FOSTER WHEELER ENVIRONMENTAL CORPORATION

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MOFFETT FIELD
SSIC NO. 5090.3

SWDIV CONTRACT NO. N44255-95-D-6030
DO NO. 0088

FINAL

TECHNICAL MEMORANDUM/ COST JUSTIFICATION FOR REMEDIAL ALTERNATIVES

Revision 0
May 30, 2001

SITE 22 GOLF COURSE LANDFILL
MOFFETT FEDERAL AIRFIELD
MOFFETT FIELD, CALIFORNIA

DCN: FWSD-RACII-01-0228

Southwest Division
Naval Facilities Engineering Command
1220 Pacific Highway
San Diego, California 92132-5190

CONTRACT NO. N44255-95-D-6030
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DCN: FWSD-RACII-01-0228

FOSTER WHEELER ENVIRONMENTAL CORPORATION
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DEPARTMENT OF THE NAVY
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NAVAL FACILITIES ENGINEERING COMMAND
1220 PACIFIC HIGHWAY
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5090
Ser 06CH.AM/0567
May 23, 2001

Mr. John Hamill
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San Francisco, CA 94105-3901

Dr. Lynn Suer
Regional Water Quality Control Board
San Francisco Bay Region
1515 Clay Street, Suite 1400
Oakland, CA 94612

Dear Mr. Hamill and Dr. Suer:

I am pleased to provide you with the final Technical Memorandum/Cost Evaluation for Remedial Alternatives for Moffett Federal Airfield Site 22. This document explains the differences between the costs of the remedial alternatives presented in the March 1999 Feasibility Study and the April 2001 Proposed Plan. Thank you for your assistance during the preparation of this document. As always, if you have any questions or comments, please do not hesitate to contact Wilson Doctor or me in any of the following ways:

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Sincerely,

Andrea Muckerman

ANDREA MUCKERMAN
BRAC Environmental Coordinator,
By direction of the Commander

Enclosure: 1. Final Technical Memorandum/Cost Justification for Remedial Alternatives

5090
Ser 06CH.AM/0567
May 23, 2001

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TO: Contracting Officer
Naval Facilities Engineering Command
Southwest Division
Mr. Richard Lovering, 02R1.RL
1220 Pacific Highway
San Diego, CA 92132-5190

DATE: 06/01/01
DO: 0088
LOCATION: Moffett Fed. Airfield

FROM: **Neil Hart**, Program Manager

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ABBREVIATIONS AND ACRONYMS

DO	Delivery Order
EPA	U.S. Environmental Protection Agency
FS	Feasibility Study
GCL	Geosynthetic Clay Liner
MFA	Moffett Federal Airfield
O&M	Operation and maintenance
OM&M	Operation, monitoring, and maintenance
RAC	Remedial Action Contract

1.0 INTRODUCTION

The main purpose of this technical memorandum is to update the cost estimates presented in the March 17, 1999 Feasibility Study (FS) for the Site 22 Landfill at Moffett Federal Airfield (MFA), Moffett Field, California. This Technical Memorandum explains the cost differential for the various remedial alternatives described in the March 17, 1999 FS and the costs provided for implementation of these alternatives as presented in the Proposed Plan.

The technical memorandum also addresses a comment received from the U.S. Environmental Protection Agency (EPA) requesting justification of costs for implementation of the various alternatives as presented in the Proposed Plan for the Site 22 Landfill. This technical memorandum will be appended to the March 17, 1999 FS for the site.

2.0 JUSTIFICATION FOR THE COST ESTIMATES

Justification for the cost estimates presented for each alternative considered in the FS and the Proposed Plan is provided below. Cost estimates for implementation of the various alternatives proposed in the FS have been reevaluated based on current practices and actual costs for materials, equipment, and labor. The revised cost estimates for these alternatives are presented in the Proposed Plan. In addition to an explanation for the cost differential between the FS and the Proposed Plan, tabulated summaries of the estimated costs from the Proposed Plan for implementation of Alternatives 2, 3A, and 3B are also provided in Tables 1, 2, and 3, respectively.

2.1 ALTERNATIVE 1: NO ACTION WITH GROUNDWATER AND LANDFILL GAS MONITORING

Alternative 1	Proposed Plan	Feasibility Study
Total Cost (Capital + OM&M)	$200,000	$185,100
Capital	$2,000	$1,200
Annual OM&M	$10,000	$9,500

Initial capital costs of $2,000 and annual operation, monitoring, and maintenance (OM&M) costs of $10,000 are currently proposed. The $10,000 was calculated using the annual OM&M estimate of $9,500 from the March 1999 FS and adding two years of cost escalation (estimated at 4 percent per annum) and rounding off to the nearest thousand. Using $10,000 per year over 30 years instead of $9,500 per year (as proposed in the FS) approximately results in an additional $15,000 (or $200,000 versus $185,100) over the life of the project.

2.2 ALTERNATIVE 2: BIOTIC BARRIER

Alternative 2	Proposed Plan	Feasibility Study
Total Cost (Capital + O&M)	$1,835,000	$641,500
Capital	$1,415,000	$367,100
Annual O&M	$21,000	$16,500

This alternative is the preferred alternative for the site. The significant cost differential from the current estimate of $1,835,000 versus the 1999 FS estimate of $641,500 for implementation of this alternative is due to several factors. The primary difference relates to the additional time, materials, labor, and equipment that is needed to implement an effective biotic barrier using cobbles, aggregate stone, and concrete slurry rather than a geotextile membrane and a minimum soil cover as described in the FS. There is approximately $627,000 in additional costs for labor, equipment, and materials involved in importing and placing 16,000 tons of cobble stone, 8,000 tons of aggregate stone, and 1,800 yards of gunnite cement over 7 acres as currently proposed versus the placement of geotextile material and estimated 6 inches of soil over 5 acres as proposed in the FS. This makes up the majority of the cost differential between the two approaches.

From recent experience, the geotextile and soil cover alone would not be adequate to prevent burrowing of squirrels into the landfill. The current and more effective approach will require 4 months to install rather than 2 months, will address 7 acres of the site versus 5 acres proposed in the FS, and will require additional equipment, materials, and labor costs over what was proposed in the FS. Following is a comparison of additional factors that support the current cost estimate for the biotic barrier versus the 1999 FS estimate:

- The O&M costs for the Proposed Plan assume an annual escalation rate of 4% and the costs are discounted back to present value using a U.S. Treasury Rate of 7.25% in effect November 10, 2000 versus the FS which only assumed a 6.0% discount rate back to present value.
- Eight pieces of heavy equipment will be required over 4 months at $31,000/month versus the previous estimate of 5 pieces of equipment at $17,000/month for 2 months.
- $4,000 for abandonment of two groundwater monitoring wells has been added, which was not accounted for in the 1999 FS.
- Four instead of three additional landfill wells will be installed per the FS, while the previous estimate had included only three new wells.
- $18,000 has been estimated for removal of the existing irrigation system on the site. The 1999 FS did not address removal of the irrigation system.
- $40,600 has been estimated for removal of trees, grubbing of vegetation, and erosion control and the FS did not address tree removal, grubbing, or erosion control.
- Estimated equipment operator labor rates using Davis-Bacon Act wage scale rates of $44 per hour is proposed, while it appears the FS proposed only $22 per hour for operator rates.
- The current proposal is to remove, temporarily stockpile, and replace 9,000 cubic yards of topsoil and import an additional 1,000 cubic yards. The topsoil cover will be 1-foot

thick to support substantial vegetation and prevent erosion. The FS does not account for removal of soil and only accounts for 6 inches of topsoil over the site, which would be inadequate protective soil cover to control erosion or to support sufficient vegetation growth.

- The estimated costs for water for dust control at 15,000 gallons per day at $.01/gallon are $13,500 over 90 workdays. The cost of the water to be used for dust control was not included as a line item in the 1999 FS.
- $143,000 is proposed for installing an irrigation system, adding soil amendments, and hydroseeding the final cover, while the 1999 FS did not propose costs for any irrigation system, soil amendments, or initiation of a vegetative cover.

2.3 ALTERNATIVE 3A: MULTI-LAYER COVER AND CLAY CAP

Alternative 3A	Proposed Plan	Feasibility Study
Total Cost (Capital + O&M)	$4,105,000	$2,230,900
Capital	$3,490,000	$1,956,500
Annual O&M	$31,000	$16,500

As with Alternative 2, the significant cost differential from the current estimate and the 1999 FS estimate for implementation of this alternative is due to the additional time, materials, labor, and equipment that is needed to implement an effective biotic barrier using cobbles, aggregate stone, and concrete slurry rather than geotextile membrane and clay cap as described in the FS. The additional cost of labor, equipment, and materials involved in importing and placing 23,000 tons of cobble stone, 12,000 tons of aggregate stone, and 2,200 yards of gunnite cement over 9.4 acres versus the placement of only geotextile material over the clay cap is approximately $900,000, which makes up the majority of the cost differential between the two approaches.

As mentioned in Alternative 2, from recent experience, the geotextile and soil cover alone would not be adequate to prevent burrowing of squirrels into the landfill. The Navy's current estimate is that the more effective biotic barrier will require 6 months to install rather than 3.5 months, and will require additional equipment, materials, and labor costs over what was proposed in the FS. Following is a comparison of additional factors that support the current cost estimate for the biotic barrier with multi-layer cover and clay cap versus the 1999 FS estimate:

- The O&M costs for the Proposed Plan assume an annual escalation rate of 4% and the costs are discounted back to present value using a U.S. Treasury Rate of 7.25% in effect

November 10, 2000 versus the FS which only assumed a 6.0% discount rate back to present value.

- Eight pieces of heavy equipment will be needed over 6 months at $31,000/month versus the FS proposal of 5 pieces of equipment at $17,000/month for 3.5 months.
- Grubbing vegetation and clearing trees over 7 acres will be required for effective implementation, and the FS only proposed grubbing and clearing trees over 2 acres.
- The current estimate has included costs for importing 17,000 tons of material to support a 2-foot foundation layer for compaction of the clay cover. The FS did not address construction of a foundation layer.
- The current plan estimates annual operation and maintenance (O&M) costs of $31,000/year over years 3 to 30, and the FS estimated $16,500/year for O&M costs over this period. The current proposal includes a higher allocation of O&M costs for cap inspections and repairs due to settlement that would lead to surface or subsurface ponding.

2.4 ALTERNATIVE 3B: MULTI-LAYER COVER AND GEOSYNTHETIC CLAY LINER (GCL)

Alternative 3B	Proposed Plan	Feasibility Study
Total Cost (Capital + O&M)	$3,790,000	$1,537,400
Capital	$3,175,000	$1,263,000
Annual O&M	$31,000	$16,500

As described for Alternatives 2 and 3A, the most significant cost differential from the current estimate and the 1999 FS estimate for implementation of this alternative is due to the additional time, materials, labor and equipment that is needed to implement an effective biotic barrier using cobble, aggregate stone, and concrete slurry rather than geotextile membrane over the GCL layer as described in the FS. The additional cost of labor, equipment, and materials involved in importing and placing cobble stone, aggregate stone, and gunnite cement over 9.4 acres as mentioned in Alternative 3A versus the placement of only geotextile material over the GCL cover is $900,000, which makes up the majority of the cost differential between the two approaches.

As previously stated, from recent experience, the geotextile material over the GCL cover alone would not be adequate to prevent burrowing of squirrels into the landfill. The current and more effective approach will require 6 months to install rather than 3.5 months, and will require

significant additional equipment, materials, and labor costs over what was proposed in the FS. Following is a comparison of additional factors that support the current cost estimate for the biotic barrier with multi-layer cover and GCL versus the 1999 FS estimate:

- The O&M costs for the Proposed Plan assume an annual escalation rate of 4% and the costs are discounted back to present value using a U.S. Treasury Rate of 7.25% in effect November 10, 2000 versus the FS which only assumed a 6.0% discount rate back to present value.
- Eight pieces of heavy equipment will be needed over 6 months at $31,000/month versus the FS proposal of 5 pieces of equipment at $17,000/month for 3.5 months.
- Grubbing vegetation and clearing trees over 7 acres will be required, and the FS only proposed grubbing and clearing trees over 2 acres.
- The 1999 FS costs for a protective soil layer appear to address only material purchase prices but do not include an additional $5.00/ton for labor and equipment required for ground preparation and placement of cover material.
- The current estimate accounts for placement of a 2-foot protective layer over the GCL, which is the minimum required before equipment can be used on the cover. The 1999 FS costs account for only a 1-foot protective layer.
- The current estimate includes costs for importing 17,000 tons of material for a 2-foot foundation layer to support the GCL cover. The 1999 FS only provided for a 1-foot foundation layer.
- The current plan estimates annual operation and maintenance (O&M) costs of $31,000/year over years 3 to 30, and the FS estimated $16,500/year for O&M costs over this period. The current proposal includes a higher allocation of O&M costs for cap inspections and repairs due to settlement that would lead to surface or subsurface ponding.

2.5 ALTERNATIVE 4: EXCAVATION AND OFFSITE DISPOSAL

The current costs for this alternative as presented in the Proposed Plan are an average of the cost range that was proposed in the 1999 FS.

TABLE 1

ALTERNATIVE 2 - BIOTIC BARRIER
MOFFETT FEDERAL AIRFIELD - SITE 22 LANDFILL

	QUANTITY	UNIT	MATERIAL	LABOR & EQUIPMENT	TOTAL
ABANDON GROUNDWATER WELL	2	EACH	$500.00	$1,500.00	$4,000.00
PLACE GAS WELL	4	EACH	$1,000.00	$2,000.00	$12,000.00
IRRIGATION SYSTEM REMOVAL	4500	LF	$1.00	$3.00	$18,000.00
TREE REMOVAL	110	EACH	$20.00	$120.00	$15,400.00
GRUBBING	7	ACRES	$500.00	$1,500.00	$14,000.00
EROSION CONTROL	7	ACRES	$500.00	$1,100.00	$11,200.00
DUST CONTROL	90	DAYS	$200.00	$500.00	$63,000.00
REMOVE TOPSOIL/STOCKPILE	9000	CY	$1.00	$4.00	$45,000.00
PLACE COBBLE STONE	16000	TON	$20.00	$5.00	$400,000.00
PLACE AGGREGATE STONE	8000	TON	$15.00	$3.00	$144,000.00
GUNNITE CEMENT	1800	CY	$54.00	$8.00	$111,600.00
IMPORT TOPSOIL	1000	TON	$18.00	$2.00	$20,000.00
PLACE TOPSOIL	10000	CY	$1.00	$4.00	$50,000.00
FINISH GRADING/SOIL ADDM	7	ACRES	$1,200.00	$1,000.00	$15,400.00
HYDROSEEDING	7	ACRES	$3,000.00	$1,000.00	$28,000.00
IRRIGATION	5000	LF	$8.00	$12.00	$100,000.00
SURVEY	2	EACH	$500.00	$4,500.00	$10,000.00
QUALITY CONTROL	90	DAYS	$100.00	$200.00	$27,000.00
SECURITY/TRAFFIC CONTROL	30	DAYS	$20.00	$150.00	$5,100.00
SMALL EQUIP/HAND TOOLS	90	DAYS	$150.00	$75.00	$20,250.00
			SUBTOTAL		$1,113,950.00
			CONTINGENCY 27%		$1,414,716.50

Notes:
cy - cubic yard
LF - linear feet

TABLE 2

ALTERNATIVE 3A - MULTILAYER CAP (CLAY)
MOFFETT FEDERAL AIRFIELD - SITE 22 LANDFILL

	QUANTITY	UNIT	MATERIAL	LABOR & EQUIPMENT	TOTAL
ABANDON GROUNDWATER MONITORING WELL	2	EACH	$500.00	$1,500.00	$4,000.00
PLACE GAS WELL	4	EACH	$1,000.00	$2,000.00	$12,000.00
IRRIGATION SYSTEM REMOVAL	5500	LF	$1.00	$3.00	$22,000.00
TREE REMOVAL	115	EACH	$20.00	$120.00	$16,100.00
GRUBBING	7	ACRES	$500.00	$1,500.00	$14,000.00
EROSION CONTROL	9.4	ACRES	$500.00	$1,100.00	$15,040.00
DUST CONTROL	120	DAYS	$200.00	$500.00	$84,000.00
REMOVE 6 INCHES FROM 7 ACRES TOPSOIL/STOCKPILE	5600	CY	$1.00	$4.00	$28,000.00
IMPORT/PLACE FOR 24-INCH FOUNDATION	17000	TON	$10.00	$4.00	$238,000.00
IMPORT FOR CLAY BARRIER	23000	TON	$18.00	$2.00	$460,000.00
CLAY TEST PAD	1	EACH	$1,000.00	$50,000.00	$51,000.00
CLAY CONDITIONING	15000	CY	$1.00	$3.00	$60,000.00
CLAY PLACEMENT & COMPACTION	15000	CY	$1.00	$5.00	$90,000.00
PLACE COBBLE STONE	23000	TON	$20.00	$5.00	$575,000.00
PLACE AGGREGATE STONE	12000	TON	$15.00	$3.00	$216,000.00
GUNNITE CEMENT	2200	CY	$54.00	$8.00	$136,400.00
IMPORT TOPSOIL	20000	TON	$16.00	$2.00	$360,000.00
PLACE TOPSOIL	23000	CY	$1.00	$4.00	$115,000.00
FINISH GRADING/SOIL AMENDMENT	9.4	ACRES	$1,200.00	$1,000.00	$20,680.00
HYDROSEEDING	9.4	ACRES	$3,000.00	$1,000.00	$37,600.00
IRRIGATION	5000	LF	$8.00	$12.00	$100,000.00
SURVEY	4	EACH	$500.00	$4,500.00	$20,000.00
QUALITY CONTROL	120	DAYS	$100.00	$200.00	$36,000.00
SECURITY/TRAFFIC CONTROL	60	DAYS	$20.00	$150.00	$10,200.00
SMALL EQUIP/HAND TOOLS	120	DAYS	$150.00	$75.00	$27,000.00
			SUBTOTAL		$2,748,020.00
			CONTINGENCY 27%		$3,489,985.40

Notes:
cy - cubic yard
LF - linear feet

TABLE 3

ALTERNATIVE 3B - MULTILAYER CAP (GCL)
MOFFETT FEDERAL AIRFIELD - SITE 22 LANDFILL

	QUANTITY	UNIT	MATERIAL	LABOR & EQUIPMENT	TOTAL
ABANDON GROUNDWATER MONITORING WELL	2	EACH	$500.00	$1,500.00	$4,000.00
PLACE GAS WELL	4	EACH	$1,000.00	$2,000.00	$12,000.00
IRRIGATION SYSTEM REMOVAL	5500	LF	$1.00	$3.00	$22,000.00
TREE REMOVAL	115	EACH	$20.00	$120.00	$16,100.00
GRUBBING	7	ACRES	$500.00	$1,500.00	$14,000.00
EROSION CONTROL	9.4	ACRES	$500.00	$1,100.00	$15,040.00
DUST CONTROL	100	DAYS	$200.00	$500.00	$70,000.00
REMOVE 6 INCHES FROM 7 ACRES TOPSOIL/STOCKPILE	5600	CY	$1.00	$4.00	$28,000.00
IMPORT/PLACE FOR 24-INCH FOUNDATION	17000	TON	$10.00	$4.00	$238,000.00
GCL MAT	410000	SF	$0.80	$0.00	$328,000.00
GCL & SOIL PLACEMENT ADDITION	410000	SF	$0.03	$0.25	$114,800.00
PLACE COBBLE STONE	23000	TON	$20.00	$5.00	$575,000.00
PLACE AGGREGATE STONE	12000	TON	$15.00	$3.00	$216,000.00
GUNNITE CEMENT	2200	CY	$54.00	$8.00	$136,400.00
IMPORT TOPSOIL	20000	TON	$16.00	$2.00	$360,000.00
PLACE TOPSOIL	23000	CY	$1.00	$4.00	$115,000.00
FINISH GRADING/SOIL AMENDMENT	9.4	ACRES	$1,200.00	$1,000.00	$20,680.00
HYDROSEEDING	9.4	ACRES	$3,000.00	$1,000.00	$37,600.00
IRRIGATION	5000	LF	$8.00	$12.00	$100,000.00
SURVEY	3	EACH	$500.00	$4,500.00	$15,000.00
QUALITY CONTROL	100	DAYS	$100.00	$200.00	$30,000.00
SECURITY/TRAFFIC CONTROL	60	DAYS	$20.00	$150.00	$10,200.00
SMALL EQUIP/HAND TOOLS	100	DAYS	$150.00	$75.00	$22,500.00
			SUBTOTAL		$2,500,320.00
			CONTINGENCY 27%		$3,175,406.40

Notes:
cy - cubic yard
LF - linear feet
SF - square feet
GCL - Geosynthetic Clay Liner