AND RESPONSES
Draft Engineering Evaluation/Cost Analysis (EE/CA) Report for Site LF01
Operable Unit 1, Bellows Air Force Station, Oahu, Hawaii
Reviewer: Randall Hu, U.S. Marine Corps (16 April 2001)

ITEM	PAGE	SECTION	COMMENT	CONTRACTOR RESPONSE
1	Figure 9	Figure 9	The Figure 9 conceptual landfill cover design gives the appearance that the cover does not extend over DP-17A as depicted in Figure A-2. Need to ensure that the landfill cover extends over all affected landfill areas in LF01 and DP-17A.	Figure 9 will be revised to ensure that the soil/vegetative cover extends over the DP17A area. *[Please note: Figures 9, 10, and 11 in the draft EE/CA Report have been combined into Figure 10 in the final EE/CA Report, which shows a plan view and cross-sections of Alternative 3. Figure 9 in the final EE/CA Report has been developed to serve the same purposes for Alternative 2.]*
2	4-	4.3.3	Should provide further justification (e.g. evaluation of past groundwater results) for proposal to sample selected metals during long-term monitoring.	Additional justification will be provided to support the analytical suite for long-term monitoring.

REVIEW COMMENTS AND RESPONSES
Draft Engineering Evaluation/Cost Analysis (EE/CA) Report for Site LF01
Operable Unit 1, Bellows Air Force Station, Oahu, Hawaii
Reviewer: Teresita S. Salire, State of Hawaii Department of Health, Hazard Evaluation and Emergency Response Office (Additional Comments on 5 June 2001)

ITEM	PAGE	SECTION	COMMENT	CONTRACTOR RESPONSE
1		Alternative 4	How did the contractor arrive at the volume of 1,600 cubic yards of excavated soil?	This volume is based on the area depicted in Figure 13, calculated as approximately 13,800 square feet (where concentrations of lead exceeded the industrial PRG of 750 ppm) x 3-foot excavation = 41,400 cubic feet/27 cubic feet per cubic yard = 1,600 cubic yards (rounded up to the nearest 100 cubic yards).
2		Alternative 4	Why excavate to a depth of 3 feet?	Sampling during the EE/CA was from 0 to 2 feet; 0 to 3 feet was assumed for conservatism.
3		Alternative 4	What bulk density was used?	Bulk density was assumed to be 1.5 tons per cubic yard.
4		Alternative 4	How did the contractor arrive at the total of 2,400 tons?	1,600 cubic yards x 1.5 tons/cubic yard = 2,400 tons.
5		Alternative 4	What were the cover soil and top soil calculations based on?	Cover: It was assumed that 1/2 of the area would require cover (13,800/2 = 6,900 square feet x a 2-foot cover = 13,800 cubic feet/27 cubic feet per cubic yard = 520 cubic yards (rounded up to the nearest 10 cubic yards). Top soil: It was assumed that the entire area would require a top soil cover of 0.5 feet (13,800 square feet x 0.5 foot = 6,900 cubic feet/27 cubic feet per cubic yard = 260 cubic yards (rounded up to nearest 10 cubic yards).
6		Alternative 4	No number was provided for backfill soil.	It was assumed that the cover/top soil would suffice for backfill.
7		Alternatives 3 and 4	Why is a full suite of analytes anticipated in the laboratory analysis for Alternative 4, while only the four metals for the LTM of groundwater would be analyzed under Alternative 3?	The laboratory analysis for LTM of groundwater would be a full suite of analytes under both alternatives; only lead, mercury, and zinc analyses are assumed for the confirmatory soil sampling that would be done once the surface soil had been excavated.
8		Alternative 3	What was the cover soil calculation based on?	The cover soil calculation was based on covering 55,800 square feet (based on the area of the landfill, plus the DP17A area outside the actual landfill, and including a "halo" as shown in Figure 9 of the draft EE/CA report [to be slightly revised in the final report]). The cover thickness was assumed to be 2 feet, top soil thickness was assumed to be 0.5 foot, and bulk density was assumed to be 1.5

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ITEM	PAGE	SECTION	COMMENT	CONTRACTOR RESPONSE
				tons per cubic yard.
9		General; new Attachment E	I would like to see an asterisk in the EE/CA Report directing any interested readers to the alternatives that are discussed in the Review Comments and Responses attachment but not in the report itself.	Footnotes will be added where applicable in the final EE/CA Report directing interested readers to the alternatives that are discussed in the Review Comments and Responses attachment. This will be a new Attachment E in the final EE/CA Report.

01-188--TS

June 7, 2001

Ms. Leanne Tanouye
Environmental Restoration Program
Department of the Air Force
15 CES/CEVR
75 H Street
Hickam AFB, Hawaii 96853-5223

Subject: Review of Response to Comments on the *Draft Engineering Evaluation/Cost Analysis (EE/CA) Report for Landfill 01 (LF01) Operable Unit 1, Bellows Air Force Station, Oahu, Hawaii – March 2, 2001*

Dear Ms. Tanouye:

The Hawaii Department of Health (HDOH), Hazard Evaluation and Emergency Response (HEER) Office has reviewed the response to comments on the subject draft report. We concur with the responses and the recommended remedial alternative for LF01.

Should you have any questions, please contact me at 586-4256.

Sincerely,

TERESITA S. SALIRE
Remedial Project Manager
Hazard Evaluation and Emergency Response Office