DEPARTMENT OF THE AIR FORCE
27TH CIVIL ENGINEER SQUADRON (ACC)
CANNON AIR FORCE BASE NEW MEXICO

Rec'd 3/24/03

10 MAR 2003

Mr. Robert S. Pyeatt
Deputy Base Civil Engineer
506 N DL Ingram Blvd
Cannon AFB NM 88103-5003

Mr. James Bearzi
Hazardous Waste Bureau Chief
New Mexico Environment Department
2905 Rodeo Park Drive East, Bldg 1
Santa Fe NM 87505

Dear Mr. Bearzi

Foster Wheeler Environmental Corporation has sent under separate cover three copies of the Final Work Plan for the Closure of Solid Waste Management Unit (SWMU) 101 dated Feb 03 for your review and records. Two copies were sent to Mr. Glenn von Gonten in your Santa Fe office and one was sent to Mr. Rob Warder in Albuquerque. The Work Plan describes the activities required of the contractor, Foster Wheeler Environmental Corporation, and its subcontractors to close the aforementioned SWMU.

This Work Plan was prepared in accordance with the findings of the corrective measures study for the closure of the sewage lagoons. If you have any questions, please contact Mr. Peter P. Zamie at (505) 784-1092.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or person who managed the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Sincerely

ROBERT S. PYEATT, GS-13

Attachment:
Final Work Plan, Feb 03

cc:
NMED (G. von Gonten)

CAFB 2003

FOSTER WHEELER ENVIRONMENTAL CORPORATION

February 11, 2003
TERC-035-001-03X-015

FEB 2003

Mr. Max Pastor
U.S. Army Corps of Engineers
201 North Perimeter Road
Cannon AFB, NM 88103

Subject: TERC Contract No. DACW45-94-D-0003, Delivery Order 35, WAD 1; Submittal of Final Work Plan for the Closure of SWMU 101- Sewage Lagoons, Cannon Air Force Base, New Mexico

Dear Mr. Pastor:

Attached for your use are two copies of the above mentioned Final Work Plan. By cover of this letter, Pete Zamie at Cannon AFB was provided three copies of the work plan; and an additional four copies were delivered to Tom Zink at the U.S. Army Corps of Engineers (USACE), Omaha District. All comments received have been incorporated into the final document and listed in the comment response document provided in Attachment 1.

If you would like more detailed information or have any other questions or concerns, please call me at (505) 878-8925, or Carol Bieniulis at (505) 878-8924.

Sincerely,
Foster Wheeler Environmental Corporation

Robert Ederer, PE
Task Manager

Attachments

cc: P. Zamie/Cannon AFB (3 copies)
T. Zink/USACE, Omaha (4 copies)
C. Bieniulis/FWENC (1 copy)
J. Morning/FWENC (1 copy)
S. Seyedian/FWENC (w/o attachments)
TERC Project File (1 copy)

6605 Uptown Boulevard, N.E., Suite 220, Albuquerque, New Mexico 87110
Tel: 505-878-8900 Fax: 505-878-8933

Attachment 1

Comment Response Document

Draft Work Plan for the Closure of SWMU 101–Sewage Lagoons
Cannon Air Force Base, New Mexico
November 2002

Comment No.	Page/Section	Comments	Response
Reviewer: Pete Zamie, Cannon AFB			
1.	General/Appendix E	There are two storm drain culverts in the area that convey water directly to the North Playa Lake, a "Waters of the US." Consequently, this project has the potential to discharge a large amount of pollutants (e.g., sediment) to this water body.	North Playa Lake will be added to the map and addressed with appropriate BMPs. These BMPs are also discussed in Section 3.2.4.
2.	General/Appendix E	The SWPPP needs to be a stand-alone, complete, and easily maneuvered document. For example, only include those documents necessary for this project. Attachment 1, California Storm Water Best Management Practice Handbooks, may be a great reference too, but should no be part of the SWPPP.	Only applicable BMP's will be included and referenced in Attachment 1, as indicated in comment 9.
3.	Page E-iii/Appendix E	Change 27th Civil Engineer Squadron Commander's name to : Lt Col John C. Bower	Signature block changed
4.	Page E-5/Appendix E Section 1.3.1	The construction schedule table in Attachment 4 needs to be in a form that allows it to be revised. The intent is to annotate when various phases began, when they are anticipated to be complete, and when they were actually completed.	The construction schedule table will be modified and list the planned start and finish as well as the actual start and finish dates.
5.	Page E-8/Appendix E Section 2.3	States that location of potential pollution sources is indicated on Figure E-2. This figure shows nothing other than the location of the lagoons. Storm water regulation requires a site map that indicates (1) drainage patterns and approximate slopes anticipated after major grading activities; (2) areas of soil disturbance; (3) an outline of areas which are not to be disturbed; (4) the location of major structural and nonstructural controls identified in the plan; (5) the location of areas where stabilization practices are expected to occur; (6) locations of off-site material, waste, borrow, or equipment storage areas; (7) surface waters (including wetlands); and (8) locations where storm water is discharged to a surface water.	A new figure (E-3) will be added to account for detailed site parameters.
6.	E-9/Appendix E Section 2.3.4	Use "practical" rather than "possible."	Sentence modified.
7.	General/Appendix E	The SWPPP shall address all non-storm water discharges. Except for flows from fire fighting activities, sources of non-storm water that are combined with storm water discharges associated with construction activities shall be identified in the plan. The **Federal Register** identifies these acceptable non-storm water discharges. While Page E-22, Section 3.2.6 mentions dust control as the only "non-rainfall discharge," are there any others (e.g., landscape watering to establish turf)? Foster Wheeler should review the permit to determine whether just mentioning dust control complies with the permit requirements. May need to elaborate on how water will be applied during dust control operations.	The following non-stormwater discharges will be added: — Water from irrigation activities — Waters used to wash vehicles And the following sentence added: "Only the amount of water needed to suppress dust will be applied and no runoff from dust suppression activities is anticipated."
8.	General/Appendix E	Storm water regulations require that a brief project description be posted at the construction site in a prominent and safe place, e.g., contractor's trailer. Add statement in SWPPP of where the description will be maintained.	Statement added to Section 1.3.2
9.	Page E-11/Appendix E Section 3	Last sentence states a complete listing of applicable BMPs is provided as Attachment 1. This attachment identifies all possible BMPs, not just those applicable to this project. SWPPP needs to be tailored to this project.	BMP's will be tailored to this project.

Draft Work Plan for the Closure of SWMU 101–Sewage Lagoons
Cannon Air Force Base, New Mexico
November 2002

Comment No.	Page/Section	Comments	Response
10.	Page E-12/Appendix E Table E-4	Strongly recommend that the SWPPP only address the minimum requirements of the storm water permit (e.g., inspections within 24 hours of a storm event of 0.5 inches or more, inspections at least every 14 calendar days), rather than include words such as "regularly" and "weekly". There should not be two inspection "checklists" in the SWPPP. That is, all items on Figure E-3, *Erosion, Sediment, and Pollution Control Checklist*, and Figure E-4, *Stormwater Pollution Prevention Plan Inspector Report*, are items that need to inspected every 14 days or within 24 hours of a storm event of 0.5 inches or more.	This section will be updated to reflect the minimum requirements stated in NPDES General Permits for Storm Water Discharges in Region 6; Notice, dated July 6, 1998.
11a.	Page E-14/Appendix E Table E-5	The inspections listed in the SWPPP need to be specific to requirements set forth in the storm water NPDES permit. As mentioned above, there shouldn't be a required inspection frequency more often than required by the permit (e.g., at least every 14 calendar days). My point is this: do not require weekly documented inspections when the permit does not require it. If done more frequently than every 14 calendar days, then document the inspection, but do not commit to this increased frequency in the SWPPP.	This section will be updated to reflect the minimum requirements stated in NPDES General Permits for Storm Water Discharges in Region 6; Notice, dated July 6, 1998. Clarification will be inserted into Section 3.1.3 to distinguish between the "official" inspections conducted pursuant to the permit requirements from the routine "maintenance" inspections conducted on a more regular basis as part of the BMPs.
11b.	Page E-14/Appendix E Table E-5	Change "(and after storm events)" to "(and after applicable storm events)."	Sentence modified.
12a.	Page E-14/Appendix E Section 3.1.4	I disagree that suspended solids are predominantly released in runoff from spills and leaks, rather solids are transported via runoff not associated spill and leaks. Please reevaluate this statement.	This statement will be reevaluated and modified, as appropriate.
12b.	Page E-15/Appendix E Section 3.1.4	Recommend the following statements be added to this section: Foster Wheeler personnel will immediately notify the CO and Mr. John Rebman, 27th Civil Engineer Squadron Environmental Flight (784-1099) when a release containing a hazardous substance in an amount equal to or in excess of a reportable quantity (RQ) established under either 40 CFR 117 or 40 CFR 302, occurs during a 24 hour period. Foster Wheeler personnel will assist Mr. Rebman in obtaining all information deemed necessary to notify the National Response Center (NRC) and the EPA. In general, notification will be made by the Environmental Flight, however, should an RQ release occur on a weekend/holiday, Foster Wheeler will notify the NRC (not the EPA as written notification within 14 calendar days is only required). The CO and the Environmental Flight will be notified the next duty day after notification. The NRC may be contacted at 800-424-8802. The SWPPP will be modified within 14 calendar days of knowledge of the release to: provide a description of the release, the circumstances leading to the release, and the date of the release. In addition, the plan will be reviewed to identify measures to prevent the reoccurrence of such releases and to respond to such releases, and the plan shall be modified where appropriate. Should an RQ spill occur over the weekend or on a holiday, Foster Wheeler will notify the NRC within 24 hours of being aware of the release. Mr. Rebman will be notified of the spill the next duty day, including all details of the spill and what information was passed to the NRC.	Statement added. Foster Wheeler Environmental will attempt to contact Cannon AFB personnel prior to notifying the NRC.
13a.	Page E-16/Appendix E Section 3.1.6	Reference my previous comment on inspections documented on Figures E-3 and E-4. There should only be one inspection checklist associated with the SWPPP.	Section modified

Comment No.	Page/Section	Comments	Response
13b.	Page E-16/Appendix E Section 3.1.6	Delete the word "generally" in the third paragraph.	Word deleted.
14.	General	Recommend the format of the inspection checklist be changed (in addition to combining items in Figures E-3 and E-4), as the storm water NPDES permit requires that a certification statement (identical to that shown in the SWPPP's Preface) be signed if non-compliance is not identified during the inspections. A certification statement must be signed each time an inspection indicates full compliance (another reason why Foster Wheeler should not self-impose more frequent inspections).	Clarification will be inserted in Section 3.1.3 to distinguish between the "official" inspections conducted pursuant to the permit requirements from the routine "maintenance" inspections conducted on a more regular basis as part of the BMPs. Verbiage clarifying the certification requirements for the reports completed for the "official" inspections will also be included in Section 3.1.6.
15.	General/Appendix E	The NPDES permit requires that based upon the results of the inspection, the site description identified in the plan and pollution prevention measures shall be revised as appropriate, but in no case later than 7 calendar days following the inspection (yet another reason why Foster Wheeler should not self-impose more frequent inspections). This requirement shall be addressed in the SWPPP. Foster Wheeler shall coordinate the proposed changes with the CO at least 3 calendar days prior to the 7-calendar day limit. If existing BMPs need to be modified or if additional BMPs are necessary, implementation shall be completed before the next anticipated storm event (if impracticable, they shall be implemented as soon as possible).	SWPPP updates based on non-conformance added to Section 5. However, only the "official" inspections conducted on behalf of the permit requirements will lead to the modifications of the SWPPP as discussed in Section 3.1.3. and Section 3.1.6.
16.	Page E-20/Appendix E Section 3.1.7	The 29-acre figure referenced in the first sentence has not been cited previously. Unsure what this refers to.	Section modified.
17a.	Page E-21/Appendix E Section 3.2.2	Will there be a "crusher at the southern end of the landfill?" This appears to be language from the landfill debris removal project done by Foster Wheeler several years ago.	Statement deleted from the text.
17b.	Page E-21/Appendix E Section 3.2.2	Bermed areas can only be pumped after visual inspection verifies that sheen is not present on accumulated water. The SWPPP should stipulate this.	Statement added.
18.	Page E-21/Appendix E Section 3.2.4	The second bullet refers to a landfill (see above comment).	Second bullet deleted from the text.
19.	Page E-22/Appendix E Section 5	Any discussion regarding revisions and modifications must include those revisions/modifications that may be necessitated as a result of certain non-compliance identified during inspections (see previous comment).	Section 5 modified to reflect changes made as a result of non-conformance.
20.	Page E-23/Appendix E Section 6.1	There is no requirement for Professional Engineer certification. Note additional reference to landfill in the "certification" statement.	Typically, as a best management practice, Foster Wheeler Environmental has a PE review and sign the SWPPP when we perform a design/build project. Since the USACE performed the design, the PE certification will be removed from this section.

Comment No.	Page/Section	Comments	Response
21.	Page E-23/Appendix E Section 6.2	40 CFR Part 122 stipulates who is authorized to sign NPDES related documents. Two individuals from Foster Wheeler are identified in the SWPPP's Preface as having signatory authority. Foster Wheeler management (Corporate Officer) must authorize, in writing to EPA, signatory authority to these individuals. This includes authorization to sign reports (e.g., inspection reports) required by the storm water NPDES permit. As such, there is no need for "management approval" of the SWPPP. As noted with the Professional Engineer certification, to be compliant, certifications must include specific language.	We do consider Delivery Order Managers (by position) to be duly authorized representatives of the company and we have not previously officially sent an authorization letter to the EPA describing this delegation and authority.
22.	General/Appendix E	SWPPP needs information on the Notice of Termination (NOT) form. An NOT form must be submitted by each co-permittee (Foster Wheeler, US Army Corps of Engineers, and Cannon) when the construction site has been finally stabilized and all storm water discharges from the construction activities are eliminated. (Final stabilization occurs when all soil-disturbing activities are completed and a uniform perennial vegetative cover with a density of 70 percent for the unpaved areas and areas not covered by permanent structures have been established or equivalent stabilization measures have been employed).	NOT information will be added to Section 1.3.1. Foster Wheeler Environmental's current specifications require 60 days of vegetation maintenance and watering. We propose submitting the NOT for Foster Wheeler Environmental at this time as long-term vegetation establishment is beyond the current scope of our project. This is similar to actions taken at Landfill 25 where Foster Wheeler Environmental submitted the NOT at the completion of revegetation.
23.	General/Appendix E	A description of measures that will be installed during construction process to control pollutants in discharges occurring after construction has been completed must be identified in the plan. For example, if silt fences will remain in place after the project is completed, this must be identified.	Section 3.2.4 has been revised to describe the BMPs that will be left in place at the completion of construction to protect North Playa Lake until sufficient vegetation has been established allowing the BMPs to be removed. This section also indicates that the contractor is responsible for maintenance and inspection of the BMPS throughout the construction period and that Cannon AFB is responsible for these activities following construction and until such time that vegetation is reestablished. .
Reviewer: Cecelia Horner, USACE			
1.	Section 2.2 Last Paragraph	Since the closure action is voluntary, will the groundwater monitoring continue after closure? What other monitoring requirements will be needed for the cover?	Cannon AFB performs groundwater monitoring.
2.	Section 3.3 Fieldwork	There is no description regarding the approval of borrow materials or final survey/closure report part of the scope of work.	Borrow material approval is addressed in Appendix A, Specifications. A statement has been added in Section 3.3. Final survey will be the topographic survey discussed under the heading, "Soil Barrier Layer Construction ".
3.	Section 3.3 Biota Barrier Construction	Verify that there are no issues with the use of this recycled concrete as a subsurface material and possible resulting chemical reactions that may change the final performance of the cover.	The alkali-aggregate reaction refereed to is not expected to be detrimental to the crushed concrete used for the biota barrier. The reaction is "harmful only when it produces significant expansion". The cracking occurs when internal pressure from swelling exceeds the tensile strength of the concrete. The expansion condition is not likely in our application.
4.	Section 3.3	Indicate if there are any specific final or future performance requirements for the cover.	Cover performance requirements were addressed as part of the USACE's "Alternative Cover Demonstration Report" Foster

Comment No.	Page/Section	Comments	Response
			Wheeler Environmental address this comment at the direction of the USACE-Omaha.
5.	Appendix A Spec 01330 Section 1.2	Include borrow source testing data and chemical test data.	USACE Responded
6.	Appendix A Spec 01351 Section 1.3	Although this project is considered to be "clean" construction, these submittals can be critical if an unforeseen or contingency situation. Recommend that these items be submitted for Government Approval and coded with "G".	USACE Responded
7.	Appendix A Spec 01351 Section 1.3, SD-02	Modify the bracketed language [areas] and [facilities] to indicate which is being specified.	USACE Responded
8.	Appendix A Spec 01351 Section 1.10.1	Modify the bracketed language to indicate which is being specified.	USACE Responded
9.	Appendix A Spec 01351 Section 1.10.2	Modify the bracketed language to indicate which is being specified.	USACE Responded
10.	Appendix A Spec 01351 Section 1.10.3	Modify the bracketed language to indicate which is being specified.	USACE Responded
11.	Appendix A Spec 01351 Section 1.12.2.1	Modify the bracketed language to indicate which is being specified.	USACE Responded
12.	Appendix A Spec 01351 Section 1.17	This language is for tank removal and not applicable to the scope of work for this project.	USACE Responded
13.	Appendix A Spec 01351 Section 1.19	State whether confined space entry is required in the scope of work for this project.	USACE Responded
14.	Appendix A Spec 01351 Section 1.20	State whether hot work is required in the scope of work for this project.	USACE Responded
15.	Appendix A Spec 01351 Section 1.21	This language is for tank removal and not applicable to the scope of work for this project.	USACE Responded
16.	Appendix A Spec 01351 Section 1.22	This language is for tank removal and not applicable to the scope of work for this project.	USACE Responded
17.	Appendix A Spec 01351 Section 1.23	This language is for tank removal and not applicable to the scope of work for this project.	USACE Responded

Comment No.	Page/Section	Comments	Response
18.	Appendix A Spec 01351 Section 1.24	This language is for tank removal and not applicable to the scope of work for this project.	USACE Responded
19.	Appendix A Spec 01351 Section 1.25	This language is for tank removal and not applicable to the scope of work for this project.	USACE Responded
20.	Appendix A Spec 01351 Section 1.26	This language is for tank removal and not applicable to the scope of work for this project.	USACE Responded
21.	Appendix A Spec 01351 Section 1.27.1	The Hazard Analysis is critical to determining what level of site control is needed. Verify when this will be submitted and that it is subject to government approval as some of the requirements in the plans may need adjusting. See comment under Appendix B, Safety and Health Plan also.	USACE Responded
22.	Appendix A Spec 01351 Page 24	This language is for tank removal and not applicable to the scope of work for this project.	USACE Responded
23a.	Appendix A Spec 01450 Section 1.4.4.1	Will any samples be taken at the sides of the lagoon to have some definition of lateral extent? Make language consistent with Specification 02111 Section 3.4.	Appendix C, Attachment 1 (Field Sampling Plan), Figure 2-1 identifies the sampling locations. There is presently no requirement to samples the side (berms) of the lagoon.
23b.	Appendix A Spec 01450 Section 1.4.4.1	Will samplers be required to wear new, clean gloves at each sampling location?	Appendix C, Attachment 1 (Field Sampling Plan) describes the sampling methodology. The requirement to wear clean new gloves at each sampling location will be added.
24.	Appendix A Spec 01450 Section 1.4.9	Specify IDW disposal method.	Appendix C, Attachment 1 (Field Sampling Plan), Section 11 describes management of wastes.
25.	Appendix A Spec 02111 Section 3.3	Briefly specify how the material will be transported to the north lagoon, type of equipment, transport path, etc.	No change made. This work will be determined by the earthwork subcontractor. It is assumed that equipment will travel between the north and south lagoon by removing a portion of the dividing earth berm.
26.	Appendix A Spec 02111 Section 3	Specify requirements for decontamination of excavation and compaction equipment when this work activity is complete.	No change made. Appendix B, Section 9 states that no decontamination is required unless site conditions change.
27.	Appendix A Spec 02115 Section 2	Specify if the recycled concrete material already on-site and transport procedures if needed.	No change made. Work Plan Section 3.3.3 indicates that 16,000 cubic yards is available onsite.
28.	Appendix A Spec 02140 Section 3.1.1.1	Depending on the amount of borrow needed, one set of assessment tests may not be sufficient to determine a representative sampling of the source. Specify frequency.	USACE Responded
29.	Appendix A Spec 02210 Section 1.3.7	Specify range required. Verify where this information will be submitted and that it is subject to government approval.	USACE Responded

Comment No.	Page/Section	Comments	Response
30.	Appendix A Spec 02210 Section 1.4	Specify Corps certified Geotechnical testing laboratory.	Appendix A, Section 01451, Paragraph 3.6.2 specifies the requirements for testing laboratories. FWENC will add the USACE certification requirement to Appendix C, Section 4.2. Also, potential subcontractors were informed at the prebid meeting of the requirement to use USACE certified laboratories.
31.	Appendix A Spec 02210 Section 3.1	Specify where the topsoil is being removed. The description of this work does not seem to fit into the execution of work required for the erosion/vegetation layer.	USACE Responded
32.	Appendix A Spec 02377 Section 3.1	Depending on the amount of borrow needed, one set of assessment tests may not be sufficient to determine a representative sampling of the source. Specify frequency.	USACE Responded
33.	Appendix A Spec 02377 Section 3.2.1	Verify that two 10" loose lifts will be sufficient to obtain the 18" finished compacted thickness.	USACE Responded
34.	Appendix A Spec 02210 Section 3.2.2	Specify range required. Verify where this information will be submitted and that it is subject to government approval.	USACE Responded
35.	Appendix A Spec 02210 Section 3.2.3	Specify range required. Verify where this information will be submitted and that it is subject to government approval.	USACE Responded
36.	Appendix A Spec 02377 Section 3.2.4	Specify equipment and maximum scarification depth.	USACE Responded
37.	Appendix A Sheet C-7	Although Specification 02111 indicates that no cover material will be placed in the north lagoon, include a drawing for the final grade plan of the north lagoon (Area B).	USACE Responded
38.	Appendix A Sheet C-8, Note 1 and 2	Clarify note language to specify that sludge is being excavated from north lagoon.	USACE Responded
39.	Appendix A Sheet C-8	Note that subgrade for the south lagoon includes existing sludge that must be prepared in accordance with Specification 02111 prior to placement of north lagoon sludge, fill, and cover materials.	USACE Responded
40.	Appendix B Sections 8.1 and 9.0	Note that Specification 01351 and 01450 require decontamination of equipment.	USACE Responded
41.	Appendix B Section 4	The Hazard Analysis is critical to determining what level of site control is needed. Verify when this will be submitted and that it is subject to government approval as some of the requirements in the plans may need adjusting.	Paragraph expanded to include this statement: *"The Hazardous Analysis is critical to determining the level of site control and is subject to USACE approval".*
42.	Appendix C Construction Quality Control Plan Section 2	Indicate the Chemical Quality Control Officer and Field Analytical Data Coordinator with qualifications as in Specification 01450.	Pamela Moss of Foster Wheeler Environmental is assigned the responsibility of Chemical Quality Control Officer and Field Analytical Data Coordinator. She will direct field staff and the analytical lab on completion of the confirmation sampling. Figure 6-1 has been modified to reflect this change.

Comment No.	Page/Section	Comments	Response
			Note: In Section 2.3, James Morning has been assigned as a the Project Site Representative. In this role, will serve as the Construction Quality Control Manager and Site Health and Safety Officer. Also in Section 2.5, the position of field engineer has been eliminated. This paragraph has been reworded to allow field engineering to be directed from the home office in Albuquerque.
43.	Appendix C Construction Quality Control Plan Section 3	Include soil chemical and physical analysis results with these types of submittals.	Section 3.0, 3rd paragraph, 6th bullet the following clarifying statement was added: *"Soil physical and chemical test reports are included with this type of submittal".*
44.	Appendix C Construction Quality Control Plan Table C-1 Section 02111 § 3.2	Criterion for Area A requires use of a tiller to loosen existing sludge in the south lagoon to a depth of 24 inches.	Corrected as noted.
45.	Appendix C Construction Quality Control Plan Table C-1 Section 02140 § 3.1.3	This section is required if borrow material will be used.	No chemical contamination testing for borrow sources was specified. Foster Wheeler Environmental will request USACE direction on this matter.
46.	Appendix C Construction Quality Control Plan Table C-1 Section 02377 § 3.1.5	This section is required if borrow material will be used.	No chemical contamination testing for borrow sources was specified. Foster Wheeler Environmental will request USACE direction on this matter.
47.	Appendix C Construction Quality Control Plan Section 5.1.4	Depending on the duration of the construction period, consider a more frequent meeting period.	A statement was added: *"More frequent meetings may be held as required by the level of activity"*
48.	Appendix C Field Sampling Plan Section 1	Verify excavated depth, Specification 02111 §3.3 indicates that a maximum depth of 24 inches will be excavated and Specification 01450 §1.4.4.1 indicates an excavation depth of 12 inches.	Corrected. Sludge will be excavated to 24-inches underlying
49.	Appendix C Field Sampling Plan Section 2	Verify number of samples, Specification 02111§3.4 indicates a frequency of 1/40,000sf and Table C-1 states a frequency of 10 samples.	Foster Wheeler Environmental will request USACE direction on the correct amount.
50.	Appendix C Field Sampling Plan	Delete reference to augers, drill bits, and other equipment that is not a part of the sample collection for this project. Specify which equipment used will be	Corrected and clarified as noted.

Comment No.	Page/Section	Comments	Response
	Section 6.2	decontaminated or if new equipment will be used at each location since disposable spoons and pans will be used.	
51.	Appendix C Field Sampling Plan Section 10.1	Indicate frequency of glove change.	A statement was added: *"Gloves used to handle samples will be removed and replaced before collecting a new sample."*
52.	Appendix C Field Sampling Plan Section 11	Verify that no liquid waste (decontamination water) will be generated.	A statement was added: *"No liquid waste (decontamination water) will be generated from sampling operations."*
53.	Appendix C QA Project Plan Section 3.2	Verify references to Section 8.1.1, Section 8.1.2, and Section 8.1.3 of this QAPP.	References to Section 8.1.1, Section 8.1.2, and Section 8.1.3 will be deleted.
54.	Appendix D Section 7.1	Verify that spilled products, PCS, and sorbent materials w/spilled product will be disposed in accordance with the Regulatory Compliance Plan.	
55.	Appendix E Section 2.3.3	Verify construction activities are consistent with the scope of work for this project.	
56.	Appendix E Section 3.1.7	Verify project area is 33 acres.	
57.	Appendix E Section 6.1	Verify that the construction experience required for a PE is consistent with the scope of work for this project.	
58.	Appendix E Construction Schedule Documentation	Verify construction of silt fences, earthen berms, and other, as these items are not discussed in the Specifications or Plans.	
59.	Appendix F Section 3	Include sorbent materials with product and decon water generated from sampling activities in the potentially generated waste streams.	
60.	Appendix F Table F-2	These contacts should be consistent with your SPCC Plan.	
61.	Appendix F Section 8.1.2	Verify that USACE personnel will be signing manifest. Usually, this is handled strictly by the Base Officials.	
Reviewer: Brad Jones, USACE			
1.	Section 3.3.3 Page 3-7 Erosion/Vegetation Layer Construction	Change specification reference to 02140, 1st sentence.	Corrected as noted
2.	Section 3.3.3 Page 3-7 Site Restoration Activities	Change specification reference to 02921, 1st sentence	Corrected as noted
3.	Section 5.0 Page 5-1	Change specification reference to 01451 in the 2nd sentence.	Corrected as noted
4.	Appendix A	"Specifications and Drawings" – Addendum No. 1 should also indicate a change to specification section 02377, pg. 7, paragraph 3.1.4, "Acceptable Zone Development" – Indicate the maximum allowable hydraulic conductivity has	Statement clarified to reflect Addendum No. 1.

Comment No.	Page/Section	Comments	Response
		changed from 1.0×10^{-6} cm/sec to 1.5×10^{-4} cm/sec based on the "*HELP Model Analysis of Alternative Covers for SWMU 101-Sewage Lagoons*".	

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Final Work Plan for the Closure of SWMU 101 - Sewage Lagoons Cannon Air Force Base

February 2003

Prepared for:

27 CE/CEV
Cannon Air Force Base, NM

and

HQ ACC/CEV
Langely Air Force Base, VA

CAFB 03-002

DEPARTMENT OF THE AIR FORCE
27TH CIVIL ENGINEER SQUADRON (ACC)
CANNON AIR FORCE BASE NEW MEXICO

Mr. Robert S. Pyeatt
Deputy Base Civil Engineer
506 N DL Ingram Blvd
Cannon AFB NM 88103-5003

27 FEB 2003

MAR 2003
NMED
Waste

Mr. James Bearzi
Hazardous Waste Bureau Chief
New Mexico Environment Department
20905 Rodeo Park Drive East, Building 1
Santa Fe NM 87505

Dear Mr. Bearzi

Foster Wheeler Environmental Corporation has sent under separate cover ~~three~~ 2 copies of the Final Work Plan for the Closure of Solid Waste Management Unit (SWMU) 101 dated February 2003 for your review and records. Two copies were sent to Mr. Glenn von Gonten in your Santa Fe office and one was sent to Mr. Rob Warder in Albuquerque. The Work Plan describes the activities required of the contractor, Foster Wheeler Environmental Corporation, and its subcontractors to close the aforementioned SWMU.

This work plan was prepared in accordance with the findings of the corrective measures study for the closure of the sewage lagoons. If you have any questions, please contact Mr. Peter P. Zamie at (505) 784-4639.

Sincerely

ROBERT S. PYEATT, GS-13

cc:
NMED (G. von Gonten)

RECEIVED

WORK PLAN FOR THE CLOSURE OF SWMU 101—SEWAGE LAGOONS

Prepared for:

27 CE/CEV
Cannon Air Force Base, NM
and
HQ ACC/CEV
Langley Air Force Base, VA

Prepared by:

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Under Contract No. DACW45-94-D-0003

Delivery Order No. 35, Work Authorization Directive 1

U.S. Army Corps of Engineers
Omaha District
Omaha, Nebraska

February 2003

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LIST OF ACRONYMS AND ABBREVIATIONS

AFB	Air Force Base
Area A	south lagoon
Area B	north lagoon
bcy	bank cubic yard
CIH	Certified Industrial Hygienist
CMS	Corrective Measures Study
COPC	chemical of potential concern
CQCP	Construction Quality Control Plan
cy	cubic yard
DOM	Delivery Order Manager
DQCR	daily quality control report
EM 385-1-1	U.S. Army Corps of Engineers Manual (EM) 385-1-1, Safety and Health Requirements Manual
EPA	U.S. Environmental Protection Agency
ft	foot/feet
Foster Wheeler Environmental	Foster Wheeler Environmental Corporation
HASP	Health and Safety Plan
HHRA	human health risk assessment
HHSL	human health screening levels
NMED	New Mexico Environment Department
PCB	Polychlorinated biphenyl
PCC	precast concrete
PE	Professional Engineer
PESM	Project Environmental Safety Manager
QA	quality assurance
QC	quality control
RCP	Regulatory Compliance Plan
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
SLERA	screening-level ecological risk assessment
SPCCP	Spill Prevention Control and Countermeasures Plan
SSHP	Site Safety and Health Plan
SWMU	Solid Waste Management Unit
SWMU 101	Sewage Lagoons
TERC	Total Environmental Restoration Contract

LIST OF ACRONYMS AND ABBREVIATIONS (Continued)

USACE	U.S. Army Corps of Engineers
VOC	volatile organic compound

1. INTRODUCTION

This Work Plan describes the activities required of Foster Wheeler Environmental Corporation (Foster Wheeler Environmental) and its subcontractors to close Solid Waste Management Unit (SWMU) 101, Sewage Lagoons, at Cannon Air Force Base (AFB), New Mexico. Foster Wheeler Environmental, at the direction of the U.S. Army Corps of Engineers (USACE) Omaha District and Cannon AFB, will demolish concrete and piping, excavate dried sludge and contaminated soil, consolidate waste material in the South Lagoon (Area A), and construct a 20-acre, 42-inch-thick engineered earth cover system.

This Work Plan meets the requirements stipulated within the Total Environmental Restoration Contract (TERC) No. DACW45-94-D-0003, Delivery Order 35, Work Authorization Directive 1; Resource Conservation and Recovery Act (RCRA) Corrective Action Plan Guidance (EPA, 1994a); and USACE and Cannon AFB requirements. All work will be performed according to the requirements of the USACE's Final Drawings and Specifications (USACE, 2001) included in Appendix A.

The Work Plan provides project objectives, descriptions, field procedures, and related plans that address all aspects of the proposed construction activities at the Sewage Lagoons. A Site Safety and Health Plan (SSHP) addendum to the Cannon AFB Base-Wide Health and Safety Plan (HASP) (USAF, 2000) is included as Appendix B. All field activities will be performed according to the Base-Wide HASP, the SSHP addendum, and health and safety requirements from the USACE and Foster Wheeler Environmental.

1.1 Project Objectives

The Sewage Lagoons cover system is designed to minimize the threat to human health and the environment by completing the following work:

- Approve borrow sources for soil barrier, biota barrier, and topsoil materials
- Demolish concrete and piping identified on the Drawings (Appendix A) and consolidate in Area A
- Excavate sludge and contaminated soil from north lagoon (Area B) and place in Area A according to the Specifications (Appendix A)
- Construct a cover system over the Area A as described in the Specifications and shown on the Drawings (Appendix A)

- Seed and mulch the entire cover system, construction staging, and equipment lay-down areas
- Perform a topographic survey of the final site contours and features to develop record drawings to be provided with the Completion Report that will be prepared by Foster Wheeler Environmental.

1.2 Document Organization

This Work Plan is organized as follows:

- Section 1—Introduction
- Section 2—Site Description and History
- Section 3—Project Implementation Plan
- Section 4—Regulatory Compliance Plan
- Section 5—Construction Quality Control Plan
- Section 6—Project Management
- References

The Work Plan also contains the following Appendices.

- Appendix A—Specifications and Drawings
- Appendix B—Site Safety and Health Plan (SSHP)
- Appendix C—Construction Quality Control Plan
- Appendix D—Spill Prevention Control and Countermeasures Plan (SPCCP)
- Appendix E—Stormwater Pollution Prevention Plan
- Appendix F—Regulatory Compliance Plan (RCP)
- Appendix G—Resumes

2. SITE DESCRIPTION AND HISTORY

A description of Cannon AFB and a brief discussion of the Sewage Lagoons, including site description, history, and results of previous investigations, are provided below. Site history and detailed descriptions of previous site activities were obtained from the USACE and previous reports.

2.1 Cannon AFB Description And History

Cannon AFB occupies approximately 4,000 acres south of U.S. Highway 60/84 in Curry County, New Mexico. The Base is 6 miles west of the city of Clovis, near the New Mexico-Texas border (Figure 2-1). The area surrounding Cannon AFB is used mainly for farming and ranching. Cannon AFB also maintains several satellite facilities.

In 1942, the Department of Defense established Clovis Army Air Base, a training facility for B-17, B-24, and B-29 aircrews. In 1945, the base was renamed Clovis Army Airfield; it was closed in 1947. In 1951, the facility was reactivated and reassigned to the Tactical Air Command; in 1957 it was renamed Cannon AFB. In 1975, the 27th Tactical Fighter Wing became the principal Air Force unit at Cannon AFB. In 1992, the Base was reassigned to the Air Combat Command and currently maintains a combat-ready force and provides replacement training of combat aircrews for worldwide tactical organizations.

2.2 Sewage Lagoons Description And History

The Sewage Lagoons were identified as SWMU 101 in the Cannon AFB Hazardous Waste Permit dated November 14, 1989. The Sewage Lagoons consist of two unlined surface impoundments that were used from 1966 to 1998 and received combined sanitary and industrial waste from Base facilities. The lagoons operated in series and have a combined surface area of approximately 39 acres (Figure 2-2). The lagoons were constructed with unlined earthen bottoms and concrete-lined banks. When a new wastewater treatment plant began operation in 1998, wastewater was no longer discharged to the lagoons.

In 1992, SWMU 101 was investigated during the Appendix I RCRA Facility Investigation (RFI). The RFI information indicated that the sludge depth was approximately 2 feet (ft) and the

average water depth ranged from 3.5 ft to 4.5 ft (Woodward-Clyde, 1992; E&E, 1998). As of May 2001, Foster Wheeler Environmental personnel noted that there was no freestanding water in the lagoons. At the time of the RFI, SWMU 101 was not included in the Cannon AFB RCRA Part B Permit. Cannon AFB, the U.S. Environmental Protection Agency (EPA), and the New Mexico Environment Department (NMED) resolved the regulatory requirement for this unit. As a result of the RFI, the only recommendation for the Sewage Lagoons was to continue annual groundwater monitoring for volatile

organic compounds (VOCs), metals, pesticides, nitrate, sulfate, and total dissolved solids. According to the RFI report, a recommendation was made for an interim monitoring program to support site closure until the regulatory framework was resolved. Groundwater monitoring is conducted annually at the Sewage Lagoons to comply with the RCRA requirements.

Closure of the sewage lagoons is considered to be a voluntary measure by Cannon AFB. NMED solicited a review of the design. At the publication date of this Work Plan, no formal comments had been received.

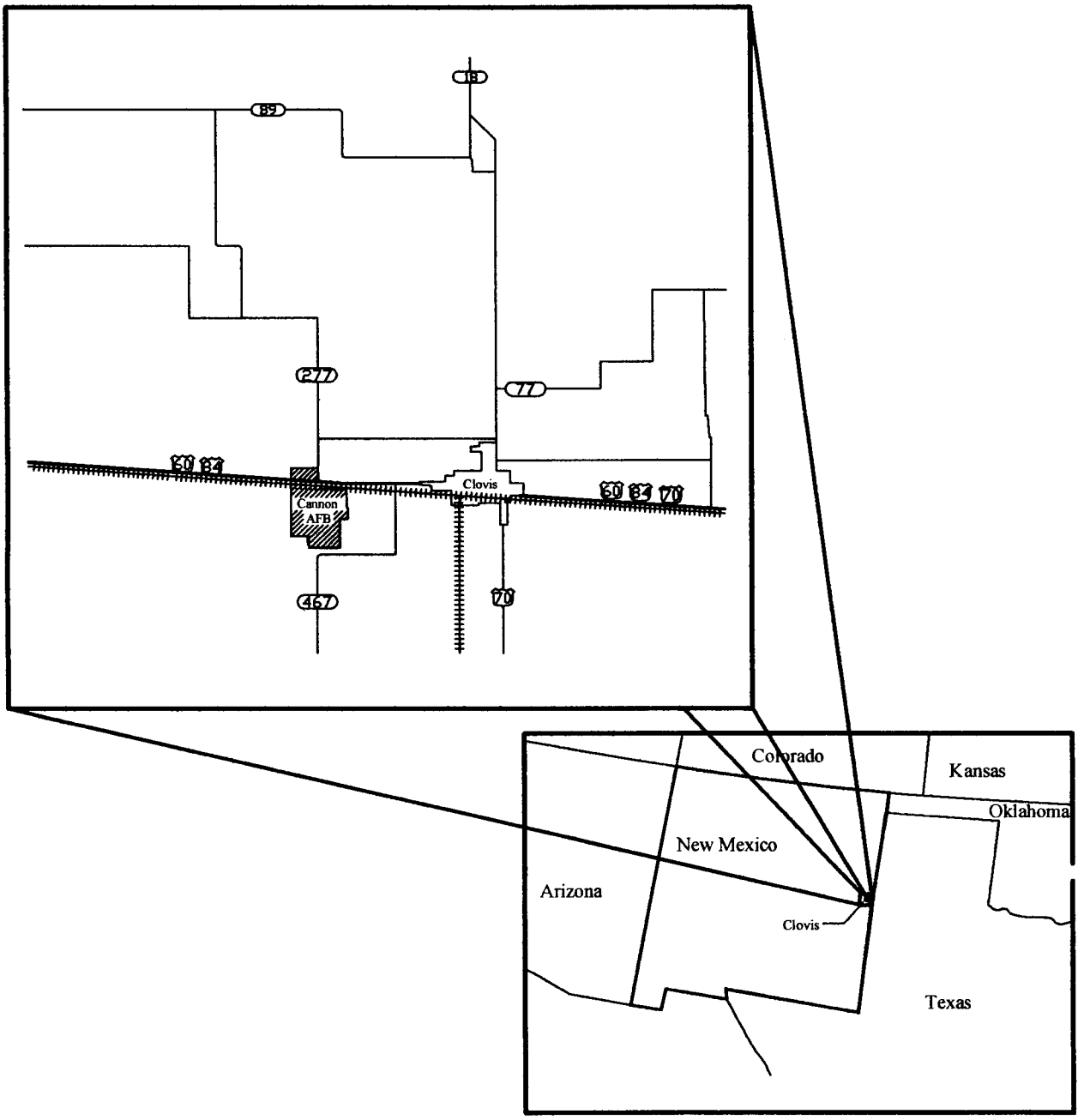
2.3 Corrective Measures Study

A Corrective Measures Study (CMS) for closure of the Sewage Lagoons identified and evaluated potential corrective actions (USAF, 2001). Human health and ecological risk assessments were conducted as part of the CMS in order to determine the level at which containment and source control was required. An ecological survey of the area was also conducted to support the risk assessment.

The human health risk assessment (HHRA) considered soil data from 0- to 10-foot below grade and sludge. Detected chemicals were screened against site-specific background levels and EPA Region 6 residential human health screening levels (HHSLs). Four chemicals of potential concern (COPCs) were identified for further evaluation in the HHRA: arsenic, dieldrin, polychlorinated biphenyl (PCB)-1260, and endrin aldehyde. All noncancer risks from contaminants in soil and sludge in the north and Area A were below the target hazard index of 1.0. The total excess lifetime cancer risk was below the NMED target risk of 1×10^{-6}.

The screening-level ecological risk assessment (SLERA) evaluated all chemicals positively identified above the detection limit in site sludge and soil data collected to a depth of 6 feet below grade. Concentrations of inorganic chemicals produced elevated ecological screening values for receptors. Elevated risk to potential ecological receptors was assessed for background concentrations of metal present at Cannon AFB.

To prevent exposure to ecological receptors, sludge removal, in-place consolidation, and closure with an engineered cover were selected as the corrective actions for closing the lagoons. Removal of soil and sludge in the Area B to be consolidated in the Area A eliminates the risk to ecological receptors in the Area B. A potential exposure for burrowing animals would still exist in the Area A; however, burrowing animal receptors could burrow through debris, soil, and vegetation that would comprise the cover. Therefore, a biotic barrier will be installed to limit this exposure pathway to potential receptors.



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FOSTER WHEELER ENVIRONMENTAL CORPORATION

N

Closure of
SWMU 101 – Sewage Lagoon
Cannon Air Force Base, New Mexico
U.S. Army Corps of Engineers, Omaha District

Base Location Map

Date: 01/30/03	Figure 2-1
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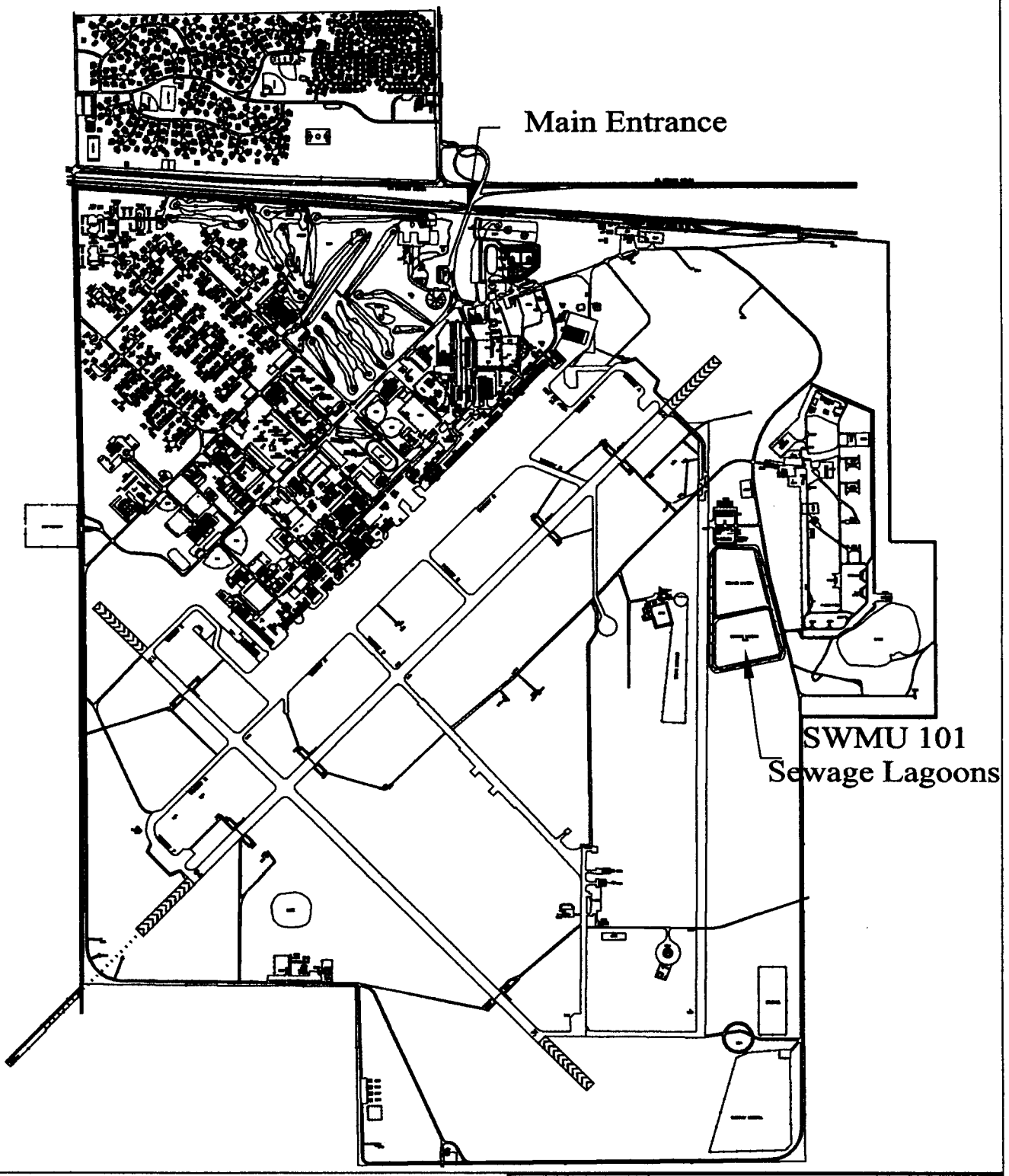

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FOSTER WHEELER
ENVIRONMENTAL CORPORATION

Closure of
SWMU 101 - Sewage Lagoons
Cannon Air Force Base, New Mexico
U.S. Army Corps of Engineers, Omaha District

Sewage Lagoons Site
Location Map

Date: 11/06/02

File Name: Fig 2-2_Final

Figure 2-2

3. PROJECT IMPLEMENTATION PLAN

This section provides the scope of work for supporting on-site and off-site activities including Base access and site security, mobilization, demolition, construction activities, and demobilization.

3.1 Base Access and Security

Contractor and subcontractor vehicles will access the site via the Cannon AFB south gate. Vehicles will only use improved roads and will not enter secure areas without receiving clearance from Cannon AFB. The vehicle route is identified on Sheet C-1 of the Drawings (Appendix A).

Vehicle passes valid for the project duration will be issued to Foster Wheeler Environmental personnel, subcontractors, and vendors. A valid driver's license, proof of vehicle insurance, and valid vehicle registration will be required to obtain a pass. The site security consists of procedures, structures, and personnel provided by Cannon AFB at the Base perimeter.

3.2 On-Site Support Activities

Foster Wheeler Environmental is responsible for the following on-site support activities:

- Conducting the preconstruction meeting
- Supervising and approving the reconstruction site inspection
- Mobilizing Foster Wheeler Environmental support facilities
- Restoring and revegetating the site
- Conducting field engineering
- Monitoring health and safety programs
- Conducting the punchlist, pre-final, and final inspections with the owner and subcontractor
- Performing oversight of subcontractor demobilization and demobilization of Foster Wheeler Environmental temporary facilities

3.2.1 Preconstruction Conference

Foster Wheeler Environmental will conduct a project kickoff meeting at Cannon AFB prior to mobilization with participation from Foster Wheeler Environmental, USACE, Cannon AFB, and key subcontractor personnel. The meeting agenda will include:

- Introductions, roles, responsibilities, and lines of communication
- Review of project scope
- Review of Foster Wheeler Environmental and subcontractor construction schedule
- Review of subcontractor's labor and equipment force
- Mobilization logistics and requirements
- Schedule coordination and work sequence
- Submittal requirements
- Quality assurance/quality control (QA/QC) requirements
- Review of the Base-Wide HASP and project-specific health and safety requirements
- Procedures for changes and substitutions
- Site rules and regulations
- Other business related to field activities

A formal agenda will be provided prior to the meeting. Attendees at the conference will include the personnel listed below.

Name	Affiliation	Project Role
Pete Zamie	Cannon AFB	Base Project Manager
Tom Zink	USACE Omaha	Project Manager
Brad Jones	USACE/Omaha	Design Project Engineer
Max Pastor	USACE/Albuquerque	Resident Engineer/Contracting Officer's Representative
Donna Russell	USACE/Albuquerque	Construction Inspection (QA)
Carol Bieniulis	Foster Wheeler Environmental	Delivery Order Manager (DOM)
Robert Ederer	Foster Wheeler Environmental	Task Manager and Lead Engineer

Name	Affiliation	Project Role
Eric Snow	Foster Wheeler Environmental	Construction Manager
James Morning	Foster Wheeler Environmental	Site Health and Safety Officer Construction Quality Control Systems Manager
Identified at Award	General Subcontractor	Project Manager
Identified at Award	General Subcontractor	Site Superintendent

3.2.2 Preconstruction Site Tour

Foster Wheeler Environmental and the subcontractor will complete a preconstruction site tour following the preconstruction meeting to review the work shown on the Drawings and Specifications (Appendix A), and plan access routes, staging areas, and temporary facilities.

3.2.3 Mobilization

Mobilization will consist of logistical planning, movement of labor and equipment to the project site, and a personnel orientation meeting prior to startup. Foster Wheeler Environmental and subcontractor personnel will be required to attend this meeting prior to the start of field activities. The personnel orientation meeting will include a site-specific health and safety briefing that covers planned operations, site hazards and procedures, a review of the SSHP (Appendix B), and training in pollution prevention and waste minimization procedures.

3.3.2.1 Submittals

Foster Wheeler Environmental and its subcontractors will prepare and submit required submittals according to Section 01330 of the Specifications (Appendix A). Submittals that are the responsibility of the subcontractors [see Construction Quality Control Plan (Appendix C)] will be submitted to Foster Wheeler Environmental for review and approval.

3.3.2.2 Utility Clearance

Cannon AFB will provide utility clearance for the construction sites. Foster Wheeler Environmental will notify Cannon AFB a minimum of 7 days prior to mobilization. The subcontractor will verify the location of marked underground utilities by means including, but not limited to, exploratory excavation (pot-holing) or electronic locating equipment.

3.3.2.3 Staging and Storage Area

The staging and storage area is identified on Sheet C-1 of the Drawings (Appendix A). This area will be used for temporary facilities, storage of equipment and supplies, maintenance operations, and general construction administration.

3.3.2.4 Site Preparation

Foster Wheeler Environmental construction and health and safety personnel will establish work areas and identify existing site features that require protection. The subcontractor will install spill prevention and stormwater pollution prevention control measures described in Appendices D and E, respectively. Foster Wheeler Environmental will monitor the maintenance of these measures and direct the subcontractor as necessary to comply with this Work Plan.

3.2.4 Field Engineering and Quality Control

Foster Wheeler Environmental under the direction of the Task Manager will perform field engineering. QC inspections will be conducted, and field change requests, design change notices, and nonconformance notices will be used to document discrepancies between constructed elements and associated drawings or specifications. In addition, daily quality control reports (DQCRs) documenting construction activities will be completed and maintained and the approximate locations of the construction area incorporated into the record drawings.

3.2.5 Health and Safety

Health and safety activities will be conducted in accordance with the SSHP (Appendix B); Cannon AFB Base-Wide HASP (USAF, 2000); Foster Wheeler Corporate Health and Safety Program; and USACE Engineering Manual, Safety and Health Requirements Manual (EM 385-1-1) (USACE, 1996). All site workers, including subcontractors, will review and comply with the project health and safety requirements and procedures.

3.3 Field Work

The following subsections describe the fieldwork that will be completed to close SWMU 101. Division 2 of the Specifications (Appendix A) provides the details of the work to be performed. Foster Wheeler Environmental's general subcontractor will complete the Division 2 work. Foster Wheeler Environmental will oversee the work, review and approve payment requests, document quality control, clarify questions concerning the Drawings and Specifications (Appendix A), and document and report QC requirements as outlined in Division 1 of the Specifications (Appendix A).

3.3.1 Demolition and Removal

The required work will be performed as described in Section 02220 of the Specifications and on the Drawings (Appendix A). The subcontractor will remove steel and polyvinyl chloride (PVC) piping, concrete slabs, concrete gate structure, and 4-inch precast concrete (PCC) berm where shown on the Drawings (Appendix A).

3.3.2 Excavation and Handling of Contaminated Material

Foster Wheeler Environmental's subcontractor will complete the work as described in the Section 02111 of the Specifications and on the Drawings (Appendix A). The Specifications (Appendix A) identify approximately 70,000 cubic yards (cy) of sludge and soil from Area B that will be excavated and placed in Area A. Sludge is estimated to be 2 ft deep. Soil presumed to be contaminated is estimated to extend 1 ft below the sludge.

Confirmation sampling and analysis will be performed after contaminated soil removal per Article 3.4 and Section 01450 and Section 02111 of the Specifications (Appendix A). Soil samples will be collected according to the Field Sampling Plan provided as an attachment to the Construction Quality Control Plan (CQCP) (Appendix C).

If results indicate the presence of contamination above the action levels defined in Section 01450 of the specifications (Appendix A), additional excavation may be performed. Additional work will only be performed at the written direction of the USACE. A topographic survey will be completed prior to and after excavation of sludge as described in Article 1.3 of the Specifications (Appendix A).

3.3.3 Final Cover Construction

Cover construction will be performed as described in Division 2 of the Specifications and on the Design (Appendix A). The cover construction work is described in the following paragraphs.

3.3.3.1 Sludge Consolidation and Random Fill

This work includes preparing the subgrade for the final cover by grading and compacting the sludge and random filling to the lines and grades shown on the Drawings (Appendix A). Random fill will be cut from the berms of Area A and placed over debris and sludge as shown on the Drawings and described in the Specifications (Appendix A).

3.3.3.2 Biota Barrier Construction

The required work will be performed as described in Section 02115 of the Specifications and on the Drawings (Appendix A). Foster Wheeler Environmental estimates that approximately 36,300 bank cubic yards (bcy) crushed concrete or stone material is required. Approximately 16,000 bcy of recycled concrete material is available on-site. Compaction will be performed as stipulated in the Specifications (Appendix A).

Topographic surveying will be conducted following placement of the biota barrier as described in Article 1.3 of the Specifications (Appendix A). Surveys will be used to determine as-built conditions prior to placement of the final cover.

3.3.3.3 Soil Barrier Layer Construction

The required work will be performed as described in Section 02377 of the Specifications and on the Drawings (Appendix A). Foster Wheeler Environmental estimates that approximately 36,300 bcy of material is required. Approximately 22,000 bcy of suitable material is stockpiled near the site. Compaction will be performed as stipulated in the Specifications (Appendix A) to meet a saturated hydraulic conductivity (permeability) of 1.5×10^{-4} centimeters per second per Section 02377 Paragraph 3.1.4.

Topographic surveying will be conducted following placement of the biota barrier as described in Article 1.3 of the Specifications (Appendix A). This survey will document the as-built conditions of the soil barrier layer.

3.3.3.4 Erosion/Vegetation Layer Construction

The required work will be performed as described in Section 02140 of the Specifications and on the Drawings (Appendix A). Foster Wheeler Environmental estimates that approximately 12,100 bcy of material is required. Compaction will be performed as stipulated in the Specifications (Appendix A).

Topographic surveying will be conducted following placement of the erosion/vegetation layer as described in Article 1.3 of the Specifications (Appendix A). This survey will be used to determine as-built conditions of the finished cover system.

3.3.3.5 Site Seeding

This work includes seeding of the final cover system and staging areas where vegetation was disturbed during construction operations. The required work will be performed as described in Section 02921 of the Specifications and on the Drawings (Appendix A).

3.3.3.6 Site Restoration Activities

Access roads and staging areas will be graded and prepared for seed according to Section 02921 of the Specifications (Appendix A) (Attachment A).

3.3.3.7 Demobilization

Demobilization activities will include site cleanup, trash disposal, exit of personnel and equipment from the site, and filing of field records. USACE and Cannon AFB will be briefed on the anticipated completion of field activities prior to the demobilization of the site and the departure of field personnel.

3.4 Field Sampling Activities

The Field Sampling Plan is provided as an attachment in Appendix C. This plan was prepared according to the requirements of Section 01450, Article 3.4 of the Specifications (Appendix A). Field sampling will be required to:

- Test soil in Area B after sludge and soil removal for the presence of soil contamination
- Test imported and on-site borrow soils for the presence of contaminants
- Confirm that materials, installation, and placement meet the Specifications (Appendix A)

Foster Wheeler Environmental will be responsible for all chemical testing and analysis related to confirmation sampling of Area B following excavation sludge and contaminated soil. This work is described in Section 02111, Article 3.4 (Appendix A). Subcontractors will provide all other chemical and material test results to Foster Wheeler Environmental to comply with Division 2 of the Specifications (Appendix A).

3.4.1 Off-Site Support Activities

The DOM will oversee the project from the Albuquerque, New Mexico, office. The Project Site Superintendent will serve as the point of contact for all inquiries from the project engineering staff regarding design and construction efforts. All Foster Wheeler Environmental personnel will comply with Foster Wheeler Environmental corporate procedures and applicable professional standards.

Additional project staff will provide the following administrative support functions:

- Procurement Specialist—Procures subcontractors, equipment, and material
- Contract Compliance Administrator—Assists project management with all issues pertaining to contract compliance
- Regulatory Compliance Specialist—Oversees permits and regulatory requirements as described in the RCP provided in Appendix F

- Project Environmental Safety Manager (PSEM)—Monitors the project-specific health and safety program

- Foster Wheeler Environmental Corporate Environmental Safety Quality and Compliance Director Supervisor—Evaluates all issues regarding corporate, regulatory, health and safety, and project compliance

During the project, Foster Wheeler Environmental personnel from Albuquerque and other offices may be required to visit the site to provide routine inspection and technical assistance. Visits and inspections will be coordinated through the DOM according to project needs.

4. REGULATORY COMPLIANCE PLAN

An RCP has been developed for this project and is provided as Appendix F. The RCP details project-specific requirements, waste management practices, and applicable training requirements to be implemented during fieldwork. Although this project is considered a "clean" construction project, the RCP provides information on how any wastes that may be associated with project activities will be stored and disposed. A secondary goal of the RCP is to ensure that waste minimization practices are followed, to the extent practicable, to reduce the volume of waste that will be generated, stored, and removed from the site for disposal.

Appendix D provides the Spill Prevention Control and Countermeasures Plan (SPCCP). The SPCCP addresses the potential for spills associated with a 2,000-gallon aboveground diesel fuel storage tank and several 55-gallon petroleum, oil, lubricant, and antifreeze storage drums that will be on the project site during construction.

Appendix E details the Stormwater Pollution Prevention Plan, which addresses potential impacts to surface water quality that may result from construction activities at the Sewage Lagoons.

5. CONSTRUCTION QUALITY CONTROL PLAN

The QA project plan requirements for the closure of the sewage lagoons are addressed in the CQCP (Appendix C). The CQCP has been prepared to meet the requirements of Section 01451, Article 3.2 of the Specifications (Appendix A). The CQCP discusses the QC organization and responsibilities, the construction inspection plan, testing requirements, document control, nonconformances, and submittals.

6. PROJECT MANAGEMENT

6.1 Project Schedule

The proposed project schedule is shown on Table 6-1. The schedule will be finalized during the preconstruction conference. Fieldwork is anticipated to begin in February 2003. The project duration will be approximately 6 months.

Table 6-1. Project Schedule

Activity	Anticipated Date
Final Work Plan	January 31, 2003
Notice to Proceed	February 11, 2003
Pre-Construction Meeting	February 13, 2003
Construction Work Starts	February 18, 2003
Site Work Complete	August 5, 2003
Completion and Closeout	November 5, 2003

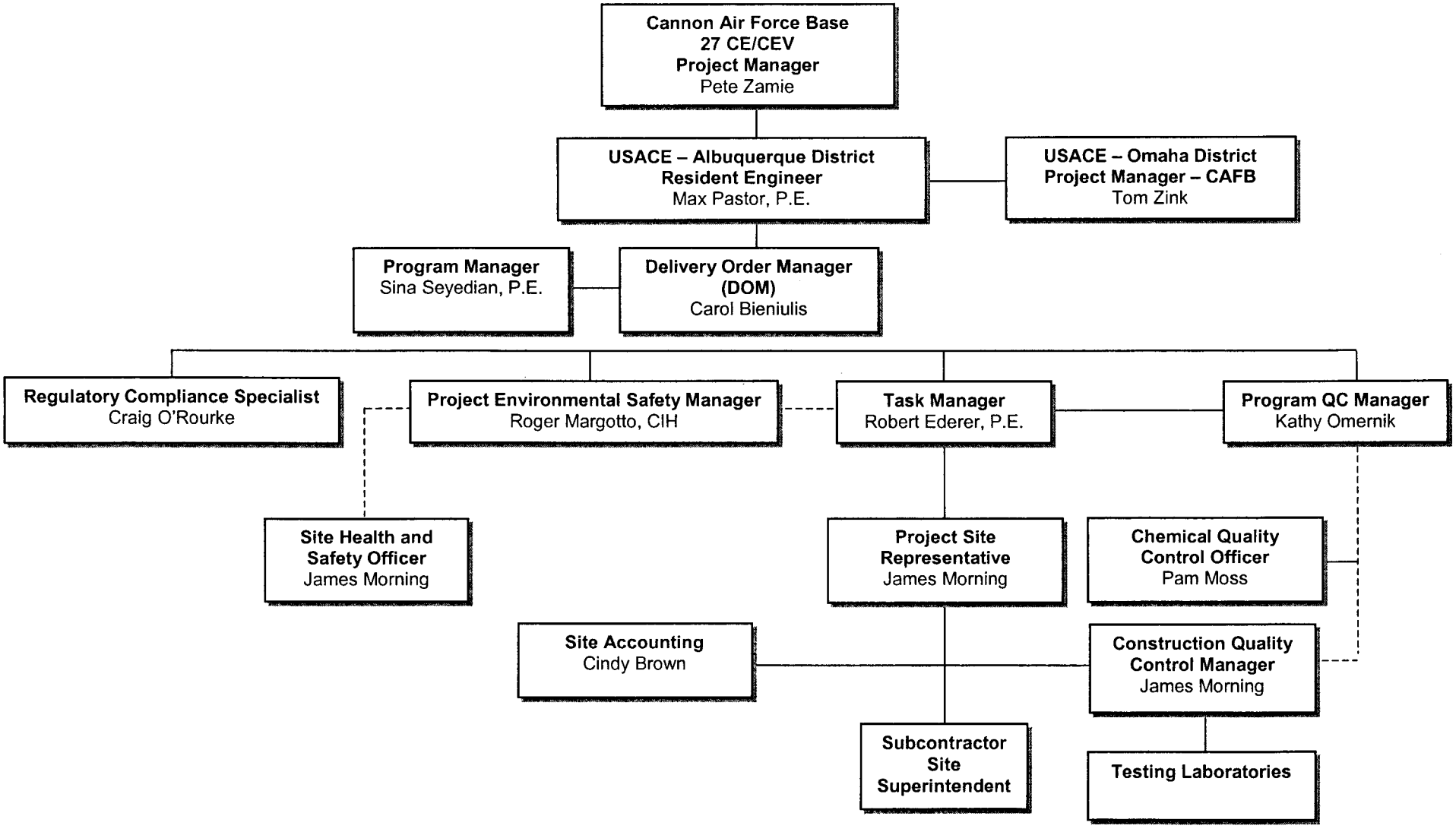
The Construction subcontractor will be required to submit a construction schedule to Foster Wheeler Environmental at the preconstruction meeting. The schedule will be in bar chart format determined by the critical path method. At a minimum, duration and dates of early start and finish will be shown for all activities outlined in the Bid Schedule. Schedule status will be updated weekly and submitted to Foster Wheeler Environmental at the weekly progress meeting.

6.2 Project Staffing Plan

The project staffing plan is outlined in the organization chart shown on Figure 6-1. The key participants are the USACE-Omaha, USACE-Albuquerque, Cannon AFB, and Foster Wheeler Environmental. Key Foster Wheeler Environmental project team members and their responsibilities are described below. Resumes for these team members are provided in Appendix G.

- Mr. Sina Seyedian, P.E., is the TERC Program Manager.
- Ms. Carol Bieniulis is the DOM for Cannon AFB. She is responsible for the direction, execution, and successful completion of all project tasks.
- Mr. Dan Sullivan is the Contract Administrator for the Southwest TERC Program. He is responsible for addressing program contractual issues.

Figure 6-1. Project Organization Chart



- Mr. Rob Ederer, P.E., is the Task Manager for this project. He is responsible for implementing the work in accordance with performance, cost, and schedule goals and for overall coordination of the project. In addition, as Project Engineer, he will provide technical assistance and oversight of the work in accordance with regulations, professional standards, and client expectations.

- Ms. Kathy Omernik is the QC Manager responsible for quarterly QC inspections in accordance with the CQCP and corporate procedures.

- Mr. James Morning is the Foster Wheeler Environmental Site Representative. His duties include daily direction of Subcontractors and Foster Wheeler Environmental activities, implementing the CQCP and the Site Health and Safety Plan.

- Mr. Craig O'Rourke is the Regulatory Compliance Specialist and is responsible for addressing the project-related regulatory compliance issues.

- Mr. Roger Margotto, CIH is the Project Environmental Safety Manager (PESM). He will assist site personnel in resolving health and safety issues that may arise during the course of the project.

- All subcontractors will report to the Foster Wheeler Environmental Site Representative, James Morning.

6.3 Document Control

Document control is addressed in detail in Section 6 of the CQCP (Appendix C).

6.4 Progress Meetings

Progress meetings will be conducted weekly at the construction site during the active construction work. Other meetings will be scheduled on an as-needed basis. Topics of discussion at meetings will include:

- Review of work progress and schedule

- Discussion of construction schedule impacts and proposed corrective actions

- Revisions to the construction schedule

- Two-week forecast of progress

- Review of submittal schedules

- Review of off-site delivery schedules
- Review of quality health and safety programs
- Review of proposed or pending changes and substitutions

6.5 Reports

Reports and submittals are addressed in detail in Section 3 of the CQCP (Appendix C).

7. REFERENCES

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1998. *Phase III Sludge Management Compliance Evaluation and Requirements Identification.* 1998.

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2000. *Final Basewide Health and Safety Plan for Cannon Air Force Base.* Cannon Air Force Base, New Mexico.

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USACE
1996. *U.S. Army Corps of Engineers Engineering Manual (EM) 385-1-1, Safety and Health Requirements Manual.* September 1996.

2002. *Sewage Lagoons Closure Final Specifications.* U.S. Army Corps of Engineers, Omaha District, September 2002.

Woodward Clyde
1992. *Remedial Investigation Report for 18 Solid Waste Management Units.* Cannon Air Force Base, Clovis, New Mexico.

APPENDIX A

Specifications and Drawings

SPECIFICATIONS

SEWAGE LAGOONS CLOSURE

CANNON AFB
Clovis, New Mexico

FEBRUARY 2003

U.S. ARMY CORPS OF ENGINEERS
OMAHA DISTRICT

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SPECIFICATIONS FOR

SEWAGE LAGOONS CLOSURE
CANNON AFB
CLOVIS, NEW MEXICO

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DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01110

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SECTION 01110

SUMMARY OF WORK

PART 1 GENERAL

1.1 WORK COVERED BY CONTRACT DOCUMENTS

1.1.1 Project Description

Work under this contract involves closing two formerly used sewage lagoons by constructing a soil cover to minimize infiltration of surface water into the subgrade. The work involves excavating and transporting sludge that has been tilled and dried from the north sewage lagoon to the south sewage lagoon and building a soil cover over the south lagoon.

Major items of work include the following:

1) Identification of borrow sources (soil barrier and biota barrier layers)
2) Develop alternative cover design and closure plan with reduced hydraulic conductivity requirement (reference specification 02377)
3) Preparation and submission of all required submittals
4) Site mobilization
5) Removal items in north and south lagoons (reference drawings C-4, C-5 and specification 02220)
6) Sludge tilling and drying-north and south lagoons (contingency item if required-reference specification 02111)
7) Prepare subgrade in south lagoon (reference specification section 02210)
8) Excavate sludge from the north lagoon (reference specification 02111)
9) Place north lagoon sludge in the south lagoon (reference specification 02111)
10) Compact sludge in south lagoon (reference specification 02111)
11) Construct soil barrier layer (reference specification 02377)
12) Construct biota barrier layer (reference specification 02115)
13) Construct erosion/vegetation layer (reference specification 02140)
14) Seed and mulch south lagoon (reference specification 02921)
15) Topographic surveys of grading and cover components
16) Demobilization

1.1.2 Location

The project location is Cannon AFB located approximately 10 miles west of Clovis, New Mexico. The former sewage lagoons are located in the southeast part of Cannon AFB, east of the NE-SW runway and west of the munitions storage area.

1.2 UNDERGROUND UTILITIES

The Contractor shall obtain digging permits prior to the start of any excavation activity in accordance with requirements of the Base Civil Engineering Office at Cannon AFB.

1.2.1 Notification Prior to Excavation

The Contractor shall notify the Contracting Officer at least 48 hours prior to starting any excavation work.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

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DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01330

SUBMITTAL PROCEDURES

09/01; Omaha Update 11/02

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-- End of Section Table of Contents --

SECTION 01330

SUBMITTAL PROCEDURES
09/01; Omaha Update 11/02

PART 1 GENERAL

Attachments: Submittal Register
ENG Form 4025, Transmittal Form

1.1 CONTRACTOR RESPONSIBILITIES

The Contractor is responsible for total management of his work including scheduling, control, and certification of all submittals. The submittal management system provided in these specifications is intended to be a complete system for the Contractor to use to control the quality of materials, equipment and workmanship provided by manufacturers, fabricators, suppliers and subcontractors. The Contractor shall review each submittal for contract compliance. Submittals that comply will be forwarded to the Government. Submittals that do not conform will be returned to the originator to be corrected. The Submittal Register (ENG Form 4288) will be utilized to log and monitor all submittal activities. No construction or installation activities shall be performed prior to required approvals of applicable submittals. The Contractor shall perform a check to assure that all materials and/or equipment have been tested, submitted and approved during the preparatory phase of quality control inspections.

1.2 SUBMITTAL IDENTIFICATION (SD)

Submittals required are identified by SD numbers and titles as follows:

SD-01 Preconstruction Submittals

Tabular lists showing location, features, or other pertinent information regarding products, materials, equipment, or components to be used in the work.

In addition, the following items are included:

Construction Progress Schedule
Health and safety plan
Work plan
Quality control plan
Environmental protection plan
Permits

SD-02 Shop Drawings

Submittals which graphically show relationship of various components of the work, schematic diagrams of systems, details of fabrication, layouts of particular elements, connections, and other relational aspects of the work.

SD-03 Product Data

Catalog cuts, illustrations, schedules, diagrams, performance charts, instructions and brochures illustrating size, physical appearance and other characteristics of materials or equipment for some portion of the work.

Samples of warranty language when the contract requires extended product warranties.

SD-04 Samples

Samples, including both fabricated and unfabricated physical examples of materials, products, and units of work as complete units or as portions of units of work.

Physical examples of materials, equipment or workmanship that illustrate functional and aesthetic characteristics of a material or product and establish standards by which the work can be judged. Color samples from the manufacturer's standard line (or custom color samples if specified) to be used in selecting or approving colors for the project.

Field samples and mock-ups constructed on the project site establish standards by which the ensuring work can be judged. Includes assemblies or portions of assemblies which are to be incorporated into the project and those which will be removed at conclusion of the work.

SD-05 Design Data

Calculations, mix designs, analyses or other data pertaining to a part of work.

SD-06 Test Reports

Report signed by authorized official of testing laboratory that a material, product or system identical to the material, product or system to be provided has been tested in accordance with specified requirements. (Testing must have been within three years of date of contract award for the project.)

Report which includes findings of a test required to be performed by the contractor on an actual portion of the work or prototype prepared for the project before shipment to job site.

Report which includes finding of a test made at the job site or on sample taken from the job site, on portion of work during or after installation.

Investigation reports

Daily checklists

Final acceptance test and operational test procedure

Borrow Source testing data

Chemical Analysis laboratory data

SD-07 Certificates

A document, required of the Contractor, or through the Contractor, from a

supplier, installer, manufacturer, or other lower tier Contractor, the purpose of which is to confirm the quality or orderly progression of a portion of the work by documenting procedures, acceptability of methods or personnel, qualifications, or other verifications of quality.

Statement signed by an official authorized to certify on behalf of the manufacturer of a product, system or material, attesting that the product, system or material meets specified requirements. The statement must be dated after the award of the contract, must state the Contractor's name and address, must name the project and location, and must list the specific requirements which are being certified.

Confined space entry permits.

SD-08 Manufacturer's Instructions

Preprinted material describing installation of a product, system or material, including special notices and material safety data sheets, if any, concerning impedances, hazards, and safety precautions.

SD-09 Manufacturer's Field Reports

Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.

Factory test reports.

SD-10 Operation and Maintenance Data

Data intended to be incorporated in operations and maintenance manuals.

SD-11 Closeout Submittals

Documentation to record compliance with technical or administrative requirements or to establish an administrative mechanism.

In addition, the following items are included:

As-built drawings

Special warranties

Posted operating instructions

Training plan

1.3 SUBMITTAL CLASSIFICATION

Submittals are classified as follows:

1.3.1 Government Approved

Governmental approval is required for extensions of design, critical materials, deviations, equipment whose compatibility with the entire system must be checked, and other items as designated by the Contracting Officer. Within the terms of the Contract Clause entitled "Specifications and Drawings for Construction," they are considered to be "shop drawings." All submittals noted in the technical specifications and Submittal Register as

"G-ED", or "G-RE" are subject to Government Approval.

1.3.2 Information Only (FIO)

All submittals not requiring Government approval will be for information only. They are not considered to be "shop drawings" within the terms of the Contract Clause referred to above. The Contracting Officer has the option to review any submittal.

1.4 APPROVED SUBMITTALS

The Contracting Officer's approval of submittals shall not be construed as a complete check, but will indicate only that the general method of construction, materials, detailing and other information are satisfactory. Approval will not relieve the Contractor of the responsibility for any error which may exist, as the Contractor under the Contractor Quality Control (CQC) requirements of this contract is responsible for dimensions, the design of adequate connections and details, and the satisfactory construction of all work. After submittals have been approved by the Contracting Officer, no resubmittal for the purpose of substituting materials or equipment will be considered unless accompanied by an explanation of why a substitution is necessary.

1.5 DISAPPROVED SUBMITTALS

The Contractor shall make all corrections required by the Contracting Officer and promptly furnish a corrected submittal in the form and number of copies specified for the initial submittal. If the Contractor considers any correction indicated on the submittals to constitute a change to the contract, a notice in accordance with the Contract Clause "Changes" shall be given promptly to the Contracting Officer.

1.6 WITHHOLDING OF PAYMENT

Payment for materials incorporated in the work will not be made if required approvals have not been obtained.

1.7 GENERAL

The Contractor shall make submittals as required by the specifications. The Contracting Officer may request submittals in addition to those specified when deemed necessary to adequately describe the work covered in the respective sections. Units of weights and measures used on all submittals shall be the same as those used in the contract drawings. Each submittal shall be complete and in sufficient detail to allow ready determination of compliance with contract requirements. Prior to submittal, all items shall be checked and approved by the Contractor's Quality Control (CQC) System Manager and each item shall be stamped, signed, and dated by the CQC System Manager indicating action taken. Proposed deviations from the contract requirements shall be clearly identified. Submittals shall include items such as: Contractor's, manufacturer's, or fabricator's drawings; descriptive literature including (but not limited to) catalog cuts, diagrams, operating charts or curves; test reports; test cylinders; samples; O&M manuals (including parts list); certifications; warranties; and other such required submittals. Submittals requiring Government approval shall be scheduled and made prior to the acquisition of the material or equipment covered thereby. Samples remaining upon completion of the work shall be picked up and disposed of in accordance with manufacturer's Material Safety Data Sheets (MSDS) and in

compliance with existing laws and regulations.

1.8 SUBMITTAL REGISTER AND ENG FORM 4288 (RMS) SUBMITTAL REGISTER

At the end of this section is a submittal register (submittal form) showing items of equipment and materials for which submittals are required by the specifications; this list may not be all inclusive and additional submittals may be required. The attached submittal register identifies only the submittal section, type of submittal, description of item submitted, paragraph number related to submittal item (section submittal paragraph if none listed), submittal classification (G), and submittal reviewer identifier (ED or RE). Any submittal without a submittal classification and submittal reviewer identifier is considered to be For Information Only (FIO). The submittal register generated by the Government Resident Management System (RMS) Software is used for tracking construction submittals and is referred to as ENG Form 4288 (RMS). The Contractor shall maintain an ENG Form 4288 (RMS) for the project in accordance with the attached ENG Form 4288 (RMS) Instructions. The Contractor will be furnished one (1) set of ENG Forms 4288 (RMS) at the preconstruction conference. Much of the same information contained on the atttached submittal register will be included on the ENG Forms 4288 (RMS) furnished to the Contractor. The Contractor shall complete the appropriate columns as indicated on the attached ENG Form 4288 (RMS) Instructions and return to the Contracting Officer for approval within 20 calendar days after the preconstruction conference. The ENG Form 4288 (RMS)will become a part of the contract after approval. The TRANSMITTAL NUMBER AND ITEM NUMBER shall be left blank for use later to record the respective transmittal and item number corresponding to those listed on the transmittal form entitled: "TRANSMITTAL OF SHOP DRAWINGS, EQUIPMENT DATA, MATERIAL SAMPLES, OR MANUFACTURER'S CERTIFICATES OF COMPLIANCE" (ENG Form 4025). The approved ENG Form 4288 (RMS) will become the scheduling document and will be used to control submittals throughout the life of the contract. The ENG Form 4288 (RMS) and the progress schedules shall be coordinated.

1.9 SCHEDULING

Submittals covering component items forming a system or items that are interrelated shall be scheduled to be coordinated and submitted concurrently. Certifications to be submitted with the pertinent drawings shall be so scheduled. Adequate time (a minimum of [20] calendar days exclusive of mailing time) shall be allowed and shown on the register for review and approval. No delay damages or time extensions will be allowed for time lost in late submittals.

1.10 TRANSMITTAL FORM (ENG FORM 4025)

The sample transmittal form (ENG Form 4025) attached to this section shall be used for submitting both Goverment approved and information only submittals in accordance with the instructions on the reverse side of the form. These forms will be furnished to the Contractor. This form shall be properly completed by filling out all the heading blank spaces and identifying each item submitted. Special care shall be exercised to ensure proper listing of the specification paragraph and/or sheet number of the contract drawings pertinent to the data submitted for each item.

1.11 SUBMITTAL PROCEDURES

Submittals shall be made as follows:

1.11.1 Procedures

1.11.1.1 "G-ED Submittals

All items listed as "G-ED" submittals in the various sections or on the Submittal Register shall be mailed directly to the addressee shown below as directed. For each submittal, a completed information copy of the attached transmittal form shall also be mailed to the Area Engineer.

Technical Reviewer

Engineering Division (ED)
Attn: CENWO-ED-GA (Brad Jones)
U.S. Army Engineer District, Omaha
106 South 15th Street
Omaha, NE 68102-1618

Each required submittal which is in the form of a drawing shall be submitted as seven (7) prints of the drawing. Drawing prints shall be either blue or black line permanent-type prints on a white background or blueprint and shall be sufficiently clear and suitable for making legible copies.

All catalog and descriptive data shall be submitted in seven (7) copies. Catalog cuts and other descriptive data which have more than one model, size, or type or which shows optional equipment shall be clearly marked to show the model, size, or type and all optional equipment which is proposed for approval. Submittals on component items forming a system or that are interrelated shall be submitted at one time as a single submittal in order to demonstrate that the items have been properly coordinated and will function as a unit.

1.11.1.2 "G-RE" and FIO Submittals

Except as noted below, data for all items listed as "G-RE" Submittals in the various sections shall be submitted in five (5) copies to the Area Engineer using the transmittal form. Items not to be submitted in multiples, such as samples and test cylinders, shall be submitted to the Area or Resident Engineer (as directed) accompanied by five (5) copies of the transmittal form.

Except as noted below, data for all items listed as FIO Submittals in the various sections shall be submitted in three (3) copies to the Area Engineer using the transmittal form. Items not to be submitted in multiples, such as samples and test cylinders, shall be submitted to the Area or Resident Engineer (as directed) accompanied by three (3) copies of the transmittal form. The Government has the option to review any FIO submittal.

1.11.1.3 Certificates of Compliance

Each certificate shall be signed by an official authorized to certify in behalf of the manufacturing company and shall contain the name and address of the Contractor, the project name and location, and the quantity and date or dates of shipment or delivery to which the certificates apply. Copies of laboratory test reports submitted with certificates shall contain the name and address of the testing laboratory and the date or dates of the tests to which the report applies. Certification shall not be construed as

relieving the Contractor from furnishing satisfactory material, if, after tests are performed on selected samples, the material is found not to meet the specific requirements.

1.11.1.4 Purchase Orders

Copies of purchase orders shall be furnished to the Contracting Officer when the Contractor requests assistance for expediting deliveries of equipment or materials, or when requested by the Contracting Officer for the purpose of quality assurance review. Each purchase order issued by the Contractor or his subcontractors for materials and equipment to be incorporated into the project shall (1) be clearly identified with the applicable DA contract number, (2) carry an identifying number, (3) be in sufficient detail to identify the material being purchased, (4) indicate a definite delivery date, and (5) display the DMS priority rating, if applicable.

1.11.2 Deviations

For submittals which include proposed deviations requested by the Contractor, the column "variation" of ENG Form 4025 shall be checked. The Contractor shall set forth in writing the reason for any deviations and annotate such deviations on the submittal. The Government reserves the right to rescind inadvertent approval of submittals containing unnoted deviations.

1.12 CONTROL OF SUBMITTALS

The Contractor shall carefully control his procurement operations to ensure that each individual submittal is made on or before the Contractor scheduled submittal date shown on the approved "Submittal Register."

1.13 GOVERNMENT APPROVED SUBMITTALS

Upon completion of review of submittals requiring Government approval, the submittals will be identified as having received approval by being so stamped and dated.

1.13.1 "G-ED" Submittals

The drawing print and five (5) sets of all catalog data and descriptive literature and drawing prints will be retained by the Contracting Officer and two (2) sets of catalog data and descriptive literature and drawing prints will be returned to the Contractor.

1.13.2 "G-RE" Submittals

Two (2) copies of "G-RE" submittals for approval will be returned to the Contractor except for samples, test cylinders, and O&M manuals for which two (2) copies of the transmittal form only will be returned to the Contractor.

1.14 INFORMATION ONLY SUBMITTALS

Normally submittals for information only will not be returned. Review by the Contracting Officer is not required on information only submittals. The Government reserves the right to require the Contractor to resubmit any item found not to comply with the contract. This does not relieve the

Contractor from the obligation to furnish material conforming to the plans and specifications; will not prevent the Contracting Officer from requiring removal and replacement of nonconforming material incorporated in the work; and does not relieve the Contractor of the requirement to furnish samples for testing by the Government laboratory or for check testing by the Government in those instances where the technical specifications so prescribe.

1.15 STAMPS

Stamps used by the Contractor on the submittal data to certify that the submittal meets contract requirements shall be similar to the following. The stamp shall be affixed and filled out on the back of each ENG Form 4025.

CONTRACTOR

(Firm Name)

_____ Approved

_____ Approved with corrections as noted on submittal data and/or attached sheets(s).

SIGNATURE: _____

TITLE: _____

DATE: _____

INSTRUCTIONS
ENG FORM 4288 (RMS)

1. The Contractor shall utilize the ENG Form 4288 (RMS) generated by the Government Residential Management System (RMS)software for tracking construction submittals. The Submittal Register information, columns (c) thru (f) from the Submittal Forms furnished with this solicitation, will be utilized by the Government to generate the ENG Form 4288 (RMS). The Government will furnish the Contractor a hard copy of the ENG Form 4288 (RMS) at the preconstruction conference.. The ENG Form 4288 (RMS) includes the following items and parties responsible for completing the information required on the ENG Form 4288 (RMS). The subparagraph headings below do not correspond to the Submittal Register column headings.

a. Activity Number: will be provided by the Contractor from his Network Analysis, if required, and when a network analysis is accepted.

b. Transmittal Number and Item Number: will be provided by the Contractor from ENG Form 4025 for each item.

c. Specification Paragraph Number: will be provided by the Government from the Submittal Register from column entitled "Specification Paragraph Number".

d. Description of Submittal: will be provided by the Government from the Submittal Register from column entitled "Description of Item Submitted".

e. Type of Submittal: will be provided by the Government from the Submittal Register from column entitled "Type of Submittal" or "Description of Item Submitted".

f. Classification: will be provided by the Government from the Submittal Register from column entitled "Classification".

g. Reviewing Office - Reviewer: will be provided by the Government from the Submittal Register from column entitled "Classification" or "Reviewer".

h. Contractor Schedule Dates: the Contractor will provide schedule dates for

"Submit Needed By" (Date the Contractor expects to submit an item. It is the Contractors responsibility to calculate the lead time needed for the government approval. Note if resubmittal is required it is the Contractors responsibility to make all adjustments necessary to meet the contract completion date.)

"Approval Needed By" (date the Contractor can receive approval and still obtain the material by need date.), and

"Material Needed By" (date that the material is needed at the site. If there is a network analysis it should reflect that date on the analysis.)

i. Contractor Action: Includes the following items: "Code" and "Submit to the Corps". These items will be completed by the Contractor. The action codes will be one of the following:

A - Approved as submitted.

B - Approved, except as noted.
G - Other (specify)

j. Government Action: This item includes a Government Action "Code" and "Date" and is reserved for Government use. The Government reserves the right to review any submittal for contract compliance. Receipt of an Action Code "F - Receipt Acknowledged" or failure of the Contractor to receive an Action Code by the Government, does not mean that the submittal is in compliance with the contract requirements. When used by the Government, the action code will be one of the following:

A - Approved as submitted.
B - Approved except as noted on drawings.
C - Approved, except as noted on drawings. Refer to attached ____ sheet resubmission required.
D - Will be returned by separate correspondence.
E - Disapproved (See Attached).
F - Receipt Acknowledged.
Fx - Receipt acknowledged, does not comply as noted with contract requirements.
G - Other (specify).

2. Reviewer Abbreviation code will be as follows;

G-ED or G-RE - Government Approved
For Information Only - Any submittal without a Government Approved abbreviation code.

INSTRUCTIONS
ENG FORM 4025

1. DATE at the top of form will be the date submitted to the Government which is to be completed by the Contractor.

2. TRANSMITTAL NO. Each new transmittal (i.e. G-ED,] G-RE or FIO) shall be numbered consecutively for each specification section in the space provided in "Transmittal No.". This number will be the identifying symbol for each submittal. Example: "15400A-001", "15895A-001" "15895A-002", "16415A-001", etc. For each new submittal or for a resubmittal, the appropriate box must be marked. Resubmittals must be designated by their original sequential number followed by an ".1", ".2", etc. for each sequential resubmittal. Example: "15895A-001.1" (previous submittal No. 15895A-001).

3. TO: Box will contain the name and address of the office which will review the submittal (as designated by the Contracting Officer).

4. FROM: Box will be the name and address of the Contractor. Contractor is to complete this box.

5. CONTRACT NO. box will contain the Contractors construction contract number (e.g., DACXXX-XX-C-XXXX).

6. CHECK ONE box

a. CHECK ONE box (for transmittal/ retransmittal) will be completed by the Contractor with one box marked. If a resubmittal is provided last transmittal number will be added.

b. CHECK ONE box will be completed by the Contractor with one box marked for the submittal type.

7. SPECIFICATION SECTION NO. box will be completed by the Contractor. The number will be the five digit number found in the specifications. No more than one section will be covered with each transmittal.

8. PROJECT TITLE AND LOCATION box will be completed by the Contractor.

9. Column a, will be completed by the Contractor and will contain a different number for each item submitted in that transmittal. Once a number is assigned to an item it will remain the same even if there is a resubmittal.

10. Column b, will be completed by the Contractor. The description of each item on this form will be the descriptions provided on the submittal register. The Contractor shall submit each submittal register item all at once on one transmittal if possible. If a submittal register item can not be submitted all at once Contractor should note that in the remarks box.

11. Column c, will be completed by the Contractor. The information will be the appropriate submittal description number as described this Section or shown on the submittal register (e.g. SD-XX).

12. Column d, will be completed by the Contractor. The number of copies will be determined by the Contractor after review of submittal register for the classification of the item and after review of paragraph: SUBMITTAL PROCEDURES of this Section.

13. Column e, will be completed by the Contractor. The Contractor shall state all applicable paragraph numbers.

14. Column f, will be completed by the Contractor. The Contractor shall state all applicable drawing sheet numbers.

15. Column g, will be completed by the Contractor. The action codes will be one of the following:

A - Approved as submitted.
B - Approved, except as noted.
G - Other (specify)

16. Column h, will be completely by the Contractor. A check shall be placed in this column when a submittal is not in accordance with the plans and specifications also, a written statement to that effect shall be included in the space provided for "Remarks".

17. Column i, is reserved for Government use and may or may not be provided. When used by the Government, the action code will be one of the following:

A - Approved as submitted.
B - Approved except as noted on drawings.
C - Approved, except as noted on drawings. Refer to attached ____ sheet resubmission required.
D - Will be returned by separate correspondence.
E - Disapproved (See Attached).
F - Receipt Acknowledged.
Fx - Receipt acknowledged, does not comply as noted with contract requirements.
G - Other (specify).

18. REMARKS box self explained.

19. Contractor Quality Control Manager must provide name and sign all Eng Form 4025 certifying conformance. In the space for the name and signature, also include a phone number where the CQC Manager may be reached.

20. Section II will be completed by the Government. Contractor is not to write in this space.

See reverse side of ENG Form 4025 for additional instructions.

-- End of Section --

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
Sewage Lagoons Closure, Cannon AFB, Clovis, New Mexico

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH #	CLASSIFICATION	GOVT OR A/E REVWR	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION		DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	APPROVING AUTHORITY				MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
							SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION		DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION		
(a)	(b)	(c)	(d)	(e)	(f)		(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		01351	SD-02 Shop Drawings															
			Work Zones	1.27.1	G	RE												
			Decontamination Facilities	1.28.1	G	RE												
			SD-03 Product Data															
			Exposure Monitoring/Air Sampling	1.14	G	RE												
			Program															
			Site Control Log	1.27.2														
			HAZWOPER Qualifications															
			Certificates															
		01450	SD-03 Product Data															
			Sampling and Analysis Plan	3.4	G	ED												
			SD-06 Test Reports															
			Analytical Data Package	3.2.2	G	ED												
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			Laboratory Approval	1.5	G	ED												
			FADC	3.3.1	G	ED												
		02111	SD-02 Shop Drawings															
			Topographic Survey	1.3	G	ED												
			SD-06 Test Reports															
			Excavation and Handling Plan		G	ED												
			Confirmation Sampling and		G	ED												
			Analysis															
		02115	SD-02 Shop Drawings															
			Topographic Survey	1.3	G	ED												
			SD-06 Test Reports															

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
Sewage Lagoons Closure, Cannon AFB, Clovis, New Mexico

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH #	CLASSIFICATION	GOVT OR A/E REVWR	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY					MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
							SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION		
(a)	(b)	(c)	(d)	(e)	(f)		(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		02115	Excavation and Handling Plan		G	ED												
		02140	SD-02 Shop Drawings															
			Topographic Survey	1.3.1	G	ED												
			SD-05 Design Data															
			Moisture Content of In-Place		G	ED												
			Erosion/Vegetation Layer Fill															
			SD-06 Test Reports															
			Materials Handling Plan	1.4	G	ED												
			Borrow Source Assessment		G	ED												
			Report															
		02210	SD-02 Shop Drawings															
			Topographic Survey	1.3.4	G	ED												
			SD-06 Test Reports															
			Disposal Facility	3.1	G	ED												
			Suitable Materials	1.3.1	G	ED												
			Borrow material		G	ED												
			SD-07 Certificates															
			Field Testing Control	3.9	G	ED												
		02220	SD-06 Test Reports															
			Work Plan		G	ED												
		02377	SD-02 Shop Drawings															
			Topographic Survey	1.5	G	ED												
			SD-06 Test Reports															
			Borrow Source Assessment	3.1	G	ED												
			Assessment Tests	3.1	G	ED												

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
Sewage Lagoons Closure, Cannon AFB, Clovis, New Mexico

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH #	CLASSIFICATION	GOVT OR A/E REVWR	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY					REMARKS
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(a)	(b)	(c)	(d)	(e)	(f)		(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		02377	Moisture Content and Density	3.4.2	G ED													
			Tests of In-Place Soil Barrier Layer															
			Hydraulic Conductivity Tests of		G ED													
			In-Place Soil Barrier Layer															
			SD-07 Certificates															
			Commercial Testing Laboratory	3.1.6	G ED													
		02921	SD-07 Certificates															
			Seed	2.1														
			Fertilizer	2.3														
			Mulch	2.4														
			SD-10 Operation and Maintenance															
			Data															
			Maintenance Record	3.6.3.3														

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TRANSMITTAL OF SHOP DRAWINGS, EQUIPMENT DATA, MATERIAL SAMPLES OR MANUFACTURE'S CERTIFICATES OF COMPLIANCE	DATE	TRANSMITTAL NO.

SECTION I - REQUEST FOR APPROVAL OF THE FOLLOWING ITEMS (This section to be initiated by the Contractor)

TO:	FROM:	CONTRACT NO.	CHECK ONE: ☐ THIS IS A NEW TRANSMITTAL ☐ THIS IS A RE-SUBMITTAL OF TRANSMITTAL NO. _____
SPECIFICATION SECTION NO.	PROJECT TITLE AND LOCATION		CHECK ONE: ☐ FIO ☐ G-RE ☐ G-ED ☐ G-AE

ITEM NO. *a.*	DESCRIPTION OF ITEM SUBMITTED *(Type, size, model, etc.)* *b.*	MFG. OR CONTR. CAT., CURVE DRAWING OR BROCHURE NO. *c.*	NO. of COPIES *d.*	CONTRACT REFERENCE DOCUMENT		FOR CONTRACTOR USE CODE *g.*	VARIA-TION *(SEE #6)* *h.*	FOR CE USE CODE *i.*
				SPEC. PARA. *e.*	DWG. SHEET *f.*			

REMARKS:

I certify that the above submittal items have been reviewed in detail and are correct and in strict compliance with the contract drawings and specifications except as otherwise stated.

_____

NAME, PHONE NUMBER, AND SIGNATURE OF CONTRACTOR QC

SECTION II - APPROVAL ACTION

ENCLOSURES RETURNED *(List by Item No.)*	NAME, TITLE, AND SIGNATURE OF APPROVING AUTHORITY	DATE

INSTRUCTIONS

1. Section I will be initiated by the Contractor in the required number of copies.

2. Each new transmittal shall be numbered consecutively for each specification section in the space provided in "Transmittal No.". This number, in addition to the contract number, will be the identifying symbol for each submittal. Example: "15400A-001", "15895A-001" "15895A-002", "16415A-001", etc. For each new submittal or for a resubmittal, the appropriate box must be marked. Resubmittals must be designated by their original sequential number followed by an ".1", ".2", etc. for each sequential resubmittal. Example: "15895A-001.1" (previous submittal No. 15895A-001).

3. The "Item No." will be the same "Item No." as indicated on ENG FORM 4288-R for each entry on this form.

4. Submittals requiring expeditious handling will be submitted on a separate form.

5. Separate transmittal form will be used for submittals under separate sections of the specifications.

6. A check shall be placed in the "Variation" column when a submittal is not in accordance with the plans and specifications--also, a written statement to that effect shall be included in the space provided for "Remarks".

7. Form is self-transmittal, letter of transmittal is not required.

8. When a sample of material or Manufacturer's Certificate of Compliance is transmitted, indicate "Sample" or "Certificate" in column c, Section I.

9. U.S. Army Corps of Engineers approving authority will assign action codes as indicated below in space provided in Section I, column i to each item submitted. In addition they will ensure enclosures are indicated and attached to the form prior to return to the contractor. The Contractor will assign action codes as indicated below in Section I, column g, to each item submitted.

THE FOLLOWING ACTION CODES ARE GIVEN TO ITEMS SUBMITTED

A -- Approved as submitted.
B -- Approved, except as noted on drawings.
C -- Approved, except as noted on drawings. Refer to attached sheet resubmission required.
D -- Will be returned by separate correspondence.
E -- Disapproved (See attached).
F -- Receipt acknowledged.
FX -- Receipt acknowledged, does not comply as noted with contract requirements.
G -- Other (Specify)

10. Approval of items does not relieve the contractor from complying with all the requirements of the contract plans and specifications.

(Reverse of CENWO-CD-Q SUBMITTAL FORM, IFB-1 (Omaha Version of ENG Form 4025-R))

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-- End of Section Table of Contents --

SECTION 01351

SAFETY, HEALTH, AND EMERGENCY RESPONSE (HTRW/UST)

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH)

ACGIH Limit Values	(1999) Threshold Limit Values for Chemical Substances and Physical Agents Biological Exposure Indices

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z358.1	(1998) Emergency Eyewash and Shower Equipment

CODE OF FEDERAL REGULATIONS (CFR)

29 CFR 1904	Recording and Reporting Occupational Injuries and Illnesses
29 CFR 1910	Occupational Safety and Health Standards
29 CFR 1926	Safety and Health Regulations for Construction
49 CFR 172	Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements

ENGINEERING MANUALS/REGULATIONS (EM)

EM 385-1-1	(1996) U.S. Army Corps of Engineers Safety and Health Requirements Manual

ENGINEERING REGULATIONS (ER)

ER 385-1-92	(2000) Safety and Occupational Document Requirements for Hazardous, Toxic, and Radioactive Waste (HTRW) Activities

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH (NIOSH)

NIOSH Pub No. 85-115	(1985) Occupational Safety and Health Guidance Manual for Hazardous Waste Site

Activities

1.2 DESCRIPTION OF WORK

This section requires contractors to implement practices and procedures for working safely and in compliance with OSHA and USACE regulation while performing cleanup activities on uncontrolled hazardous waste sites.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Work Zones G-RE

Drawings including initial work zone boundaries: Exclusion Zone (EZ), including restricted and regulated areas; Contamination Reduction Zone (CRZ); and Support Zone (SZ).

Decontamination Facilities G-RE

Drawings showing the layout of the personnel and equipment decontamination areas.

SD-03 Product Data

Exposure Monitoring/Air Sampling Program G-RE

Personnel exposure monitoring/sampling results.

Site Control Log

Record of each entry and exit into the site, as specified.

HAZWOPER Qualifications Certificates

A certificate for each worker performing cleanup operations with potential for unacceptable occupational exposure signed by the safety and health manager and the occupational physician indicating the workers meet the training and medical surveillance requirements of this contract.

1.4 REGULATORY REQUIREMENTS

Work performed under this contract shall comply with EM 385-1-1, OSHA requirements in 29 CFR 1910 and 29 CFR 1926, especially OSHA's Hazardous Waste Operations and Emergency Response Standard 29 CFR 1926.65/29 CFR 1910.120 and state specific OSHA requirements where applicable. Matters of interpretation of standards shall be submitted to the appropriate administrative agency for resolution before starting work. Where the requirements of this specification, applicable laws, criteria, ordinances, regulations, and referenced documents vary, the most stringent requirements shall apply.

1.5 PRECONSTRUCTION SAFETY CONFERENCE

Not required.

1.6 SAFETY AND HEALTH PROGRAM

The Contractor shall develop and implement a Safety and Health Program (SHP) which incorporates requirements in OSHA standards 29 CFR 1910, Section .120 (b) and 29 CFR 1926, Section .65 (b) and section 01.A.07 of EM 385-1-1. The Safety and Health Program shall address the items in paragraph (b) of 29 CFR 1910.120/29 CFR 1926.65 and Appendix A of EM 385-1-1 in corporate specific detail. These items are: Signature Sheet; Background Information; Statement of Safety and Health Policy; Responsibilities and Lines of Authority; Subcontractors and Suppliers; Training; Safety and Health Inspections; Safety and Health Expectations, Incentives programs and Compliance; Accident Reporting; Medical Surveillance/Medical Support; Personal Protective Equipment; Standard Operating Procedures and Corporate Plans supporting occupational safety and health.

1.7 SITE SAFETY AND HEALTH PLAN

The Contractor shall develop and implement a Site Safety and Health Plan (SSHP) meeting the requirments of section 01.A.10 of EM 385-1-1 and 29 CFR 1910.120/29 CFR 1926.65 (b)(4). At a minimum, the SSHP shall address each element in Appendix C of ER 385-1-92 and shall incorporate an Activity Hazard Analysis meeting the requirments of 01.A.10 and Figure 1-1 of EM 385-1-1.

a. The SSHP shall be considered a living document and shall be updated as occupational safety and health conditions change during project execution and improved as occuptional safety and health lessons are learned during the course of the poject.

b. SSHP elements in Appendix C of ER 385-1-92 are: 1. Site Description and Contamination Characterization; 2. Activity Hazard Analysis; 3. Health and Safety Staff Organization, Qualifications and Responsibilities for the project; 4. Health and Safety Training requirements for the project; 5. Personal Protective Equipment; 6. Medical Surveillance requirments for the poject; 7. Radiation Dosimetry, if applicable; 8. Exposure Monitoring/Air Sampling; 9. Heat Stress/Cold Stress Prevention; 10. Applicable elements of the Safety and Health Program edited to meet site specific conditions and site specific standard operating safety procedures, engineering controls and work practices used to reduce exposure to contaminants and prevent accidents; 11. Site Control Measures; 12. Personal Hygiene and Decontamination; 13. Equipment Decontamination; 14. Emergency Equipment and First Aid Requirements; 15. Emergency Response and Contingency Procedures. 16. Accident Prevention; 17. Logs, Reports and Recordkeeping.

1.7.1 Acceptance and Modifications

Prior to submittal, the SSHP shall be signed and dated by the Safety and Health Manager and the Site Superintendent. The SSHP shall be submitted for review at least 14 days prior to the start of work. Deficiencies in the SSHP will be discussed at the preconstruction safety conference, and the SSHP shall be revised to correct the deficiencies and resubmitted for acceptance. Onsite work shall not begin until the plan has been accepted. A copy of the written SSHP shall be maintained onsite. Changes and

modifications to the accepted SSHP shall be made with the knowledge and concurrence of the Safety and Health Manager, the Site Superintendent, and the Contracting Officer. Should any unforeseen hazard become evident during the performance of the work, the Site Safety and Health Officer (SSHO) shall bring such hazard to the attention of the Safety and Health Manager, the Site Superintendent, and the Contracting Officer, both verbally and in writing, for resolution as soon as possible. In the interim, necessary action shall be taken to re-establish and maintain safe working conditions in order to safeguard onsite personnel, visitors, the public, and the environment. Disregard for the provisions of this specification or the accepted SSHP shall be cause for stopping of work until the matter has been rectified.

1.7.2 Availability

The SSHP shall be made available in accordance with 29 CFR 1910, Section .120 (b)(1)(v) and 29 CFR 1926, Section .65 (b)(1)(v).

1.8 SITE DESCRIPTION AND CONTAMINATION CHARACTERIZATION

1.8.1 Project/Site Conditions

The Contractor shall refer to the following reports and information for the site description and contamination characterization. Reference the *Final Corrective Measures Study Report for SWMU 101-Sewage Lagoons*, dated October 2000.

1.8.2 Ordnance and Explosives (OE)

The Contractor shall stop work and contact the Contracting Officer if ordnance and explosives are discovered during HTRW remedial action construction.

1.9 TASK SPECIFIC HAZARDS, INITIAL PPE, HAZWOPER MEDICAL SURVEILLANCE AND TRAINING APPLICABILITY

Task specific occupational hazards, task specific HAZWOPER medical surveillance and training applicability and task specific initial PPE requirements for the project are listed on the **Task Hazard and Control Sheets** at the end of this section. It is the Contractor's responsibility to reevaluate occupational safety and health hazards as the work progresses and to adjust the PPE and onsite operations, if necessary, so that the work is performed safely.

1.10 STAFF ORGANZATION, QUALIFICATION AND RESPONSIBILITIES

1.10.1 Safety and Health Manager

Safety and Health Manager shall be an Industrial Hygienist certified by the American Board of Industrial Hygiene or a safety professional certified by the Board of Certified Safety Professionals.

1). The Safety and Health Manager shall have the following additional qualifications:

a. A minimum of 3 years experience in developing and implementing safety and health programs at hazardous waste sites.

b. Documented experience in supervising professional and technician

level personnel.

c. Documented experience in developing worker exposure assessment programs and air monitoring programs and techniques.

d. Documented experience in the development of personal protective equipment programs, including programs for working in and around potentially toxic, flammable and combustible atmospheres and confined spaces.

e. Working knowledge of state and Federal occupational safety and health regulations.

2). The Safety and Health Manager shall:

a. Be responsible for the development, implementation, oversight, and enforcement of the SSHP.

b. Sign and date the SSHP prior to submittal.

c. Conduct initial site-specific training.

d. Be present onsite during the first 3 days of remedial activities and at the startup of each new major phase.

e. Visit the site as needed and at least once per month for the duration of activities, to audit the effectiveness of the SSHP.

f. Be available for emergencies.

g. Provide onsite consultation as needed to ensure the SSHP is fully implemented.

h. Coordinate any modifications to the SSHP with the Site Superintendent, the SSHO, and the Contracting Officer.

i. Provide continued support for upgrading/downgrading of the level of personal protection.

j. Be responsible for evaluating air monitoring data and recommending changes to engineering controls, work practices, and PPE.

k. Review accident reports and results of daily inspections.

l. Serve as a member of the Contractor's quality control staff.

1.10.2 Additional Certified Health and Safety Support Personnel

The Contractor shall retain either safety support from a safety professional certified by the Board of Certified Safety professionals to develop written occupational safety procedures for the SSHP and when necessary visit the site to help implement SSHP requirements, or industrial hygiene support from an industrial hygienist certified by the American Board of Industrial Hygiene to develop occupational health practices for the SSHP and if necessary visit the site to help implement SSHP requirements.

1.10.3 Site Safety and Health Officer

An individual and one alternate shall be designated the Site Safety and Health Officer (SSHO). The name, qualifications (education and training summary and documentation), and work experience of the Site Safety and Health Officer and alternate shall be included in the SSHP.

1). The SSHO shall have the following qualifications:

a. A minimum of 1 year experience in implementing safety and health programs at hazardous waste sites where Level C personal protective equipment was required.

b. Documented experience in construction techniques and construction safety procedures.

c. Working knowledge of Federal and state occupational safety and health regulations.

d. Specific training in personal and respiratory protective equipment program implementation, confined space program oversight, and in the proper use of air monitoring instruments, and air sampling methods including monitoring for ionizing radiation.

2). The Site Safety and Health Officer shall:

a. Assist and represent the Safety and Health Manager in onsite training and the day to day onsite implementation and enforcement of the accepted SSHP.

b. Be assigned to the site on a full time basis for the duration of field activities. The SSHO shall have no duties other than Safety and Health related duties. If operations are performed during more than 1 work shift per day, a site Safety and Health Officer shall be present for each shift and act as the radiation safety officer (RSO) as defined in paragraph 06.E.02 of EM 385-1-1 on radioactive waste cleanup projects.

c. Have authority to ensure site compliance with specified safety and health requirements, Federal, state and OSHA regulations and all aspects of the SSHP including, but not limited to, activity hazard analyses, air monitoring, monitoring for ionizing radiation, use of PPE, decontamination, site control, standard operating procedures used to minimize hazards, safe use of engineering controls, the emergency response plan, confined space entry procedures, spill containment program, and preparation of records by performing a daily safety and health inspection and documenting results on the Daily Safety Inspection Log in accordance with 29 CFR 1904.

d. Have authority to stop work if unacceptable health or safety conditions exist, and take necessary action to re-establish and maintain safe working conditions.

e. Consult with and coordinate any modifications to the SSHP with the Safety and Health Manager, the Site Superintendent, and the Contracting Officer.

f. Serve as a member of the Contractor's quality control staff on matters relating to safety and health.

g. Conduct accident investigations and prepare accident reports.

h. Review results of daily quality control inspections and document

safety and health findings into the Daily Safety Inspection Log.

i. In coordination with site management and the Safety and Health Manager, recommend corrective actions for identified deficiencies and oversee the corrective actions.

1.10.4 Occupational Physician

The services of a licensed physician, who is certified in occupational medicine by the American Board of Preventative Medicine, or who, by necessary training and experience is Board eligible, shall be utilized. The physician shall be familiar with this site's hazards and the scope of this project. The medical consultant's name, qualifications, and knowledge of the site's conditions and proposed activities shall be included in the SSHP. The physician shall be responsible for the determination of medical surveillance protocols and for review of examination/test results performed in compliance with 29 CFR 1910, Section .120 (f) and 29 CFR 1926, Section .65 (f) and paragraph MEDICAL SURVEILLANCE.

1.10.5 Persons Certified in First Aid and CPR

At least two persons who are currently certified in first aid and CPR by the American Red Cross or other approved agency shall be onsite at all times during site operations. They shall be trained in universal precautions and the use of PPE as described in the Bloodborne Pathogens Standard of 29 CFR 1910, Section .1030. These persons may perform other duties but shall be immediately available to render first aid when needed.

1.10.6 Safety and Health Technicians

For each work crew in the exclusion zone, one person, designated as a Safety and Health technician, shall perform activities such as air monitoring, decontamination, and safety oversight on behalf of the SSHO. They shall have appropriate training equivalent to the SSHO in each specific area for which they have responsibility and shall report to and be under the supervision of the SSHO.

1.11 TRAINING

The Contractor's training program for workers performing cleanup operations and who will be exposed to contaminants shall meet the following requirements.

1.11.1 General Hazardous Waste Operations Training

All Personnel performing duties with potential for exposure to on-site contaminants shall meet and maintain the following 29 CFR 1910.120/29 CFR 1926.65 (e) training requirements:

a. 40 hours of off site hazardous waste instruction.

b. 3 days actual field experience under the direct supervision of a trained, experienced supervisor.

c. 8 hours refresher training annually.

Onsite supervisors shall have an additional 8 hours management and supervisor training specified in 29 CFR 1910.120/29 CFR 1926.65 (e) (4).

1.11.2 Initial Session (Pre-entry Briefing)

Prior to commencement of onsite field activities, all site employees, including those assigned only to the Support Zone, shall attend a site-specific safety and health training session of at least 4 hours duration. This session shall be conducted by the Safety and Health Manager and the Site Safety and Health Officer to ensure that all personnel are familiar with requirements and responsibilities for maintaining a safe and healthful work environment. Procedures and contents of the accepted SSHP and Sections 01.B.02 and 28.D.03 of EM 385-1-1 shall be thoroughly discussed. The Contracting Officer shall be notified at least 5 days prior to the initial site-specific training session so government personnel involved in the project may attend.

1.11.3 Periodic Sessions

Periodic onsite training shall be conducted by the SSHO at least daily for personnel assigned to work at the site during the following day. The training shall address safety and health procedures, work practices, any changes in the SSHP, activity hazard analyses, work tasks, or schedule; results of previous week's air monitoring, review of safety discrepancies and accidents. Should an operational change affecting onsite field work be made, a meeting prior to implementation of the change shall be convened to explain safety and health procedures. Site-specific training sessions for new personnel, visitors, and suppliers shall be conducted by the SSHO using the training curriculum outlines developed by the Safety and Health Manager.

1.11.4 Other Training

a. The Safety and Health Manager shall provide training as specified by 29 CFR 1910 Section .146, for employees who are required to supervise, standby, or enter permit-required confined spaces. Persons involved in any aspect of the transportation of hazardous materials shall be trained in accordance with 49 CFR 172 Subpart H.

1.12 PERSONAL PROTECTIVE EQUIPMENT

1.12.1 Site Specific PPE Program

Onsite personnel exposed to contaminants shall be provided with appropriate personal protective equipment. Components of levels of protection (B, C, D and modifications) must be relevant to site-specific conditions, including heat and cold stress potential and safety hazards. Only respirators approved by NIOSH shall be used. Protective equipment and clothing shall be kept clean and well maintained. The PPE section of the SSHP shall include site-specific procedures to determine PPE program effectiveness and for onsite fit-testing of respirators, cleaning, maintenance, inspection, and storage of PPE.

1.12.2 Levels of Protection

The Safety and Health Manager shall establish and evaluate as the work progresses the levels of protection for each work activity. The Safety and Health Manager shall also establish action levels for upgrade or downgrade in levels of PPE. Protocols and the communication network for changing the level of protection shall be described in the SSHP. The PPE evaluation protocol shall address air monitoring results, potential for exposure, changes in site conditions, work phases, job tasks, weather, temperature extremes, individual medical considerations, etc.

1.12.2.1 Initial PPE Components

The following items constitute minimum protective clothing and equipment ensembles to be utilized during this project: consider use of cotton or cotton/polyester blend coveralls for level D and level C PPE ensembles.

Level D. hardhat, safety glasses, hearing protection, safety shoes.

Modified Level D. Same as Level D with coveralls.

Level C. N/A.

Level B. N/A.

1.12.3 PPE for Government Personnel

Three clean sets of personal protective equipment and personal dosimeters for work on radioactive waste cleanup sites and clothing (excluding air-purifying negative-pressure respirators and safety shoes, which will be provided by individual visitors), as required for entry into the Exclusion Zone and/or Contamination Reduction Zone, shall be available for use by the Contracting Officer or official visitors. The items shall be cleaned and maintained by the Contractor and stored on site and clearly marked: "FOR USE BY GOVERNMENT ONLY." The Contractor shall provide basic training in the use and limitations of the PPE provided.

1.13 MEDICAL SURVEILLANCE PROGRAM

The Contractor's medical surveillance program for workers performing cleanup operations and who will be exposed to contaminants shall meet 29 CFR 1910.120/1926.65 (f) and the following requirements. The Contractor shall assure the Occupational Physician or the physician's designee performs the physical examinations and reviews examination results. Participation in the medical surveillance program shall be without cost to the employee, without loss of pay and at a reasonable time and place.

1.13.1 Frequency of Examinations

Medical surveillance program participants shall receive medical examinations and consultations on the following schedule:

a. Every 12 months

b. If and when the participant develops signs and symptoms indicating a possible overexposure.

c. Upon termination or reassignment to a job where medical surveillance program participation is not required, unless his/her previous annual examination/consultation was less than 6 months prior to reassignment or termination.

d. On a schedule specified by the occupational physician.

1.13.2 Content of Examinations

The physical examination/consultation shall verify the following information about medical surveillance program participants:

a. Baseline health conditions and exposure history.

b. Allergies/sensitivity/susceptiblity to hazardous substances exposure.

c. Ability to wear personal protective equipment inclusive of NIOSH certified respirators under extreme temperature conditions.

d. Fitness to perform assigned duties.

The Contractor shall provide the occupational physician with the following information for each medical surveillance program participant:

a. Information on the employee's anticipated or measured exposure.

b. A description of any PPE used or to be used.

c. A description of the employee's duties as they relate to the employee's exposures (including physical demands on the employee and heat/cold stress).

d. A copy of 29 CFR 1910 Section .120, or 29 CFR 1926 Section .65.

e. Information from previous examinations not readily available to the examining physician.

f. A copy of Section 5.0 of NIOSH Pub No. 85-115.

g. Information required by 29 CFR 1910 Section .134.

1.13.3 Physician's Written Opinion

Before work begins a copy of the physician's written opinion for each employee shall be obtained and furnished to the Safety and Health Manager; and the employee. The opinion shall address the employee's ability to perform hazardous waste site remediation work and shall contain the following:

a. The physician's recommended limitations upon the employee's assigned work and/or PPE usage.

b. The physician's opinion about increased risk to the employee's health resulting from work; and

c. A statement that the employee has been informed and advised about the results of the examination.

1.13.4 Medical Records

Documentation of medical exams shall be provided as part of the Certificate of Worker or Visitor Acknowledgment. Medical records shall be maintained in accordance with 29 CFR 1910 Section .120, and 29 CFR 1926Section .65.

1.13.5 Site Specific Medical Surveillance

Prior to on-site work, medical surveillance program participants shall undergo the following medical testing: None. The Contractor shall provide an explanation of the site specific medical surveillance testing in the SSHP.

1.14 EXPOSURE MONITORING/AIR SAMPLING PROGRAM

The Safety and Health Manager shall prepare and implement an exposure monitoring/air sampling program to identify and quantify safety and health hazards and airborne levels of hazardous substances in order to assure proper selection of engineering controls, work practices and personal protective equipment for affected site personnel.

1.15 HEAT STRESS MANAGEMENT

The Contractor shall establish a heat stress management program and implement it when the ambient temperature exceeds 70 Degrees F. The heat stress management program shall consist of the following procedures and practices.

1.15.1 Physiological Monitoring

The Contractor shall train or otherwise assure workers heart rates and body core temperatures are monitored and assure that threshold levels in Table 4 of ACGIH Limit Values are not exceeded.

1.15.2 ACGIH General Controls for Heat Stress

The Contractor shall implement general heat stress control procedures in Table 5 of ACGIH Limit Values as part of his heat stress management program.

1.15.3 ACGIH Job Specific Controls for Heat Stress

The Contractor shall implement job specific heat stress controls in Table 5 of ACGIH Limit Values when site specific conditions warrant.

1.16 SPILL AND DISCHARGE CONTROL

Written spill and discharge containment/control procedures shall be developed and implemented. These procedures shall address radioactive wastes, shock sensitive wastes, laboratory waste packs, material handling equipment, and appropriate procedures for tank and vault entry as well as drum and container handling, opening, sampling, shipping and transport. These procedures shall describe prevention measures, such as building berms or dikes; spill control measures and material to be used (e.g. booms, vermiculite); location of the spill control material; personal protective equipment required to cleanup spills; disposal of contaminated material; and who is responsible to report the spill. Storage of contaminated material or hazardous materials shall be appropriately bermed, diked and/or contained to prevent any spillage of material on uncontaminated soil. If the spill or discharge is reportable, and/or human health or the environment are threatened, the National Response Center, the state, and the Contracting Officer shall be notified as soon as possible.

1.17 MATERIALS TRANSFER SAFETY

Not used.

1.18 DRUM AND CONTAINER HANDLING

Procedures and Precautions (opening, sampling, overpacking): Reference EM 385-1-1.

1.19 CONFINED SPACE ENTRY PROCEDURES

No entry to confined space is required.

1.20 HOT WORK

Not used.

1.21 TANK PURGING FOR PERMIT-REQUIRED CONFINED SPACE ENTRIES

Not used.

1.22 TANK INERTING (NO ENTRY)

Not used.

1.23 TANK ATMOSPHERE TESTING

Not used.

1.23.1 Monitoring to Ensure Purging

Not used.

1.23.2 Monitoring to Ensure Inerting

Not used.

1.24 TANK LIFTING

Not used.

1.25 TANK DEMOLITION

Not used.

1.26 TANK CLEANING

Not used.

1.27 SITE CONTROL MEASURES

1.27.1 Work Zones

Initial anticipated work zone boundaries are shown on the drawings. Utilizing this guidance, work zone boundaries (exclusion zone, including restricted and regulated areas; contamination reduction zone; and support zone) and access points shall be established and the boundary delineations shall be included on the drawings. Delineation of work zone boundaries shall be based on the contamination characterization data and the hazard/risk analysis to be performed as described in paragraph: HAZARD/RISK ANALYSIS. As work progresses and field conditions are monitored, work zone boundaries may be modified with approval of the Contracting Officer. Work zones shall be clearly identified and marked in the field (using fences, tape, signs, etc.). A site map, showing work zone boundaries and locations of decontamination facilities, shall be posted in the onsite office. Work zones shall consist of the following:

a. Exclusion Zone (EZ): The exclusion zone is the area where hazardous contamination is either known or expected to occur and the greatest potential for exposure exists. Entry into this area shall be controlled and exit may only be made through the CRZ.

b. Contamination Reduction Zone (CRZ): The CRZ is the transition area between the Exclusion Zone and the Support Zone. The personnel and equipment decontamination areas shall be separate and unique areas located in the CRZ.

c. Support Zone (SZ): The Support Zone is defined as areas of the site, other than exclusion zones and contamination reduction zones, where workers do not have the potential to be exposed to hazardous substances or dangerous conditions resulting from hazardous waste operations. The Support Zone shall be secured against active or passive contamination. Site offices, parking areas, and other support facilities shall be located in the Support Zone.

1.27.2 Site Control Log

A log of personnel visiting, entering, or working on the site shall be maintained. The log shall include the following: date, name, agency or company, time entering and exiting site, time entering and exiting the exclusion zone (if applicable), and personal protective equipment utilized. Before visitors are allowed to enter the Contamination Reduction Zone or Exclusion Zone, they shall show proof of current training, medical surveillance and respirator fit testing (if respirators are required for the tasks to be performed) and shall fill out the Certificate of Worker or Visitor Acknowledgment. This visitor information, including date, shall be recorded in the log.

1.27.3 Communication

An employee alarm system that has adequate means of on and off site communication shall be provided and installed in accordance with 29 CFR 1910 Section .165. The means of communication shall be able to be perceived above ambient noise or light levels by employees in the affected portions of the workplace. The signals shall be distinctive and recognizable as messages to evacuate or to perform critical operations.

1.27.4 Site Security

Signs shall be printed in bold large letters on contrasting backgrounds in English and/or where appropriate, in the predominant language of workers unable to read English. Signs shall be visible from all points where entry might occur and at such distances from the restricted area that employees may read the signs and take necessary protective steps before entering.

1.28 PERSONAL HYGIENE AND DECONTAMINATION

Personnel entering the Exclusion or Contamination Reduction Zones or otherwise exposed or subject to exposure to hazardous chemical vapors, liquids, or contaminated solids shall adhere to the following personal hygiene and decontamination provisions. Decontamination shall be performed in the CRZ prior to entering the Support Zone from the Exclusion Zone. Chapter 10.0 of NIOSH Pub No. 85-115 shall be consulted when preparing decontamination procedures. A detailed discussion of personal hygiene and decontamination facilities and procedures to be followed by site workers shall be submitted as part of the SSHP. Employees shall be trained in the

procedures and the procedures shall be enforced throughout site operations. Persons disregarding these provisions of the SSHP shall be barred from the site.

1.28.1 Decontamination Facilities

The Contractor shall initially set up a decontamination line in the CRZ. Employees shall exit the exclusion zone through the CRZ and shall implement the following decontamination procedures and techniques: hand and face wash. Showers if needed, must comply with 29 CFR 1910, Section.141 and EM 385-1-1, 02 C, Washing Facilities. It is the site safety and health officer's responsibility to recommend techniqes to improve personnel decontamination techniques and procedures, if necessary. Initial personnel decontamination equipment include the following: soap and potable water.

1.28.2 Equipment Decontamination

Vehicles and equipment used in the EZ shall be decontaminated in the CRZ prior to leaving the site.

1.28.2.1 Decontamination Facilities

Gross contamination shall be removed from vehicles and equipment prior to demobilization from the site.

1.28.2.2 Procedures

Procedures for equipment decontamination shall be developed and utilized to prevent the spread of contamination into the SZ and offsite areas. These procedures shall address disposal of contaminated products and spent materials used on the site, including containers, fluids, oils, etc. Any item taken into the EZ shall be assumed to be contaminated and shall be inspected and/or decontaminated before the item leaves the area. Vehicles, equipment, and materials shall be cleaned and decontaminated prior to leaving the site. Construction material shall be handled in such a way as to minimize the potential for contaminants being spread and/or carried offsite. Prior to exiting the site, vehicles and equipment shall be monitored to ensure the adequacy of decontamination.

1.29 EMERGENCY EQUIPMENT AND FIRST AID REQUIREMENTS

The following items, as a minimum, shall be maintained onsite and available for immediate use:

a. First aid equipment and supplies approved by the consulting physician.

b. Emergency eyewashes and showers which comply with ANSI Z358.1.

c. Emergency-use respirators. Not required.

d. Fire extinguishers with a minimum rating of 20-A:120-B:C shall be provided at site facilities and in all vehicles and at any other site locations where flammable or combustible materials present a fire risk.

1.30 EMERGENCY RESPONSE AND CONTINGENCY PROCEDURES

An Emergency Response Plan, that meets the requirements of 29 CFR 1910 Section .120 (l) and 29 CFR 1926 Section .65 (l), shall be developed and

implemented as a section of the SSHP. In the event of any emergency associated with remedial action, the Contractor shall, without delay, alert all onsite employees that there is an emergency situation; take action to remove or otherwise minimize the cause of the emergency; alert the Contracting Officer; and institute measures necessary to prevent repetition of the conditions or actions leading to, or resulting in, the emergency. Employees that are required to respond to hazardous emergency situations shall be trained in how to respond to such expected emergencies. The plan shall be rehearsed regularly as part of the overall training program for site operations. The plan shall be reviewed periodically and revised as necessary to reflect new or changing site conditions or information. Copies of the accepted SSHP and revisions shall be provided to the affected local emergency response agencies. The following elements, as a minimum, shall be addressed in the plan:

a. Pre-emergency planning. Contact the local emergency response planner during preparation of the Emergency Response Plan. The contractor shall arrange to have fire, rescue, medical and police security services provided by local emergency responders. The Contractor shall ensure the Emergency Response Plan for the site is compatible and integrated with the local fire, rescue, medical and police security services available from local emergency response planning agencies.

b. Personnel roles, lines of authority, communications for emergencies.

c. Emergency recognition and prevention.

d. Site topography, layout, and prevailing weather conditions.

e. Criteria and procedures for site evacuation (emergency alerting procedures, employee alarm system, emergency PPE and equipment, safe distances, places of refuge, evacuation routes, site security and control).

f. Specific procedures for decontamination and medical treatment of injured personnel.

g. Route maps to nearest prenotified medical facility. Site-support vehicles shall be equipped with maps. At the beginning of project operations, drivers of the support vehicles shall become familiar with the emergency route and the travel time required.

h. Emergency alerting and response procedures including posted instructions and a list of names and telephone numbers of emergency contacts (physician, nearby medical facility, fire and police departments, ambulance service, Federal, state, and local environmental agencies; as well as Safety and Health Manager, the Site Superintendent, the Contracting Officer and/or their alternates).

i. Criteria for initiating community alert program, contacts, and responsibilities.

j. Procedures for reporting incidents to appropriate government agencies. In the event that an incident such as an explosion or fire, or a spill or release of toxic materials occurs during the course of the project, the appropriate government agencies shall be immediately notified. In addition, the Contracting Officer shall be verbally notified immediately and receive a written notification within 24 hours. The report shall include the following items:

(1) Name, organization, telephone number, and location of the Contractor.

(2) Name and title of the person(s) reporting.

(3) Date and time of the incident.

(4) Location of the incident, i.e., site location, facility name.

(5) Brief summary of the incident giving pertinent details including type of operation ongoing at the time of the incident.

(6) Cause of the incident, if known.

(7) Casualties (fatalities, disabling injuries).

(8) Details of any existing chemical hazard or contamination.

(9) Estimated property damage, if applicable.

(10) Nature of damage, effect on contract schedule.

(11) Action taken to ensure safety and security.

(12) Other damage or injuries sustained, public or private.

k. Procedures for critique of emergency responses and follow-up.

1.31 CERTIFICATE OF WORKER/VISITOR ACKNOWLEDGEMENT

A copy of a Contractor-generated certificate of worker/visitor acknowledgement shall be completed and submitted for each visitor allowed to enter contamination reduction or exclusion zones, and for each employee, following the example certificate at the end of this section.

1.32 INSPECTIONS

The SSHO's Daily Inspection Logs shall be attached to and submitted with the Daily Quality Control reports. Each entry shall include the following: date, work area checked, employees present in work area, PPE and work equipment being used in each area, special safety and health issues and notes, and signature of preparer. In the event of an accident, the Contracting Officer shall be notified according to EM 385-1-1. Within 2 working days of any reportable accident, an Accident Report shall be completed on ENG Form 3394 and submitted.

1.33 SAFETY AND HEALTH PHASE-OUT REPORT

A Safety and Health Phase-Out Report shall be submitted within 10 working days following completion of the work, prior to final acceptance of the work. The following minimum information shall be included:

a. Summary of the overall performance of safety and health (accidents or incidents including near misses, unusual events, lessons learned, etc.).

b. Final decontamination documentation including procedures and techniques used to decontaminate equipment, vehicles, and on site facilities.

c. Summary of exposure monitoring and air sampling accomplished during the project.

d. Signatures of Safety and Health Manager and SSHO.

Task Hazard and Control Requirements Sheet.

Task _____

Initial Anticipated Hazards_____

Initial PPE_____

Initial Controls_____

Initial Exposure Monitoring _____

HAZWOPER Medical Surveillance Required yes no

HAZWOPER Training Required yes no

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

-- End of Section --

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SECTION 01450

CHEMICAL DATA QUALITY CONTROL

PART 1 GENERAL

This section sets forth the Contractor's responsibility for sample collection, handling, reporting, and analysis requirements to ensure compliance with environmental regulations. The results will be used to ensure that chemical contamination has been removed to below action limits. Dewatered, tilled, and aerated sludge from the north lagoon will be placed into the south lagoon. The north lagoon will be restored for use as an emergency stormwater management basin. Therefore, existing soil from the north lagoon will be excavated to a maximum of 24 inches to eliminate contamination from the sludge.

a. Previous Investigations at Cannon AFB, SWMU 101, Sewage Lagoons.

Final Corrective Measures Study Report for SWMU 101, Sewage Lagoons, Cannon AFB, prepared by Foster Wheeler Environmental Corporation, October 2000 This document provides information on site background and previous studies, methodology and technical approach for the evaluation of site-specific risk, overview of corrective action alternatives, field investigation sampling program for characterization of lagoon sludge and soil, project specific quality assurance and quality control protocol and regulatory compliance.

Supplemental Sludge Sampling, at SWMU 101, Sewage Lagoons, conducted by E & E, 1998.

Remedial Investigation at SWMU 101, Sewage Lagoons, conducted by Woodward-Clyde Consultants, 1992. This investigation recommended annual site groundwater monitoring.

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA-SW-846	(1986) Test Methods for Evaluating Solid Waste Physical/Chemical Methods, 3rd Edition, November 1986, revised July 1992 and January 1995
EPA-540/R-93-071	(1993) Data Quality Objectives Process for Superfund
EPA-450/4-89-015	Aug. 1989 Data Quality Objectives for Ambient Air Monitoring Around Superfund Sites (Stages I and II)

EPA-450/4-90-005	Mar. 1990 Data Quality Objectives for Ambient Air Monitoring Around Superfund Sites (Stage III)

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 200-1-3	Requirements for the Preparation of Sampling and Analysis Plans
ER 1110-1-263	(1996) Data Quality Management for Hazardous, Toxic, Radioactive Waste Remedial Activities

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330SUBMITTAL PROCEDURES:

SD-03 Product Data

Sampling and Analysis Plan; G-ED.

The Contractor shall submit the SAP(which includes a Field Sampling Plan and a Quality Assurance Project Plan) as part of the Contractor Quality Control Plan to the COR for review within 30 calendar days after Notice to Proceed and prior to commencement of any sampling or analysis. The Contractor shall make all necessary changes as required by the COR, until the SAP is accepted, by written approval by the COR. Sampling shall not be permitted until the SAP has been approved by the COR. The SAP shall be brief and less than 20 pages.

SD-06 Test Reports

Analytical Data Package; G-ED.

The Analytical Data Package, no later than 60 days after receipt of last sample to the laboratory.

Field Testing Results

The field testing results site map and analytical results shall be logged and submitted daily.

SD-07 Certificates

Laboratory Approval; G-ED

The Contract Laboratory shall submit the qualifications and any current certifications 30 days prior to initiation of sampling. Submit USACE or NELAPvalidation letter.

FADC; G-ED

The Contractor shall submit the resume and qualifications of the Field Analytical Data coordinator.

1.3 ACRONYMS

The definition of acronyms used by the Contractor which pertain to chemical data quality control shall be clearly defined for all contract related products and communications.

1.4 CHEMISTRY REQUIREMENTS

1.4.1 Data Quality Objectives (DQOs)

Sample acquisitions, chemical analyses and chemical parameter measurements shall be performed in such a manner that the resulting data meets and supports data use requirements. The chemical data shall be acquired, documented, verified and reported in a manner that assures that the specified precision, accuracy, representativeness, comparability, sensitivity, and completeness requirements are achieved. Contract-required development of DQOs shall be in accordance with EPA-540/R-93-071, EPA-450/4-89-015 and EPA-450/4-90-005. The DQOs shall contain, as a minimum, a definition of each chemical sample analysis, and shall define to the analytical laboratories the final uses of the analytical data for all samples submitted. Contractor developed DQOs shall be presented in the Sampling and Analysis Plan and shall address the following:

a. Precision
b. Accuracy
c. Representativeness
d. Comparability
e. Completeness
f. Method Sensitivity
g. Documentation
h. Data Validation
i. Data Reporting

The Contractor shall be responsible for the Project's data quality and for ensuring field team and laboratory compliance with the approved DQO's.

1.4.2 Field Quality Control Samples

Field duplicate samples shall be collected at a minimum rate of 5 percent of the total number of samples, unless otherwise specified. Extra volumes of sample shall be obtained for Matrix Spike/Matrix Spike Duplicate Samples at the rate of 5 percent.

1.4.3 Government Quality Assurance Samples

The Contractor shall be responsible for collection and transportation of QA samples to the government QA laboratory. Samples for all analyses shall be taken as splits of homogenized samples. Samples shall be collected at a rate of 10 percent per matrix per analysis per sampling event. The government QA laboratory is as follows:

Environmental Chemistry Branch
420 S. 18th Street
Omaha, NE 68102
Phone: 402-444-4314

a. The Contractor shall notify the QA Laboratory at least 24 hours in advance of the first shipment of QA samples.

b. The Contractor shall provide all labor and field supplies, including sample containers and shipping coolers, for collecting and shipping samples for QA testing. The Contractor shall, in the presence of the CO, properly collect, label, and package the QA samples, fill out all chain-of-custody forms, and ship the samples by one-day delivery service to the designated QA laboratory for analysis. The Contractor shall notify the laboratory when all sampling is completed and shall clearly mark the chain-of-custody form accompanying the final shipment "FINAL" in 1 inch high lettering.

c. The Contractor shall allow 60 calendardays for laboratory analysis of QA samples, data review, and submission of the Government chemical quality assurance report. The elapsed time shall begin when the Contractor's last sample arrives at the QA laboratory, provided that the Contractor's completed chemistry data package is received within 30 calendar days thereafter. Otherwise, the Contractor shall allow 30 calendar days from the date the completed chemistry data package is received at the laboratory. [The Contractor may, as an option, continue activities based on initial sampling and QC results, before receipt of QA test results.] Where QA results are unacceptable due to Contractor negligence (e.g. improper sample collection and/or handling by the Contractor), or where QA sample results conflict with the Contractor's primary sample results, further sampling and testing shall be performed as directed by the CO. All costs for such additional sampling and testing due to Contractor negligence, including both QC and QA testing and analysis, and for any required remedial actions in the work, shall be borne by the Contractor. USACE acceptance of final disposition of any excavated soil shall not occur until the Contractor's sampling and QC results have been confirmed by QA results. This includes all final stockpiling, wasting, backfilling, and related construction. No payment will be made for laboratory sampling and testing before receipt and acceptance by the Government of the QA samples and the completed Chemical Data Final Report (CDFR), properly formulated according to these specifications. Government QA samples are not required to be collected.

1.4.4 Sampling Requirements

The Contractor shall describe in the Sampling and Analysis Plan (SAP) the implementation procedures to meet the requirements of the specifications. This shall include the sampling rationale, data types, quality needs and quantity needs sufficient to address the regulatory requirements and also to support decision making efforts. Soil samples will be obtained at the bottom and sides of the excavation to verify that contaminated material has been removed.

1.4.4.1 Soil Sampling Locations

Confirmation soil samples shall be collected from the North Lagoon once the sludge has been removed. The confirmation soil samples shall be collected at a frequency of one per 40,000 square feet from the bottom and side slopes of the excavated area in the north lagoon. The contracting Officer may request sampling on a more frequent basis depending on the visual appearance of the excavated subgrade. Sample locations shall be determined by the contracting Officer. Based on test results, the Contractor shall

determine if additional excavation is needed to remove material that is contaminated above actions levels. Additional excavation, if required, shall be approved in advance by the contracting Officer.

Soil samples shall be collected in accordance with the following protocol:

SAMPLING PROTOCOL

Sampling personnel shall record in the field log book the preparation activities that may be pertinent to the sampling event at each location. This documentation shall include information on the presence of surface staining, background vapor concentrations (vapor concentrations may be obtained for safety), depth that cover the extent of the composite sample collected, sampling equipment used, and sampling personnel involved.

* The samples shall be collected with stainless steel sampling equipment.

* Sampling equipment shall be decontaminated between each sample.

* Soil shall be packed into the sample container with a spoon in an attempt to eliminate voids in the container. Once the sample container is filled with soil, the excess soil shall be removed from the container mouth so that the lid will properly seal.

* The sample material shall be placed in an appropriate container as, and placed on ice.

* At each unique sampling location, field personnel shall wear new, clean disposable gloves while taking samples.

* Samples shall be labeled and shipped according to specifications in Appendix F to ER 1110-1-263.

1.4.5 Sample Analysis

The soil samples shall be analyzed for RCRA Metals, Pesticides, PCBs, and nitrates. Samples will be extracted and analyzed by EPA-SW-846 Method 5030A and analyzed by EPA-SW-846 method 6010B for the RCRA metals, except for mercury. Mercury will be analyzed by EPA-SW-846 Method 7471. Pesticides will be analyzed by EPA-SW-846 Method 8181A, PCBs by EPA-SW-846 Method 8082, and nitrate by EPA Method 300.0.

1.4.6 Chemistry Requirements - Methodology

The Contract laboratory must be capable of achieving reporting limits that will meet New Mexico Environment Department Soil Screening Levels (December 2000). The calibration of a method must bracket the reporting limit analyte level between a low-level standard and a high level standard. The Contractor must ensure that the Contract laboratory can adequately quantify low-level analytes such that a comparison of the analytical results to appropriate and applicable regulations can be made. The Contractor shall ensure that the reporting limits and analytes provided below are sufficient for the project. Any deviations from the limits prescribed in the below tables must be approved by the COR. The analytical turn-around time (TAT) shall be sufficient to meet project schedules, be economical and ensure quality data are obtained. The Contractor shall propose the TAT.

1.4.7 Sample Chain-of-Custody, Packing, Transportation, and Sample Designation

The Contractor shall address the procedures for sample packing, shipping and all chain of custody concerns as described in the temporary firing range stockpile. Identify the numbering scheme to be used on the labels and information regarding sample containers.

1.4.8 Decontamination Procedure for Sampling Equipment

The decontamination area shall be established in an area of the site considered free from contamination. Equipment and personnel decontamination activities shall be centralized in this area. Prior to arrival on-site, all equipment shall be steam cleaned. Equipment used for excavation and sampling shall be decontaminated prior to use in accordance with the following cleaning procedures:

a. The backhoe and all support equipment shall be free from excess grease, oils, and caked-on soils from previous work prior to arrival at the site. Equipment which leaks fuel, coolant, and lubricants shall be removed from the site and repaired prior to use.

b. Equipment or materials not used immediately after decontamination shall be placed on a plastic sheet, covered with plastic, and secured to avoid potential contamination.

c. Clean with tap water and Laboratory detergent, (Liquinox or equivalent) using a brush if necessary to remove particular matter and surface films.

d. Rinse three times with potable water.

e. Rinse thoroughly with deionized water and allow to air dry.

f. Wrap sampling equipment completely with aluminum foil, shiny side out, to prevent contamination if equipment is to be stored or transported.

g. Equipment such as pumps, flow lines, etc., shall be flushed thoroughly with potable water prior to use.

Clean, disposable gloves shall be worn while handling sampling equipment during the final stages of decontamination.

1.4.9 Investigation Derived Waste

Investigation Derived Waste (IDW) will be generated and will consist of decontamination water and associated sediments and used personal protective equipment (PPE). IDW will be disposed of by the Contractor according to State and EPA requirements.

1.5 LABORATORY APPROVAL

Any laboratory performing chemical analyses for this project shall be either NELAP or USACE approved prior to contract award. The laboratory must be NELAP or USACE validated for the method of analysis specified. The laboratory shall be reviewed and approved by the Contracting Officer.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 GENERAL

The Contractor is responsible for chemical sample acquisition, sample analysis, instrumental measurements of chemical parameters and for chemical data quality control. An effective chemical data quality control system shall be established that meets the requirements for the chemical measurement DQOs applicable to the project. The chemical data quality control system shall consist of a Chemical Quality Management staff responsible for the sampling and measurement plans, analytical procedures, minimum data reporting requirements, and the organization necessary to produce the required chemical data. The system shall cover chemical measurements pertaining to and required for Contractor and subcontractor produced chemical data.

3.2 DATA VALIDATION AND REPORTING

3.2.1 Data Validation and Qualification

The Contractor shall verify the analytical data. This verification shall ensure at a minimum that the holding times are met, the surrogate recoveries are in QC limits, that blanks are reviewed, the Laboratory control samples are in QC limits, initial and continuing calibrations are in QC limits, provide an assessment of the overall analysis per sample batch, and shall qualify and ensure that the data has been appropriately qualified on the criteria established in the National Functional Guidelines. Data shall be qualified on the basis of the blank contamination, and the Contractor shall ensure that samples in a sample batch or in a sample cooler that are affected by field or laboratory contamination are appropriately qualified. The Contractor shall provide a summary of the data validation. The results of the data verification shall be reported in the Analytical Data Package.

3.2.1.1 Data Qualifiers

Data shall be "J" (estimated concentration) qualified, if such data are greater than the Method Detection Limit and less than the lowest calibration standard. Any result less than the Method Detection Limit shall be reported as non-detect. Appropriate EPA data qualifiers shall be used and defined for the data validation.

3.2.2 Analytical Data Package

The Analytical Data Package (ADP) shall report the analytical data for the project, and include in a separate section the field and laboratory Quality Control (QC) results. The ADP shall also provide a summary of the data validation, lab narratives, and a summary of achievement of project specific DQOs.

3.2.2.1 Data Reporting Requirements

The following are the minimum data reporting requirements for the Analytical Data Package. If the Contractor's laboratory uses the CLP forms, these shall be submitted for this requirement, along with the other requirements. Provide chromatograms chromatograms full scale, which fill up the entire page, which clearly depict the base line, and limits of

integration of all contaminants-of-concern peaks.

3.2.2.2 Laboratory Case Narrative

The associated laboratory case narratives shall be included in the results if the reported sample batch results are affected. If the QC is within limits for a sample batch, and the overall assessment is that the sample meets the data quality objectives, a statement to that effect must be included as well. The laboratory narratives will be provided for each sample batch for each type of analyses.

3.2.2.3 Sample Identification

The Contractor shall prepare a tabular presentation with matched contract laboratory sample identifications to the corresponding contractor sample identifications, if they are different. The table shall identify all field duplicates and field blanks as such and match their corresponding field samples where applicable. All of the field and laboratory Quality Control samples (field duplicates, trip blanks, Laboratory control samples, Method Blanks, Matrix Spike Duplicates/Matrix Spikes, and surrogate recoveries) shall be identified with the environmental samples in the associated batch or run as appropriate.

3.2.2.4 Data Verification Summary

A narrative of the data verification will be included with the Analytical Data Package. The results of the data validation, changes in the data qualification, will be included with the ADP or annotated on the appropriate pages of the ADP.

3.2.2.5 Sample Receipt

The Contractor shall include all Cooler Receipt Forms and Chain-of-Custody forms associated with the required sample results.

3.2.2.6 Quality Control Reporting Requirements

A complete set of QC results shall be reported for each analytical batch associated with the required sample results. The QC results shall include, but is not limited to, trip blanks, rinsate blanks, method blanks, laboratory control samples, blanks, surrogate and matrix spike recoveries, initial calibration forms, continuing calibration forms, laboratory duplicates and/or matrix spike duplicate pairs.

3.2.2.7 Quality Control Assessment

An assessment of the quality of each sample batch will be provided. This assessment will discuss the performance of the method, the performance of the quality control samples, holding times, surrogate spikes, post-digestion spikes, other quality control measures. This assessment will discuss which samples were affected by QC exceedances and field or laboratory contamination.

3.2.2.8 Data Review

Analytical Data which has not been subjected to data validation shall be reviewed by the FADC or other responsible qualified personnel to ensure compliance with the DQOs and to ensure data will meet the project needs. The detections, surrogate recoveries, MS/MSDs, field duplicates RPDs, LCS,

method blanks shall be reviewed.

3.3 PERSONNEL QUALIFICATIONS

The Contractor's Chemical Quality Control Officer shall have, as a minimum, a bachelors degree in Chemistry or in a technical field, and a minimum of 2 years of experience with HTRW Chemical Quality Control including responsibilities for HTRW DQO definitions, HTRW sampling and analysis, HTRW project requirements for data documentation and validation, and final HTRW project reports. The field sampling personnel shall have a minimum of 1 year college chemistry, and they shall be familiar with the operation and of all field instrumentation. The field sampling personnel shall be experienced and trained in sample collection, sample handling, and sample shipping procedures.

3.3.1 Field Analytical Data Coordinator

The FADC shall be responsible for sample collection, sample custodial duties, preparing data reports, sample maps, and implementing the SAP. Qualifications shall include field sampling, reporting, data interpretation, and at least two years of chemistry education.

3.4 SAMPLING AND ANALYSIS PLAN

3.4.1 General

a. The SAP Plan shall identify personnel, qualifications and procedures for implementing a chemical data quality control system for Contractor and subcontractor. The plan shall include analytical capability and procedures; SAP responsibility; a corporate verification letter from management committing the assigned personnel to the project; and an organizational chart including DQO and submittal responsibilities and sequence for chemical data quality verification. Chemical measurements including sampling and/or chemical parameter measurement will not be permitted to begin until after acceptance of the SAP. The measurement of a chemical parameter, which is not included in the approved SAP and is not included in the contract specification, will not be permitted. The SAP shall identify how the Contractor shall provide oversight of the Laboratory's Data Quality. The SAP shall specify the DQOs, PARCC, and other detection limits (MDL's, PQL's), and QC parameters. The SAP shall be prepared according to EM 200-1-3.

b. The SAP shall show the sample locations, and analytical methods. The SAP shall include a letter from the Contract laboratory stating their NELAP or USACE validation status.

3.5 ANALYTICAL TESTING LABORATORY PERFORMANCE

The Contractor shall provide and/or require continued acceptable analytical performance and shall establish a procedure to address data deficiencies noted by review and/or quality assurance sample results. The Contractor shall provide and implement a mechanism for providing analytical labs with the SAP for monitoring the lab's performance and for performing corrective action procedures. The Contractor is responsible for acquiring analytical services with additional USACE validated laboratories in the event a project lab loses its USACE validation status during the project. The Contractor shall be responsible for the Contract laboratory data quality, precision and accuracy.

3.6 DOCUMENTATION

Documentation records shall be provided as factual evidence that required chemical data has been produced and chemical data quality has been achieved.

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SECTION 01451

CONTRACTOR QUALITY CONTROL

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. Publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 3740	(1999b) Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
ASTM E 329	(1998a) Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

1.2 PAYMENT

Not Used.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

The Contractor is responsible for quality control and shall establish and maintain an effective quality control system in compliance with the Contract Clause titled "Inspection of Construction." The quality control system shall consist of plans, procedures, and organization necessary to produce an end product that complies with the contract requirements. The system shall cover all construction operations, both onsite and offsite, and shall be keyed to the proposed construction sequence. The site project superintendent will be held responsible for the quality of work on the job and is subject to removal by the Contracting Officer for non-compliance with the quality requirements specified in the contract. The site project superintendent in this context shall be the highest level manager responsible for the overall construction activities at the site, including quality and production. The site project superintendent shall maintain a physical presence at the site at all times, except as otherwise acceptable to the Contracting Officer, and shall be responsible for all construction and construction related activities at the site.

3.2 QUALITY CONTROL PLAN

The Contractor shall furnish for review by the Government, not later than 30 calendar days after the design is finalized, the Contractor Quality Control (CQC) Plan proposed to implement requirements of this project. The plan shall identify personnel, procedures, control, instructions, tests, records, and forms to be used. Construction will be permitted to begin only after acceptance of the CQC Plan.

3.2.1 Content of the CQC Plan

The CQC Plan shall include, as a minimum, the following to cover all construction operations, both onsite and offsite, including work by subcontractors and suppliers:

a. A description of the quality control organization, including a chart showing lines of authority and acknowledgment that the CQC staff shall implement the three phase control system for all aspects of the work specified. The staff shall include a CQC System Manager who shall report to the project superintendent.

b. The name, qualifications (in resume format), duties, responsibilities, and authorities of each person assigned a CQC function.

c. A copy of the letter to the CQC System Manager signed by an authorized official of the firm that describes responsibilities and delegates sufficient authorities to adequately perform the functions of the CQC System Manager, including authority to stop work which is not in compliance with the contract. The CQC System Manager shall issue letters of direction to all other various quality control representatives outlining duties, authorities, and responsibilities. Copies of these letters shall also be furnished to the Government.

d. Procedures for scheduling, reviewing, certifying, and managing submittals, including those of subcontractors and suppliers. These procedures shall be in accordance with specification section 01330, SUBMITTAL PROCEDURES.

e. Control, verification, and acceptance testing procedures for each specific test to include the test name, specification paragraph requiring test, feature of work to be tested, test frequency, and person responsible for each test. (Laboratory facilities will be approved by the Contracting Officer.)

f. Procedures for tracking preparatory, initial, and follow-up control phases and control, verification, and acceptance tests including documentation.

g. Procedures for tracking construction deficiencies from identification through acceptable corrective action. These procedures shall establish verification that identified deficiencies have been corrected.

h. Reporting procedures, including proposed reporting formats.

i. A list of the definable features of work. A definable feature of work is a task that is separate and distinct from other tasks, has separate control requirements, and may be identified by different trades or disciplines, or it may be work by the same trade in a

different environment. Although each section of the specifications may generally be considered as a definable feature of work, there are frequently more than one definable features under a particular section. This list will be agreed upon during the coordination meeting.

3.2.2 Acceptance of Plan

Acceptance of the Contractor's plan is required prior to the start of construction. Acceptance is conditional and will be predicated on satisfactory performance during construction. The Government reserves the right to require the Contractor to make changes in the CQC Plan and operations including removal of personnel, as necessary, to obtain the quality specified.

3.2.3 Notification of Changes

After acceptance of the CQC Plan, the Contractor shall notify the Contracting Officer in writing of any proposed change. Proposed changes are subject to acceptance by the Contracting Officer.

3.3 QUALITY CONTROL ORGANIZATION

3.3.1 Personnel Requirements

The requirements for the CQC organization are a CQC System Manager and sufficient number of additional qualified personnel to ensure safety and contract compliance. The Safety and Health Manager shall receive direction and authority from the CQC System Manager and shall serve as a member of the CQC staff. Personnel identified in the technical provisions as requiring specialized skills to assure the required work is being performed properly will also be included as part of the CQC organization. The Contractor's CQC staff shall maintain a presence at the site at all times during progress of the work and shall have authority and responsibility to take any action necessary to ensure contract compliance. The CQC staff shall be subject to acceptance by the Contracting Officer. The Contractor shall provide adequate office space, filing systems and other resources as necessary to maintain an effective and fully functional CQC organization. Complete records of all letters, material submittals, schedules and all other project documentation shall be promptly furnished to the CQC organization by the Contractor. The CQC organization shall be responsible to maintain these documents and records at the site at all times, except as otherwise acceptable to the Contracting Officer.

3.3.2 CQC System Manager

The Contractor shall identify as CQC System Manager an individual within the onsite work organization who shall be responsible for overall management of CQC and shall have authority to act in all CQC matters for the Contractor. The CQC System Manager shall be a person familiar with earthwork construction projects with a minimum of 2 years experience in related work. This CQC System Manager shall be on the site at all times during construction and shall be employed by the prime Contractor. The CQC System Manager shall be assigned as System Manager but may have duties as project superintendent in addition to quality control. An alternate for the CQC System Manager shall be identified in the plan to serve in the event of the System Manager's absence. Requirements for the alternate shall be the same as for the designated CQC System Manager.

3.3.3 Organizational Changes

The Contractor shall maintain the CQC staff at full strength at all times. When it is necessary to make changes to the CQC staff, the Contractor shall revise the CQC Plan to reflect the changes and submit the changes to the Contracting Officer for acceptance.

3.4 SUBMITTALS AND DELIVERABLES

Submittals shall be made as required in specification section 01330 SUBMITTAL PROCEDURES. The CQC organization shall be responsible for certifying that all submittals and deliverables are in compliance with the contract requirements.

3.5 CONTROL

Contractor Quality Control is the means by which the Contractor ensures construction, to include that of subcontractors and suppliers, complies with requirements of the contract. At least three phases of control shall be conducted by the CQC System Manager for each definable feature of work as follows:

3.5.1 Preparatory Phase

This phase shall be performed prior to beginning work on each definable feature of work, after all required plans/documents/materials are approved/accepted, and after copies are at the work site. This phase shall include:

a. A review of each paragraph of applicable specifications, reference codes, and standards. A copy of those sections of referenced codes and standards applicable to that portion of the work to be accomplished in the field shall be made available by the Contractor at the preparatory inspection. These copies shall be maintained in the field and available for use by Government personnel until final acceptance of the work.

b. A review of contract drawings.

c. A check to assure that all materials and/or equipment have been tested, submitted, and approved.

d. Review of provisions that have been made to provide required control inspection and testing.

e. Examination of the work area to assure that all required preliminary work has been completed and is in compliance with the contract.

f. A physical examination of required materials, equipment, and sample work to assure that they are on hand, conform to approved submitted data, and are properly stored.

g. A review of appropriate activity hazard analysis to assure safety requirements are met.

h. Discussion of procedures for controlling quality of the work including repetitive deficiencies. Document construction tolerances and workmanship standards for that feature of work.

i. Discussion of the initial control phase.

j. The Government shall be notified at least 2 business days in advance of beginning the preparatory control phase. This phase shall include a meeting conducted by the CQC System Manager and attended by the superintendent, other CQC personnel (as applicable), and the foreman responsible for the definable feature. The results of the preparatory phase actions shall be documented by separate minutes prepared by the CQC System Manager and attached to the daily CQC report. The Contractor shall instruct applicable workers as to the acceptable level of workmanship required in order to meet contract specifications.

3.5.2 Initial Phase

This phase shall be accomplished at the beginning of a definable feature of work. The following shall be accomplished:

a. A check of work to ensure that it is in full compliance with contract requirements. Review minutes of the preparatory meeting.

b. Verify adequacy of controls to ensure full contract compliance. Verify required control inspection and testing.

c. Establish level of workmanship and verify that it meets minimum acceptable workmanship standards. Compare with required sample panels as appropriate.

d. Resolve all differences.

e. Check safety to include compliance with and upgrading of the safety plan and activity hazard analysis. Review the activity analysis with each worker.

f. The Government shall be notified at least 2 business days in advance of beginning the initial phase. Separate minutes of this phase shall be prepared by the CQC System Manager and attached to the daily CQC report. The exact location of the initial phase shall be indicated for future reference and comparison with follow-up phases.

g. The initial phase should be repeated for each new crew to work onsite, or any time acceptable specified quality standards are not being met.

3.5.3 Follow-up Phase

Daily checks shall be performed to assure control activities, including control testing, are providing continued compliance with contract requirements, until completion of the particular feature of work. The checks shall be made a matter of record in the CQC documentation. Final follow-up checks shall be conducted and all deficiencies corrected prior to the start of additional features of work which may be affected by the deficient work. The Contractor shall not build upon nor conceal non-conforming work.

3.5.4 Additional Preparatory and Initial Phases

Additional preparatory and initial phases shall be conducted on the same definable features of work if: the quality of on-going work is unacceptable; changes occur in the applicable CQC staff, onsite production supervision or work crew; work on a definable feature is resumed after a substantial period of inactivity; other problems develop.

3.6 TESTS

3.6.1 Testing Procedure

The Contractor shall perform specified or required tests to verify control measures are adequate to provide a product that conforms to contract requirements. Upon request, the Contractor shall furnish to the Government duplicate samples of test specimens for possible testing by the Government. Testing includes operation and/or acceptance tests when specified. The Contractor shall procure the services of a Corps of Engineers approved testing laboratory or establish an approved testing laboratory at the project site. The Contractor shall perform the following activities and record and provide the following data:

a. Verify testing procedures comply with contract requirements.

b. Verify facilities and testing equipment are available and comply with testing standards.

c. Check test instrument calibration data against certified standards.

d. Verify recording forms and test identification control number system, including all test documentation requirements, have been prepared.

e. Results of all tests taken, both passing and failing tests, shall be recorded on the CQC report for the date taken. Specification paragraph reference, location where tests were taken, and the sequential control number identifying the test shall be given. If approved by the Contracting Officer, actual test reports may be submitted later with a reference to the test number and date taken. An information copy of tests performed by an offsite or commercial test facility shall be provided directly to the Contracting Officer. Failure to submit timely test reports as stated may result in nonpayment for related work performed and disapproval of the test facility for this contract.

3.6.2 Testing Laboratories

3.6.2.1 Capability Check

The Government reserves the right to check laboratory equipment in the proposed laboratory for compliance with standards set forth in the contract specifications and to check the laboratory technician's testing procedures and techniques. Laboratories utilized for testing soils and concrete shall meet criteria detailed in ASTM D 3740 and ASTM E 329.

3.6.2.2 Capability Recheck

If the selected laboratory fails the capability check, the Contractor will be assessed a charge of $3,000 to reimburse the Government for each succeeding recheck of the laboratory or the checking of a subsequently selected laboratory. Such costs will be deducted from the contract amount

due the Contractor.

3.6.3 Onsite Laboratory

The Government reserves the right to utilize the Contractor's control testing laboratory and equipment to make assurance tests, and to check the Contractor's testing procedures, techniques, and test results at no additional cost to the Government.

3.7 COMPLETION INSPECTION

3.7.1 Pre-Final Inspection

The Government will perform the pre-final inspection to verify that the facility is complete and ready to be occupied. A Government Pre-Final Punch List may be developed as a result of this inspection. The Contractor's CQC System Manager shall ensure that all items on this list have been corrected before notifying the Government, so that a Final inspection with the customer can be scheduled. Any items noted on the Pre-Final inspection shall be corrected in a timely manner. These inspections and any deficiency corrections required by this paragraph shall be accomplished within the time slated for completion of the entire work or any particular increment of the work if the project is divided into increments by separate completion dates.

3.7.2 Final Acceptance Inspection

The Contractor's Quality Control Inspection personnel, plus the superintendent or other primary management person, and the Contracting Officer's Representative shall be in attendance at the final acceptance inspection. Additional Government personnel including, but not limited to, those from the Cannon AFB Base Civil Engineering office and major commands may also be in attendance. The final acceptance inspection will be formally scheduled by the Contracting Officer based upon results of the Pre-Final inspection. Notice shall be provided to the Contracting Officer at least 14 days prior to the final acceptance inspection and shall include the Contractor's assurance that all specific items previously identified to the Contractor as being unacceptable, along with all remaining work performed under the contract, will be complete and acceptable by the date scheduled for the final acceptance inspection. Failure of the Contractor to have all contract work acceptably complete for this inspection will be cause for the Contracting Officer to bill the Contractor for the Government's additional inspection cost.

3.8 DOCUMENTATION

The Contractor shall maintain current records providing factual evidence that required quality control activities and/or tests have been performed. These records shall include the work of subcontractors and suppliers and shall be on an acceptable form that includes, as a minimum, the following information:

a. Contractor/subcontractor and their area of responsibility.

b. Work performed each day, giving location, description, and by whom. When Network Analysis (NAS) is used, identify each phase of work performed each day by NAS activity number.

c. Test and/or control activities performed with results and

references to specifications/drawings requirements. The control phase shall be identified (Initial, Follow-up). List of deficiencies noted, along with corrective action.

d. Quantity of materials received at the site with statement as to acceptability, storage, and reference to specification and drawing requirements.

e. Submittals and deliverables reviewed with contract reference, person reviewing submittal/deliverable, and action taken.

f. Job safety evaluations stating what was checked, results, and instructions or corrective actions.

g. Instructions given/received and conflicts in plans and/or specifications.

h. Contractor's verification statement.

These records shall indicate a description of trades working on the project; the number of personnel working; weather conditions encountered; and any delays encountered. These records shall cover both conforming and deficient features and shall include a statement that equipment and materials incorporated in the work and workmanship comply with the contract. The original and one copy of these records in report form shall be furnished to the Government daily, except that reports need not be submitted for days on which no work is performed. As a minimum, one report shall be prepared and submitted for every 7 days of no work and on the last day of a no work period. All calendar days shall be accounted for throughout the life of the contract. The first report following a day of no work shall be for that day only. Reports shall be signed and dated by the CQC System Manager. The report from the CQC System Manager shall include copies of test reports and copies of reports prepared by all subordinate quality control personnel.

3.9 SAMPLE FORMS

Sample forms are enclosed at the end of this specification section.

3.10 NOTIFICATION OF NONCOMPLIANCE

The Contracting Officer will notify the Contractor of any detected noncompliance with the foregoing requirements. The Contractor shall take immediate corrective action after receipt of such notice. Notice delivered to the Contractor at the work site shall be deemed sufficient notification. If the Contractor fails or refuses to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to such stop orders shall be made the subject of claim for extension of time or for excess costs or damages by the Contractor.

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SECTION 02111

EXCAVATION AND HANDLING OF CONTAMINATED MATERIAL

PART 1 GENERAL

1.1 MEASUREMENT AND PAYMENT

Not Used

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with specification section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Topographic Survey; G-ED

See requirements in paragraph 1.4, TOPOGRAPHIC SURVEY.

SD-06 Test Reports

Excavation and Handling Plan; G-ED

Plan describing equipment proposed for use in tilling sludge in the north and south lagoons. The plan shall also describe compaction equipment proposed for compacting the south lagoon subgrade and north lagoon sludge placed in the south lagoon.

Confirmation Sampling and Analysis; G-ED

Test results of confirmation testing.

1.3 TOPOGRAPHIC SURVEY

A topographic survey shall be performed immediately prior to and after excavation of contaminated material in order to document as-built conditions. The Contractor shall provide cross-sections on 100 foot intervals and at obvious break points in the excavated area. Ground elevations shall be determined to the nearest 0.1 foot using conventional ground surveying techniques or RTK GPS. Locations of confirmation samples shall also be surveyed and documented on the final as-built drawings.

1.4 DESCRIPTION OF WORK

The work shall consist of excavating approximately 70,000 cubic yards of sludge from the north lagoon and placing this material in the south lagoon. Depending on the moisture content and apparent shear strength of north lagoon sludge, the Contractor may be required to till and dry north lagoon

sludge prior to placement in the south lagoon. The decision to till and dry north lagoon sludge shall be made by the Contracting Oficer. The Contracting Officer shall be notified immediately if sludge or any contaminated material is discovered that has not been previously identified or if other discrepancies between the data provided and actual field conditions are discovered.

1.5 CHEMICAL TESTING

Required sampling and chemical analysis shall be conducted in accordance with specification section 01450, CHEMICAL DATA QUALITY CONTROL.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.1 EXISTING STRUCTURES AND UTILITIES

No excavation shall be performed until site utilities have been field located by the Base Civil Engineering Office at Cannon AFB. The Base Civil Engineering Office at Cannon AFB shall obtain all utility clearances and digging permits prior to construction. The Contractor shall be responsible for reviewing all utility clearances and digging permits prior to construction to ensure they are accurate and complete. The Contractor shall take all necessary precautions to ensure no damage occurs to existing structures and utilities. Monitoring Wells F, G, and H and their associated purge tanks shall be protected from damage during construction according to requirements in specification section 02220 DEMOLITION.

Damage to existing structures or utilities resulting from the Contractor's operations shall be repaired at no additional cost to the Government. Utilities encountered that were not previously shown or otherwise located shall not be disturbed without prior approval from the Contracting Officer.

3.2 SUBGRADE PREPARATION

Prior to receiving sludge from the north lagoon, sludge in the south lagoon shall be loosened to a depth of 24 inches and allowed to dry for a minimum period of 48 hours during dry weather conditions as approved by the Contracting Officer. Sludge shall be loosened using a tiller or other equipment approved by the Contracting Officer prior to use. After the upper 24 inches of sludge has been loosened and dried in the south lagoon, the subgrade shall be compacted by a minimum of 3 passes using a footed roller with a minimum weight of 40,000 pounds. Additional passes shall be made until the subgrade is firm, exhibiting not more than 1 inch of deflection during a pass of the footed roller. No density testing shall be performed.

3.3 CONTAMINATED MATERIAL REMOVAL

Sludge from the north lagoon shall be excavated and placed in the south lagoon after sludge in the south lagoon has been dried and compacted as described above. Sludge in the north lagoon shall be excavated 12 inches below the bottom of sludge based on visual examination. Sludge from the north lagoon shall be allowed to dry for a minimum period of 48 hours during dry weather conditions as approved by the Contracting Officer before

being removed and transported to the south lagoon. The drying process shall consist of using a tiller or other equipment approved by the Contracting Officer prior to use. The equipment shall loosen the upper 12 inches of sludge in a given area. A 12 inch lift of the tilled area shall then be allowed to dry for a minimum of 48 hours prior to removal and placement in the south lagoon. The maximum total depth of sludge to be removed from the north lagoon is approximately 24 inches. Reference *Final Corrective Measures Study Report for SWMU101-Sewage Lagoons*, October 2000, for depth and volume of sludge in lagoons.

3.4 CONFIRMATION SAMPLING AND ANALYSIS

After all sludge and underlying subgrade material has been removed according to paragraph 3.3, confirmation samples of the subgrade shall be obtained and tested to determine the need for additional excavation. Confirmation samples shall be collected and analyzed for contaminants according to requirements in specification section 01450, CHEMICAL DATA QUALITY CONTROL.

Confirmation samples shall be collected at a frequency of one per 40,000 square feet from the bottom and side slopes of the excavated area in the north lagoon. The Contracting Officer may request sampling on a more frequent basis depending on the visual appearance of the excavated subgrade. Sample locations shall be determined by the Contracting Officer. Based on test results, the Contractor shall determine additional excavation needed to remove material that is contaminated above action levels stated in specification section 01450 CHEMICAL DATA QUALITY CONTROL. Additional excavation, if required, shall be approved in advance by the Contracting Officer.

3.5 PLACEMENT

3.5.1 Confirmation Test Results

After all sludge material has been removed from the north lagoon and confirmation test results have been approved by the Contracting Officer, the Contractor shall shape the north lagoon subgrade to minimize ponding of water. All grading shall be approved by the Contracting Officer. No backfill material shall be placed in the north lagoon.

3.5.2 Placement and Compaction of Sludge in the South Lagoon

Sludge from the north lagoon shall be placed in the south lagoon in 12 inch lifts. Sludge shall be compacted by 3 passes of a footed roller with a minimum weight of 40,000 lbs. No density testing shall be performed.

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BIOTA BARRIER LAYER

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SECTION 02115

BIOTA BARRIER LAYER

PART 1 GENERAL

1.1 MEASUREMENT AND PAYMENT

Not Used

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Topographic Survey; G-ED

See requirements in paragraph 1.4, TOPOGRAPHIC SURVEY.

SD-06 Test Reports

Excavation and Handling Plan; G-ED

Plan describing equipment and procedures proposed for use in placing the biota barrier layer.

1.3 TOPOGRAPHIC SURVEY

A topographic survey shall be performed immediately prior to and after placement of the biota barrier layer material in order to document as-built conditions. The Contractor shall provide cross-sections on 100 foot intervals and at obvious break points for all areas where the biota barrier layer is placed. Ground elevations shall be determined to the nearest 0.1 foot using conventional ground surveying techniques or RTK GPS.

1.4 DESCRIPTION OF WORK

This section describes the requirements for excavation of on-site recycled concrete and placement on the south lagoon for use as a biota barrier layer to discourage small, burrowing rodents from penetrating the soil barrier layer. The Contractor may also obtain rock or stones from off-site sources for use as biota barrier material. The Contracting Officer shall be notified immediately if the recycled concrete appears to be out of compliance with any requirements listed in this specification.

PART 2 BIOTA BARRIER MATERIAL

Biota barrier layer material shall consist of crushed (recycled) concrete obtained from onsite sources, or may consist of rock or stones obtained from off-site sources with a minimum dimension of 3 inches and a maximum

dimension of 6 inches. Crushed concrete shall be obtained from the stockpile located east of the lagoons, consisting of crushed concrete from the former Landfill 25. Recycled concrete used for the biota barrier shall consist of reasonably clean; durable; angular particles that are reasonably free of organic matter; soft particles; friable particles; and other objectionable materials as determined by the Contracting Officer. The maximum particle size of the biota barrier layer material shall be 6 inches. Determination of maximum particle size of the recycled concrete shall be based on visual observation only.

PART 3 EXECUTION

3.1 EXISTING STRUCTURES AND UTILITIES

No excavation shall be performed until site utilities have been field located. The Contractor shall take the necessary precautions to ensure no damage occurs to existing structures and utilities. Damage to existing structures and utilities resulting from the Contractor's operations shall be repaired at no additional cost to the Government. Utilities encountered that were not previously shown or otherwise located shall not be disturbed without approval from the Contracting Officer.

3.2 PLACEMENT

Biota barrier layer material shall be placed in a single lift above the soil barrier layer. The completed biota barrier layer shall be a minimum of 15 inches and a maximum of 18 inches in thickness.

3.3 COMPACTION

Biota barrier material shall be compacted using a 10 ton smooth drum roller approved by the Contracting Officer prior to use. Compaction shall consist of 2 passes over all areas with the approved roller. The roller shall be operated at a speed that prevents displacement of biota barrier material.

-- End of Section --

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SECTION 02140

EROSION/VEGETATION LAYER

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 422	(1963; R 1998) Particle-Size Analysis of Soils
ASTM D 2216	(1998) Laboratory Determination of Water (Moisture) Content of Soil and Rock
ASTM D 2487	(1998) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2974	(1987) Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Materials
ASTM D 3017	(1988; R 1996e1) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
ASTM D 4318	(1998) Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D 4972	(1995a) Test Method for pH of Soils

1.2 MEASUREMENT AND PAYMENT

Not Used

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with specification section 01330, SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Topographic Survey; G-ED

See requirements in paragraph 1.4, TOPOGRAPHIC SURVEY.

SD-05 Design Data

Moisture Content of In-Place Erosion/Vegetation Layer Fill; G-ED

SD-06 Test Reports

Materials Handling Plan; G-ED

The Materials Handling Plan describing placement and compaction procedures. At a minimum, the plan shall include documentation of equipment to be used (including ground pressures), traffic patterns, and sequence of operations.

Borrow Source Assessment Report; G-ED

Borrow Source Assessment Report at least 15 days prior to material placement. No material shall be placed until the Borrow Source Assessment Report is approved. The report shall include the following:

1) Location of each borrow source
2) Estimated available quantity of borrow
3) Logs of subsurface explorations
4) Laboratory test results.

1.3.1 TOPOGRAPHIC SURVEY

A topographic survey shall be performed immediately prior to and after placement and compaction of the erosion/vegetation layer in order to determine as-built conditions. The Contractor shall provide cross-sections on 100 foot intervals and at obvious break points within the work area. Ground elevations shall be determined to the nearest 0.1 foot using conventional ground surveying techniques or RTK GPS.

1.4 EQUIPMENT

Equipment used to place the erosion/vegetation layer shall be as described in the approved Materials Handling Plan.

PART 2 PRODUCTS

2.1 Erosion/Vegetation Layer Soil

Erosion/vegetation layer soil shall consist of natural, friable soil that is representative of soils in the vicinity that produce heavy growths of crops, grass, or other vegetation. In addition, erosion/vegetation layer soil shall be reasonably free from underlying subsoil; clay lumps; weeds; brush; litter; matted roots; toxic substances; or any material that might be harmful to plant growth or be a hindrance to grading, planting, or maintenance operations. Soil from ditch bottoms, drained ponds, or eroded areas shall be dried to an acceptable moisture content prior to use as determined by the Contracting Officer. Erosion/vegetation layer soil shall comply with criteria listed in Table 1.

TABLE 1
REQUIRED PHYSICAL PROPERTIES OF EROSION/VEGETATION LAYER MATERIAL

Property	Test Value	Test Method
Soil classification	Lean clay (CL) Clayey sand (SC) Silty clay (CL-ML)	ASTM D 2487
Max. particle size (inches)	1	ASTM D 422
pH	5-7	ASTM D 4972
Organic content (%)	5-20	ASTM D 2974

PART 3 EXECUTION

3.1 BORROW SOURCE ASSESSMENT

3.1.1 Erosion/Vegetation Layer Material

3.1.1.1 Classification Testing

Borrow source assessment tests shall be performed on each principal type or combination of materials proposed for use to ensure compliance with specified requirements. At least one set of borrow assessment tests shall be performed on each borrow source proposed for use. A set of borrow source assessment tests shall consist of Atterberg limits (ASTM D 4318), particle size analysis excluding hydrometer (ASTM D 422), and moisture content (ASTM D 2216). Based on borrow source assessment testing, soils shall be classified in accordance with ASTM D 2487.

3.1.1.2 Erosion/Vegetation Layer Material

Testing shall be performed on representative samples of each principal type or combination of materials. At least one set of tests shall be performed on each borrow source proposed. Testing shall consist of grain-size analysis in accordance with ASTM D 422 (excluding hydrometer), pH in accordance with ASTM D 4972, and organic content in accordance with ASTM D 2974.

3.1.2 Chemical Contamination Testing

Borrow used for the erosion/vegetation layer shall be free of contamination. Each proposed borrow source shall be sampled and analyzed for chemical contamination in accordance with specification section 01450, CHEMICAL DATA QUALITY CONTROL.

3.2 INSTALLATION

3.2.1 Erosion/Vegetation Layer Material Placement

Erosion/vegetation layer material shall be uniformly placed in a single lift and traffic compacted by 1 pass of compaction equipment in all areas. The completed thickness shall be 6 inches. Soil shall not be placed when

the subgrade is frozen, excessively wet, extremely dry, or in a condition otherwise detrimental to proper grading as determined by the Contracting Officer. Soil shall be placed within a range of 2 percent dry to 3 percent wet of optimum moisture content based on ASTM D 698. Soil shall be maintained within the above allowable moisture content range until seed has been placed and requirements in specification section 02921, SEEDING, become applicable.

3.3 CONSTRUCTION TOLERANCES

Finished surfaces shall be uniformly graded and shall be free from depressions, mounds, or windrows. The top surface of the erosion/vegetation layer shall be no greater than 0.15 feet above the grades shown on the drawings. No minus tolerance will be permitted.

3.4 CONSTRUCTION TESTS

3.4.1 Erosion/Vegetation Layer Material

During construction of the erosion/vegetation layer, representative samples shall be taken for testing at the frequencies listed in Table 2 from the borrow source. Test results shall comply with requirements listed in Part 2, PRODUCTS, or the material will be rejected for use.

TABLE 2

E

ROSION/VEGETATION LAYER MATERIAL TESTING FREQUENCIES

Property	Frequency	Test Method
Grain size analysis (excluding hyrometer)	2,000 cubic yards	ASTM D 422
pH	2,000 cubic yards	ASTM D 4972
Organic content	2,000 cubic yards	ASTM D 2974

3.4.2 Moisture Content of In-Place Erosion/Vegetation Layer Material

Moisture content tests shall be performed in accordance with Table 3.

TABLE 3
MOISTURE CONTENT TESTS OF IN-PLACE EROSION/VEGETATION LAYER MATERIAL

Property	Frequency per Lift	Test Method
Nuclear moisture content	10,000 square feet	ASTM D 3017
Standard moisture content	1 for every 20 rapid tests	ASTM D 2216

3.4.2.1 Test Frequencies and Locations

Each day that material is placed, a minimum of 3 standard moisture content

tests shall be performed for correlation with nuclear moisture test data. Nuclear moisture content tests shall be checked at the frequencies shown in Table 3. Standard tests shall be performed at locations that are as close as possible to nuclear density test locations.

3.4.2.2 Nuclear Moisture Content Tests

Nuclear moisture calibration curves shall be checked and adjusted in accordance with procedures described in ASTM D 3017. The nuclear gauge calibration checks shall be made at the beginning of a job, on each different type of material to be placed, and at intervals as directed. Nuclear moisture content gauges shall be standardized daily in accordance with ASTM D 3017.

3.4.2.3 Test Results

Field moisture content test results shall be compared to the compaction curve for the appropriate material type being tested. If test results are not within the acceptable range for moisture content, as described in paragraph 3.2.1, Erosion/Vegetation Layer Material Placement, 3 additional tests shall be performed near the location of the failed parameter. If all retests pass, no additional action shall be taken. If any of the retests fail, the lift of soil shall be repaired out to the limits defined by passing tests for that parameter. The area shall then be retested as directed.

3.5 PROTECTION

3.5.1 Damage

Erosion rills that exceed 1 inch in depth or other damage resulting in depressions that exceed 1 inch in depth shall be repaired and grades re-established by the Contractor until the time of seed placement. Repairs to the erosion/vegetation layer shall be documented including location and volume of soil affected, corrective action taken, and results of retests.

3.5.2 Stockpiles

Storage or stockpiling of any material on the completed surface of the erosion/vegetation layer shall not be permitted.

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SECTION 02210

EARTHWORK/GRADING

PART 1 GENERAL

Requirements in this specification section pertain to general earthwork and grading to include removal of the existing soil berm surrounding the south lagoon and placement of random fill within the south lagoon. Reference specification section 02111 for excavation and handling requirements pertaining to sludge (contaminated) material.

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 422	(1963; R 1990) Particle-Size Analysis of Soils
ASTM D 1556	(1990; R 1996) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 698	(1991) Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/cu. ft. (600 kN-m/cu.m.))
ASTM D 2216	(1992) Laboratory Determination of Water (Moisture) Content of Soil, and Rock
ASTM D 2487	(1993) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2488	(1993) Description and Identification of Soils (Visual-Manual Procedure)
ASTM D 2922	(1996) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	(1996) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
ASTM D 4318	(1996) Liquid Limit, Plastic Limit, and Plasticity Index of Soils

1.2 MEASUREMENT AND PAYMENT

Not Used

1.3 DEFINITIONS

1.3.1 Suitable Materials

Suitable materials are materials that classify according to ASTM D 2487 as GW, GP, GC, GM, SW, SP, SC, SM, CL, CH, and ML. Lime and flyash shall also be considered as suitable materials when used as stabilizing agents.

1.3.2 Unsuitable Materials

Unsuitable materials include all materials that are not defined above as suitable materials. In addition, unsuitable materials are materials that classify according to ASTM D 2487 as MH, OH, Pt, and OL. Unsuitable materials also include all material that contains debris; refuse; roots; organic matter; frozen material; fine grained sedimentary rocks (i.e., shale, claystone, siltstone, mudstone, and marl) even though they may be intensely weathered. In addition, material that contains contamination from hazardous, toxic, biological or radiological substances; stone having a maximum dimension larger than 3 inches in any dimension; or other materials that are determined by the Contracting Officer as unsuitable for providing a stable subgrade or stable foundation for the lagoon cover system shall be considered unsuitable. Otherwise suitable material which has excess moisture content shall not be classified as unsuitable material unless it cannot be dried by manipulation, aeration, or blending with other materials as determined by the Contracting Officer.

1.3.2 Cohesionless and Cohesive Materials

Cohesionless materials include materials classified in ASTM D 2487 as GW, GP, SW, and SP. Cohesive materials include materials classified as GC, SC, ML, CL, MH, and CH. Materials classified as GM and SM will be identified as cohesionless only when the fines are nonplastic.

1.3.3 Random Fill

Random fill shall consist of soil that classifies as suitable material according to paragraph 1.3.1. Soil excavated beneath sludge in the north lagoon for placement in the south lagoon shall be considered random fill (reference Cover Sections, drawing C-8).

1.3.5 Topsoil

For purposes of this contract, topsoil shall also be referred to as erosion/vegetation layer material. Reference specification section 02140, EROSION/VEGETATION LAYER.

1.3.6 Spot Subgrade Reinforcement Material

Spot subgrade reinforcement material includes sound, tough, durable crushed stone, slag or gravel, consisting of pieces varying from 1 inch to 3-1/2 inches in diameter, or other approved material, with necessary filler. When a finer material is necessary for filler, broken stone chips, screened gravel, or sand may be used to completely fill all voids.

1.3.7 Degree of Compaction

Degree of compaction shall be expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 698.

1.3.4 TOPOGRAPHIC SURVEY

A topographic survey shall be performed after completion of grading work described in this specification in order to document as-built conditions. The Contractor shall provide cross-sections on 100 foot intervals and at obvious break points. Ground elevations shall be determined to the nearest 0.1 foot using conventional ground surveying techniques or RTK GPS for determination of earthwork quantities.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with specification section 01330, SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Topographic Survey; G-ED

See requirements in paragraph 1.4, TOPOGRAPHIC SURVEY.

SD-06 Test Reports

Disposal Facility; G-ED.

Location of disposal facility and appropriate documentation.

Suitable Materials G-ED

Certified test reports and analysis certifying suitable materials proposed for use at the project site conform to specified requirements, and for all tests conducted in accordance with paragraph 3.10, FIELD TESTING CONTROL.

Borrow material; G-ED.

The following tests shall be performed for each type of borrow material:

Compaction curve, ASTM D 698

Liquid limit, ASTM D 4318

Plastic limit, ASTM D 4318

Insitu moisture content, ASTM D 2216

Visual description of material, ASTM D 2488

Particle-size analysis, ASTM D 422

Soil classification, ASTM D 2487

SD-07 Certificates

Field Testing Control; G-ED

Qualifications of the commercial testing laboratory who will be performing all testing in accordance with paragraph 3.10, FIELD TESTING CONTROL.

Submit CORP Engineer Research & Development Center - Material Testing Center accreditation

PART 2 PRODUCTS

2.1 BORROW MATERIAL

Borrow material shall be selected to meet requirements and conditions of the particular fill for which it is to be used. Necessary clearing, grubbing, disposal of debris, and satisfactory drainage of borrow pits shall be performed by the Contractor as incidental operations to the borrow excavation.

2.1.1 Selection

Borrow materials shall be obtained from sources outside the limits of Government-owned land. Borrow materials shall be subject to approval by the Contracting Officer. The source of borrow material shall be the Contractor's responsibility. The Contractor shall obtain from the owners the right to procure material, shall pay all royalties and other charges involved, and shall bear all the expense of developing the sources, including rights-of-way for hauling. If required, spot subgrade reinforcement material shall be obtained from approved sources outside the limits of Government-owned land.

2.1.2 Borrow Pits

Except as otherwise permitted, borrow pits shall be excavated to provide satisfactory drainage, as determined by the Contracting Officer. Overburden and other spoil material shall be disposed of or may be used at the discretion of the Contracting Officer.

PART 3 EXECUTION

3.1 EXCAVATION

Excavation of every description, regardless of material encountered, within the grading limits of the project shall be performed to the lines and grades shown on construction drawings. Suitable excavated material shall be transported to and placed in fill areas within the limits of the work. Unsuitable material encountered within the limits of the work shall be excavated and replaced with suitable material as directed by the Contracting Officer. Unsuitable material shall be disposed of by the Contractor outside the limits of Government-owned land. The location of any disposal facility located outside of the limit of Government-owned land shall be submitted to the Contracting Officer prior to removal from the project site. The Contractor shall submit documentation from the disposal facility to verify that it is licensed to accept the material. No material shall be removed from the project site without prior approval from the Contracting Officer. The Contractor shall notify the Contracting Officer if any material to be disposed of is found to contain hazardous, toxic, biological or radiological substances. During construction, excavation and

filling shall be performed in a manner and sequence that will utilize all suitable material from required excavation prior to obtaining material from borrow areas. Excavation shall be done in a manner to provide satisfactory drainage at all times.

Following excavation and removal of north lagoon sludge, the subgrade in the north lagoon shall be graded to minimize ponding of water. All grading shall be approved by the Contracting Officer.

3.2 EXCAVATION OF DITCHES

Not applicable.

3.3 UTILIZATION OF EXCAVATED MATERIALS

Suitable material removed from required excavation under this section shall be utilized in the formation of the cover system provided the material complies with all specification requirements. No excavated material shall be wasted without authorization of the Contracting Officer. Material authorized to be wasted shall be disposed of as directed and in such manner as not to obstruct the flow characteristics of any existing ditch or channel, or impair the efficiency or appearance of any structure.

3.4 BACKFILL ADJACENT TO STRUCTURES

Not applicable.

3.5 PREPARATION OF GROUND SURFACE FOR RANDOM FILL

All vegetation, such as roots, brush, heavy sods, heavy growth of grass, and all decayed vegetable matter, rubbish, and other unsuitable material within the area upon which fill is to be placed, shall be stripped or otherwise removed before the fill is started. In no case will unsuitable material remain in or under the fill area. Stumps, logs and roots more than 1-1/2 inch in diameter shall be excavated and removed to a depth not less than 18 inches below the original ground surface. Sloped ground surfaces steeper than one vertical to four horizontal on which fill is to be placed shall be uniformly scarified to a depth of 1-2 inches to promote bonding of fill material with the existing subgrade. The subgrade shall be wetted or dried as required to obtain the specified moisture content and density prior to placement of fill.

3.6 RANDOM FILL

Random fill shall be placed within the south lagoon as shown on construction drawings. The completed fill shall correspond to the shape of the typical sections shown on the drawings. Suitable material removed from excavation areas may be used as random fill. Where otherwise suitable material is too wet, it shall be aerated or dried to provide the moisture content specified for compaction. Material shall be placed in loose lifts not to exceed 8 inches in thickness for the full width of the cross section. Each layer shall be compacted before placing the next (overlying) lift. Compaction shall be as specified in paragraph 3.8, COMPACTION.

3.7 COMPACTION

Each layer of fills constructed shall be compacted to at least 90 percent of maximum density as determined in paragraph 1.3.7, Degree of Compaction. Cohesive soils shall be at a moisture content between 1 percent below and 4

percent above optimum moisture when compacted. Cohesionless soils shall be compacted at a moisture content as required to facilitate compaction without bulking.

3.8 PLACING TOPSOIL

Reference specification section 02140, EROSION/VEGETATION LAYER.

3.9 FIELD TESTING CONTROL

3.9.1 Sampling and Testing

All quality control sampling and testing shall be performed by the Contractor in accordance with specification section 01451, CONTRACTOR QUALITY CONTROL, and as specified herein.

3.9.2 Moisture-Density Determinations

Tests for determination of maximum density and optimum moisture shall be performed by the Contractor in accordance with ASTM D 698, a mechanical tamper may be used provided the results are correlated with those obtained with the referenced hand tamper. Samples shall be representative of the materials to be placed. An optimum moisture-density curve shall be obtained for each principal type of material or combination of materials encountered or utilized. Results of these tests shall be the basis of control for compaction. The above testing shall include Atterberg limits, grain size determinations and specific gravity. A copy of these tests shall be furnished to the Contracting Officer with the construction quality control daily report.

3.9.3 Density Control

The Contractor shall adequately control his compaction operations by tests made in accordance with any of the following methods: ASTM D 1556 or ASTM D 2922 and ASTM D 3017, to insure placement of materials within the limits of densities specified. When ASTM D 2922 is used, the calibration curves shall be checked, and adjusted if necessary, using the sand cone method as described in paragraph "Calibration" of ASTM D 2922. ASTM D 2922 results in a wet unit weight of soil and when using this method, ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall be checked along with the density calibration checks as described in ASTM D 3017. The calibration checks of both the density and moisture gauges shall be made at the beginning of a job, on each different type of material encountered, at intervals as directed by the Contracting Officer. If ASTM D 2922 is used for field density control, there should be at least one test performed according to ASTM D 1556 per every 10 tests performed according to ASTM D 2922-\ for correlation of test results.

One test shall be made for each 1,500 square yards or less for each layer of specified depth. Additional tests shall be made as necessary at the direction of the Contracting Officer. All test results shall be made available to the Contracting Officer not more than 24 hours after test completion. Acceptance tests may be made by the Government for verification of compliance; however, the Contractor shall not depend on such tests for his control of operations. Deficiencies in construction shall be corrected by the Contractor at no additional cost to the Government.

3.10 FINISHED EXCAVATION AND FILL AREAS

All areas covered by the project, including excavated and filled sections and adjacent transition areas, shall be uniformly smooth graded. The finished surface shall be reasonably smooth, compacted, and free from irregular surface changes. The degree of finish shall be that ordinarily obtainable from either blade-grader or scraper operations. The finished surface shall be not more than 0.15 foot above or below the established grade or approved cross section and shall be free of depressed areas where water would pond. All ditches shall be finished to drain readily.

3.11 PROTECTION

During construction, embankments and excavations shall be kept shaped and drained. Existing ditches and channels shall be maintained in a condition to drain effectively at all times. Where ruts that exceed 1 inch in depth occur in the subgrade, the subgrade shall be brought to grade, reshaped if required, and recompacted prior to placement of overlying materials. Storage or stockpiling materials on the completed subgrade will not be permitted. Fill material shall not be placed on a muddy subgrade or on one containing frost. Newly graded areas shall be protected from traffic and from erosion, and any settlement or erosion that occurs from any cause prior to acceptance shall be repaired and grades reestablished to the required elevations and slopes.

3.11.1 Protection of Existing Service Lines and Utilities Structures

Existing utility lines that are shown on the drawings or the locations of which are made known to the Contractor prior to excavation that are to be retained as well as utility lines constructed during excavation operations, shall be protected from damage during excavation and backfilling. If such utilities are damaged, they shall be repaired or replaced by the Contractor and at the expense of the Contractor, as directed by the Contracting Officer. When utility lines that are to be removed or relocated are encountered within the area of operations, the Contractor shall notify the Contracting Officer in ample time for the necessary measures to be taken to prevent interruption of service.

3.12 ADJUSTMENT OF EXISTING STRUCTURES

All manholes, valve boxes, or inlets of any nature within the project that do not conform to the new finish grade in either surfaced or unsurfaced areas shall be adjusted to the new finish grade.

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PART 3 EXECUTION

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-- End of Section Table of Contents --

SECTION 02220

DEMOLITION

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ENGINEERING MANUALS (EM)

EM 385-1-1	(1996) U.S. Army Corps of Engineers Safety and Health Requirements Manual

1.2 GENERAL REQUIREMENTS

The work includes demolition of the following items located in the south lagoon:

1) Concrete dike surrounding the lagoon on all 4 sides (4-inch unreinforced PCC based on as-built drawings dated September 1967, provided by Cannon AFB, see Photo 1, Sheet C-9)

2) Concrete gate structure, associated piping, water valves and meters -southeast corner of lagoon (see Photo 4, Sheet C-9)

3) 15-inch diameter steel discharge pipe-northwest corner of lagoon (see Photo 1 and 2, Sheet C-9)

4) 15-inch diameter steel overflow pipe-northwest corner of lagoon (see Photo 1, Sheet C-9)

5) 15-inch diameter steel overflow pipe-northeast corner of lagoon (see Photo 1, Sheet C-9)

6) 6-inch diameter PVC diffuser pipe located adjacent to concrete gate structure, southeast corner of lagoon

7) Concrete slab approximately 12 feet by 10 feet, 6-inches thick, with No. 8 reinforcing steel 12" on center each face-northwest corner of lagoon

8) Five soil access roads shall be pushed into the south lagoon and used as random fill beneath the cover system (see Photo 3, Sheet C-9)

The work includes demolition of the following items located in the north lagoon:

1) 15-inch diameter steel discharge pipe located at the north end of the lagoon shall be removed as described in Note 5, Sheet C-5

(see Photo 1, Sheet C-9).

Overflow pipes identified above shall be cut off flush with the existing ground surface. The remaining section of pipe shall be completely filled with grout having a minimum 28-day compressive strength of 250 psi. All demolition work shall be performed in accordance with EM 385-1-1, Section 23, Demolition, and other applicable Sections.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with specification section 01330, SUBMITTAL PROCEDURES:

SD-06 Test Reports

Work Plan; G-ED

Procedures and methods for accomplishing all demolition work in a safe manner. Procedures shall include protection of property that is to remain undisturbed; coordination with other work in progress; and timely disconnection of utility services, as applicable. The procedures shall include a detailed description of the methods and equipment to be used for each operation and the sequence of operations in accordance with EM 385-1-1.

1.4 DUST CONTROL

The amount of dust resulting from demolition shall be controlled to prevent the spread of dust to occupied portions of the construction site and to avoid creation of a nuisance in the surrounding area. Use of water will not be permitted when it will result in or create objectionable conditions such as flooding or pollution.

1.5 PROTECTION

1.5.1 Protection of Personnel

The Contractor shall evaluate site conditions prior to and during demolition work and take necessary precautions to protect personnel working in and around the demolition area at all times.

1.5.2 Protection of Existing Structures

Before beginning any demolition work, the Contractor shall survey the site and examine the drawings and specifications to determine the extent of the work. The Contractor shall take all necessary precautions to avoid damage to Monitoring Wells F, G, and H during construction. Purge tanks located adjacent to Monitoring Wells F, G, and H shall be removed by the Contractor prior to construction. These tanks shall be stored in a safe, secure area until construction is complete at which time the Contractor shall relocate the tanks in their original location.

Any features damaged due to neglect or carelessness of the Contractor shall be repaired or replaced at the expense of the Contractor, as directed by the Contracting Officer. The Contractor shall coordinate work described in

this specification section with all other required work.

1.5.3 Protection of Existing Trees

One Elm tree is located along the west side of the south lagoon, along the fence separating the lagoons from the abandoned runway. The Contractor shall coordinate with the Cannon AFB Base Civil Engineering Office prior to beginning construction to determine whether this tree is to be removed as part of this project or protected. If the Base Civil Engineering Office indicates this tree is to be protected, the Contractor shall be responsible for implementing all necessary measures to protect the tree during construction. If the tree is damaged by activities of the Contractor, the tree shall be replaced with the same type of tree at the expense of the Contractor, as approved by the Contracting Officer.

1.6 EXISTING FENCE

Sections of the existing fence along the south and west sides of the lagoons may be removed to provide Contractor access to the site. The Contractor shall obtain the approval of the Base Civil Engineering Office prior to removing any sections of fence. Sections of fence removed shall be stored in a secure area and shall be protected from damage by the Contractor. The Contractor shall reinstall sections of fence in their original locations to the satisfaction of the Contracting Officer at completion of the project.

1.7 BURNING

Burning to dispose of refuse and debris will not be permitted at any time.

1.8 USE OF EXPLOSIVES

Use of explosives will not be permitted at any time.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 UTILITIES

When utility lines are encountered that are not indicated on the drawings, the Contracting Officer shall be notified prior to further work in that area.

3.2 DISPOSITION OF MATERIAL

All removal items listed in paragraph 1.2, GENERAL REQUIREMENTS, shall be placed in random fill areas of the south lagoon. Concrete dikes shall be broken into pieces not to exceed 36 inches in any dimension. All removal items listed in paragraph 1.2 shall be covered with at least 24 inches of random fill prior to placement of the soil barrier layer.

-- End of Section --

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SECTION 02377

SOIL BARRIER LAYER

PART 1 GENERAL

Requirements in this specification section pertain to the soil barrier layer of the lagoon cover system shown on construction drawings. The minimum compacted thickness of the soil barrier layer shall be 18 inches. Approximately 36,300 cubic yards of soil barrier layer material is required.

The Contractor shall obtain soil barrier layer material from an offsite source. For purposes of this specification, offsite shall mean outside the property boundary of Cannon AFB. Alternatively, the Contractor may use native soil excavated beneath the keel section for the runway improvement project at Cannon AFB currently under construction. Approximately 22,000 cubic yards of keel subgrade material has been stockpiled northwest of the lagoons. Grain-size information obtained on samples of keel subgrade material indicates the approximate range of material passing the No. 200 sieve is between 5 and 15 percent.

The soil barrier layer shall provide an in-place hydraulic conductivity of 1.5 x 10-4 cm/sec or less. If the Contractor elects to use keel subgrade material, the Contractor shall be responsible for blending flyash, portland cement, bentonite, or other suitable materials in order to obtain the required in-place hydraulic conductivity (see requirements for the Borrow Source Assessment Report, paragraph 1.4, SUBMITTALS).

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 422	(1963; R 1990) Particle-Size Analysis of Soils
ASTM D 698	(1991) Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/cu. ft. (600 kN-m/cu. m.))
ASTM D 1587	(2000) Standard Practice for Thin-Walled Tube Sampling of Soils for Geotechnical Purposes
ASTM D 1556	(1990; R 1996) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(1991) Laboratory Compaction Characteristics of Soil Using Modified

	Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu. m.))
ASTM D 2216	(1992) Laboratory Determination of Water (Moisture) Content of Soil and Rock
ASTM D 2488	(1993) Description and Identification of Soils (Visual-Manual Procedure)
ASTM D 2922	(1996) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	(1996) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
ASTM D 3740	(2001) Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
ASTM D 4220	(1995) Preserving and Transporting Soil Samples
ASTM D 4318	(1995a) Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D 5084	(1990; 1997) Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

1.2 MEASUREMENT AND PAYMENT

Not Used

1.3 EQUIPMENT

1.3.1 Compaction Equipment

Compaction equipment shall consist of tamping foot rollers that have a minimum weight of 40,000 pounds. At least one tamping foot shall be provided for each 110 square inches of drum surface. The length of each tamping foot, from the outside surface of the drum, shall be equal to or greater than the loose lift thickness. During compaction operations, the spaces between the tamping feet shall be maintained clear of materials that may impair the effectiveness of tamping foot rollers. Compaction equipment shall be approved by the Contracting Officer prior to use.

1.3.2 Scarification Equipment

Disks, rotor tillers, or other approved means shall be provided to scarify the initial lift of soil barrier layer material prior to placing the overlyinig lift. Scarification equipment shall be capable of uniformly disturbing the upper 2 inches of the compacted surface to provide bonding between lifts. Scarification equipment shall be approved by the Contracting Officer prior to use.

1.3.3 Hand Operated Tampers

Hand operated tampers shall consist of rammers or other impact type equipment. Vibratory type equipment shall not be allowed.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with specification section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Topographic Survey; G-ED

See paragraph 1.5, TOPOGRAPHIC SURVEY.

SD-06 Test Reports

Borrow Source Assessment; G-ED

Assessment Tests; G-ED

Moisture Content and Density Tests of In-Place Soil Barrier Layer; G-ED

Hydraulic Conductivity Tests of In-Place Soil Barrier Layer; G-ED

Borrow Source Assessment Report for all offsite sources of proposed borrow at least 15 business days prior to placement of soil barrier layer material. No soil shall be placed until the Borrow Source Assessment Report is approved. The report shall include the following for offsite borrow sources:

1) Location of each borrow source
2) Plan view and estimated available quantity of soil
3) Locations and logs of subsurface explorations
4) Laboratory test results
5) Moisture-density curves showing the "Acceptable Zone" of moisture contents and densities that achieve the required hydraulic conductivity for each principal type of material or combination of materials. A zero air voids curve shall be included on each moisture-density curve.

The report shall include the following if the Contractor elects to use keel subgrade material:

1) Proposed mix design indicating type and quantity of all materials blended to achieve the required hydraulic conductivity
2) Method and description of soil blending procedure to include a list and description of all equipment used
3) Laboratory test results
4) Moisture-density curves showing the "Acceptable Zone" of moisture contents and densities that achieve the required hydraulic conductivity for each principal type of material or combination of materials. A zero air voids curve shall be included on each moisture-density curve.

SD-07 Certificates

Commercial Testing Laboratory; G-ED

Name and qualifications of the proposed commercial testing laboratory.

1.5 TOPOGRAPHIC SURVEY

A topographic survey shall be performed before and immediately after placement of the soil barrier layer in order to document as-built conditions. The Contractor shall provide cross-sections on 100 foot intervals and at obvious break points in the excavated area. Ground elevations shall be determined to the nearest 0.1 foot using conventional ground surveying techniques or RTK GPS.

PART 2 PRODUCTS

2.1 SOIL BARRIER LAYER

Soil shall be free of roots, debris, organic or frozen material, and shall have a maximum clod size of 2 inches at the time of compaction. Soil barrier layer material shall comply with criteria listed in Table 1.

TABLE 1
REQUIRED PHYSICAL PROPERTIES OF SOIL BARRIER LAYER MATERIAL

Property	Test Value	Test Method
Max. particle size (inches)	1	ASTM D 422
Min. percent passing No. 4 sieve	80	ASTM D 422
Min. percent passing No. 200 sieve	40	ASTM D 422

PART 3 EXECUTION

3.1 BORROW SOURCE ASSESSMENT

Borrow source assessment tests shall be performed on each principal type or combination of materials from all sources proposed for use in the soil barrier layer to assure compliance with specified requirements and to develop compaction requirements for placement. A minimum of one set of borrow assessment tests shall be performed for each borrow source proposed. A set of borrow source assessment tests shall consist of classification testing, moisture-density (compaction) testing, and hydraulic conductivity testing.

3.1.1 Classification Testing

Test pits or soil borings shall be used to characterize each proposed offsite borrow source. Test pits and borings shall be arranged in a grid pattern and shall extend uniformly over the entire areal limit of the proposed borrow source. Depth of test pits and borings shall extend to the full depth of the proposed borrow source. Visual classification as described in ASTM D 2488 shall be performed over the full depth of each test pit or boring by a qualified geologist or geotechnical engineer with at least 3 years experience in laboratory classification of soil. Soils shall be grouped into "principal types" based on visual classification.

Classification testing shall be performed on representative samples of each principal type or combination of materials. At a minimum, one set of classification tests shall be performed per 6,500 cubic yards of proposed borrow. Classification testing shall consist of liquid and plastic limits in accordance with ASTM D 4318 and particle size analysis in accordance with ASTM D 422. Moisture content testing of proposed borrow shall be performed at a frequency of once per 2,500 cubic yards in accordance with ASTM D 2216

3.1.2 Compaction Testing

A representative sample from each principal type or combination of borrow materials proposed from all sources shall be tested to establish compaction curves using ASTM D 698 and ASTM D 1557. A minimum of one set of compaction curves shall be developed per 6,500 cubic yards of each proposed borrow material. A minimum of 5 points shall be used to develop each compaction curve. The compaction curves for each principal type or combination of borrow materials shall be plotted on a single graph of dry density versus moisture content.

3.1.3 Hydraulic Conductivity Testing

A set of hydraulic conductivity tests shall be performed on representative samples of each principal type or combination of borrow materials from all sources. A minimum of one set of tests shall be performed per 6,500 cubic yards of proposed borrow material. A set of tests shall consist of one hydraulic conductivity test run on a representative sample corresponding to each point from each compaction curve at or above ASTM D 698 optimum moisture content. Hydraulic conductivity testing referenced in this section shall be conducted in accordance with ASTM D 5084. In addition, the following procedures shall be adhered to when performing the testing:

a. Saturation of test specimens shall be verified by determination of the B coefficient. The B coefficient must be at least 0.95. The B coefficient is defined as the change in pore water pressure divided by the change in confining pressure.

b. During consolidation of the test specimens, outflow volumes versus time shall be recorded on a semi-log graph to confirm primary consolidation has been completed prior to permeation of the specimens.

c. The permeant used for back pressure saturation and permeation shall be 0.005 N calcium sulfate as specified in ASTM D 5084.

d. The average effective confining pressure shall be 3 psi.

3.1.4 Acceptable Zone Development

An "Acceptable Zone" of moisture contents and densities shall be developed and displayed with the compaction curve graphs for each principal type of borrow material or combination of borrow materials. The "Acceptable Zone" shall consist of moisture-density values that meet the following requirements:

a. Maximum Allowable Hydraulic Conductivity = 1.5 x 10 to the -4 cm per second (0.00015 cm/sec).

b. The minimum allowable moisture content shall be no less than

optimum moisture content based on ASTM D 698.

c. The minimum allowable density shall be no less than 90 percent of maximum dry density based on ASTM D 698.

3.1.5 Chemical Contamination Testing

Borrow obtained from offsite sources shall be free of contamination. Each proposed offsite borrow source shall be sampled and analyzed for chemical contamination in accordance with specification section 01450, CHEMICAL DATA QUALITY CONTROL.

3.1.6 Commercial Testing Laboratory

Tests for the soil barrier layer shall be performed by an approved testing laboratory furnished by the Contractor. No testing will be permitted until the facilities have been inspected and approved. The inspection will be performed to determine if the laboratory has a quality system in place for personnel, equipment, reporting procedures, record keeping, and equipment calibration that ensures the laboratory is capable of accurately performing the specified testing. The quality system shall be in accordance with ASTM D 3740 or as approved by the Government Inspector. The first inspection will be at the Government's expense. Cost incurred for subsequent inspections required because of deficiencies found during the first inspection will be charged to the Contractor.

3.2 INSTALLATION

3.2.1 Soil Barrier Layer Placement

Soil shall be placed to the lines and grades shown on the drawings. Soil shall be placed in 2 equal loose lifts, resulting in a completed thickness of 18 inches after compaction. In areas where hand operated tampers must be used, the loose lift thickness shall not exceed 4 inches. If grade stakes are driven into the soil barrier layer to control lift thickness, they shall be numbered and accounted for at the end of each shift. When removing grade stakes, no broken portion of the grade stakes shall be left in the soil barrier layer. Holes left by grade stakes shall be backfilled and compacted.

3.2.2 Moisture Control

Soil shall be placed and compacted within the "Acceptable Zone" moisture content range in the approved Borrow Source Assessment Report. The moisture content shall be maintained uniform throughout each lift. Moisture added shall be thoroughly incorporated into the soil to ensure uniformity of moisture content prior to compaction.

3.2.3 Compaction

Soil shall be compacted to meet the density requirements in the approved Borrow Source Assessment Report and by at least 3 passes of the approved compaction equipment over all areas of each lift. For self-propelled compactors, one pass is defined as one pass of the entire vehicle. For towed rollers, one pass of the drum constitutes a pass. Hand operated tampers shall be used in areas where standard compaction equipment cannot be operated.

3.2.4 Scarification

Scarification shall be performed on all areas of the upper surface of the initial lift of soil barrier layer material prior to placement of the next lift. Scarification shall be accomplished with approved equipment. Contractor shall uniformly scarify to a depth of 2 inches. The final lift of soil barrier layer material shall not be scarified.

3.2.5 Repair of Voids

Voids created in the soil barrier layer during construction (including, but not limited to, penetrations for test samples, grade stakes, and other penetrations necessary for construction) shall be repaired by removing sand or other non-cohesive material, placing soil infiltration layer backfill in lifts no thicker than 3 inches and tamping each lift with a steel rod. Each lift shall be tamped a minimum of 25 times altering the location of the rod within the void for each blow. Other ruts and depressions in the surface of the lifts shall be scarified, filled, and then compacted to grade.

3.3 CONSTRUCTION TOLERANCES

The top surface of the soil barrier layer shall be no greater than 2 inches above the grades shown on the drawings. No minus tolerance will be permitted.

3.4 CONSTRUCTION TESTS

3.4.1 Soil Barrier Layer Material Tests

During construction of the soil barrier layer, representative samples shall be taken for testing at the frequencies listed in Table 2 from onsite stockpiles or after a loose lift of soil barrier layer material has been placed. Test results shall meet requirements listed in Table 1.

TABLE 2
SOIL BARRIER LAYER MATERIAL PROPERTIES

Property	Frequency	Test Method
Percent passing No. 4 sieve (Note 1)	1,500 cubic yards	ASTM D 422
Percent passing No. 200 sieve (Note 1)	1,500 cubic yards	ASTM D 422
Compaction	5,000 cubic yards	ASTM D 698

Note 1: At least one test shall be performed each day that soil is placed.

3.4.2 Moisture Content and Density Tests of In-Place Soil Barrier Layer

Moisture content and density testing shall be performed in a grid pattern. The grid pattern shall be staggered for successive lifts so that sampling points are not at the same location in each lift. Moisture content and density tests shall be performed in accordance with Table 3.

TABLE 3
MOISTURE CONTENT AND DENSITY TESTS OF IN-PLACE SOIL BARRIER LAYER MATERIAL

Property	Frequency Per Lift	Test Method
Rapid Moisture Content	10,000 square feet	ASTM D 3017
Standard Moisture Content (Note 1)	1 for every 20 rapid tests	ASTM D 2216
Rapid Density	10,000 square feet	ASTM D 2922
Standard Density (Note 1)	1 for every 20 rapid tests	ASTM D 1556

Note 1: The standard moisture content test is defined as ASTM D 2216. Standard density tests are defined by ASTM D 1556.

3.4.2.1 Rapid Tests

Each day that soil barrier layer material is compacted, a minimum of one set of moisture content and density tests shall be performed using standard procedures. Rapid tests shall be checked at the frequencies shown in Table 3. Standard tests shall be performed at locations which are as close as possible to the location of rapid tests being checked.

3.4.2.2 Nuclear Density and Moisture Content Tests

Nuclear density readings shall be taken in the direct transmission mode. Nuclear density and moisture calibration curves shall be checked and adjusted in accordance with the procedures described in ASTM D 2922 and ASTM D 3017. The nuclear gauge calibration checks shall be made at the beginning of a job, on each different type of material to be placed, and at intervals as directed. Nuclear density and moisture content gauges shall also be standardized daily in accordance with ASTM D 2922 and ASTM D 3017.

3.4.2.3 Test Results

The field moisture content and density test results shall be plotted on the "Acceptable Zone" plot that corresponds to the appropriate material type being tested. If test results are not within the "Acceptable Zone" for moisture content or density, 3 additional tests shall be performed near the location of the failed parameter. If all retests pass, no additional action shall be taken. If any of the retests fail, the lift of soil shall be repaired out to the limits defined by passing tests for that parameter. The area shall then be retested as directed. Repairs to the soil infiltration layer shall be documented including location and volume of soil affected, corrective action taken, and results of retests.

3.4.3 Hydraulic Conductivity Tests of In-Place Soil Barrier Layer Material

A minimum of 5 undisturbed samples shall be taken for hydraulic conductivity testing at locations selected by the Contracting Officer for each lift of soil barrier layer material placed and compacted. Samples shall be cut from the lift in accordance with ASTM D 1587 and transported

in the vertical position in accordance with ASTM D 4220, Group C. Each undisturbed sample shall be tested for hydraulic conductivity in accordance with ASTM D 5084. Hydraulic conductivity testing shall be conducted in accordance with requirements in paragraph 3.1.3, Hydraulic Conductivity Testing. If any test result is greater than 1.5 x 10-4 cm/sec or the minimum hydraulic conductivity requirement, modifications shall be proposed and approved prior to placement of additional soil barrier layer material of that type. If the hydraulic conductivity of any test is more than 7.5 x 10-4 cm/sec or 5 times the minimum hydraulic conductivity requirement, 3 additional tests shall be performed near the location of the original failed test. If all retests pass, no additional action shall be taken. If any of the retests fail, the area shall be repaired out to the limits defined by passing hydraulic conductivity tests. The area shall then be retested as directed. Repairs to the soil barrier layer shall be documented including location and volume of soil affected, corrective action taken, and results of retests.

3.5 PROTECTION

3.5.1 Moisture Content

After placement, moisture content shall be maintained or adjusted to comply with acceptable zone criteria.

3.5.2 Erosion

Erosion rills in excess of 1 inch in depth that occur in the soil barrier layer shall be repaired and grades re-established. The method of repair shall not decrease the minimum required thickness of the soil barrier layer.

3.5.3 Retests

Areas that require repair shall be retested as directed. Repairs to the soil barrier layer shall be documented including location and volume of soil affected, corrective action taken, and results of retests.

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SECTION 02921

SEEDING

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AGRICULTURAL MARKETING SERVICE (AMS)

AMS Seed Act	(1995) Federal Seed Act Regulations Part 201

1.2 NOT USED

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with specification section 01330, SUBMITTAL PROCEDURES:

SD-07 Certificates

Seed

Fertilizer

Mulch

Prior to delivery of materials, certificates of compliance attesting that materials meet the specified requirements. Certified copies of the material certificates shall include the following:

a. Seed. Classification, botanical name, common name, percent pure live seed, minimum percent germination and hard seed, maximum percent weed seed content, and date tested.

b. Fertilizer. Chemical analysis and composition percent.

c. Mulch: Composition and source.

SD-10 Operation and Maintenance Data

Maintenance Record

Maintenance work performed, area repaired or reinstalled, diagnosis for unsatisfactory stand of grass plants.

1.4 DELIVERY, INSPECTION, STORAGE, AND HANDLING

1.4.1 Inspection

Seed shall be inspected upon arrival at the job site for conformity to species and quality. Seed that is wet, moldy, or bears a test date five months or older, shall be rejected. Unacceptable materials shall be removed from the job site.

1.4.2 Storage

Materials shall be stored in designated areas. Seed and fertilizer shall be stored in cool, dry locations away from contaminants.

1.4.3 Handling

Except for bulk deliveries, materials shall not be dropped or dumped from vehicles.

1.4.4 Time Limitation for Hydroseeding

Seed shall not be held in a slurry for more than 24 hours.

PART 2 PRODUCTS

2.1 SEED

2.1.1 Seed Classification

State-certified seed of the latest season's crop shall be provided in original sealed packages bearing the producer's guaranteed analysis for percentages of mixture, purity, germination, hard seed, weed seed content, and inert material. Labels shall be in conformance with AMS Seed Act and applicable state seed laws.

2.1.2 Permanent Seed Species and Mixtures

Permanent seed species shall be proportioned by weight as shown in Table 1.

TABLE 1

Common Name	Botanical Name	Lbs Pure Live Seed per Acre
Sideouts gramma (Vaughn variety)	Bouteloua curtipendula	4.5
Blue gramma (Halchita variety)	Bouteloua gracilis	1.5
Little bluestem (Pastura variety)	Schizachyrium scoparium	3.2
Indiangrass (Lanno variety)	Sorhastrum rutans	5.0
Switchgrass (Blackwell variety)	Panicum virgatum	3.5
Purple prairie clover	Petalostemum purpureum	7.5
Fourwing Saltbush	Atriplex confertifolia	15.0
	TOTAL LBS PLS/ACRE	**40.2**

2.1.3 Quality

Weed seed shall be a maximum 1 percent by weight of the total mixture.

2.1.4 Seed Mixing

The mixing of seed may be done by the seed supplier prior to delivery, or on site if directed by the Contracting Officer.

2.1.5 Substitutions

Substitutions will not be allowed without written request and approval from the Contracting Officer.

2.2 EROSION/VEGETATION LAYER

Reference specification section 02140, EROSION/VEGETATION LAYER.

2.3 FERTILIZER

Fertilizer shall be controlled release commercial grade, free flowing, uniform in composition, and consist of a nitrogen-phosphorus-potassium ratio. Fertilizer shall be derived from sulphur coated urea, urea formaldehyde, plastic or polymer coated pills, or isobutylenediurea (IBDU). Fertilizer shall be balanced with the inclusion of trace minerals and micro-nutrients.

2.4 MULCH

Mulch shall be free from weeds, mold, and other deleterious materials. Mulch materials shall be native to the region. The material selected for mulch shall be chosen from the following.

2.4.1 Straw

Straw shall be stalks from oats, wheat, rye, barley, or rice, furnished in air-dry condition with a consistency suitable for placement with commercial mulch-blowing equipment.

2.4.2 Hay

Hay shall be native hay, sudan-grass hay, broomsedge hay, or other herbaceous mowings, furnished in an air-dry condition suitable for placing with commercial mulch-blowing equipment.

2.4.3 Wood Cellulose Fiber

Wood cellulose fiber shall not contain any growth or germination-inhibiting factors and shall be dyed an appropriate color to facilitate placement during application. Composition on air-dry weight basis: 9 to 15 percent moisture, pH range from 4.5 to 6.0.

2.4.4 Paper Fiber

Paper fiber mulch shall be recycled news print that is shredded for the purpose of mulching seed.

2.5 WATER

Water shall be provided by the Contractor. Water shall not contain elements toxic to plant life.

PART 3 EXECUTION

3.1 INSTALLING SEED TIME AND CONDITIONS

3.1.1 Seeding Time

Seeding shall occur between 1 June and 1 September.

3.1.2 Seeding Conditions

Seeding operations shall be performed only during periods when beneficial results can be obtained. When drought, excessive moisture, or other unsatisfactory conditions prevail, the work shall be stopped when directed by the Contracting Officer. When conditions warrant a variance to the specified seeding operation, proposed alternative methods shall be submitted for approval.

3.2 SITE PREPARATION

3.2.1 Finished Grade

The Contractor shall verify that finished grades for the erosion/vegetation layer are as shown on the drawings prior to commencement of the seeding operation.

3.2.2 Application of Fertilizer

Fertilizer shall be incorporated into the soil to a maximum 4 inch depth or may be incorporated as part of the tillage or hydroseeding operation.

3.2.3 Prepared Surface

3.2.3.1 Preparation

The prepared surface shall be a maximum 1 inch below the adjoining grade of any surfaced area. New surfaces shall be blended to existing areas. The prepared surface shall be completed with a light raking to remove debris.

3.2.3.2 Field Area Debris

Debris and stones larger than 1 inch in any dimension shall be removed from the surface prior to seeding.

3.2.3.3 Protection

The prepared surface shall be protected from compaction or damage by vehicular or pedestrian traffic and surface erosion prior to seeding. Erosion rills greater than 1 inch in depth shall be repaired to the satisfaction of the Contracting Officer prior to seeding. The method of repair shall not reduce the minimum required thickness of the erosion/vegetation layer shown on the drawings.

3.3 INSTALLATION

Prior to installing seed, any previously prepared surface compacted or damaged shall be reworked to meet the requirements of paragraph 3.2, SITE PREPARATION.

3.3.1 Installing Seed

Seeding method shall be drill seeding or hydroseeding. The method of seeding shall result in uniform coverage over the entire area to be seeded. Gravity feed applicators that drop seed directly from a hopper onto the prepared soil shall not be used because of the difficulty in achieving even coverage.

3.3.1.1 Drill Seeding

Seed shall be uniformly drilled to a maximum 1/2 inch depth and at the rate of 12 pounds of pure live seed per acre, using equipment with drills a maximum 7 inches apart. Row markers shall be used when drill seeding to provide even coverage. Half the total rate of seed application shall be drilled in 1 direction, with the remainder of the seed rate drilled at 90 degrees from the first direction. The drilling equipment shall be maintained with half full seed boxes during the seeding operation.

3.3.1.2 Rolling

The entire seeded area shall be firmed with a roller not exceeding 90 pounds per foot roller width. Areas seeded with seed drills equipped with rollers shall not be rolled.

3.3.2 Hydroseeding

Seed shall be mixed to ensure broadcast at the rate of 12 pounds of pure live seed per acre. Seed and fertilizer shall be added to water and thoroughly mixed to meet the specified application rate. Seed shall be held in slurry for a time period not to exceed 24 hours. Wood cellulose fiber mulch and tackifier shall be added at the rates recommended by the manufacturer after the seed, fertilizer, and water have been thoroughly mixed to produce a homogeneous slurry. Slurry shall be uniformly applied

under pressure over the entire area. The hydroseeded area shall not be rolled.

3.3.3 Mulching

3.3.3.1 Hay or Straw Mulch

Hay or straw mulch shall be spread uniformly at the rate of 2 tons per acre. Mulch shall be spread by hand, blower-type mulch spreader, or other approved method. Mulching shall be started on the windward side of relatively flat areas or on the upper part of steep slopes, and continued uniformly until the area is covered. The mulch shall not be bunched or clumped. Sunlight shall not be completely excluded from penetrating to the ground surface. All areas installed with seed shall be mulched on the same day as the seeding. Mulch shall be anchored immediately following spreading.

3.3.3.2 Mechanical Anchor

Mechanical anchor shall be a V-type-wheel land packer; a scalloped-disk land packer designed to force mulch into the soil surface; or other suitable equipment approved in advance by the Contracting Officer.

3.3.3.3 Wood Cellulose Fiber, Paper Fiber, and Recycled Paper

Wood cellulose fiber, paper fiber, or recycled paper shall be applied as part of the hydroseeding operation. The mulch shall be mixed and applied in accordance with the manufacturer's recommendations.

3.3.4 Watering Seed

Watering shall be started immediately after completing seeding in an area. Water shall be applied to supplement rainfall at a rate sufficient to ensure moist soil conditions to a minimum 1 inch depth during the seed establishment period specified in paragraph SEED ESTABLISHMENT PERIOD. Run-off and puddling shall be prevented. Watering trucks shall not be driven over seeded areas without prior permission of the Contracting Officer. Watering of other adjacent areas or plant material shall be prevented to the greatest extent possible.

3.4 RESTORATION AND CLEAN UP

3.4.1 Restoration

Existing turf areas and pavements that have been damaged from the seeding operation in the opinion of the Contracting Officer shall be restored to original condition at the Contractor's expense.

3.4.2 Clean Up

Excess and waste material shall be removed from the seeded areas and shall be disposed of offsite. Adjacent paved areas shall be cleaned to the satisfaction of the Contracting Officer.

3.5 PROTECTION OF INSTALLED AREAS

Immediately upon completion of the seeding operation in any area, the area shall be protected against traffic or other use by erecting barricades and providing signage as directed by the Contracting Officer.

3.6 SEED ESTABLISHMENT PERIOD

3.6.1 Commencement

The seed establishment period to obtain a healthy stand of grass plants shall begin on the first day of work under this contract and shall end 60 days after the last day of the seeding operation. The seed establishment period may be modified for inclement weather, shut down periods, or for other reasons directed by the Contracting Officer.

3.6.2 Satisfactory Stand of Grass Plants

Grass plants shall be evaluated for species and health when the grass plants are a minimum 1 inch in height.

3.6.2.1 Field Area

A satisfactory stand of grass plants from the seeding operation for a field area shall be a minimum 10 grass plants per square foot. Total bare spots shall not exceed 2 percent of the total seeded area.

3.6.3 Maintenance During Establishment Period

Maintenance of the seeded areas shall include eradicating weeds; insects and diseases; protecting embankments and ditches from surface erosion; maintaining mulch; protecting installed areas from traffic; mowing; and watering.

3.6.3.1 Mowing

Field Areas: Field areas shall be mowed once during the season to a minimum 3 inch height. Clippings shall be removed when the amount cut prevents sunlight from reaching the ground surface.

3.6.3.2 Repair

Unsatisfactory areas of grass plants and mulch, and eroded areas shall be repaired in accordance with paragraph 3.2, SITE PREPARATION. All repairs shall be to the satisfaction of the Contracting Officer.

3.6.3.3 Maintenance Record

A record of each site visit shall be furnished, describing the maintenance work performed; areas repaired; and diagnosis for unsatisfactory stand of grass plants.

-- End of Section --

SERVING THE ARMY AND THE NATION

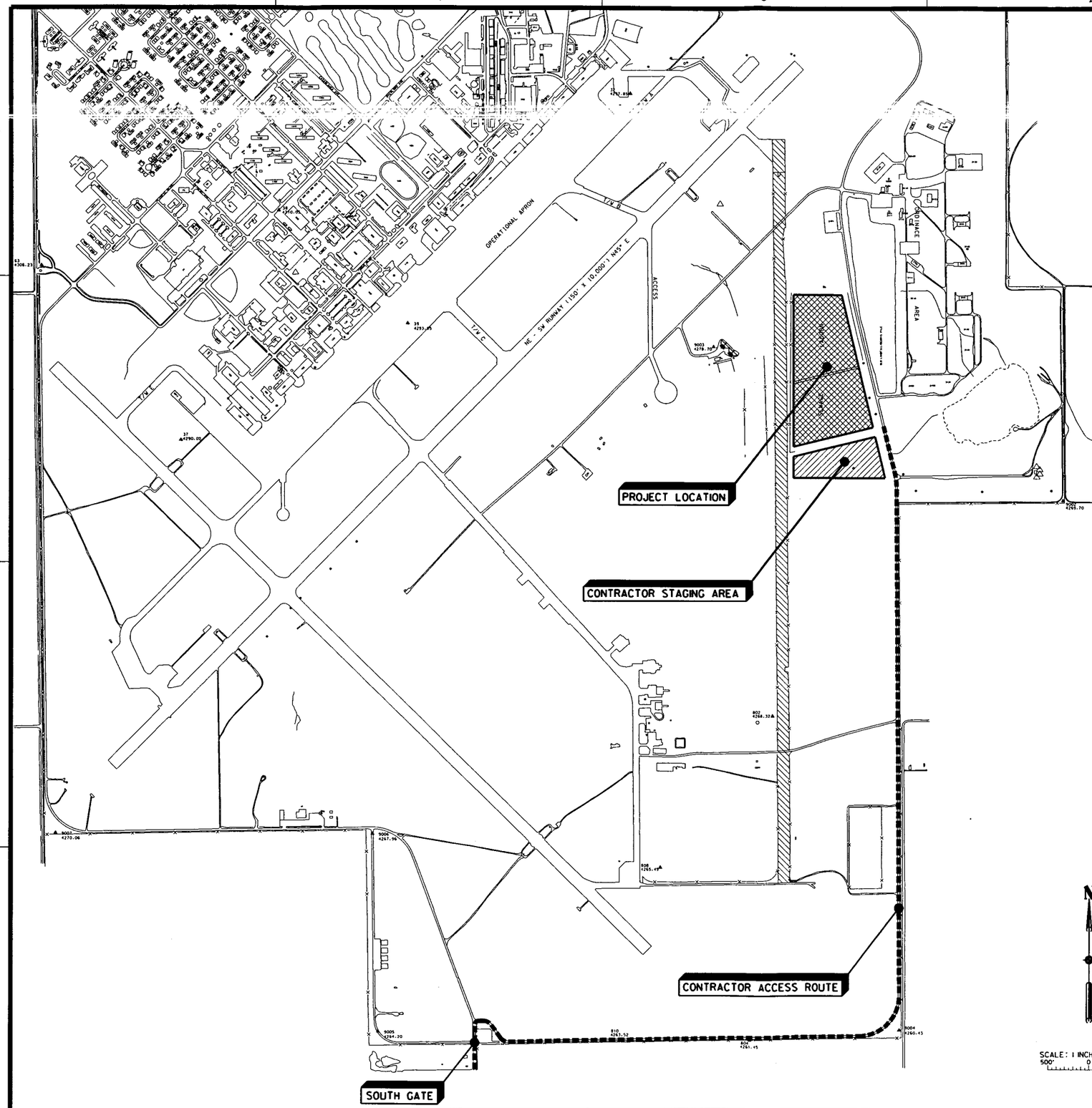
US Army Corps of Engineers ®
Omaha District

US Army Corps
of Engineers
Omaha District

SEWAGE LAGOONS FINAL CLOSURE PROJECT

CANNON AIR FORCE BASE
CLOVIS, NEW MEXICO

FINAL DESIGN
JULY 2001



INDEX

DESIGN FILE	SHEET NO.	DESCRIPTION
CN01C000.DGN	-	COVER SHEET
CN01C001.DGN	C-1	LOCATION PLAN & INDEX
CN01C002.DGN	C-2	EXISTING SITE CONDITIONS - AREA A
CN01C003.DGN	C-3	EXISTING SITE CONDITIONS - AREA B
CN01C004.DGN	C-4	REMOVAL PLAN - AREA A
CN01C005.DGN	C-5	REMOVAL PLAN - AREA B
CN01C006.DGN	C-6	TOP OF SLUDGE & RANDOM FILL GRADING PLAN - AREA A
CN01C007.DGN	C-7	TOP OF COVER GRADING PLAN - AREA A
CN01C008.DGN	C-8	COVER SECTIONS & DETAILS
CN01C009.DGN	C-9	EXISTING SITE PHOTOGRAPHS

LEGEND:

- APPROXIMATE LIMITS OF CONSTRUCTION
- APPROXIMATE LIMITS OF CONTRACTOR STORAGE AREA - SEE NOTE 1
- ABANDONED RUNWAY - SEE NOTE 2
- CONTRACTOR ACCESS ROUTE

NOTES:

1. EXACT LIMITS TO BE COORDINATED WITH CANNON BASE CIVIL ENGINEERING OFFICE PRIOR TO CONTRACTOR MOBILIZATION.
2. ALTERNATE STAGING AREA AT THE DISCRETION OF THE CANNON BASE CIVIL ENGINEERING OFFICE PRIOR TO CONTRACTOR MOBILIZATION.

N

SCALE: 1 INCH = 500 FEET
500' 0 500'

ALL SCALES SHOWN ARE BASED ON A STANDARD DRAWING SIZE OF 28" X 40" OR METRIC DRAWING SIZE OF 841mm X 594mm. IF ANY OTHER SIZE DRAWINGS ARE FURNISHED OR PLOTTED THE CONTRACTOR SHALL ADJUST THE SCALES ACCORDINGLY. THE CONTRACTOR SHALL ALSO ADVISE SUB-CONTRACTORS OF THE ABOVE.

$$ – THINK VALUE ENGINEERING – $$

Revisions

Symbol	Descriptions	Date	Approved

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
OMAHA, NEBRASKA

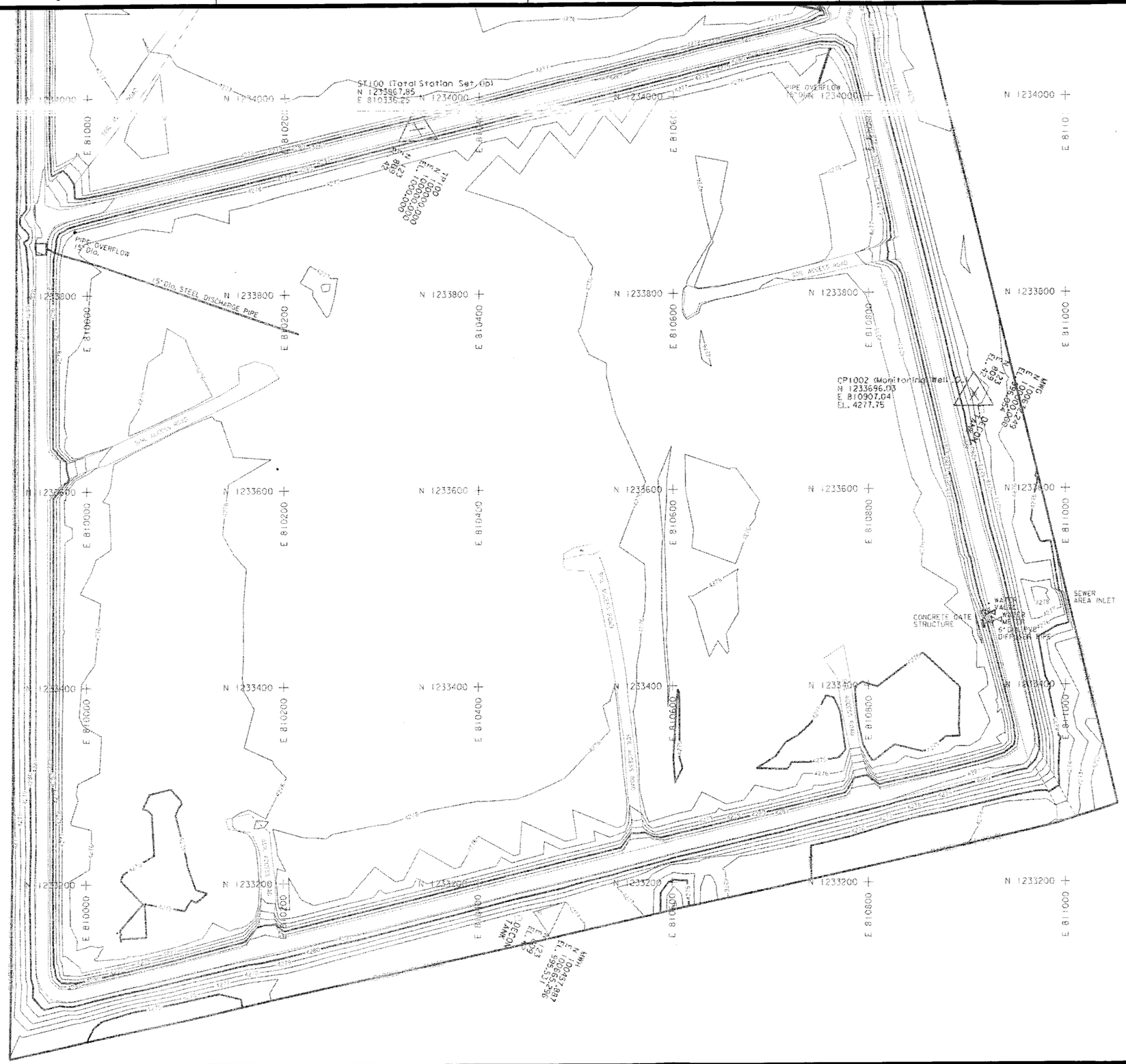
Designed by:
MARK A. HUCKLE
(402)-221- 3977
Date:
Drawn by:
MARK A. HUCKLE

CANNON AFB NEW MEXICO
SEWAGE LAGOONS FINAL CLOSURE

LOCATION PLAN & INDEX

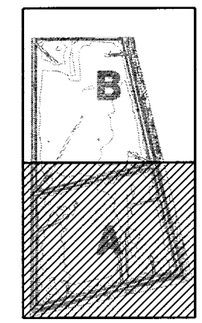
Submitted by:
Date:
Chief: Soils A Section

Plot Scale Ratio: 500 : 1
Design File: CN02C001.DGN
Date: JULY 2001
Spec. No.: DACA 45
Drawing Code: DER154-400
Contract No.: DACA 45
Sheet reference number: C-1



NOTES:

1. THE TOPOGRAPHIC SURVEY WAS PERFORMED BY THE U.S. ARMY CORPS OF ENGINEERS, OMAHA DISTRICT, ON 27-29 MARCH 2001. THE SURVEY IS BASED ON THE 1983 NAD HORIZONTAL DATUM AND THE 1929 NVD VERTICAL DATUM.
2. BASED ON REVIEW OF BASE COMPREHENSIVE PLAN UTILITY DRAWINGS [illegible] LAGOONS OR ADJACENT BERMS. CONTRACTOR SHALL FIELD LOCATE ALL POTENTIAL UTILITIES PRIOR TO CONSTRUCTION.



KEY PLAN

N

SCALE: 1 INCH = 40 FEET
40' 0 40'

ALL SCALES SHOWN ARE BASED ON A STANDARD DRAWING SIZE OF 28" X 40" OR METRIC DRAWING SIZE OF 841mm X 594mm. IF ANY OTHER SIZE DRAWINGS ARE FURNISHED OR PLOTTED THE CONTRACTOR SHALL ADJUST THE SCALES ACCORDINGLY. THE CONTRACTOR SHALL ALSO ADVISE SUB-CONTRACTORS OF THE ABOVE.

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(402)-221- 3977
Date:
Drawn by:
MARK A. HUCKLE

CANNON AFB — NEW MEXICO

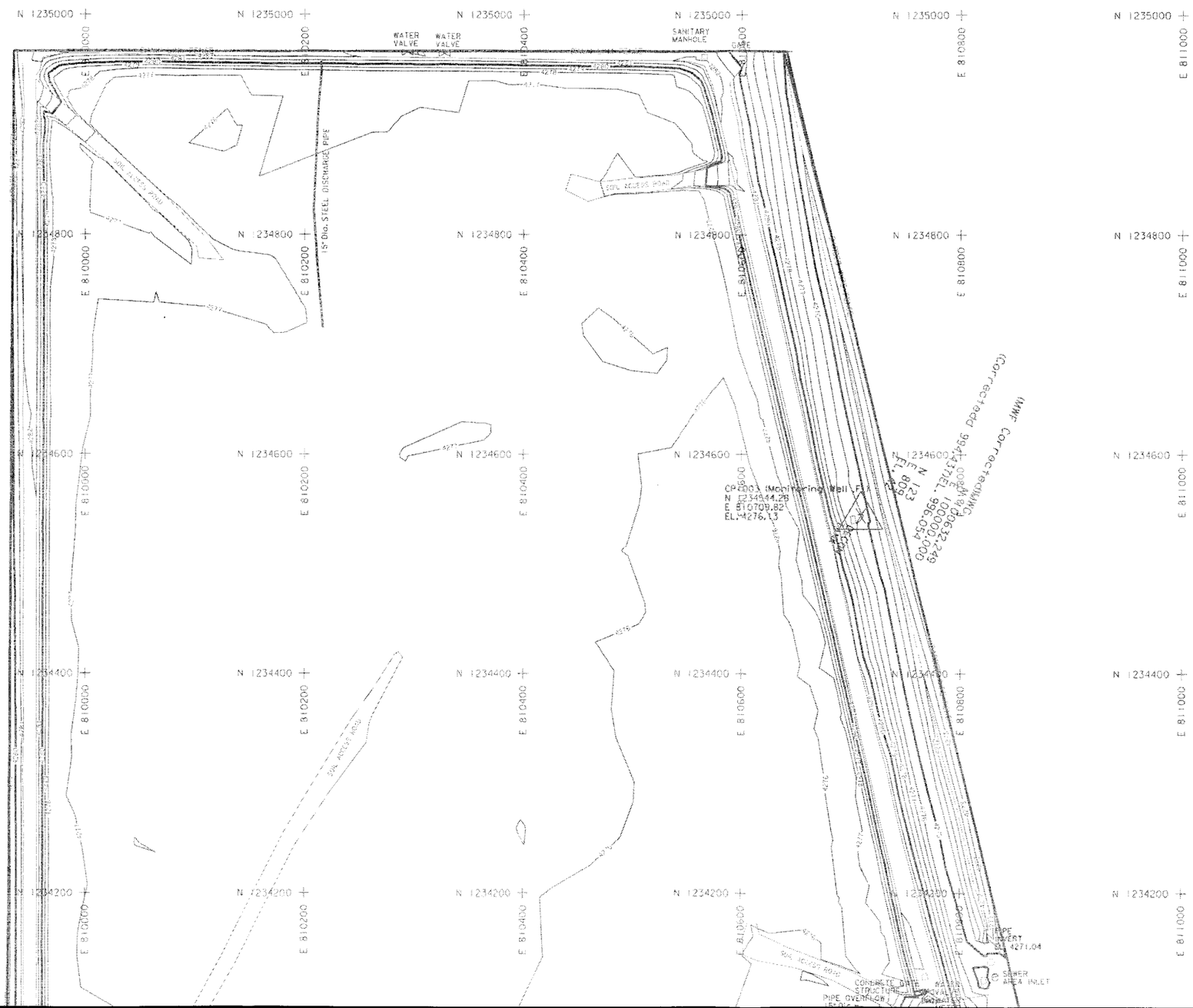
SEWAGE LAGOONS FINAL CLOSURE

AREA A

EXISTING SITE CONDITIONS

Submitted by:
Date:
Chief: Soils A Section

Plot Scale Ratio: 40 : 1
Design File: CN02C002.DGN
Date: JULY 2001
Spec. No.: DACA 45
Contract No.: DACA 45
Drawing Code: DER154-400
Sheet reference number: C-2



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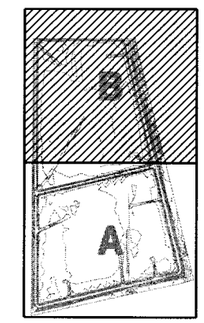
2. BASED ON REVIEW OF BASE COMPREHENSIVE PLAN UTILITY DRAWINGS DATED MAY 1995, NO UTILITIES ARE PRESENT WITHIN THE SEWAGE LAGOONS OR ADJACENT BERMS. CONTRACTOR SHALL FIELD LOCATE ALL POTENTIAL UTILITIES PRIOR TO CONSTRUCTION.



KEY PLAN

N

SCALE: 1 INCH = 40 FEET
40' 0 40'

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CORPS OF ENGINEERS
OMAHA, NEBRASKA

Designed by:
MARK A. HUCKLE
(402)-221- 3977
Date:

Drawn by:
MARK A. HUCKLE

Submitted by:
Date:

Chief: Soils A Section

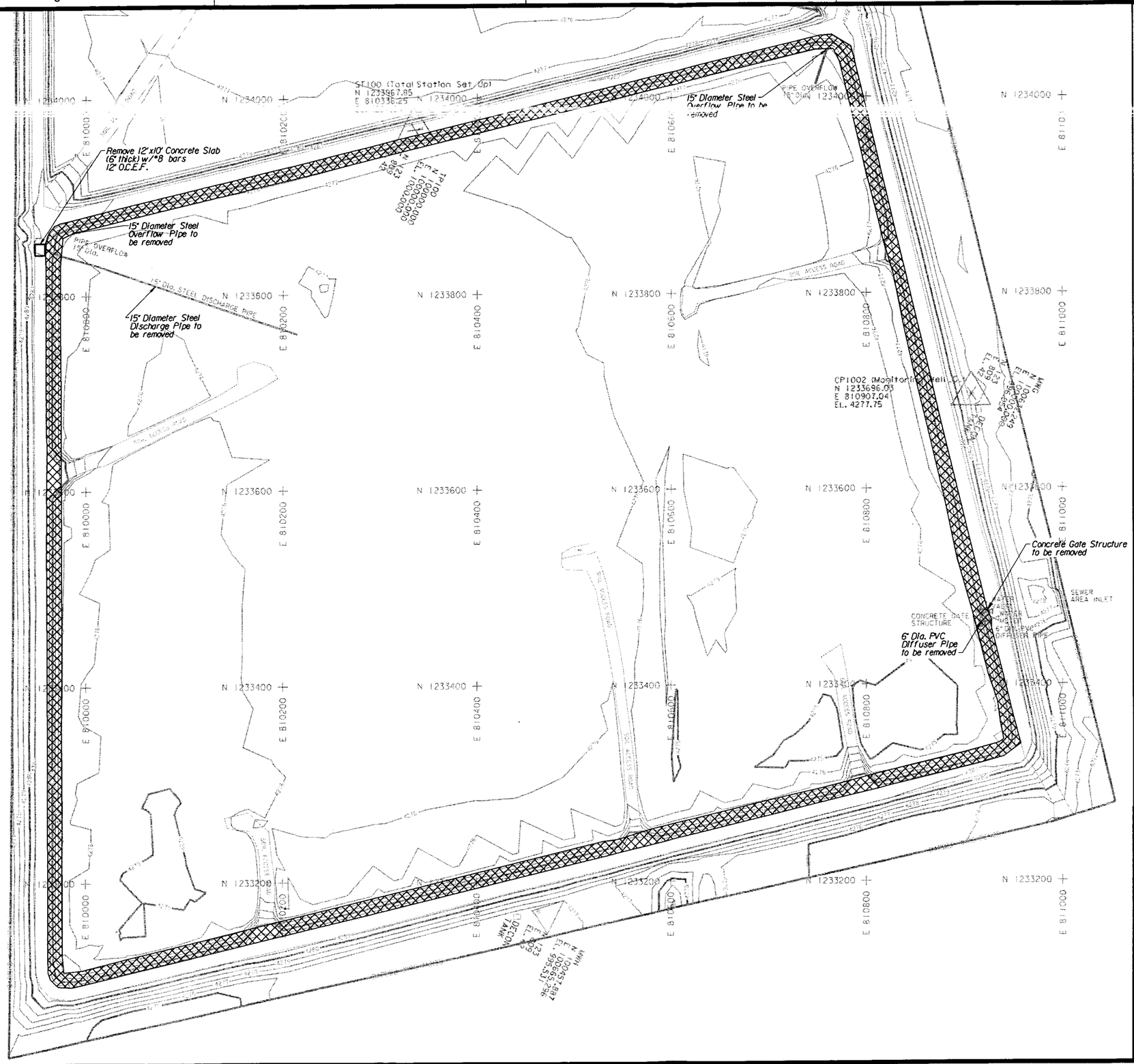
CANNON AFB NEW MEXICO

SEWAGE LAGOONS FINAL CLOSURE

AREA B

EXISTING SITE CONDITIONS

Plot Scale Ratio: 40 : 1
Design File: CN02C003.DGN
Date: JULY 2001
Spec. No.: DACA 45
Drawing Code: DER154-400
Contract No.: DACA 45
Sheet reference number: C-3

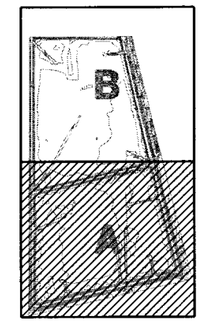


LEGEND:

EXISTING 4" NON-REINFORCED PCC BERM TO BE REMOVED

NOTES:

1. REFERENCE SPECIFICATION SECTION 02220, DEMOLITION.



KEY PLAN

N

SCALE: 1 INCH = 40 FEET
40' 0 40'

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(402)-221- 3977
Date:

Drawn by:
MARK A. HUCKLE

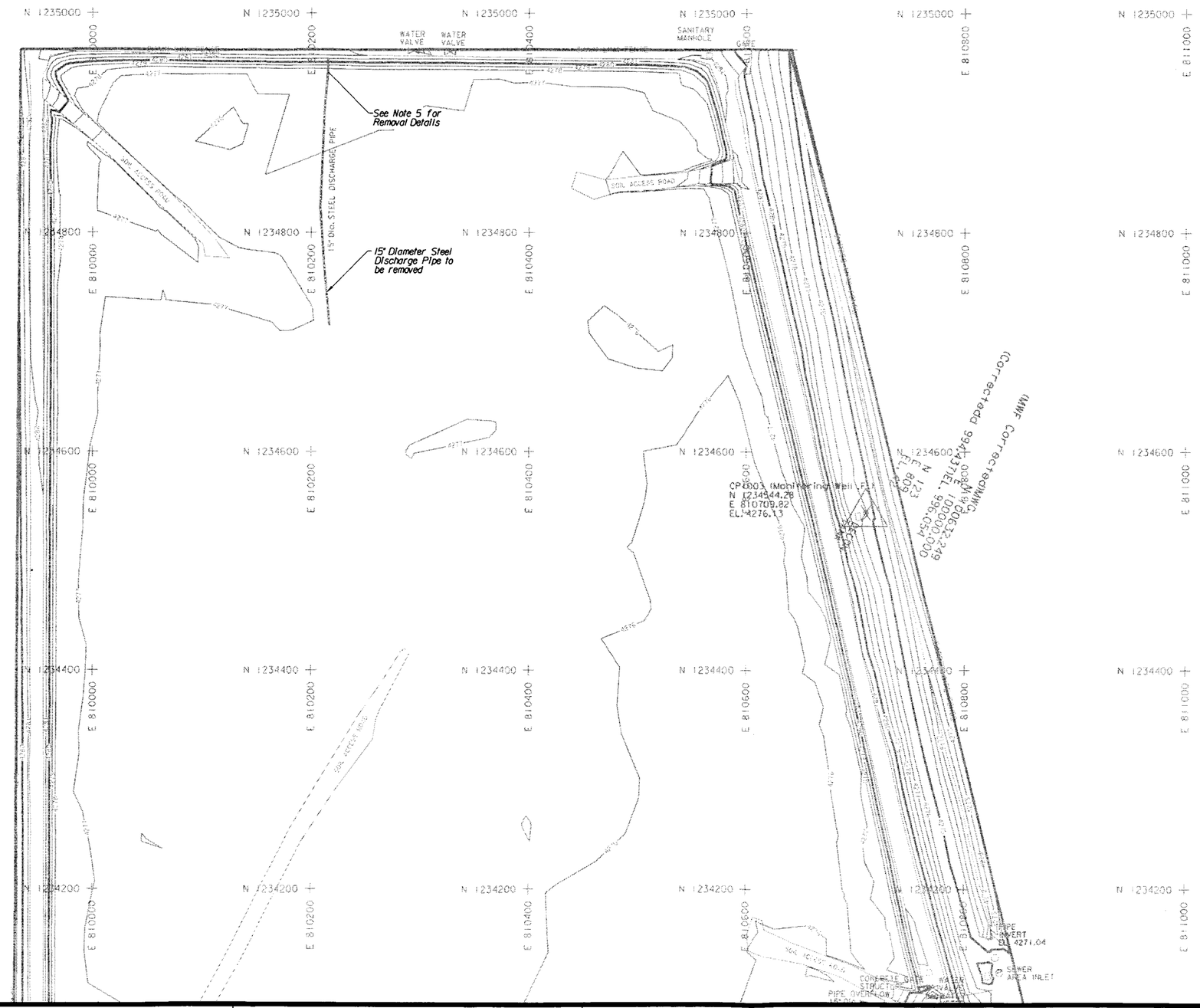
Submitted by:
Date:

Chief: Soils A Section

CANNON AFB NEW MEXICO

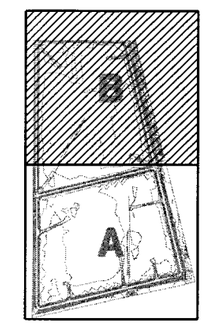
SEWAGE LAGOONS FINAL CLOSURE
AREA A
REMOVAL PLAN

Plot Scale Ratio: 40 : 1
Design File: CM02C004.DGN
Date: JULY 2001
Spec. No.: DACA 45
Contract No.: DACA 45
Drawing Code: DER154-400
Sheet reference number: C-4



NOTES:

1. REFERENCE SPECIFICATION SECTION 02220, DEMOLITION.
2. REMOVE ALL SLUDGE FROM NORTH LAGOON AFTER TILLING AND DRYING. PLACE SLUDGE FROM NORTH LAGOON IN SOUTH LAGOON.
3. REFERENCE SPECIFICATION SECTION 02111 FOR SLUDGE EXCAVATION AND HANDLING REQUIREMENTS.
4. REFERENCE FINAL CORRECTIVE MEASURES STUDY REPORT FOR SWMU 101-SEWAGE LAGOONS, OCTOBER 2000, FOR DEPTH AND VOLUME OF SLUDGE IN LAGOONS.
5. THE 15" DIAMETER STEEL DISCHARGE PIPE SHALL BE CUT 3' FROM THE POINT OF PENETRATION THROUGH THE PCC BERM. THE SECTION OF PIPE PENETRATING THE PCC BERM SHALL REMAIN IN PLACE. THE REMAINDER OF THE PIPE WITHIN THE NORTH LAGOON SHALL BE REMOVED.



KEY PLAN

N

SCALE: 1 INCH = 40 FEET
40' 0 40'

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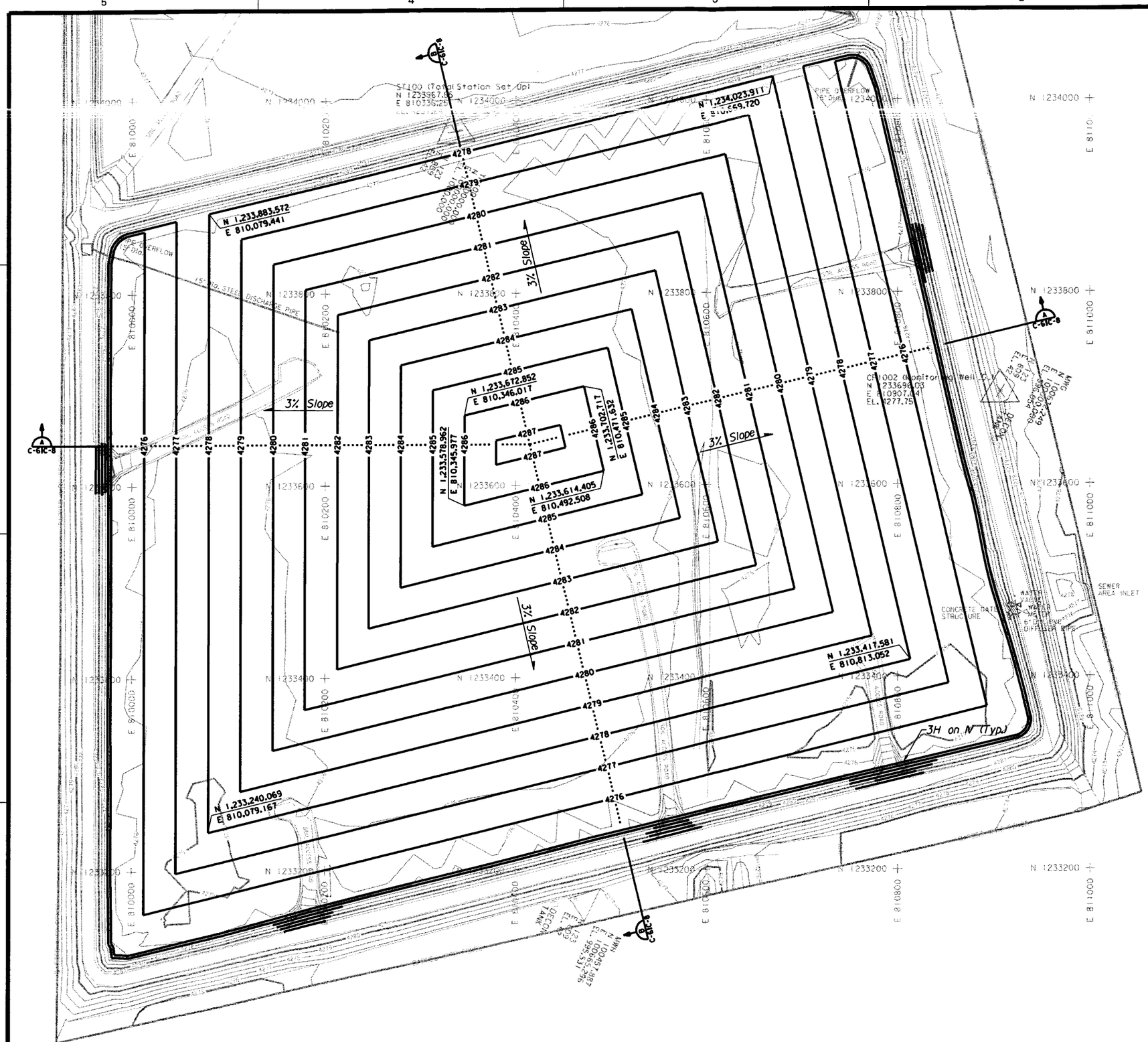
OMAHA, NEBRASKA

Designed by: MARK A. HUCKLE (402)-221- 3977
Date:
Drawn by: MARK A. HUCKLE

CANNON AFB NEW MEXICO
SEWAGE LAGOONS FINAL CLOSURE
AREA B
REMOVAL PLAN

Submitted by:
Date:
Chief: Soils A Section

Plot Scale Ratio: 40 : 1
Design File: CN02C005.DGN
Date: JULY 2001
Spec. No.: DACA 45
Contract No.: DACA 45
Drawing Code: DER154-400
Sheet reference number: C-5



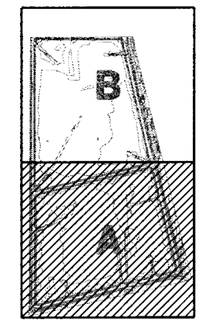
LEGEND:

4282 — NEW CONTOUR

4282 — EXISTING CONTOUR

NOTES:

1. REFERENCE SPECIFICATION SECTION 02210, EARTHWORK/GRADING.
2. REFERENCE SPECIFICATION SECTION 02111, EXCAVATION AND HANDLING OF CONTAMINATED MATERIAL.



KEY PLAN

N

SCALE: 1 INCH = 40 FEET
40' 0 40'

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CORPS OF ENGINEERS
OMAHA, NEBRASKA

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MARK A. HUCKLE
(402)-221- 3977
Date:

Drawn by:
MARK A. HUCKLE

Submitted by:
Date:

Chief: Soils A Section

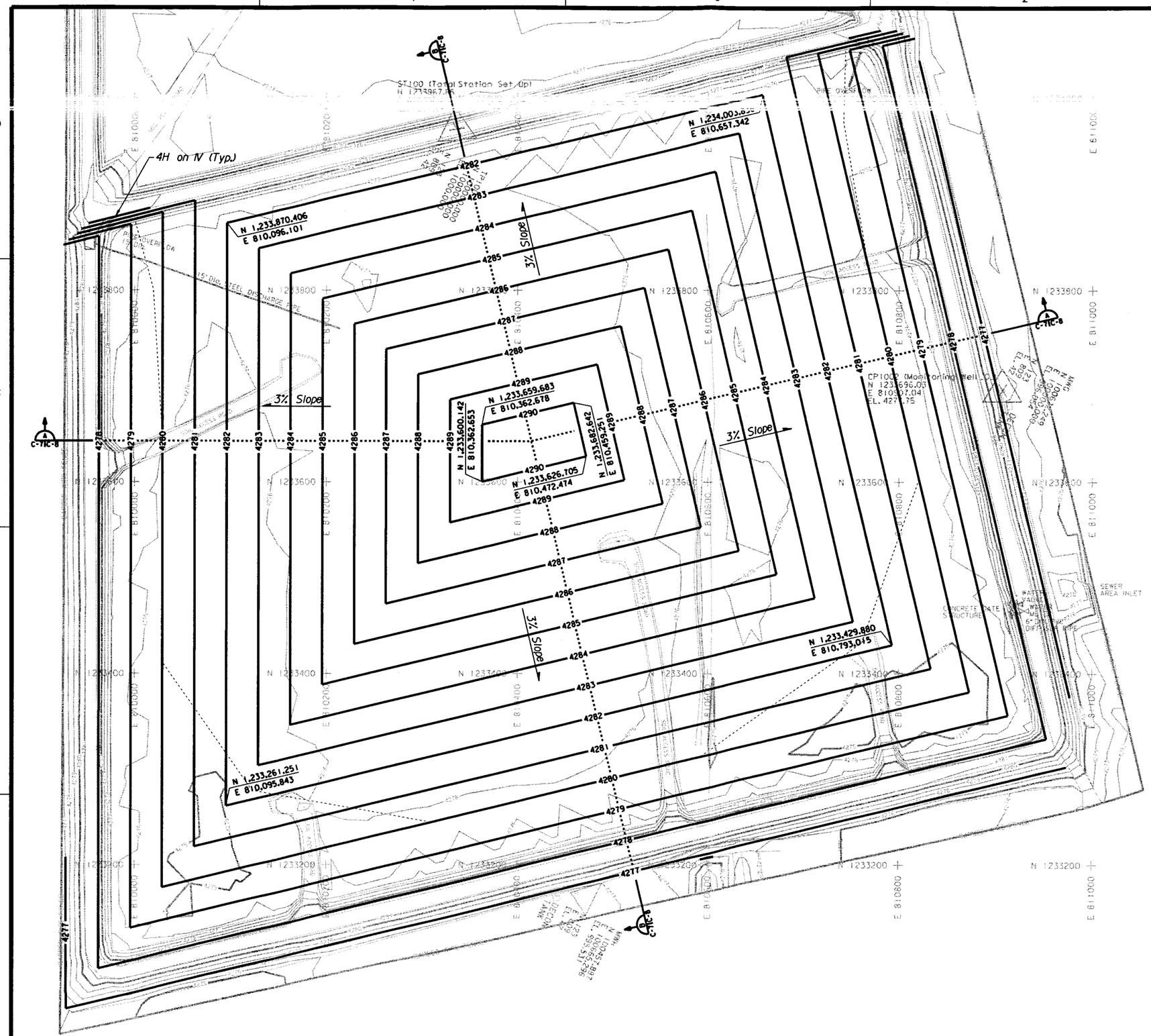
CANNON AFB NEW MEXICO

SEWAGE LAGOONS FINAL CLOSURE

AREA A

TOP OF SLUDGE & RANDOM FILL GRADING PLAN

Plot Scale Ratio: 48 : 1
Design File: CN02C006.DGN
Date: JULY 2001
Spec. No.: DACA 45
Contract No.: DACA 45
Drawing Code: DER154-400
Sheet reference number: C-6



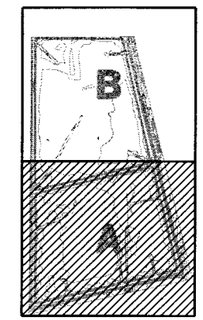
LEGEND:

4282 NEW CONTOUR

EXISTING CONTOUR

NOTES:

1. REFERENCE SHEET C-8 FOR TYPICAL COVER SECTION.



KEY PLAN

N

SCALE: 1 INCH = 40 FEET
40' 0 40'

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$$ – THINK VALUE ENGINEERING – $$

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U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
OMAHA, NEBRASKA

Designed by:
MARK A. HUCKLE
(402)-221- 3977
Date:

Drawn by:
MARK A. HUCKLE

CANNON AFB NEW MEXICO

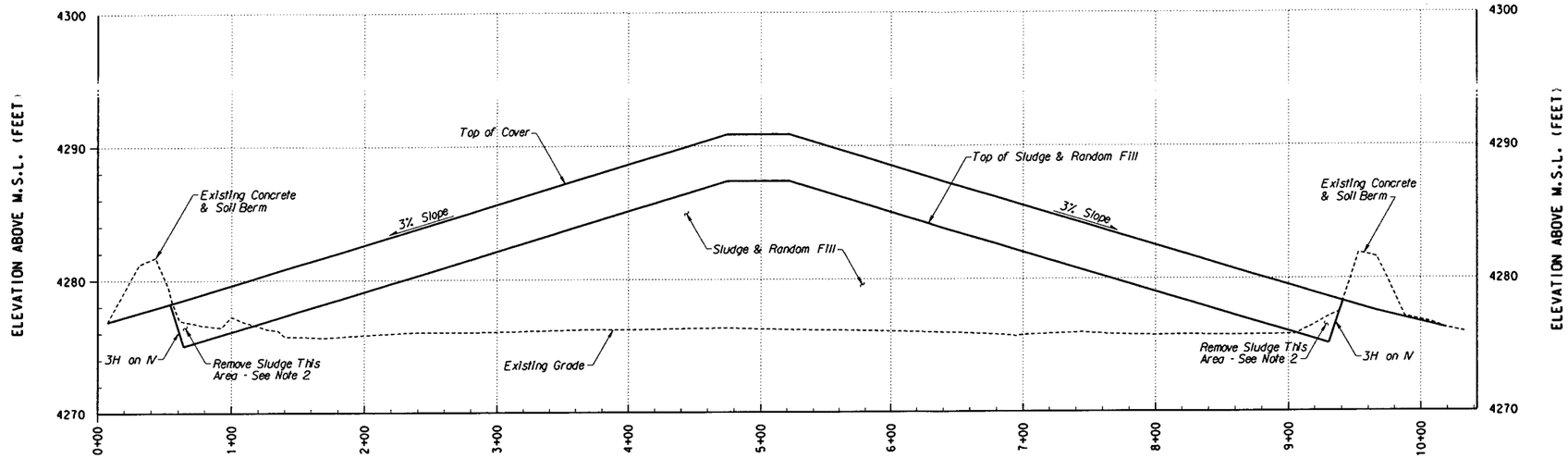
SEWAGE LAGOONS FINAL CLOSURE

AREA A

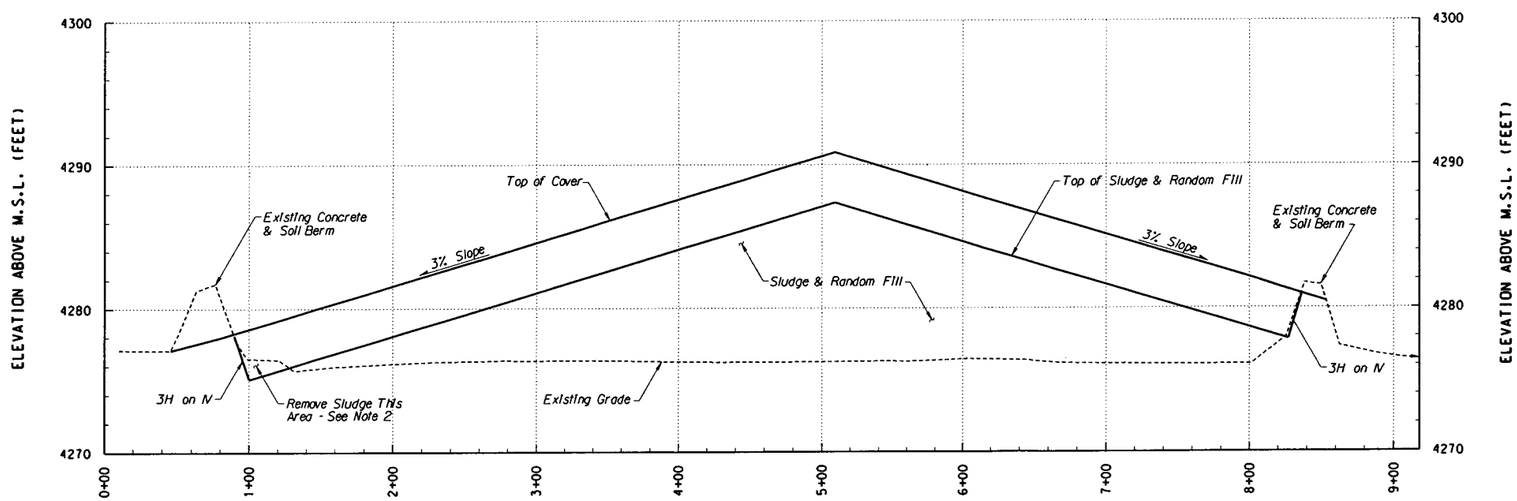
TOP OF COVER GRADING PLAN

Submitted by:
Date:
Chief: Soils A Section

Plot Scale Ratio: 40 : 1
Design File: CN02C007.DGN
Date: JULY 2001
Spec. No.: DACA 45
Contract No.: DACA 45
Drawing Code: DER154-400
Sheet reference number: C-7



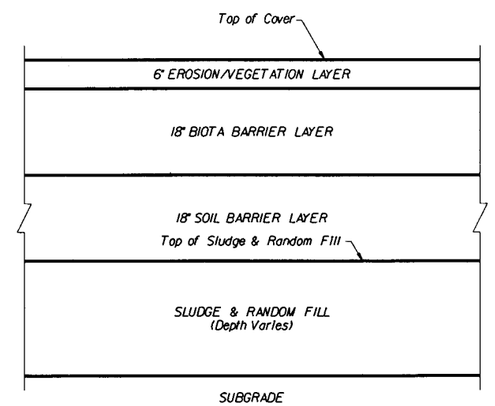
SECTION A C-6&C-8 C-7



SECTION B C-6&C-8 C-7

NOTES:

1. REFERENCE SPECIFICATION SECTION 02111 FOR SLUDGE EXCAVATION AND HANDLING REQUIREMENTS.
2. SLUDGE SHALL BE REMOVED AND PLACED WITHIN THE SOUTH LAGOON PRIOR TO CONSTRUCTING THE COVER IN THIS AREA.



TYPCIAL COVER SECTION

NO SCALE

HORIZONTAL SCALE: 1 INCH = 40 FEET
40' 0 40'

VERTICAL SCALE: 1 INCH = 4 FEET
4' 0 4'

ALL SCALES SHOWN ARE BASED ON A STANDARD DRAWING SIZE OF 28" X 40" OR METRIC DRAWING SIZE OF 841mm X 594mm. IF ANY OTHER SIZE DRAWINGS ARE FURNISHED OR PLOTTED THE CONTRACTOR SHALL ADJUST THE SCALES ACCORDINGLY. THE CONTRACTOR SHALL ALSO ADVISE SUB-CONTRACTORS OF THE ABOVE.

$$ – THINK VALUE ENGINEERING – $$

Revisions

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U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
OMAHA, NEBRASKA

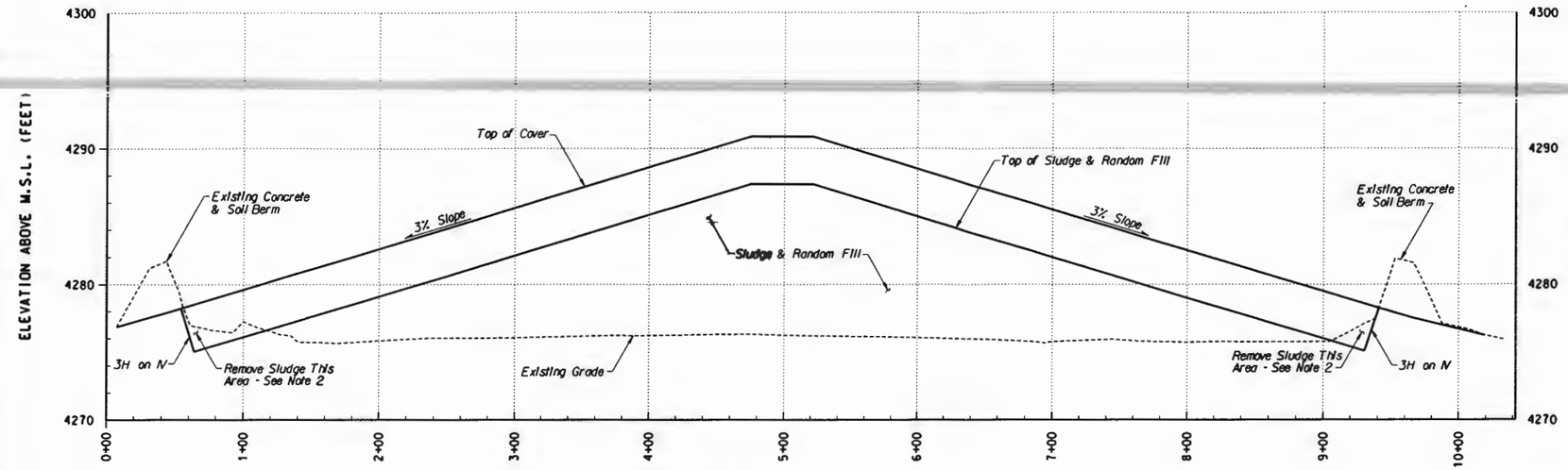
Designed by: MARK A. HUCKLE (402)-221-3977
Date:
Drawn by: MARK A. HUCKLE

CANNON AFB NEW MEXICO
SEWAGE LAGOONS FINAL CLOSURE

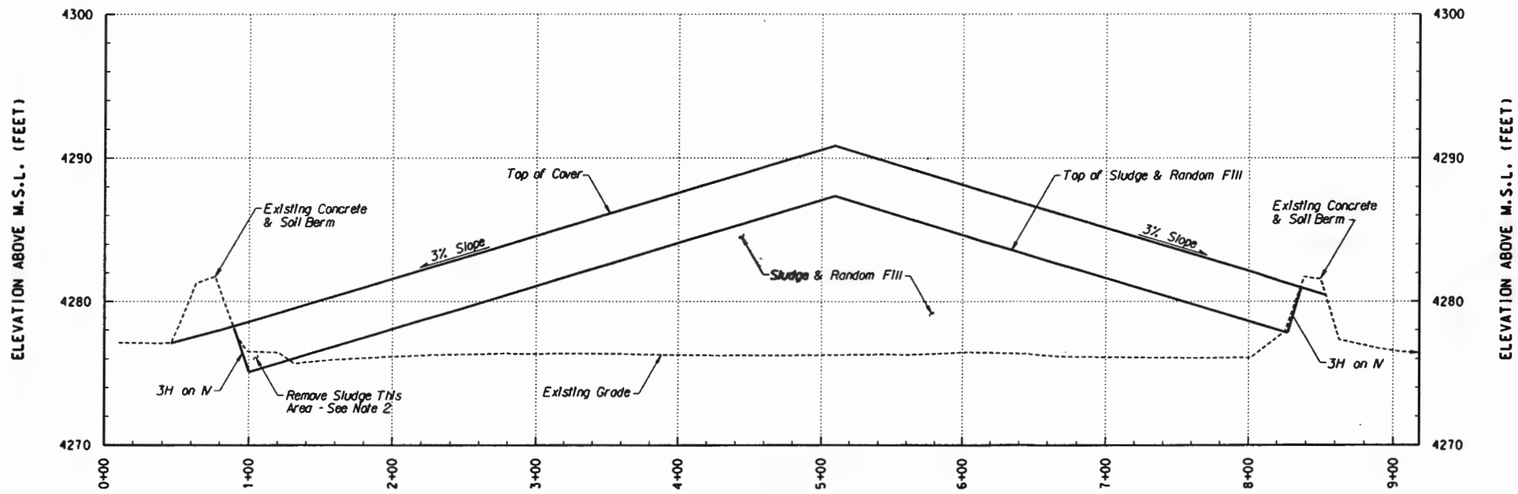
COVER SECTIONS

Submitted by:
Date:
Chief: Soils A Section

Plot Scale Ratio: 40 : 1
Design File: CN02C008.DGN
Date: JULY 2001
Spec. No.: DACA 45
Contract No.: DACA 45
Drawing Code: DER154-400
Sheet reference number: C-8



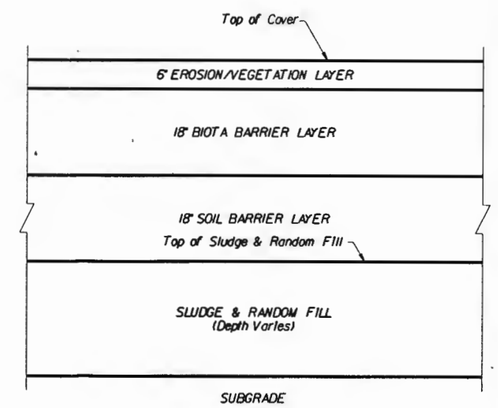
SECTION A C-6 C-8 C-7



SECTION B C-6 C-8 C-7

NOTES:

1. REFERENCE SPECIFICATION SECTION 02111 FOR SLUDGE EXCAVATION AND HANDLING REQUIREMENTS.
2. SLUDGE SHALL BE REMOVED AND PLACED WITHIN THE SOUTH LAGOON PRIOR TO CONSTRUCTING THE COVER IN THIS AREA.



TYPCIAL COVER SECTION

NO SCALE

HORIZONTAL SCALE: 1 INCH = 40 FEET

VERTICAL SCALE: 1 INCH = 4 FEET

ALL SCALES SHOWN ARE BASED ON A STANDARD DRAWING SIZE OF 28" X 40" OR METRIC DRAWING SIZE OF 841mm X 594mm. IF ANY OTHER SIZE DRAWINGS ARE FURNISHED OR PLOTTED THE CONTRACTOR SHALL ADJUST THE SCALES ACCORDINGLY. THE CONTRACTOR SHALL ALSO ADVISE SUB-CONTRACTORS OF THE ABOVE.

$$ – THINK VALUE ENGINEERING – $$

Revisions

Symbol	Descriptions	Date	Approved

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
OMAHA, NEBRASKA

Designed by: MARK A. HUCKLE (402)-221-3977
Date:
Drawn by: MARK A. HUCKLE
Submitted by:
Date:
Chief: Soils A Section

CANNON AFB NEW MEXICO

SEWAGE LAGOONS FINAL CLOSURE

COVER SECTIONS

Plot Scale Ratio: 40 : 1
Design File: CN02C008.DGN
Date: JULY 2001
Spec. No.: DACA 45
Contract No.: DACA 45
Drawing Code: DER154-400
Sheet reference number: C-8

15" Diameter Discharge and Overflow Pipes, South Lagoon

PHOTO 1

15" Diameter Discharge Pipe Outfall, North and South Lagoons

PHOTO 2

Typical Soil Access Road, North and South Lagoons

PHOTO 3

Concrete Gate Structure, South Lagoon

PHOTO 4

NOTES:

1. PHOTOGRAPHS ON THIS SHEET PORTRAY TYPICAL REMOVAL ITEMS IN THE SOUTH LAGOON.
2. THE CONTRACTOR SHALL BECOME FAMILIAR WITH EXISTING SITE CONDITIONS PRIOR TO BEGINNING WORK.
3. REFERENCE SPECIFICATION SECTION 02220 FOR DEMOLITION/ REMOVAL REQUIREMENTS.

ALL SCALES SHOWN ARE BASED ON A STANDARD DRAWING SIZE OF 28" X 40" OR METRIC DRAWING SIZE OF 841mm X 594mm. IF ANY OTHER SIZE DRAWINGS ARE FURNISHED OR PLOTTED THE CONTRACTOR SHALL ADJUST THE SCALES ACCORDINGLY. THE CONTRACTOR SHALL ALSO ADVISE SUB-CONTRACTORS OF THE ABOVE.

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$$ – THINK VALUE ENGINEERING – $$

Revisions

Symbol	Descriptions	Date	Approved

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
OMAHA, NEBRASKA

Designed by: MARK A. HUCKLE (402)-221- 3977
Date:
Drawn by: MARK A. HUCKLE

CANNON AFB NEW MEXICO

SEWAGE LAGOONS FINAL CLOSURE

EXISTING SITE PHOTOGRAPHS

Submitted by:
Date:
Chief: Soils A Section

Plot Scale Ratio: 500 : 1
Design File: CN02C009.DGN
Date: JULY 2001
Spec. No.: DACA 45
Contract No.: DACA 45
Drawing Code: DER154-400
Sheet reference number: C-9

APPENDIX B

Site Safety and Health Plan

SITE SAFETY AND HEALTH PLAN FOR CLOSURE CONSTRUCTION AT SEWAGE LAGOONS

Prepared for:

27 CE/CEV
CannonAir Force Base, NM
and
HQ ACC/CEV
Langley Air Force Base, VA

Prepared By:

Foster Wheeler Environmental Corporation
6605 Uptown Boulevard N.E. #220
Albuquerque, New Mexico 87110

TERC Contract No. DACW45-94-D-0003

Delivery Order 35, Work Authorization Directive 1

U.S. Army Corps of Engineers
Omaha District
Omaha, Nebraska

February 2003

APPROVALS

By their signature, the undersigned certify that this Site Safety and Health Plan (SSHP) addendum is approved and will be used for the closure construction at Solid Waste Management Unit (SWMU) 101, Sewage Lagoons.

Delivery Order Manager	2/7/03 Date
Task Manager	2/7/03 Date
Site Health and Safety Officer, OHST	2/11/03 Date
Roger N Margotto, CIH Project Environmental and Safety Manager	November 6, 2002 Date

HEALTH AND SAFETY PLAN ACKNOWLEDGEMENT

This form serves as documentation that field personnel have read, have been informed, and understand the provisions of the Cannon AFB Final Base-Wide Health and Safety Plan (HASP) (USAF, 2000) and the project-specific addendum to the HASP for the Work Plan for Closure of SWMU 101.

All field team members, including subcontractors, will read the Base-Wide HASP (USAF, 2000) and the project-specific addendum. Before being permitted to work on site, all personnel must complete site-specific training and sign this form. In signing this form, personnel indicate they understand the following statement:

I have read, or have been informed of, the Cannon AFB Base-Wide HASP (USAF, 2000) and the project-specific addendum for the Work Plan for Closure of SWMU 101. *I understand the information presented and will comply with the provisions contained therein.*

Name	Signature	Date

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ATTACHMENTS

Attachment 1 Foster Wheeler Environmental Procedures

Attachment 2 USACE EM 385-1-1 Engineers Regulations

FIGURES

Figure B-1. Hospital Route Map

ACRONYMS AND ABBREVIATIONS

AFB	Air Force Base
CQCP	Construction Quality Control Plan
CFR	Code of Federal Regulations
DOM	Delivery Order Manager
EM	Engineers Manual
EM 385-1-1	U.S. Army Corps of Engineers Manual (EM) 385-1-1, Safety and Health Requirements Manual
ER	Engineers Regulations
Foster Wheeler Environmental	Foster Wheeler Environmental Corporation
ft	foot/feet
HASP	Health and Safety Plan
PESM	Project Environmental Safety Manager
PPE	Personal protective equipment
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
SHSO	Site Health and Safety Officer
SSHP	Site Safety and Health Plan
SWMU	Solid Waste Management Unit
SWMU 101	Sewage Lagoons
USACE	U.S. Army Corps of Engineers
USAF	U.S. Air Force

1. INTRODUCTION

This Site Safety and Health Plan (SSHP) addendum addresses the potential health and safety hazards associated with the closure activities at Solid Waste Management Unit (SWMU) 101, Sewage Lagoons, at Cannon Air Force Base (AFB), New Mexico. The SSHP will serve as an addendum to the Cannon AFB Final Base-Wide Health and Safety Plan (HSAP) (USAF, 2000).

It shall be the Subcontractor's responsibility to develop and implement a SSHP, including an activity hazard analysis, prior to the initiation of field activities. This document, outlined in Section 11, establishes the required elements of the Subcontractor's SSHP per Foster Wheeler Environmental Corporation (Foster Wheeler Environmental) policy, the requirements of Section 01.A.10 of U.S. Army Corps of Engineers Manual (EM) 385-1-1, Health and Safety Requirements Manual [Appendix C of Engineers Regulations (ER) 385-1-92], 29 Code of Federal Regulations (CFR) 1910.120/ 29 CFR 1926.65 (b) (4), and Section 01351 of the Specifications (Appendix A).

All project activities will be conducted in accordance with the Cannon AFB Base-Wide HASP (USAF, 2000), the U.S. Army Corps of Engineers (USACE) EM 385-1-1, and this SSHP addendum.

1.1 Site Description and Contaminant Characterization

The Sewage Lagoons were identified as SWMU 101 in the Cannon AFB Hazardous Waste Permit dated November 14, 1989. SWMU 101 consists of two unlined surface impoundments that were used from 1966 to 1998 and received combined sanitary and industrial waste from base facilities. The lagoons operated in series and have a combined surface area of approximately 39 acres. They were constructed with unlined earthen bottoms and concrete-lined banks. When the new wastewater treatment plant began operation in 1998, wastewater was no longer discharged to SWMU 101.

In 1992, SWMU 101 was investigated during the Appendix I Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI). The RFI information indicated that the sludge depth was approximately 2 feet (ft) and the average water depth ranged from 3.5 ft to 4.5 ft (Woodward-Clyde, 1992; E&E, 1998). As of May 2000, Foster Wheeler Environmental personnel noted that there was no freestanding water in the lagoons. At the time of the RFI, SWMU 101 was not included in the Cannon AFB RCRA Part B Permit. The regulatory requirement for this unit was resolved by Cannon AFB, the U.S. Environmental Protection Agency, and the New Mexico Environment Department. As a result of the RFI, the only recommendation for SWMU 101 was to continue annual groundwater monitoring for volatile organic compounds, metals, pesticides, nitrate, sulfate, and total dissolved solids. According to

the RFI report, a recommendation was made for an interim monitoring program to support site closure until the regulatory framework was resolved. Groundwater monitoring is conducted annually at SWMU 101 to comply with the RCRA requirements.

1.2 Ordnance and Explosives

If ordnance or explosives are encountered during remediation activities of SWMU 101, the Contractor shall stop work immediately and contact the Contracting Officer for direction.

2. KEY PERSONNEL AND RESPONSIBILITIES

Mr. Roger Margotto is the Project Environmental Safety Manager (PESM); the Site Health and Safety Officer (SHSO) will be Mr. James Morning. Health and safety personnel and their responsibilities are detailed in the Base-Wide HASP. Additional responsibilities applicable to this project are detailed below.

2.1 Project Environmental Safety Manager

The PESM is responsible for the following:

- Oversee the Health and Safety Program and develop, implement, and approve all project-specific addenda
- Coordinate all aspects of each project-specific addendum with the Program Manager, applicable Delivery Order Managers (DOMs), and the SHSO
- Conduct health and safety inspections for tasks at Cannon AFB
- Approve and oversee implementation of the Emergency Response Plan
- Supervise and oversee the activities of the SHSO assigned to specific tasks

2.2 Site Health and Safety Officer

The SHSO is responsible for the following:

- Ensure that site-specific orientations and health and safety training are conducted
- Ensure that daily health and safety meetings are conducted

- Modify and/or develop procedures or revisions to this plan, after consultation with the PESM, when the scope of work is changed through natural causes, contract modifications, or contact with hazardous materials
- Investigate all accidents and incidents
- Ensure that work areas are appropriately posted
- Monitor compliance with this plan and all work practices
- Conduct site inspections
- Direct onsite health and safety activities

The SHSO has "stop-work authorization" if an imminent danger or potentially dangerous work practice exists. The Construction Superintendent and the PESM will verify authorization to proceed with work. The SHSO will coordinate with the Cannon AFB Safety Office, Industrial Hygiene Office, and Security Office to ensure compliance with all site requirements.

3. PROJECT DESCRIPTION

The USACE, Omaha District, retained Foster Wheeler Environmental to provide construction management services for the removal of contaminated sludge and soil and the construction of an engineered soil cover at SWMU 101.

4. HAZARD ANALYSIS

Anticipated hazards and safe work practices related to this project shall be provided in the Activity Hazard Analysis in the Subcontractor's SSHP, as specified in Section 11 of this document. The Hazard Analysis is critical to determining the level of site control and is subject to USACE approval.

5. TRAINING

All field personnel will adhere to project training requirements determined by the PESM and attend the daily safety briefings.

6. WORK ZONES, PERSONAL PROTECTION, AND COMMUNICATIONS

Work zones will be delineated according to the professional judgment of the SHSO. Because of the potential for release of fuel product, the SHSO will determine the level of personal protective equipment (PPE) based on site conditions. Additional PPE will be available if the SHSO determines level upgrade is necessary.

7. MONITORING AND MEDICAL SURVEILLANCE

Medical surveillance will not be required for this operation unless anticipated site conditions change.

8. SAFETY CONSIDERATIONS FOR SITE OPERATIONS

The SHSO will review and inspect all work areas prior to commencing each discernable feature of the work as defined in the Construction Quality Control Plan (CQCP) (Appendix C).

8.1 Safe Work Practices

Field personnel will become familiar with the specific hazards associated with each work area. Hazards causing slips, trips, and falls may be a result of debris or uneven surfaces. Field installation personnel will remain alert to the surrounding conditions. Upon arrival at a site, personnel will inspect the area for hazards, which will either be removed from the immediate area or marked to prevent injury.

Heavy leather gloves will be worn when handling materials or performing other work that could result in hand injuries.

During the performance of this work, all personnel using project vehicles will possess a valid driver's license and obey all posted speed limits, signs, and traffic signals. Personnel riding in vehicles will wear seat belts at all times. No persons will ride on the outside of vehicles or trailers. The Construction Superintendent, under the direction of the Task Manager, will coordinate with Cannon AFB to procure any necessary permits.

All electrical equipment, including portable tools, lighting, and power cords, will conform to 29 CFR 1926.400. All power tools will be inspected before use. A weekly inspection of power tools will also be performed and recorded.

The level of protection for the activities to be completed conforms to a level of protection for "clean construction" projects. Work uniforms will be similar to Level D PPE as outlined by the Occupational Safety and Health Administration requirements in 29 CFR 1910 and the requirements of 29 CFR 1926. The work uniform will include a shirt, long pants, steel-toe boots, hard hat, safety glasses, hearing protection as required, and leather work gloves. Construction equipment and PPE will be cleaned at the end of each day. Decontamination of construction equipment and PPE is not required since the work is in an area where there are no contaminants of concern.

If site conditions change or a hazardous situation is encountered, all work will be stopped, the work crew will evacuate the site, and the SHSO, Construction Superintendent, Task Manager, and the PESM will assess the situation in accordance with the requirements specified in the Regulatory Compliance Plan (RCP) (Appendix F). The SHSO will make decisions concerning changes in the level of protection and will then provide appropriate documentation to the PESM.

Work involving the use of cutting or welding equipment will be conducted using a hot work procedure. The SHSO will coordinate the initiation of permits with Cannon AFB Fire Department. In addition, the following site-specific practices will be adhered to:

- Foster Wheeler Environmental procedure Environmental Health and Safety 6-5, Welding and Hot Work (Attachment 1)
- All lines will be cleaned of contaminants prior to hot work being performed, as applicable
- Coating of piping and vessels containing lead will be chemically stripped a minimum of 6 inches on either side of the work, as applicable
- If a flammable or hazardous atmosphere exists, steps will be taken to inert or vent prior to working

9. DECONTAMINATION

No decontamination of construction equipment will be required unless site conditions change. The SHSO may authorize decontamination procedures if deemed necessary. Decontamination for soil sampling shall be performed as stipulated in the CQCP (Appendix C).

10. EMERGENCY RESPONSE PLAN

In addition to the emergency response procedures presented in the Cannon AFB Final Base-Wide HASP (USAF, 2000), Emergency Medical Response personnel, and/or Cannon AFB Environmental Compliance personnel shall be notified of on-site activities.

Emergency contact numbers will be conspicuously posted on-site to allow easy access to all personnel. Additional emergency telephone numbers include:

Mr. Roger Margotto, CIH, PESM 24-hour Pager	(619) 234-8696, ext. 203 (714) 810-3742
Mr. James Morning, SSHO	(505) 301-4716
Ms. Carol Bieniulis, DOM	(505) 878-8924, (505) 301-4715 (mobile)
Mr. Rob Ederer, Task Manager	(505) 878-8925
Mr. Dennis Timmons, Cannon AFB	(505) 784-1067
Fire Department	(505) 754-2578

A hospital route map is included as Figure B-1.

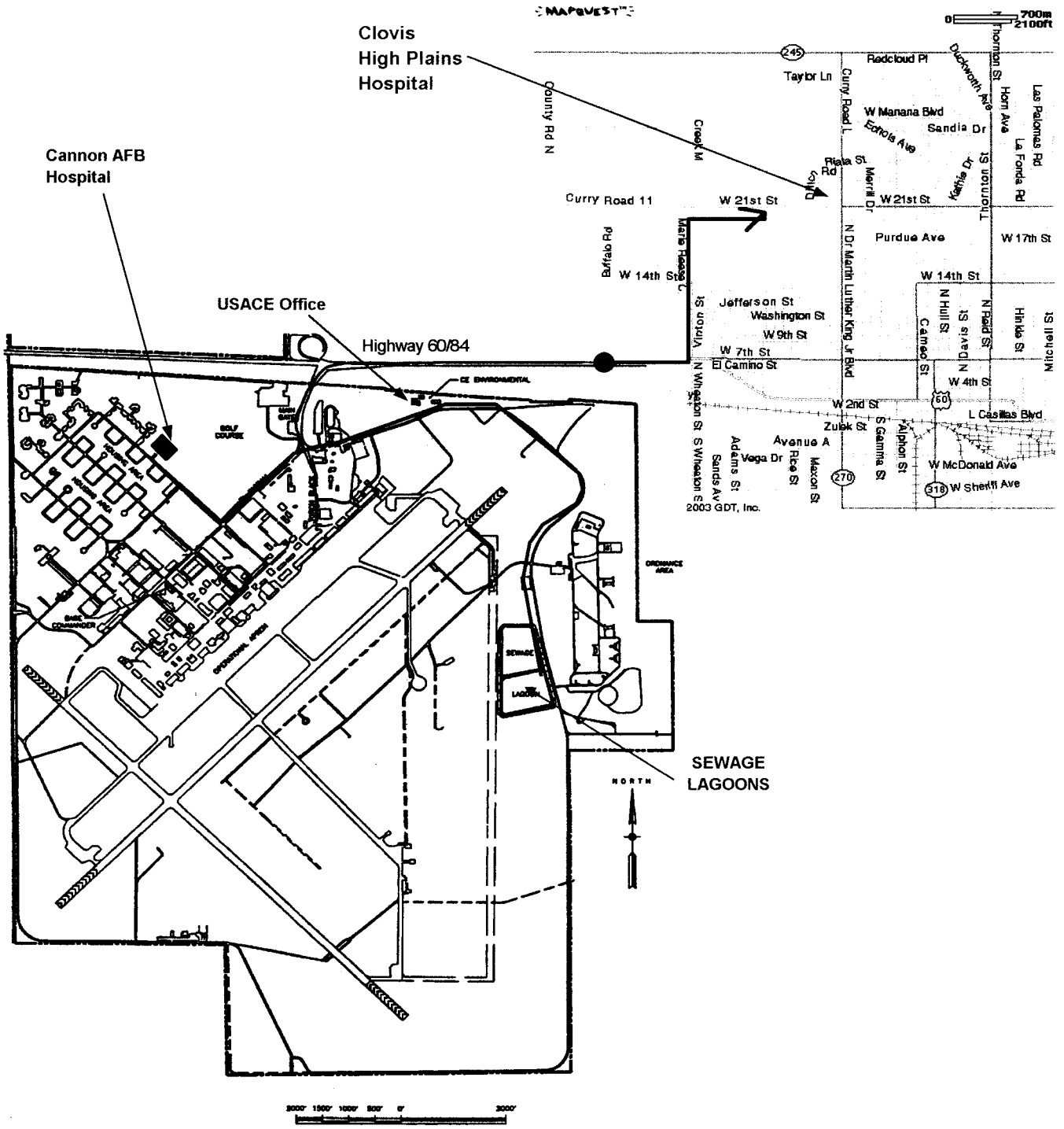
11. REQUIREMENTS FOR THE SUBCONTRACTOR'S SSHP

The following section details the required elements of the Subcontractor's SSHP and shall be in accordance with Foster Wheeler Environmental Corporation policy, the requirements of Section 01.A.10 of EM 385-1-1 (Appendix C of ER 385-1-92), 29 CFR 1910.120/ 29 CFR 1926.65 (b) (4), and Section 01351 of the Specifications (Appendix A).

11.1 Required SSHP Sections

The Subcontractor shall develop and implement a SSHP which incorporates and discusses in detail the following information.

- Section 1.0—Site Description and Contaminant Characterization (covered in Section 1.1 of this document)
- Section 2.0—Activity Hazard Analysis
- Section 3.0—Health and Safety Staff Organization, Qualifications and Responsibilities
- Section 4.0—Health and Safety Training Requirements



Scale in Feet is Approximate

SITE HEALTH AND SAFETY PLAN

Cannon Air Force Base, New Mexico

U.S. Army Corps of Engineers, Omaha District

Figure B-1

Hospital Route Map

Foster Wheeler Environmental Corporation

File: HASP Fig B-1 Final.xls

- Section 5.0—Personal Protective Equipment (PPE)
- Section 6.0—Medical Surveillance Requirements
- Section 7.0—Radiation Dosimetry, if applicable
- Section 8.0—Exposure Air Monitoring and Air Sampling, if required
- Section 9.0—Heat Stress/Cold Stress Prevention
- Section 10.0—Elements of the Subcontractor's Health and Safety Programs and Procedures edited to conform with the site-specific conditions and standard operations safety procedures
- Section 11.0—Site Control Measures
- Section 12.0—Personal Hygiene and Decontamination
- Section 13.0 – Equipment Decontamination
- Section 14.0 – Emergency Equipment and First Aid Requirements
- Section 15.0 – Emergency Response and Contingency Procedures
- Section 16.0 – Accident Prevention
- Section 17.0 – Logs, Reports, and Recordkeeping

11.2 Approvals

Prior to the initiation of field activities, the Subcontractor's SSHP, including the activity hazard analysis, will be reviewed and approved by Foster Wheeler Environmental and USACE for conformance to the established requirements listed above.

12. REFERENCES

E&E (Ecology and the Environment, Inc.)
1998. *Phase III Sludge Management Compliance Evaluation and Requirements Identification*. 1998.

USACE
1996. *U.S. Army Corps of Engineers Engineering Manual (EM) 385-1-1, Safety and Health Requirements Manual*, 3 September 1996.

USAF
2000. *Final Base-Wide Health and Safety Plan*. Cannon Air Force Base, New Mexico.

Woodward-Clyde (Woodward-Clyde Consultants)
1992. *Remedial Investigation Report for 18 Solid Waste Management Units*. Cannon Air Force Base, Clovis, New Mexico.

Attachment 1

Foster Wheeler Environmental Procedures

EHS 6-5: Welding/Hot Work (Previously HS6-6)

Purpose
The purpose of this program is to establish a method to prevent fires as a result of welding and hot work.

Version Date:	**01/05/2000** - Revised
Original Issue Date:	**02/01/95**
Department/Category:	Environmental, Health & Safety - Programs
Document Type:	Procedure
Keyword Index:	EHS Compliance/Waste Management, Field Activities/Science, Operational Control, Training, Communication
Approved by:	

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7.0 ATTACHMENTS

1.0 PURPOSE

The purpose of this program is to establish a method to prevent fires as a result of welding and hot work.

2.0 SCOPE

This document applies to all welding, cutting, open flame, grinding or other spark-producing activities on Foster Wheeler Environmental Corporation (FWENC) project sites.

3.0 MAINTENANCE

The Director, Environmental, Safety and Quality (ESQ) Programs is responsible for updating this procedure. Approval authority rests with FWENC's President and Chief Executive Officer. Suggestions for revision shall be submitted to both the department responsible for updating the procedure and the Executive Director, Administration and Compliance.

4.0 DEFINITIONS

None.

5.0 DISCUSSION

5.1 Responsibilities

5.1.1 Line Management

Supervisors are responsible for:

- Ensuring implementation of the program requirements, and
- Signing and issuing hot work permits.

5.1.2 Environmental, Health and Safety Personnel

The Environmental and Safety Supervisor (ESS) is responsible for:

- Providing oversight for program implementation
- Assisting with training of site personnel on program requirements
- Maintaining files of hot work permits.

5.2 Cutting, Welding, Open Flame, and Flame/spark Producing Equipment

If the work involves cutting, welding, or other flame/spark-producing equipment, the supervisor shall examine the area where the work is to be done and shall ensure the following:

- Sprinklers, where provided, are in commission and will not be taken out of service until this work has been completed.
- There is no flammable lint, dust, vapors, and liquids or unpurged tanks or equipment previously containing such materials in the areas.
- This work will be confined to the area or equipment specified in the permit.
- Floors and surroundings have been swept clean, with combustible floors and construction formwork (if any) wet down.
- A suitable fire extinguisher is available.
- Welding and cutting is performed by a qualified person.
- Proper personal protective equipment (PPE) is being worn by persons performing the hot work.
- All combustibles have been located 50 feet from the operation and the remainder protected with metal guard, or flameproofed curtains or covers (not ordinary tarpaulins).
- All floor and wall openings within 40 feet of the operations have been covered tightly.
- A fire watch has been assigned to watch for dangerous sparks in the area, as well as in floors above and below, and the fire watch stays in the area for 30 minutes after the end of the activity.
- Arrangements have been made for a patrol of the area, including floors above and below, during any lunch or rest period. Hot work permits are good for one shift only.
- Flame or spark-producing equipment to be used has been inspected and found in good repair.
- The hot work permit included as Attachment A or an equivalent has been completed.

5.3 Welding in Confined Spaces

Confined spaces must be adequately ventilated with clean air to prevent the accumulation of toxic materials or possible oxygen deficiency during welding or cutting in confined spaces. In circumstances where it is impossible to provide such ventilation, an air-supplied respirator shall be used.

When welding or cutting is being performed in a confined space, welding machines and cylinders shall be left outside. Heavy portable equipment mounted on wheels shall be securely blocked to prevent accidental movement. In addition to a hot work permit, all the requirements of EHS 6-1, Confined Space Entry, shall be followed, including the completion of a confined space entry permit.

5.4 Welding on Systems that Contain or Have Contained Flammable Liquids

The following precautions shall be taken when welding/cutting on systems that contain or contained flammable liquids.

- The part of the system being worked on must be isolated from other parts of the system containing flammable liquids or vapors. Isolation may be accomplished by plugging (i.e., using approved procedures and equipment), blanking, or removing from the system. Other approaches must be reviewed by the Project Environmental and Safety Manager (PESM).
- The isolated system must be purged, ventilated, or cleaned before welding, cutting, or brazing may be performed.
- Before purging, written calculations must be done to determine the time required to purge a certain size system with a given flow rate of an inert gas.
- After ventilation or cleaning a system, a lower explosive limit (LEL) reading must be taken at the area to be worked to ensure that there are no residual flammable vapors before welding is conducted. A reading of 10% of the LEL is considered acceptable.
- When a part of a system (i.e., a pipe) is worked in place, protection must be accomplished by a combination of purging and blanking-off or cleaning and blanking-off.
- A hot work permit must be completed.

5.5 Recordkeeping

Completed hot work permits shall be given to the ESS and shall be maintained as part of the project file.

5.6 Training

All persons involved in welding/hot work activities shall receive training on the requirements of this program. Training records shall be maintained in accordance with EHS1-9, Recordkeeping.

6.0 REFERENCES

OSHA (U.S. Department of Labor, Occupational Safety and Health Administration)
29 CFR 1926, Subpart J.

Environmental, Health & Safety - Programs Procedure EHS 1-9, Recordkeeping
Environmental, Health & Safety - Programs Procedure EHS 6-1, Confined Space Entry

7.0 ATTACHMENTS

Attachment A - Hot Work Permit

EHS 6-5 ATTACHMENT A
HOT WORK PERMIT

Click the icon below to download and complete.

EHS6-5 Attachment A.doc

Select the "Detach" button in the pop-up window to save a copy to a disk or hard drive.

FOSTER WHEELER ENVIRONMENTAL CORPORATION

NOTICE OF OWNERSHIP AND CONDITIONS OF USE

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This document will be updated periodically as new concepts and practices are developed. Such revisions shall be effected by issuing new or revised sections to ensure uniform practices. Deviations to the enclosed information may be authorized, when appropriate, based upon warranted circumstances.

Sections shall not be removed from this document except as required by revisions or cancellations. Employees are not to rely on printed versions of this document (except as described in Foster Wheeler Environmental Corporation procedure A-1, Procedures, Authorization, Preparation and Distribution) and shall refer to the Lotus Notes database for the most current requirements.

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Proprietary Information

EHS 6-5 ATTACHMENT A

FOSTER WHEELER ENVIRONMENTAL CORPORATION

HOT WORK PERMIT

No. _____

Site Name: _____

Site Location: _____

Permit Issue Date: _____ Permit Expiration Date: _____

Describe work to be performed and location where activity will be conducted:

_____

_____

_____

SAFETY ZONE for work established by (check all that apply)

☐ Cones ☐ Caution Tape ☐ Natural Barrier ☐ Welding Screen ☐ Building ☐ Other, explain:

_____

_____

SAFETY REQUIREMENTS (check YES or NO)

Fire Extinguisher properly rated ☐ YES ☐ NO Fire watch present ☐ YES ☐ NO

Combustibles covered within 50 ft ☐ YES ☐ NO Work area clean ☐ YES ☐ NO

Cables, hose lines, regulators, cylinders, electric sources checked ☐ YES ☐ NO

SAFETY EQUIPMENT (check all that apply) ☐ respirator ☐ welders mask ☐ burning goggles

☐ face shield, and _____

Are **SPECIAL FIRE PROTECTION** procedures being implemented? (If yes, describe): _____

_____

_____

AIR MONITORING REQUIREMENTS			
	☐ FID/PID	☐ O_2	☐ CGI
Background:			
Time: _____			
_____			
_____			

Supervisor Signature _____ User Signature _____

Air Monitor Signature _____ User Signature _____

Fire Watch Signature _____ User Signature _____

Attachment 2

Engineers Regulations

APPENDIX C

Safety and Health Elements For HTRW Documents (SSHPs/HSDAs)

C-1. Site Description and Contamination Characterization.

a. Describe the site location, topography, approximate size, and the past uses of the site.

b. Compile a complete list of the contaminants found or known to be present in site areas to be impacted by work performed. Compilation of this listing shall be based on results of previous studies; or, if not available, select the likely contaminants based on site history and prior site uses/activities. Include, as applicable, the chemical names, radioisotopes, concentration ranges (and strength of radiation fields and levels of radioactive contamination if appropriate), media in which found, locations on site, and estimated quantities/volumes to be impacted by site work.

C-2. Hazard/Risk Analysis.

a. Identify each task and/or operation to be performed. Identify the safety, chemical, physical, radiological and/or biological hazards of concern presented by each task and/or operation. EM 385-1-1, Section 01.A.10, provides details concerning activity hazard analysis preparation. The tasks and hazard/risk analyses shall be modified as needed to address changing work conditions.

(1) Safety. Evaluate the potential for injury from all site conditions and activities (e.g., excavations, slips, trips and falls, electricity, equipment and machinery etc.). Reference EM 385-1-1.

(2) Chemical. List the chemical hazards that may be encountered during site activities and evaluate the chemical, physical, and toxicological properties of the chemicals. Describe the sources and pathways of employee exposure, and anticipated on-site and off-site exposure levels. Address Federal, state and local regulations or recommended exposure standards. Address employee exposure to hazardous substances bought on site for the execution of site activities.

(3) Physical. Evaluate the potential for injury from

physical agents such as noise, heat and cold stress, vibration, etc. that may be present.

(4) Radiological. Evaluate the risk to human health caused by radioactive materials or ionizing radiation fields in the area where work is to be performed. Consider the presence of radioactive isotopes and the type of ionizing radiation they emit. Describe the sources and pathways of employee internal exposure, and anticipated on and off-site internal and external levels. Address Federal, state and local regulations or recommended exposure standards.

(5) Biological. Evaluate the potential for illness or injury due to biological agents (e.g., poisonous plants, animals, insects, microorganisms).

b. Establish action levels and methods to mitigate the hazards noted above for the situations listed below. Action levels and required actions shall be presented in text and tabular forms.

(1) Implementation of engineering controls and work practices.

(2) Upgrades/downgrades in levels of personal protective equipment.

(3) Work stoppage and/or emergency evacuation of on-site personnel.

(4) Prevention and/or minimization of public exposures to hazards created by site activities.

C-2. Staff Organization, Qualifications, and Responsibilities.

a. Develop an organizational structure that sets forth lines of authority (chain of command), responsibilities, and communication procedures concerning site safety and health, and emergency response. This organizational structure shall cover management, supervisors and employees of the contractor and all subcontractors. It shall include the means for coordinating and controlling work activities of subcontractors and suppliers.

b. For contractor conducted activities, summarize the operational and health and safety responsibilities and the qualifications of each key person identified (for in-house USACE conducted activities the operational and health and safety responsibilities noted in C-3.b. 1-5 below, shall be undertaken by qualified and competent USACE industrial hygienists, health

physicists and safety professionals (see Appendix B for definitions of these terms and qualified and competent persons) at the Design District Command or Geographic District Command performing the work as specified in paragraph 8 of this ER.)

(1) For investigative actions (Preliminary Assessments, Site Investigations, Remedial Investigations, Feasibility Studies, etc.) a Certified Industrial Hygienist (CIH) (certified by the American Board of Industrial Hygiene) with 3 years of experience in hazardous waste site operations shall be designated with overall responsibility for the development, implementation, and oversight of the contractor's Safety and Health Program (SHP) and Site Safety and Health Plan (SSHP). The CIH shall sign and date the plans as appropriate. The CIH signature on the SHP and SSHP is an indication of approval of plan development, implementation and content.

(2) For Remedial Design activities a CIH with 3 years of experience in hazardous waste site operations shall be designated with overall responsibility for the development of the contractor's health and safety design analyses (HSDA) and specification section titled Safety, Health and Emergency Response" developed for the Remedial Action (construction). During this process a systematic safety hazard analysis shall also be performed. If it is determined that significant safety hazards associated with the remediation may be present, the CIH shall utilize a Certified Safety Professional (CSP) (certified by the American Board of Certified Safety Professionals) with 3 years of experience in hazardous waste site operations to assess and recommend requirements to address the identified safety hazards related to cleanup of the contaminants (contaminant specific safety hazards). These hazards may include the handling of hazardous wastes or materials that can present fire/explosion hazards, or chemical treatment processes with inherent safety hazards applicable to that specific remedial design. The CIH shall utilize a Certified Health Physicist (CHP)(Certified by the American Board of Health Physicists) with 3 years of experience in hazardous waste site cleanup operations to assess and recommend requirements to address the identified ionizing radiation hazards as applicable. If the designated CIH possesses both certifications, CIH and CSP, or CIH and CHP, this shall be considered to meet the requirement opposed to utilizing two persons.

(3) Upon completion of the HSDA and during the development and finalization of the section titled Safety, Health and Emergency Response (SHER) specifications for the Remedial Action (construction), a determination shall be made to designate either a CIH, CHP or CSP to be responsible for the development and

oversight of the Remedial Action contractor's SHP and SSHP. For in-house designs, the decision on which certified safety and health professional to designate shall be based on the specific hazards to be encountered, and the site specific, task specific and hazard specific procedures, precautions and equipment determined necessary in the HSDA and SHER section developed in the Remedial Design. For contractor developed designs, the contractor shall recommend to the USACE which safety and health professional to designate, based on the criteria indicated above, with USACE SOH personnel making the final decision. For example, a site possessing significant health related hazards (chemical exposures) should have a CIH designated with overall responsibility; alternately a site possessing primarily physical safety hazards with low potential for health related exposures should have a CSP designated; a site possessing primarily ionizing radiation hazards with low potential for chemical contaminant or safety hazards should have a CHP designated. The requirement shall be placed in the appropriate contract documents (solicitations, SOW's, etc.) prior to issuance. The designated safety and health professional (i.e., CIH, CSP or CHP) shall sign and date the plans.

(4) During the Remedial Action Construction phase a CIH, CSP or CHP with 3 years of experience in hazardous waste site operations shall be designated with overall responsibility for the development, implementation, and oversight of the contractor's Safety and Health Program (SHP) and Site Safety and Health Plan (SSHP), based on the Remedial Design findings. The SSHP shall be signed and dated by the designated safety and health professional.

(5) During the development of SHP's and SSHP's in the Remedial Action phase the designated CIH, CSP or CHP responsible for the contractor's plans shall utilize the services of a qualified and competent industrial hygienist for health related hazards and strategies, a qualified and competent safety professional for physical safety hazards and strategies related to the remediation of the contaminants, or a qualified and competent health physicist for ionizing radiation hazards and strategies, depending on the site specific hazards.

(6) A fully trained and experienced Site Safety and Health Officer (SSHO), responsible to the contractor's CIH/CSP/CHP (or the USACE approving authority for in-house activities), may be delegated to implement and continually enforce the safety and health program and site-specific plan elements on site. The SSHO shall have specific training, knowledge, and experience necessary to implement the SSHP and verify compliance with applicable safety and health requirements. The SSHO shall function as the

Radiation Safety Officer (RSO) as defined and qualified in paragraph 06.E.02 of EM 385-1-1 on sites which involve cleanup of radioactive wastes (unless a separate RSO or HP has been designated for the site).

(7) Fully trained and experienced technicians, responsible to the contractor and the Industrial Hygienist, Health Physicist, or Safety Professional (or the USACE approving authority), may be delegated to implement monitoring and calibration of instruments, and assist the SSHO in enforcing the SSHP.

(8) At least two persons currently certified in First Aid/CPR by the American Red Cross or equivalent agency, according to EM 385-1-1, shall be present on site at all times during site operations.

(9) An Occupational Physician certified in occupational medicine by the American Board of Preventive Medicine, or who, by necessary training and experience is board eligible, shall be responsible for determination of medical surveillance protocols, and for review of all examination/test results.

C-3. Training.

a. All personnel performing on-site work activities, wherein they may be exposed to hazards resulting from hazardous waste site operations, shall have completed applicable training in compliance with 29 CFR 1910/29 CFR 1926, 29 CFR 1910.1200 (HAZCOM) and EM 385-1-1. Although OSHA regulations at 29 CFR 1910.120 and 29 CFR 1926.65 permit varying levels of training based on employee responsibility and exposure potential (i.e., 40 hours and three days or 24 hours and one day), it is the policy of USACE to require the training listed below.

b. Prior to performing on-site HTRW activities in contaminated areas (i.e., Contamination Reduction Zone, Exclusion Zone), USACE and contractor personnel shall successfully complete the following:

(1) A minimum of 40 hours of HTRW health and safety instruction off the site,

(2) Three days of actual field experience under the direct supervision of a trained, experienced supervisor, and

(3) Eight hours of refresher training annually.

(4) All on-site supervisors shall complete the above requirements and an additional 8-hour supervisor's course

covering at least the following topics:

(a) The employer's safety and health program,

(b) Personal protective equipment program,

(c) Spill containment program,

(d) Health hazard monitoring procedures and techniques.

c. Additional, site-specific training covering site hazards, procedures, and all contents of the approved SSHP shall be conducted by the SSHO for all on-site employees, including those assigned only to the Support Zone, prior to the commencement of work; for visitors prior to entering the site; and on an ongoing basis.

(1) 10 CFR 20 requires that employees working with radiation receive training to the extent that they can safely perform their jobs. Training shall also comply with applicable OSHA, DOE and Agreement State requirements (which may be more stringent.) Employees shall be instructed in the following:

(a) Site-specific procedures for handling and storing radioactive materials.

(b) Health and safety hazards associated with exposure to the radioactive material that will be cleaned up or otherwise handled and the purpose and function of protective devices and precautions used to minimize exposure.

(c) Elements of the SSHP and company specific procedures intended to provide protection from radiation exposure.

(d) Worker responsibility to report any unsafe acts or procedures which might result in exposure to ionizing radiation.

(e) Appropriate worker response procedures to on-site events and occurrences which may result in worker exposure.

(f) Worker rights and responsibilities with respect to ionizing radiation exposure.

d. Documentation of all safety and health training including names of employees, duration, contents, and dates of training shall be appended to the SSHP.

C-4. Personal Protective Equipment.

a. A written Personal Protective Equipment (PPE) program in accordance with 29 CFR 1910.132, 29 CFR 1910.120(g)(5)/29 CFR 1926.65(g)(5) and the respiratory protection requirements of 29 CFR 1910.134 is required. When working with radioactive material the respiratory protection requirements of 10 CFR 20 must be met.

b. Provide a detailed description of the minimum PPE and specific materials from which the PPE components are constructed for each site-specific task/operation to be performed, based upon the hazard/risk analysis performed above. Levels of protection must be relevant to site-specific conditions, including potential heat stress and associated PPE safety hazards.

c. Provide site-specific procedures to determine PPE program effectiveness and for on-site fit-testing of respirators, proper cleaning, maintenance, inspection, and storage of all PPE.

C-5. Medical Surveillance.

a. All personnel performing on-site work activities wherein they may be exposed to safety, health or radiologic hazards resulting from site operations shall be participants in an ongoing medical surveillance program, meeting the requirements of 29 CFR 1910.120(f)/29 CFR 1926.65(f), ANSI Z-88.2 and 10 CFR 20 (USACE personnel shall follow the requirements prescribed in EP 385-1-40, USACE Occupational Health Program and USACE Policy Memorandum, Subject: HTRW Medical Surveillance Program Inclusion and Frequency Criteria, dated 29 Sep 1999).

b. In consultation with the Occupational Physician, determine the minimum content and frequencies of necessary medical examinations/tests. This determination shall be based upon probable site conditions, potential occupational exposures and required protective equipment.

c. Examinations shall be performed by or under the supervision of a licensed physician, preferably one knowledgeable in occupational medicine. Examination/test results shall be reviewed by the Occupational Physician.

d. Certification of employees' participation in the medical surveillance program shall be appended to the SSHP. This certification shall include the employees name, the date of last examination, and name of reviewing occupational physician.

e. The written opinion from the attending physician required by 29 CFR 1910.120(f)(7)/29 CFR 1926.65(f)(7) shall be made available upon request to the CO or approving authority for any site employee.

f. All personnel medical monitoring records shall be maintained in accordance with 29 CFR 1910.20.

C-6. Radiation Dosimetry

a. All employees working within a radiologically restricted area shall receive appropriate dosimetry monitoring for radiation exposure.

b. Radiation dosimetry shall be evaluated by an individual holding current personnel dosimetry accreditation from the National Voluntary Laboratory Accreditation Program (NVLAP). Electronic dosimetry may be used to assign external dose if approved by the Qualified Health Physics personnel.

c. All employers (contractors and USACE elements) shall document employee exposure to external radiation. In order to do this employers shall review each employee's radiation exposure history as per 10 CFR 20.2104 for compliance with exposure standards prior to allowing the employee access to a restricted area. If the employee has no exposure history, the employee shall provide a signed written statement to that effect.

d. When there exists the possibility of internal radioactive contamination, employers (contractors and USACE elements) shall estimate exposure with a bioassay program. The bioassay program will provide sampling of employee nasal passages, urine and/or feces, or whole body counting, as appropriate to evaluate the suspected radionuclides. Air monitoring will be used to estimate inhalation exposure to suspected radionuclides.

e. Reports of Exposure to Ionizing Radiation will be furnished:

(1) to each employee:

(a) Annually,

(b) upon termination, and

(c) within 30 days of any personal request.

(2) to the Radiation Safety Officer (RSO) as soon as available.

C-7. Exposure Monitoring/Air Sampling Program.

a. Where it has been determined that there may be potential employee exposures to and/or off-site migration of hazardous concentrations of airborne substances, appropriate direct-reading (real-time) air monitoring and time-integrated (time-weighted average (TWA)) air sampling shall be conducted in accordance with applicable regulations (OSHA, EPA, NRC, State). Air monitoring and air sampling must accurately represent concentrations of airborne contaminants encountered on, and leaving, the site. When appropriate, air sampling shall be conducted to identify the radioactive isotopes and corresponding radiation (alpha, beta, gamma) and activities in the workplace atmosphere and at the perimeter of the site.

b. Real-time screening for ionizing radiation and radioactive materials shall be conducted prior to and during on-site activities where ionizing radiation or radioactive materials may be encountered. When possible, determine the radiation (alpha, beta, gamma) and the exposure rate for each source of radiation.

c. Sampling and analytical methods following NIOSH criteria (for on-site personnel), EPA criteria (for site perimeter or off-site locations) good practice as per 10 CFR 20 subparts C and F for airborne radioactive isotope sampling (on-site personnel and site perimeter) shall be appropriately utilized.

d. Industrial hygiene samples taken to monitor personal exposure shall be analyzed by a laboratory accredited by the American Industrial Hygiene Association and successfully participating in the proficiency analytical testing (PAT) program for the chemical contaminants being sampled for.

e. Representative meteorological data shall be evaluated and used as an adjunct in determining site layout, and perimeter and any off-site monitoring locations. Where perimeter monitoring/sampling is not deemed necessary, a suitable justification for its exclusion shall be provided.

f. Noise monitoring shall be conducted as needed, depending on the hazard/risk analysis.

g. All monitoring/sampling results shall be evaluated and appropriate actions implemented based upon "action levels" established pursuant to paragraph 2.

h. All personnel exposure monitoring records shall be maintained in accordance 29 CFR 1910.20.

C-8. Heat/Cold Stress Monitoring.

a. Heat and/or cold stress monitoring protocols shall be specified and implemented, as appropriate.

b. Physiological monitoring protocols and work/rest schedules shall be developed.

c. The NIOSH/OSHA/USCG/EPA "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities" as well as the American Conference of Governmental Industrial Hygienists (ACGIH) "Threshold Limit Values and Biological Exposure Indices" publication, provides protocols for prevention of heat stress. EM 385-1-1, Section 06.J. provides details on the application of these references depending on the type of clothing worn. Heat stress monitoring shall commence at temperatures of 70 degrees Fahrenheit and above. Cold stress monitoring, to help prevent frostbite and hypothermia, shall be conducted following the most current published ACGIH cold stress TLVs - work/warm-up regimens as prescribed in EM 385-1-1, Section 06.J.

C-10. Standard Operating Safety Procedures, Engineering Controls and Work Practices. Address, as appropriate:

a. Site rules/prohibitions (buddy system, eating/drinking/smoking restrictions, etc.).

b. Work permit requirements (e.g., radioactive work, excavation, hot work, confined space, etc.)

c. Material handling procedures (soils, liquids, radioactive materials).

d. Drum/container handling procedures and precautions (opening, sampling, overpacking).

e. Confined space entry procedures.

f. Hot work, sources of ignition, fire protection/prevention, and electrical safety (ground-fault protection, overhead power line avoidance, etc.).

g. Excavation and trench safety.

h. Guarding of machinery and equipment.

i. Lockout/Tagout.

j. Fall protection.

k. Hazard Communication.

l. Illumination.

m. Sanitation.

n. Engineering controls.

o. Process Safety Management

p. Signs and labels.

C-9. Site Control Measures.

a. Establish work zones and access points. Work zone delineation (Exclusion Zone including restricted and regulated areas, Contamination Reduction Zone, Support Zone) shall be based upon the contamination characterization data and the hazard/risk analysis performed pursuant to paragraphs C-1 and C-2 above.

b. Include a site map delineating the zones established above.

c. On sites where ionizing radiation or radioactive material may be encountered, designate restricted areas (Radiation Areas, High Radiation Areas, and Airborne Radioactive Contamination Areas as defined in 10 CFR 20).

d. Describe on-site and off-site communications.

e. Describe site security (physical and procedural).

f. Describe general site access.

C-10. Personal Hygiene and Decontamination.

a. Specify necessary facilities and their locations.

b. Provide detailed standard operating procedures, frequencies, supplies, and materials to accomplish decontamination of site personnel.

C-11. Equipment Decontamination.

a. Specify necessary facilities, equipment, and their locations.

b. Provide detailed procedures, frequencies, supplies, materials for decontamination, and methods to determine adequacy

of decontamination of equipment used on site. For sites where radioactive contamination is present, include levels of removable and fixed contamination acceptable for release from the exclusion zone.

C-12. Emergency Equipment and First Aid Requirements. The following items, as appropriate, shall be immediately available for on-site use:

a. First aid equipment and supplies approved by the consulting physician.

b. Emergency eyewashes/showers (per ANSI Z-358.1).

c. Emergency-use respirators, (i.e., for escape: 5 - 15 minute emergency escape mask with air bottle; for rescue: positive pressure self-contained breathing apparatus (SCBA)).

d. Spill control materials and equipment.

e. Fire extinguishers (specify type, size, locations).

C-13. Emergency Response and Contingency Procedures (On-Site and Off-site).

a. Local fire/police/rescue authorities having jurisdiction and nearby medical facilities that would be utilized for emergency treatment of injured personnel shall be contacted in order to notify them of upcoming site activities and potential emergency situations, to ascertain their response capabilities, and to obtain a response commitment.

b. An Emergency Response Plan, which complies with 29 CFR 1910.120(l)/29 CFR 1926.65(l), and which, as a minimum, addresses the following elements, shall be developed and implemented:

(1) Pre-emergency planning and procedures for reporting incidents to appropriate government agencies for potential chemical exposures, personal injuries, fires/explosions, environmental spills and releases, discovery of radioactive materials.

(2) Personnel roles, lines of authority, communications.

(3) Posted instructions and list of emergency contacts: physician/nearby medical facility, fire and police departments, ambulance service, Federal/state/local environmental agencies, CIH/CSP/CHP, Contracting Officer, or approving authority for in-house activities.

(4) Emergency recognition and prevention.

(5) Site topography, layout, and prevailing weather conditions.

(6) Criteria and procedures for site evacuation (emergency alerting procedures/employee alarm system, emergency PPE and equipment, safe distances, places of refuge, evacuation routes, site security and control).

(7) Specific procedures for decontamination and medical treatment of injured personnel.

(8) Route maps to nearest pre-notified medical facility.

(9) Criteria for initiating community alert program, contacts and responsibilities.

(10) Critique of emergency responses and follow-up.

c. If all personnel will be evacuated from the site and not allowed to assist in handling the emergency, the emergency response plan listed in Paragraph 15.b. may be replaced by an emergency action plan complying with 29 CFR 1910.38(a).

C-14. Accident Prevention.

a. Any additional Accident Prevention Plan topics required by EM 385-1-1 which are not specifically covered in this appendix, shall be addressed.

b. Daily safety and health inspections shall be conducted to ensure the effectiveness of the SSHP, and determine if operations are being performed in accordance with the SSHP, USACE and OSHA regulations, and contract requirements.

c. In the event of an accident/incident, the CO (or approving authority for in-house USACE activities) shall be notified according to EM 385-1-1. Within two (2) working days of any reportable accident, the contractor (or responsible USACE supervisor for in-house USACE activities) shall complete and submit required Accident Reports. If there is an accident involving radiation the RPO for the USACE Geographic Command or the Radiation Protection Staff Officer (located at HQUSACE, CESO) shall be notified immediately.

C-15. Logs, Reports, and Recordkeeping.

a. The following logs, reports, and records shall be developed, retained, and submitted to the CO (or approving authority for in-house activities):

(1) Training logs (site-specific and visitor), and records of radiological instructions and notices to workers.

(2) Daily safety inspection logs (may be part of the Daily QC Reports).

(3) Equipment maintenance logs.

(4) Employee/visitor register.

(5) Environmental and personal exposure monitoring/ sampling results.

b. For work involving exposure to radiation, the following additional logs, reports and records shall be developed, retained and submitted to the CO (or approving authority for in-house activities):

(1) Records of radiation surveys, monitoring and disposal as per 10 CFR 20 subpart L.

(2) Reports of loss of licensed material as per 10 CFR 20.402.

(3) Notification of Incidents as per 10 CFR 20 subpart M Reports.

(4) Reports of overexposure and excessive levels and concentrations as per 10 CFR 20.405.

(5) Notification and reports to individuals as per 10 CFR 20.409.

APPENDIX C

Construction Quality Control Plan

CONSTRUCTION QUALITY CONTROL PLAN FOR CLOSURE CONSTRUCTION AT SEWAGE LAGOONS

Prepared for:

27 CE/CEV
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TERC Contract No. DACW45-94-D-0003

Delivery Order 35, Work Authorization Directive 1

U.S. Army Corps of Engineers
Omaha District
Omaha, Nebraska

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ACRONYMS AND ABBREVIATIONS

AFB	Air Force Base
CQA	Construction Quality Assurance
CQC	Construction Quality Control
CQM	Construction Quality Control Manager
DCN	Design Change Notice
DFW	definable features of work
DOM	Delivery Order Manager
DQCR	Daily Quality Control Report
EHS	Environmental Health and Safety
FCR	Field Change Request
Foster Wheeler Environmental	Foster Wheeler Environmental Corporation
HIPO	high loss potential
NCR	Nonconformance Report
NMED	New Mexico Environment Department
PE	Professional Engineer
REI	request for engineering information
RFI	request for information
QA/QC	quality assurance/quality control
QAM	USACE Quality Assurance Manager
QCPM	Quality Control Program Manager
SWMU	Solid Waste Management Unit
SWMU 101	Sewage Lagoons
SWPPP	Storm Water Pollution Prevention Plan
TERC	Total Environmental Restoration Contract
USACE	U.S. Army Corps of Engineers
USAF	U.S. Air Force

1. INTRODUCTION

This Plan combines U.S. Army Corps of Engineers (USACE), Omaha District, requirements with the Foster Wheeler Environmental Corporation (Foster Wheeler Environmental) Construction Quality Control (CQC) system requirements to form a set of common requirements commensurate with the scope and nature of services planned under the Total Environmental Restoration Contract (TERC), Delivery Order 35, Work Authorization Directive 1. This Construction Quality Control Plan (CQCP) establishes the procedures and methods to be implemented for the closure of Solid Waste Management Unit (SWMU) 101 (Sewage Lagoons) at Cannon Air Force Base (AFB), New Mexico. This plan has been prepared according to the requirements of the Project Drawings and Specifications (Appendix A).

1.1 Purpose

This CQCP provides an effective system to manage the quality of work performed by Foster Wheeler Environmental and subcontractors and describes the specific organization, personnel, procedures, controls, instructions, tests, records, submittals, and forms to be used to comply with the Contract requirements and Specifications (Appendix A).

1.2 Scope

This CQCP is applicable to all construction operations and related project activities and will be available in the project field office. All work activities will be conducted in accordance with the Specifications and Drawings (Appendix A) and the Work Plan for Closure of SWMU 101. The CQC Plan will be implemented for the following definable features of work (DFWs).

- Preconstruction
  - Field engineering and QC documentation control
  - Site security
  - Waste handling
  - Transportation operations
  - Field communications
- Facility Setup Activities
  - Utility clearance and temporary utilities
  - Temporary trailers and facilities
  - Construction staking/site surveying
  - Temporary erosion and sediment control
  - Equipment mobilization
  - Material Handling and Storage
- Demolition and Removal Activities

- Excavation and Handling of Contaminated Materials
  - Confirmation Sampling

- Final Cover Construction
  - Sludge Consolidation and Random Fill
  - Soil Barrier Layer Construction
  - Biota Barrier Construction
  - Erosion/Vegetation Layer Construction
    - Seeding
  - Site Restoration Activities

- Project Close Out
  - Site cleanup
  - Pre-final and final inspections
  - Demobilization
  - Final QC report and documentation storage

Project activities are further described in Section 3 of the Closure Work Plan.

2. ORGANIZATION AND RESPONSIBILITIES

This section describes the organization and authority for project personnel performing construction operations, both onsite and offsite, including subcontractors, fabricators, suppliers, and purchasing agents. The organizational structure, functional responsibilities, personnel qualifications, levels of authority, and lines of communication are established within the organization to document the quality of the work being performed. The project organization chart showing the reporting lines for each individual is provided as Figure 6-1 in the Closure Work Plan. Resumes are provided in Appendix G.

All personnel assigned to this project will have the appropriate qualifications and experience. The responsibilities and authorities of the key project personnel are described in the following paragraphs.

2.1 Delivery Order Manager

The Delivery Order Manager (DOM), Ms. Carol Bieniulis, is responsible for the direction, execution, and successful completion of project tasks, as well as for the execution of the tasks within overall project goals. Ms. Bieniulis has responsibility for and the authority to perform the following tasks affecting activities related to the project:

- Preparing and approving all proposed Delivery Orders

- Directing the Task Manager to undertake and complete the Work Authorization Directive Scope of Work

2.2 Task Manager

Mr. Rob Ederer, PE is the project Task Manager and the Lead Engineer. He reports to the DOM. His primary responsibility is the implementation of field activities. The duties of the Task Manager as they apply to the project include the following:

- Coordinating work activities of subcontractors and Foster Wheeler Environmental personnel according to the administrative and technical requirements of the project
- Monitoring and reporting the progress of work and managing completion of project deliverables
- Adhering to the quality requirements of the contract, work specifications, and the CQC Plan
- Managing work activities in a safe manner according to the Site Safety and Health Plan, Appendix B
- Serving as the primary contact between base management, USACE, and Foster Wheeler Environmental for actions and information related to the work
- Communicating and interfacing with the Foster Wheeler Environmental Construction Quality Control Manager (CQM)
- Coordinating satisfactory resolution and completion of corrective actions of Nonconformance Reports (NCRs) (Attachment 5)
- Establishing a field base for operations and mobilizing subcontractors and Foster Wheeler Environmental personnel
- Procuring Subcontractors, equipment for work crews, and health and safety personnel
- Monitoring that all Subcontractors performing high loss potential (HIPO) work is approved according to Foster Wheeler Environmental's Environmental Health and Safety (EHS) procedures.
- Coordinating all personnel involved in task activities, including obtaining support services

2.3 Project Site Representative

The Project Site Representative, Mr. James Morning, reports to the Task Manager and is responsible for coordinating, directing, implementing, and supervising site construction activities. Specific duties include the following:

- Implementing construction activities in accordance with the Closure Work Plan
- Directing support personnel and subcontractors
- Administering site access
- Maintaining work site, vehicles, and equipment
- Coordinating and maintaining logistics of all components of onsite tasks, including all personnel and equipment
- Preparing daily production and weekly status reports along with a monthly summary report and estimating future scheduling needs
- Coordinating, preparing, and completing all required field reports
- Implementing the Spill Prevention Control and Countermeasures Plan (Appendix D)
- Implementing the Stormwater Pollution Prevention Plan (Appendix E)
- Serving as the point of contact for engineering inquiries regarding engineering and construction activities
- Implementing field engineering procedures
- Evaluating relevant documents and permits for validity and current status
- Acquiring necessary permits, licenses, and rights-of-way

2.4 Construction Quality Control Personnel

2.4.1 Construction Quality Control Manager

Mr. James Morning will also serve as the CQM and is responsible for managing the daily QC construction activities and reports to the Quality Control Program Manager (QCPM), Ms. Kathy

Omernik. The QCPM is responsible for overall Project QC and final reports and will report to the DOM. Appointment letters assigning both the CQM and QCPM for implementation of the QC program are provided in Attachment 7. The CQM, QCPM, or designee will be onsite at all times during construction. The CQM has the authority to act on behalf of the DOM and the QCPM to stop work on site-related issues affecting the quality of the work performed. In the event of his absence, a qualified individual will be appointed to serve as his replacement. The requirements for the alternate will be the same as for the designated CQM.

The duties of the CQM as they apply to this project include the following:

- Providing and maintaining an effective CQC system for all construction activities
- Monitoring QC activities for conformance with authorized policies, procedures, contract specifications, required standards, sound practices, and methods of quality construction
- Maintaining sufficient staff to perform QC activities for all work phases, work shifts, and work crews
- Preparing the Daily Quality Control Reports (DQCRs) (Attachment 4)
- Maintaining the Testing Plan and Log (Table C-1)
- Documenting the three phases of inspection (preparatory, initial, and follow-up) for all definable phases of work and maintaining Table C-2, Definable Features of Work
- Conducting all required test and inspections are performed and results are documented.
- Conducting required QC meetings, including the preconstruction conference, site survey visit, and other scheduled meetings
- Ensuring that inspections, tests, and sampling activities are conducted in compliance with contract and specification requirements.
- Coordinating and maintaining photograph log sheet, request for information (RFI), and NCR logs
- Reviewing and certifying that all submittals are in compliance with contract and specification requirements (Appendix A); distributing, and maintaining records of approved submittals, and maintaining the submittal register

- Reviewing, distributing, and maintaining records of approved DCNs and FCRs;
- Inspecting material delivery, handling, and storage in accordance with project Specifications (Appendix A)
- Stopping work and correcting work that is not in compliance with the Contract with approval by the DOM and notification of the QCPM
- Inspecting the work performed each day for compliance with the Closure Work Plan and project Specification (Appendix A)

2.4.2 Chemical Quality Control Officer

Pam Moss will serve as the Chemical Quality Control Officer as stipulated in Section 01450 of the Project Specifications (Appendix A). In this capacity, she will oversee laboratory performance, data validation, and management of the data. She will assign a field ananlytical data coordinator to implement the Field Sampling Plan (Attachment 1).

2.5 Field Engineering

The Field Engineering support will be directed by the Task Manager. Field engineering includes survey control, observation, and testing.

2.6 Subcontractors and Vendors

Qualified subcontractors will provide construction services for this project. The subcontractor is required to provide labor, material, and equipment necessary to conduct construction activities as directed by the procurement documents. Subcontractors and vendors will be required to conform with Foster Wheeler Environmental's CQC Plan and the requirements of all approved procedures, Specifications and Drawings (Appendix A), and contract provisions.

The subcontractor's QC inspectors are responsible for field inspection of their construction and operating activities. The subcontractor shall identify and document inspection activities, acceptance criteria defined within the specifications, and inspection results. Foster Wheeler Environmental personnel will monitor, oversee, and make onsite observations and inspections of work in progress to determine whether the subcontractor's work is proceeding according to the CQC Plan. Subcontractor personnel are responsible for maintaining a daily log of the project activities they perform and for providing information needed to complete the DQCR on a daily basis. All inspection records, including inspection reports, deficiency reports, and reinspections of corrective actions, will be documented.

2.7 Submittals

This section describes the review and approval process of submittals. In addition, the CQM will institute and track submittals from issue to approval as described in the Closure Work Plan and the Specifications (Appendix A). A list of required submittals is provided in Section 01330 of the Specifications (Appendix A).

Submittals will be scheduled, reviewed, certified, and managed according to the procedures defined in this section and in Section 01330 of the Specification (Appendix A).

Required submittals may consist of the following types:

- *Data*—Submittals that provide calculations, descriptions, or documentation of the work.
- *Drawings*—Submittals that graphically show the relationship of various components of the work: schematic diagrams of systems and details of fabrication layouts of particular elements, connections, and other relational aspects of the work.
- *Instruction*—Preprinted material that describes the installation of a product, system, or material, including special notices and material safety data sheets concerning impedances, hazards, and safety precautions.
- *Schedule*—Tabular lists showing the location, features, or other pertinent information regarding products, materials, equipment, or components to be used in the work.
- *Statement*—A required document that confirms the quality or orderly progression of a portion of the work by documenting procedures, acceptability of methods or personnel, qualifications, or other verifications of quality.
- *Report*—Reports of inspections or tests, each property identified, and an interpretation of results that includes a description of test methods and all results. Soil physical and chemical test reports are included with this type of submittal.
- *Certificate*—Statement signed by an official authorized to certify on behalf of the manufacturer of a product, system, or material, attesting that the product, system, or material meets specified requirements. The statement must be dated after the award of this contract, must state the contractor's name and address, must name the project and location, and must list the specific requirements that are being certified.

- *Sample*—Samples, including both fabricated and unfabricated physical examples of materials, products, and units of work as complete units or as portions of units of work.
- *Record*—Documentation to record compliance with technical or administrative requirements.
- *Plans*—Work Plans, CQC Plans that document work practices to be performed during construction activities.

2.8 Submittal Requirements

Submittal requirements shall be in accordance with the Specification (Appendix A) and Closure Work Plan. The following requirements apply to all submittals:

- Units of weights and measures will match those used in the Specification (Appendix A)
- Each submittal will be complete and in sufficient detail to allow determination of contract compliance
- The QCPM or CQM will check submittal items prior to submittal routing for approval
- Proposed deviations from the contract requirements shall be clearly identified

2.9 Review of Submittals

Submittals will be reviewed for completeness, accuracy, and contract compliance. All items will be checked by the CQM and approved by the DOM or designated representative. Any submittals requiring modifications or changes will be returned to the originating organization for correction and then resubmitted for review by the CQM and approval by the DOM, or designee, prior to acceptance. Approval by the DOM of the submittal will be indicated by stamping, signing, or initialing, in addition to dating, the submittal form.

2.10 Submittal Process

The CQM will provide all submittals to the USACE Quality Assurance Manager (QAM) and project personnel as determined by the distribution schedule established during the client kick off meeting. Each submittal will have a project document control number. Submittal approval is described in Section 01330 of the Specification (Appendix A). Certain submittals may require accelerated processing to maintain the construction schedule. Submittals shall be transmitted as outlined in Section 01330 of the Specification (Appendix A).

The CQM will update the submittal register regularly.

2.11 Revised Submittals

Revised submittals will be logged, reviewed, and processed in a manner identical with the initial submittal. Long-term disposition of submittals and documents will be maintained in the designated USACE repository.

3. TESTING (OTHER THAN CHEMICAL SAMPLING AND ANALYSIS)

The CQM shall ensure the performance of all tests specified or required by the project Specifications and Drawings (Appendix A) to verify control measures are adequate to provide a product conforming to the Specification (Appendix A). Requirements for testing procedures to be implemented for this project are included in the Specifications and Drawings (Appendix A) and in the Closure Work Plan. Procedures and Requirements for chemical testing and QA is included in the Field Sampling Plan (Attachment 1) and the Quality Assurance Project Plan, Attachment 2, to this CQC Plan.

The type, number, and frequency of required tests are specified in the Testing Plan and Log (Table C-1). Requirements identified in the Specification (Appendix A) shall take precedence over information presented in Table C-1. The CQM will coordinate the required tests with the Resident Engineer. These tests include both operational and acceptance testing as appropriate. For all testing activities, the CQM shall verify and document that:

- Testing procedures comply with Specification (Appendix A) and contract requirements
- Facilities and testing equipment are available and comply with testing standards referenced in the Specification (Appendix A)
- Instrument calibration data checks against certified standards and certification are current
- Recording forms and the test identification control number system have been prepared
- The CQM is responsible for maintaining the testing plan.

Table C-1. Testing Plan and Log

TERC CONTRACT NUMBER: DACW45-94-D-0003 **PROJECT TITLE AND LOCATION:** Closure of SWMU 101, Cannon AFB, NM **CONTRACTOR:** Foster Wheeler Environmental Corporation

Spec. Section & Para. No.	Item of Work	Test Required Method	Accredited/ Approved Lab		Sampled	Tested By	Location of Test		Frequency	Date Completed	Date Forwarded to Contractor Office	Criterion
			Yes	No			On Site	Off Site				
Division 1 - General Requirements												
Section 01450, – Chemical Data Quality Control												
1.4.5	***Confirmation Soil Sampling***											
	(Area B)											
	RCRA Metals	*EPA 6010B*							1 per 40,000 sf			*Proceed as directed by USACE*
	Mercury	*EPA 7471*							1 per 40,000 sf			*Proceed as directed by USACE*
	Pesticides	*EPA 8181A*							1 per 40,000 sf			*Proceed as directed by USACE*
	PCBs	*EPA 8082*							1 per 40,000 sf			*Proceed as directed by USACE*
	Nitrate	*EPA 300.0*							1 per 40,000 sf			*Proceed as directed by USACE*
	Sample Extraction	*EPA 5030A*							1 per 40,000 sf			*NA*
Division 2 – Site Work												
Section 02111 – Excavation and Handling of Contaminated Material												
3.4	Confirmation Soil Sampling* (Area B)	See above - Analyze per Section 01450-1.4.5							1 per 40,000 sq. ft. or 15 samples			*Proceed as directed by USACE*
Section 02115 – Biota Barrier												
Addendum No. 1, Item 2.	Particle Size Analysis ("Gradation curve")	ASTM D 422							*1 per source*			***Only required for imported material***
Addendum No. 1, Item 2.	Soil classification ("Engineering description")	ASTM D 2487							*1 per source*			***Only required for imported material***

Table C-1. Testing Plan and Log

TERC CONTRACT NUMBER: DACW45-94-D-0003 **PROJECT TITLE AND LOCATION:** Closure of SWMU 101, Cannon AFB, NM **CONTRACTOR:** Foster Wheeler Environmental Corporation

Spec. Section & Para. No.	Item of Work	Test Required Method	Accredited/ Approved Lab		Sampled	Tested By	Location of Test		Frequency	Date Completed	Date Forwarded to Contractor Office	Criterion
			Yes	No			On Site	Off Site				
Section 02140 – Erosion/Vegetation Layer												
2.1	**Borrow Source Assessment:**											
	Soil Classification	*ASTM D 2487*							*1 per source*			*CL, SC, or CL-ML*
	Max particle size	*ASTM D 422*							*1 per source*			*Maximum particle size of 1 inch*
	pH	*ASTM D 4972*							*1 per source*			*Between 5 and 7*
	Organic Content (%)	*ASTM D 2947*							*1 per source*			*5 to 20%*
3.1.1.1	*Atterberg limits*	*ASTM 4318*							*1 per source*			For Classification Testing
3.1.1.1	*Particle Size Analysis*	*ASTM D422*							*1 per source*			For Classification Testing
3.1.1.1	*Moisture Content*	*ASTM D2216*							*1 per source*			For Classification Testing
3.1.1.2	Erosion/Vegetative Layer Material	Per parag. 2.1										
3.1.3	**Chemical Contamination Testing**	Per Section 01450							***(no requirements stipulated)***			***Request USACE clarification on the testing required***
	Placement:											
3.2.1.1	*Standard Proctor*	*ASTM D 698*							*1 per 2000 cy (proposed)*			None specified.
3.2.1.1	*Grain size analysis (excluding hydrometer)*	*ASTM D 422*							*1 per 2000 cy*			*Maximum particle size of 1 inch*
3.2.1.1	*PH*	*ASTM D 4972*							*1 per 2000 cy*			*Between 5 and 7*
3.2.1.1	*Organic Content (%)*	*ASTM D2947*							*1 per 2000 cy*			*5 to 20%*
3.4.2	*Nuclear Moisture Content*	*ASTM D 3017*							*1 per 10,000 sq. ft.*			*-2% to +3% of optimum moisture content*
3.4.2 & 3.4.2.1	*Stanadard Moisture Content*	*ASTM D 2216*							*1 per 20 rapid test and a minimum of 3 per day*			*-2% to +3% of optimum moisture content*

Table C-1. Testing Plan and Log

TERC CONTRACT NUMBER: DACW45-94-D-0003 **PROJECT TITLE AND LOCATION:** Closure of SWMU 101, Cannon AFB, NM **CONTRACTOR:** Foster Wheeler Environmental Corporation

Spec. Section & Para. No.	Item of Work	Test Required Method	Accredited/ Approved Lab		Sampled	Tested By	Location of Test		Frequency	Date Completed	Date Forwarded to Contractor Office	Criterion
			Yes	No			On Site	Off Site				
Section 02210 –Earthwork/Grading												
1.3.1 & 1.4	**Random Fill - Borrow Assessment**											
1.3.1	Random Fill Suitable Materials											
	Soils Classification	ASTM D 2487.							1 per source			*GW, GP, GC, GM, SW, SP, SC, SM CL, CH, and ML.*
1.4 & 3.10.2	Compaction Curve (Standard Proctor)	ASTM D 698							1 per source			Reference curve. Required for each principal type of material or combination of materials
3.10.2	Liquid Limit	ASTM 4318							1 per source			None specified
3.10.2	Plastic Limit	ASTM D 4318							1 per source			None specified
3.10.2	In-situ moisture content	ASTM D 2216							1 per source			None specified
3.10.2	Visual description of material	ASTM D 2488							1 per source			None specified
3.10.2	Particle size analysis	ASTM D 422							1 per source			*Maximum particle size of 1 inch*
3.10.2	Soil Classification	ASTM D 2487							1 per source			*GW, GP, GC, GM, SW, SP, SC, SM CL, CH, and ML.*
	Random Fill –Placement											
3.8 & 3.10.1	Field Density	ASTM D2922							1 per 1,500 square yards per lift			90% of maximum density
3.8	Moisture content	ASTM D3017							1 per 1,500 square yards			If soils are cohesive (defined per paragraph 1.3.2) moisture shall be between –1% and +4% of OMC

Table C-1. Testing Plan and Log

TERC CONTRACT NUMBER: DACW45-94-D-0003 **PROJECT TITLE AND LOCATION:** Closure of SWMU 101, Cannon AFB, NM **CONTRACTOR:** Foster Wheeler Environmental Corporation

Spec. Section & Para. No.	Item of Work	Test Required Method	Accredited/ Approved Lab		Sampled	Tested By	Location of Test		Frequency	Date Completed	Date Forwarded to Contractor Office	Criterion
			Yes	No			On Site	Off Site				
Section 02377- Soil Barrier Layer												
1.4 & 3.1	**Source Assessment**											
2.1	Particle size analysis	ASTM D 422							1 per source			Max. particle size = 1 inch Min. passing No. 4 sieve = 80% Min. passing No. 200 sieve = 40%
3.1.1	Visual Classification	ASTM D 2488							1 per test pit or boring			For information. None specified
3.1	Soil Classification	ASTM D 2487							1 per source			For information. None specified
3.1	Liquid and Plastic Limits	*ASTM D 4318*							1 per source			For information. None specified
3.1	Moisture Content	ASTM D-2216							1 per 2,500 cy			For information. None specified.
3.1.2	Standard Proctor ("Compaction Testing").	ASTM D-698							1 per 6,500 cy from each borrow source (min)			For information. None specified. Curves shall developed with a minimum of 5 points.
3.1.2	Modified Proctor ("Compaction Testing")	ASTM D 1557							1 per 6,500 cy from each borrow source (min)			For information. None specified. Curves shall developed with a minimum of 5 points.
3.1.3 & 3.1.4	Hydraulic Conductivity (Saturated) Testing	ASTM D 5084							1 set per 6,500 cy from each borrow source. Minimum of one set of testing per borrow source. *See Paragraph 3.1.3 and 3.1.4)*			1×10^{-6} cm/s maximum tested at a minimum density of 90% and no less than optimum moisture content per ASTM D 698.
3.1.5	**Chemical Contamination Testing**	Per Section 01450							***(no requirements stipulated)***			***Request USACE clarification on the testing required***
3.4	**Soil Barrier Placement**											
3.4	Particle Size Analysis	ASTM D-422							1 per 1,500 cy (At least 1 per day)			Test only: % passing No. 4 and No 200 sieves.

Table C-1. Testing Plan and Log

TERC CONTRACT NUMBER: DACW45-94-D-0003 **PROJECT TITLE AND LOCATION:** Closure of SWMU 101, Cannon AFB, NM **CONTRACTOR:** Foster Wheeler Environmental Corporation

Spec. Section & Para. No.	Item of Work	Test Required Method	Accredited/ Approved Lab		Sampled	Tested By	Location of Test		Frequency	Date Completed	Date Forwarded to Contractor Office	Criterion
			Yes	No			On Site	Off Site				
3.4.2	Relative compaction	ASTM D-698							1 per 5,000 cy			None specified. Reference data
3.4.2	Rapid Moisture Content	ASTM D-3017							1 per 10,000 sq. ft or one per day			See Paragraph 3.4.2.3
3.4.2	Standard Moisture Content	ASTM D-2216							1 per 20 rapid moisture content test.			Correlate to Rapid Moisture Content Tests.
3.4.2	Rapid Density	ASTM D-2922							1 per 10,000 sq. ft. or one per day			See Paragraph 3.4.2.3
3.4.2	Standard Density	ASTM D-1556							1 per 20 rapid density tests			Correlate to Rapid Density test.
3.4.3	Hydraulic Conductivity (Saturated) Tests	ASTM D-5084							5 undisturbed samples collected per ASTM D-1587 and D4220 from each lift.			Less than or equal $1 * 10^{-6}$ cm/s. See Paragraph 3.4.3.

Notes:

deg C	degrees Celsius
cm/s	centimeters per second
cy	cubic yard
ASTM	American Society of Testing and Materials
AASHTO	American Association of State Highway and Transportation Officials
lb	pound
%	percent
sq. ft.	square foot/feet

3.1 Documentation

All test results, both passing and failing, will be recorded on the DQCR for the day the results are obtained. Specification paragraph reference, location where tests were taken, and the sequential control number identifying the test will be given. The actual test reports may be submitted later to the QAM. An information copy of tests performed by offsite facilities will be provided directly to the DOM or designee.

3.2 Laboratory Services

An independent testing laboratory will provide laboratory services required. The laboratory will be selected and qualified according to Section 01451 of the Specification (Appendix A).

4. CONSTRUCTION INSPECTION PLAN

The CQC Plan is the means by which Foster Wheeler Environmental Subcontractors and suppliers comply with the requirements of the contract. The DFWs establish the measures to monitor both the quality of work performed and compliance with specified requirements including inspecting materials and workmanship before, during, and after each DFW. The DFWs for this project are identified in Section 1.2 and described in Table C-2.

The controls defined shall be adequately covered in a coordination and mutual understanding meeting. The meeting will address all construction operations and proposed construction sequence along with the CQC Plan, which includes implementing the following three control phases for all aspects of the work specified:

- Preparatory phase
- Initial phase
- Follow-up phase
- Attachment 3 contains inspection checklist forms for each phase. Inspection requirements specific to this project are discussed below.

4.1 Project Meetings

Conducting and documenting periodic project meetings is the responsibility of Foster Wheeler Environmental. The following sections provide examples of the types of project meetings that may be held.

Table C-2. Definable Features of Work

Activity	Preparatory	Done	Initial	Done	Follow-Up	Done
Preconstruction						
Project Documents Site Security Transportation Field Communication Waste Handling	Ensure work plan and CQC Plan are approved by client Review specification for temporary facility setup, scope of work, and CQA control. Review Base and site security. Review all applicable regulations and Base requirements for traffic control and equipment operation. Make sure waste handling and transportation meets scope of work requirements.		Confirm clear understanding of scope of work with CQA control, technical specifications, and Base requirements. Establish site security procedures. Verify adequate waste material handling and transportation compliance. Confirm radio usage and field communication needs. Verify Base traffic patterns and requirements.		Verify specified plans and Base requirements are complied with. Verify site security. Verify waste handling and transportation requirements are complied with. Make sure of proper field communication.	
Facility Setup						
Underground Utility Identification	Review available Base utility drawings for areas where earthwork are going to take place. Mark out work areas to delineate underground utilities and demark locations for service shutoff.		Make sure that parties contacted respond to their notifications (Dig Alert). Verify that Base drawings are provided to geophysical subcontractor. To locate underground utilities.		Verify that permit is kept current. Verify that drawings generated by underground utility locating personnel are received and kept onsite.	
Facility Setup Activities	Review Scope of Work and subcontractor submittals for construction. Verify that Resident Engineer has reviewed and approved submittals for construction.		Verify that temporary facilities for the project meet requirements of Scope of Work and match subcontractor submittals. Make sure that subcontractor has understanding of work to be performed, personnel are appropriately trained, and that they maintain a current set of design drawings.		Make sure that all work has been performed in compliance with the Scope of Work. Verify that subcontractor provides as-built drawings.	
Construction Staking/Survey	Review Survey Scope of Work. Establish reference monuments		Confirm that Survey crew understands survey area and what specific locations need to be surveyed. Confirm reference monuments		Confirm reference monuments Confirm that surveyor's report is submitted.	
Pre-Earthwork Erosion/ Sediment Control	Review Site Stormwater Pollution Prevention Plan (SWPPP)		Verify that material and equipment for sediment control meet requirements of SWPPP.		Verify and verify implementation of SWPPP.	
Temporary Facilities	Review site layout plan and Base requirements.		Verify facilities meet requirements and submittals.		Verify proper access and setup.	
Equipment Mobilization	Review traffic access and Base requirements.		Verify equipment meets construction needs and safety standards.		Ensure correct operation and maintenance.	

Table C-2. Definable Features of Work

Activity	Preparatory	Done	Initial	Done	Follow-Up	Done
Material Handling and Storage	Review site layout plan, traffic access and Base requirements.		Verify equipment requirements for handling material delivery and that equipment is available.		Document proper handling and storage of material in accordance with specifications and manufacturers recommendation.	
Engineered Cover Constrcution						
Clearing and Grubbing	Review specifications, QA/QC Plan, health and safety plans, and SWPPP. Review stockpiling and soil management requirements. Review equipment usage.		Confirm clear understanding of project plans and scope of work. Verify stockpile layout and dust control. Verify equipment operation maintenance and safety condition.		Document proper soil handling and debris removal in accordance with specifications.	
Demolition and Removal	Review Specification 02220 and drawing requirements . Review demolition sizing requirements.		Define expected level of quality and workmanship and required inspections. Confirm monitoring wells and purge tanks are protected from damage. Confirm demolition sizing requirements. Confirm depth of random fill.		Verify monitoring wells are protected from damage. Verify demolition sizing requirements. Verify depth of random fill .	
Excavation and Handling of Contaminated Material	Review Specification 02111 requirements Review utility clearance and digging permits Confirm site utilities have been field located Confirm pre-excavation survey is scheduled/has been conducted		Define expected level of quality and workmanship. Sub-grade Preparation (Area A): confirm sludge loosened to 24" and dried for 48 hours; compact sub-grade with minimum 3 passes; maximum 1" deflection. Contaminated Material Removal: confirm 12" lifts and dried for 48 hours prior to removal. Contaminated Material Placement: confirm 12" lifts and compaction by 3 passes. Perform confirmation testing per specification and Testing Plan.		Verify sub-grade preparations. Verify contaminated material removal. Verify contaminated material placement. Verify confirmation tests have been accepted. Confirm post-excavation survey has been conducted, recorded, and documented.	
Soil Barrier Layer Construction	Review Specification 02377 requirements Confirm submittals have been approved. Confirm pre-construction survey has been approved. Establish grade stake controls, if used.		Confirm additional borrow sources have been approved. Confirm and perform inspection and test frequency per specification and Testing Plan. Confirm maximum lift thickness. Confirm compaction.		Verify inspection/test frequency and acceptance. Confirm compaction. Inspect for erosion rills >1". Retest and document as required by specification. Confirm post-construction survey has been conducted, recorded, and documented; verify grade –0"/+2".	
Biota Barrier Construction	Review Specification 02115 requirements. Confirm submittals have been approved. Confirm pre-construction survey has been approved.		Confirm maximum biota barrier material particle size. Confirm lift thickness within tolerance. Confirm compaction of 2 passes with a 10-ton smooth roller.		Confirm maximum biota barrier material particle size. Verify lift thickness within tolerance. Verify Compaction of 2 passes with a 10-ton smooth roller. Confirm post-construction survey has been conducted, recorded, and documented/	

Table C-2. Definable Features of Work

Activity	Preparatory	Done	Initial	Done	Follow-Up	Done
Erosion/Vegetation Layer Construction	Review Specification 02140 requirements Confirm submittals have been approved. Confirm pre-placement survey has been approved.		Confirm additional borrow sources have been approved. Confirm and perform inspection and test frequency per specification and Testing Plan. Confirm lift, compaction of 1 pass, and completed thickness.		Verify inspection/test frequency and acceptance. Verify Compaction of 1 pass and completed thickness. Inspect for erosion rills >1". Retest and document as required by specification. Confirm post-construction survey has been conducted, recorded, and documented; verify grade -0"/+0.15'.	
Earthwork	Review project Specifications and Drawings. Review soil management plan and project schedule. Review equipment usage.		Confirm clear understanding of project plan and scope of work. Confirm soil management plan and project schedule. Verify equipment operation maintenance and safety conditions.		Document proper soil handling and placement in accordance with CQC Plan. Proper equipment usage.	
Site Improvement Action						
Site Access	Review specification and drawings for access control.		Confirm project plan and scope of work.		Document proper construction of site road and security access	
Site Seeding	Review specification 2921 requirements Review seeding plan and seed mix design		Confirm seed mix design and planting schedule		Document proper placement. Record maintenance site visits.	
Project Close Out						
Site Cleanup	Review site plans for cleanup, waste handling, and extra material storage.		Verify proper work performance		Perform a pre-final site inspection to document proper work performance.	
Pre-final and Final Inspection	Coordinate completion inspection meeting.		Conduct inspection			
Demobilization	Review Base traffic requirements and equipment removal schedule.		Verify proper project documentation and records filing.		Document proper submittal of final CQC report and documentation storage.	
Final QC Report and Document Storage	Review CQC Plan for document disposition.		Verify proper project documentation and records filing.			

4.1.1 Coordination and Mutual Understanding Meeting

Prior to start of site work, the DOM shall conduct a meeting with the QAM or designated representative to discuss the QC program required by this contract. The purpose of this meeting is to develop a mutual understanding of the QC details, including forms to be used; administration of onsite and offsite work and coordination between Contractor management, production personnel, and CQM and the QAM, or designated representative. At a minimum, the Contractor's personnel required to attend shall include the Task Manager, the Construction Superintendent, and the CQM. Minutes of the meeting shall be prepared by the CQM and signed by the DOM and the Cannon AFB Project Manager or designated representative as well as the QAM. This meeting may be held in conjunction with other meetings (i.e., preconstruction meeting).

4.1.2 Preconstruction QC Meeting

A meeting will be held to resolve any uncertainties with scope of work, design, and Plan before construction is started. Representatives from Cannon AFB and USACE in addition to the DOM and the Construction Superintendent/CQM should be present. The topics of this meeting include but are not limited to:

- Providing each organization with relevant documents and supporting information
- Familiarizing each organization with the CQC Plan and its role relative to the design criteria, Drawings, and Specifications
- Determining any changes to the CQC Plan that are needed
- Reviewing the responsibilities of each organization
- Reviewing lines of authority and communication for each organization
- Discussing the established procedures or protocol for observations and tests including sampling strategies
- Discussing the established procedures or protocol for handling construction deficiencies, repairs, and retesting
- Reviewing methods for documenting and reporting inspection data
- Reviewing methods for distributing and storing documents and reports

- Reviewing work area security and safety protocol
- Conducting a site walk-around to review construction material and inspection equipment storage locations.
- Design or specification changes
- The CQM will document the meeting and minutes will be transmitted to all parties.

4.1.3 Daily Progress Meeting

A progress meeting will be held at the work area. At a minimum, the Construction Superintendent or designee and QC personnel will conduct the meeting. The purpose of the meeting is to:

- Review the previous day's activities and accomplishments
- Review the work location and activities for the day
- Identify the contractor's personnel and equipment assignments for the day
- Discuss any potential construction problems
- This meeting will be documented by QC personnel and recorded in the DQCR (Attachment 4)

4.1.4 Monthly Progress Meeting

A monthly progress meeting will be held at Cannon AFB in conjunction with the monthly status review meetings. The purpose of the meeting is to:

- Review FCRs and DCNs (Attachment 5)
- Review project status
- Review problem identification and deficiency notices and any corrective actions

More frequent progress meetings may be held as required by the level of activity. Monthly meetings are documented in accordance with Section 5.2, Confirmation Notes.

4.2 Preparatory-Phase Inspection

The CQM will conduct preparatory-phase inspections prior to starting the DFWs listed in Table C-2. These inspections shall include:

- A review of each paragraph of applicable specifications
- A review of the contract plans, Drawings, Specifications, and requirements
- A check to determine that all materials and/or equipment have been tested, submitted, and approved
- A check of provisions have been made to provide required control inspection and testing
- An examination of the work area to determine if all required preliminary work has been completed and is in compliance with the contract
- A physical examination of required materials, equipment, and sample work to determine that they are on hand, conform to approved shop drawings or submitted data, and are properly stored
- A review of the appropriate activity hazard analysis to determine safety requirements are met
- A discussion of procedures for constructing the work, including repetitive deficiencies
- Documentation of construction tolerance and workmanship standards for that phase of work
- A check to determine that the portion of the CQC Plan for the work to be performed has been accepted by USACE

The DOM and Cannon AFB Project Manager and QAM representative shall be notified at least 2 workdays in advance of preparatory phase activity. This phase shall include a meeting that will be attended by the CQM and other responsible construction personnel (as applicable) such as the USACE Project Engineer, Subcontractor Site Superintendent, and Health and Safety Representative.

The preparatory-phase meetings will be documented by item on the Preparatory Inspection Checklist (Attachment 3) and will be included as an attachment to the DQCR (Attachment 4). The CQM will advise the Construction Superintendent, who will direct personnel performing work activities as to the acceptable level of workmanship required.

4.3 Initial-Phase Inspection

An initial inspection will be performed at the beginning of a DFW and will include:

- A check of preliminary work to ensure that it is in compliance with contract requirements

- A review of the Inspection Checklist documenting results of the preparatory inspection
- Verification of full contract compliance, including required control inspection and testing
- Establishment of the required level of workmanship and inspection to determine that work meets acceptable standards
- Resolution of all differences
- A check of safety requirements to include compliance with and upgrading of the Site Safety and Health Plan and activity hazard analysis
- A review of the activity analysis with project personnel

The DOM and the QAM representative will be notified at least 2 workdays in advance of any initial-phase activity. The CQM will document initial inspections for each item using the Initial Inspection Checklist (Attachment 3) and attach it to the DQCR (Attachment 4). The exact location of the initial-phase inspection will be indicated for future reference and comparison with follow-up inspections.

A followup inspection will be conducted when acceptable specified quality standards are not being met.

4.4 Follow-Up Phase Inspection

During the completion of a particular work feature, follow-up inspections will be conducted to determine continued compliance with contract requirements. The frequency of the follow-up inspections will depend on the extent of the work being performed on each particular feature. Each follow-up inspection will be documented on the Follow-up Inspection Checklist (Attachment 3), which will be attached to the DQCR (Attachment 4). A final follow-up check will be conducted on any completed work phase prior to the commencement of a subsequent phase. Any deficiencies will be corrected prior to starting additional phases of work or will be identified on a Rework Items List (Attachment 4).

4.5 Additional Preparatory and Initial Phases

The CQM may conduct additional preparatory and initial inspections on the same DFW under the following circumstances:

- If the quality of ongoing work is unacceptable as determined by the DOM, or designee, or the Cannon AFB Project Manager and QAM;
- If there are changes in the staff, onsite supervision, or work crew;

- If work on a definable feature is resumed after a substantial period of inactivity; or
- If other problems develop.

4.6 Completion Inspection

Completion inspections will be performed as summarized in this section.

4.6.1 Construction Quality Control Completion Inspections

The CQM or designated Foster Wheeler Environmental QC inspection personnel will conduct a detailed inspection prior to the pre-final inspection, when all of the work or an increment of work is substantially complete. The DOM and Cannon AFB Project Manager and QAM may also participate and will be notified in advance of the inspection date. The work will be inspected for conformance to plans, drawings, specifications, quality, workmanship, and completeness. The CQM will prepare an itemized list of work not properly completed, inferior workmanship, or work that does not conform to plans, drawings, and specifications. The list will also include outstanding administrative items, such as record drawings, or operations and maintenance plan. The list will be included in the QC documentation, which will be submitted to the DOM or designee and the QAM and Cannon AFB Project Manager within 5 working days following the inspection and will specify an estimated date for correction of each deficiency. The completion inspection will be documented on the Completion Inspection Checklist (Attachment 4) and attached to the DQCR (Attachment 4).

4.6.2 Pre-Final Inspection

Either the CQM will conduct the pre-final inspection. The USACE Resident Engineer; Cannon AFB Project Manager, New Mexico Environment Department (NMED), Foster Wheeler Environmental QC inspection personnel, DOM, or other primary management representative, as applicable, will attend. The DOM or designee will schedule the pre-final inspection in response to notification from the CQM prior to the planned inspection date. The CQM is required to check at this time that all specific items previously identified on the Rework Items List (Attachment 4) as being out of conformance with the drawings and specifications, along with all remaining project work, will be complete and acceptable by the date scheduled for the pre-final inspection. At this inspection, the CQM will develop a specific list of incomplete and/or unacceptable work performed under the contract and will provide this list to the DOM.

4.6.3 Final Acceptance Inspection

The DOM will schedule the final acceptance inspection based on notification from the CQM of readiness. The inspection will include the QC inspection personnel; CQM, or other primary management personnel;

the DOM; and the Cannon AFB Project Manager or QAM. NMED will be notified of the inspection date. Notification will be provided by the CQM to the DOM prior to the planned final acceptance inspection date and must include verification that all specific items previously identified as being out of conformance, along with all remaining work performed under the contract, will be complete and accepted by the date scheduled for the final acceptance inspection.

4.6.4 Inspection Documentation

The CQM is responsible for maintaining the inspection records. Inspection records will be legible and clearly provide all necessary information to verify that the items or activities inspected conform to the specified requirements or, in the case of nonconforming conditions, provide evidence that the conditions were brought into conformance or otherwise accepted by the DOM. All inspection records will be made available to the Cannon AFB Project Manager.

5. DOCUMENTATION

Preparation, review, approval, and issuance of documents affecting quality will be controlled to specified requirements. Project documents to be controlled include:

- Closure Work Plan and Specifications
- Meeting Minutes, Conference Notes, and Confirmation Notes
- Preparatory, Initial and Follow-up Phase Inspection Documentation
- DQCRs and Monthly Summary Report
- Survey Logs
- Testing Plan and Log
- NCRs/Problem Identification List
- Rework Items List
- Evaluation and Acceptance Report
- DCNs

- FCRs
- Pre-Final and Final Acceptance Inspection
- Record (As-Built) Drawings

5.1 Contractor Quality Control Report

The CQM is responsible for maintaining current records of QC operation, activities, and tests performed, including the work of subcontractors and suppliers. The records will include factual evidence that required QC activities and tests were performed. The DQCR will be completed to document construction activities covered by the CQC Plan and will include:

- Contractor/subcontractor(s) and their areas of responsibility
- Trade personnel working on the project that day and number of personnel
- Operating equipment, with hours worked, idle, or down for repair
- Work performed that day, giving location, description, weather conditions, and by whom the work was done
- Any delays encountered
- Test and/or control activities performed with results and references to specifications/plan requirements, including the control phase (Preparatory, Initial, Follow-up) and deficiencies (along with corrective action)
- Material received, with statement as to its acceptability and storage
- Submittals reviewed, with contract reference, by whom, and action taken
- Offsite surveillance activities, including actions taken
- Job safety evaluations stating what was checked, results, and instructions or corrective actions
- A list of instructions given/received and conflicts in plans and/or specifications
- Contractor's verification statement

- Site visitors/purpose, deviations from plans, difficulties, and resolution

The records will indicate a description of both conforming and nonconforming features covered with a statement that equipment and materials incorporated in the work and workmanship comply with the contract. A copy of this report, if requested, will be furnished to the Cannon AFB Project Manager and/or QAM on the first workday following the date covered by the report, except that reports need not be submitted for days during which no work is performed. At a minimum, one report shall be prepared and submitted for every 7 days of no work and on the last day of a no-work period. All calendar days shall be accounted for throughout the life of the contract. The first report following a day of no work will summarize work for that day only. Reports will be signed and dated by the CQM and other appropriate personnel, including subcontractors responsible for completion of activities. The report will include copies of test reports and copies of reports prepared by all subordinate QC personnel.

5.2 Conference Notes and Confirmation Notes

In addition to other required documentation, the CQM is responsible for taking notes and preparing the reports of all conferences. Conference notes will be typed and the original report furnished to the Cannon AFB Project Manager within 7 days after the date of the conference for concurrence and subsequent distribution to all attendees. At a minimum, this report will include:

- Date and place the conference was held
- List of attendees, including name, organization, and telephone number
- Comments made during the conference and decisions affecting criteria changes
- Conference notes that augment the written comments

The DOM, or his designee, is also responsible for providing a record of all discussions, verbal directions, telephone conversations, etc. in which Foster Wheeler Environmental personnel or their representatives participate on matters relating to this contract and work. These records, entitled "Confirmation Notes," will be numbered sequentially and will fully identify participating personnel, subject discussed, and any conclusions reached. The DOM, or his designee, will forward a reproducible copy of the confirmation notes to the Cannon AFB Project Manager, or designee, and QAM within seven workdays.

5.3 Final Documentation

At the conclusion of the project, Foster Wheeler Environmental will provide the QAM with any requirements for long-term maintenance or operation of the site and any turnover documents.

6. NONCONFORMANCES

The CQM documents any work or materials not conforming to the technical specifications or project/contract requirements on an NCR (Attachment 5). The NCR will detail the nonconforming condition, the recommended corrective action(s), and the disposition of the corrective action(s). Qualified representatives from engineering, QA, and construction will review the NCR and either accept or reject the recommended corrective action or disposition. The NCR will remain open until the nonconforming condition has been satisfactorily resolved and verified by QC inspection staff, CQM, and a representative of the Resident Engineer.

6.1 Identification of Nonconforming Items

Items identified as nonconforming will be documented on an NCR that will include the following information:

- Description of nonconforming item or activity
- Detailed description of nonconformance
- Referenced criteria
- Recommended disposition and corrective action to prevent recurrence, as applicable
- Affected organization

Deficient conditions have been divided into three categories:

- In-process deficiencies
- Installed deficiencies
- Conditions that require a Stop Work order

6.1.1 In-Process Deficiencies

In-process deficiencies are those conditions discovered during the course of QC inspections that are intended to be corrected or brought into conformance with requirements. The CQM will notify the Resident Engineer and advise the Construction Superintendent of the problem or deficiency. Items not solved or corrected immediately will be considered in-process deficiencies and will be noted briefly on

the DQCR, detailed on an NCR (Attachment 5), and added to the Rework Items List (Attachment 4). Items on the punch list that cannot be corrected will be considered installed deficiencies.

6.1.2 Installed Deficiencies

Installed deficiencies are those conditions discovered during the QA and/or QC inspection of completed work and found not to meet established acceptance criteria or requirements and cannot be brought into conformance. These conditions will be noted on a Rework Items List (Attachment 4) in addition to an NCR for evaluation and disposition. The CQM will issue the NCR summarizing discrepancies within 24 hours of discovery.

6.1.3 Condition Requiring Stop Work

If corrective actions are insufficient, resolution cannot be reached, or results of prior work are indeterminate, work may be stopped. An immediate Stop Work order can be issued by anyone for health and safety issues. The QCPM, DOM, CQM or QAM can issue a Stop Work order in writing to the Construction Superintendent who will direct construction activities to stop. If there is a disagreement between the CQM and the Construction Superintendent, the difference will be brought to the attention of the DOM until resolution is achieved.

The conditions of the Stop Work order will be noted in the DQCR and described in detail on an NCR and the Rework Items List to allow evaluation of the problem(s) and proper corrective action(s). Work will not continue until the Stop Work order has been resolved by the DOM.

6.2 Nonconforming Items

Nonconforming items will be controlled to prevent inadvertent use of material or workmanship quality. All items noted as nonconforming will be clearly identified and segregated from acceptable items when practical.

6.3 Disposition

The disposition of NCRs will include the necessary actions required to bring the nonconforming condition to an acceptable condition and may include repairing, reworking, replacing, retesting, or reinspecting. Implementation of the disposition may be done in accordance with the original procedural requirements, a specific instruction, or an approved FCR (Attachment 5).

Field Change Requests and Design Change Notices

The construction Site Superintendent initiates the FCR (Attachment 5). The Resident Engineer will qualify a change to the "as-designed" or "as-specified" condition.

Changes will be qualified as follows:

- *Major change*—one that affects the intent of the original design, including equipment, component, system, or structure that relates to function, operation, or safety of the designed product and/or personnel safety

- *Minor change*—one that does not affect the intent of the original design or product, including equipment, component, system, or structure that relates to function, operation, or safety.

- Where the FCR is marked "Minor Change," the CQM may execute the change and, in parallel, obtain concurrence from the QAM and the Task Manager that the change was indeed "minor."

- Where the FCR is marked "Major Change," disposition must be sought from the Resident Engineer before execution. The Resident Engineer will respond by issuing an appropriately executed DCN for approval by DOM and QAM. NMED will be consulted before making any significant design changes. A DCN will not be issued for a "Minor Change" FCR. The DCN is provided in Attachment 5.

The Lead Engineer has the responsibility for identifying and providing input data relative to "Record" conditions. "Record drawings" are drawings that reflect the as-installed conditions, and consist of the latest revision of the design drawing plus attached copies of approved changes and FCRs.

6.4 Corrective Actions

The CQM must immediately identify the need to take corrective action if a nonconforming condition is detected. In addition to resolving identified nonconforming conditions, corrective action records will also address the initial cause of adverse conditions and establish methods and controls to prevent recurrence of the same or similar types of nonconformances. The CQM will monitor the corrective actions to determine that they were properly implemented and accepted and that the original NCR was closed out with an Evaluation and Acceptance Report approved by DOM.

7. QUALITY MANAGEMENT

In addition to the required QC field inspections, the Foster Wheeler Environmental Quality Program requires a Quality Management overview of the site QC program implementation. The QCPM will perform regular internal QC checks on the site implementation of the QC program. Deficiencies, if any, will be reported to the DOM for corrective action.

Inspection will be performed and check for the following:

- Possession and use of approved procedures, standards, and project specifications
- Conformance with appropriate procedures, standards, and instructions
- Thoroughness of performance
- Identification and completeness of documentation generated during performance

8. REFERENCES

USACE
2001. *Sewage Lagoons Final Closure Project. Final Design Drawings and Specifications.*

Attachment 1

Field Sampling Plan

ATTACHMENT 1

FIELD SAMPLING PLAN
FOR
CLOSURE CONSTRUCTION
AT SEWAGE LAGOONS

Prepared for:

27 CE/CEV
Cannon Air Force Base, NM
and
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Under Contract No. DACW45-94-D-0003

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U.S. Army Corps of Engineers
Omaha District
Omaha, Nebraska

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Figure 2-1 Proposed Sample Location Map

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Exhibit A SOP 1 Decontamination Methods
SOP 2 Equipment Decontamination
SOP 3 Sample Handling and Documentation

ACRONYMS AND ABBREVIATIONS

AFB	Air Force Base
AHA	Activity Hazard Analysis
Area A	South Lagoon
Area B	North Lagoon
°C	degrees Celsius
C-O-C	Chain-of-custody
EPA	U.S. Environmental Protection Agency
Foster Wheeler Environmental	Foster Wheeler Environmental Corporation
HASP	Base-Wide Health and Safety Plan
PCB	polychlorinated biphenyl
PPE	personal protective equipment
QAPP	Quality Assurance Project Plan
QC	quality control
RCP	Regulatory Compliance Plan
RCRA	Resource Conservation and Recovery Act
SOP	standard operating procedure
SSHP	Site Safety and Health Plan
SWMU	Solid Waste Management Unit
USACE	U.S. Army Corps of Engineers
USAF	U.S. Air Force
VOC	volatile organic compound

1. INTRODUCTION

The purpose of this document is to describe the field program for confirmation soil sampling of the north lagoon (Area B), Solid Waste Management Unit (SWMU) 101, Cannon Air Force Base (AFB), as required in Section 01450 of the Specifications (Appendix A). Sludge excavated to 24 inches will be dewatered, tilled, aerated, and then placed in the south lagoon. Underlying soil will be excavated to 12 inches and placed in the south lagoon. Confirmation soil samples will be collected from Area B when soil excavation activities are complete. Soil sampling will be conducted to determine that all material exceeding risk-based screening levels has been removed.

Chemical analyses may be required for the borrow source assessments prior to delivery to the site. Suggested analyses for the borrow source are described below.

All field activities will be conducted in accordance with the Base-Wide Health and Safety Plan (HASP) (USAF, 2000), the updated Site Safety and Health Plan (SSHP) (Appendix B) and U.S. Army Corps Engineers Manual EM 385-1-1, Safety and Health Requirements Manual (USACE, 1996).

All activities will be governed by applicable standard operating procedures (SOPs) as included in Exhibit A of this plan. The project-specific SSHP will be adhered to for health and safety on site as well as a site-specific Activity Hazard Analysis (AHA). Supplemental information for the management of waste and project-specific quality control (QC) are provided in Attachment 2 (Quality Assurance Project Plan (QAPP) of Appendix C (Construction Quality Control or CQC Plan) of the Closure Work Plan.

2. CONFIRMATION SOIL SAMPLING

Twenty composite samples will be collected from 20 grid locations across the bottom of the excavated north lagoon. Each sample will be collected employing a disposable stainless-steel spoon and homogenized in a disposable aluminum pan.

The soil samples will be analyzed for the following parameters:

- Resource Conservation and Recovery Act (RCRA) Metals by SW-846 Method 6010B/5030A
- Mercury by SW-846 Method 4171
- Pesticides by SW-846 Method 8181A

- Polychlorinated biphenyls (PCBs) by SW-846 Method 8082
- Nitrate by U.S. Environmental Protection Agency (EPA) Method 300.0

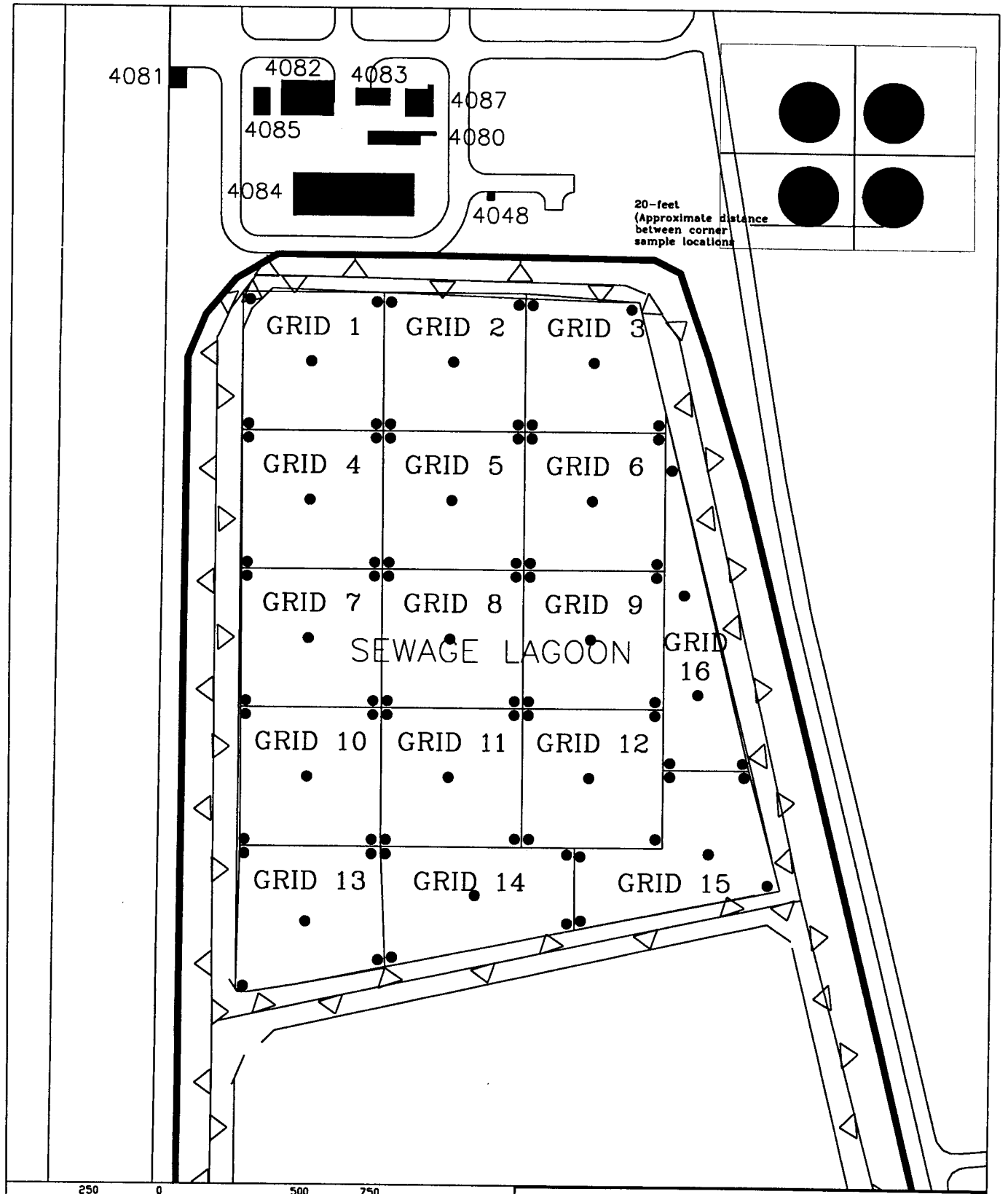
Confirmation sampling will be conducted in accordance with Foster Wheeler Environmental Corporation (Foster Wheeler Environmental) SOPs as included in Exhibit A of this document, and with Section 01450 of the Specifications (Appendix A of the Closure Work Plan). Each confirmation soil sample will be a five-point composite aliquot collected from discrete grid locations along the bottom of the excavation. Samples will be collected from 0 to 12 inches below the excavated bottom grade. Proposed sample locations are shown in Figure 2-1.

3. CHEMICAL ANALYSES FOR BORROW SOURCE ASSESSMENTS

One composite sample will be collected from each proposed borrow source for each specific material type (soil barrier layer and erosion/vegetative layer). Each sample will be collected employing a disposable stainless-steel spoon and homogenized in a disposable aluminum pan. The soil samples will be analyzed for the following parameters:

- RCRA Metals by SW-846 Method 6010B/5030A
- Mercury by SW-846 Method 4171
- Pesticides by SW-846 Method 8181A
- PCBs by SW-846 Method 8082
- Nitrate by EPA Method 300.0

Chemical borrow source assessment sampling will be conducted in accordance with Foster Wheeler Environmental Corporation SOPs as included in Exhibit A of this document and with Section 01450 of the Specifications, Appendix A of the Closure Work Plan.



250 0 500 750

SCALE IN FEET

● Proposed sample location (5-point composite within grid)

FOSTER WHEELER ENVIRONMENTAL CORPORATION

N

Closure of
SWMU 101 - Sewage Lagoon
Cannon Air Force Base, New Mexico
U.S. Army Corps of Engineers, Omaha District

SWMU 101 - Proposed Sample Location Map

Date: 01/30/03

File Name: FSPFig 2-1_Final.dwg

Figure 2-1

4. SAMPLE DESIGNATION

4.1 Sample Numbering

An established numbering system will be used for designating samples collected during restoration activities. The numbering system will consist of an alpha-numeric code, which will identify the sampling site, media, location, sampling event, and contain a sequential sample number.

The following is a general guide for sample designation:

AAAA	BB	NN	XX	ZZ
Sampling Site Code	Sample Matrix	Sample Number	Sampling Depth	QA Designation

Allowable nomenclature for this project is limited to the following:

AAAA: C101 (SWMU 101 – Area A)

BB: SB (soil boring by hand auger)

NN: 01, 02, 03, etc.

XX: 01 for 0 – 1 foot below ground surface

ZZ: 01 for field sample, 02 for field duplicate

For example, the first sample obtained from subsurface soil location #3, collected at the 0 to 1-foot depth, from SWMU 101 will be identified as "C101SB030101." A field duplicate soil sample collected to a depth of 1 foot below ground surface from the third location at SWMU 101 would be identified as "C101SB030102." If a particular code in the numbering system is not used or not applicable, then it will be replaced with a zero or a project-specific code will be defined.

4.2 Field QC Samples

In addition to the regular site samples, the following field QC samples may be collected during sampling events. The frequency of these samples will comply with the following requirements:

- Ten percent of all soil samples will be field duplicates.

- Samples and their respective duplicates will be analyzed for the same parameters in the laboratory.
- Duplicate samples will be given unique sample numbers that do not provide an indication of their intended purpose.

5. SAMPLING EQUIPMENT AND PROCEDURES

All sampling will be conducted in accordance with the following Foster Wheeler Environmental SOPs contained in Exhibit A of this document:

- SOP 1—Decontamination Methods
- SOP 2—Equipment Decontamination
- SOP 3—Sample Handling and Documentation

Details of the implementation of the sampling procedures are contained in the sections referenced above.

6. GUIDANCE FOR FIELD QUALITY CONTROL SAMPLES

6.1 Field Duplicate

Field duplicates are two samples collected independently at a sampling location during a single act of sampling. Field duplicates will be identified such that laboratory personnel are unable to distinguish them from normal field samples.

6.2 Equipment Decontamination

The methods for the proper decontamination of all field sampling equipment are detailed in Exhibit A (SOP 2). Procedures differ according to the type and the intended use of the sampling equipment, as well as guidelines specified by government agencies. All equipment that may directly or indirectly contact samples will be decontaminated in a designated decontamination area. This includes sampling implements and instruments. Care will be taken to prevent the sample device from coming into contact with potentially contaminating substances, such as tape, oil, engine exhaust, corroded surfaces, and dirt.

7. SAMPLE HANDLING AND ANALYSIS

7.1 Sample Packaging and Shipping

The objective of the sample packaging and shipping requirements is to maintain sample integrity from the time a sample is collected until it is received at the analytical laboratory. Chain-of-custody (C-O-C) forms, sample labels, custody seals, and other sample documents will be completed as specified in the QAPP, Attachment 2 to the CQC Plan (Appendix C). Specific procedures for packaging and shipping of environmental samples are presented below:

- A sample label is attached to the sample bottle. Clear tape placed over the completed jar label ensures that the writing remains legible and the label remains on the jar. It is possible for the labels to become separated from the jars if water from melted ice comes into contact with the sample jars.

- Each sample bottle is placed in a separate plastic bag, which is then sealed. As much air as possible is squeezed from the bag before sealing.

- A picnic cooler (such as a Coleman or other sturdy cooler) is typically used as a shipping container. In preparation for shipping samples, the drain plug is taped shut from the inside and outside, and a large plastic bag is used as a liner for the cooler. Approximately 1 in. of packing material, such as asbestos-free vermiculite, perlite, or absorbent padding, is placed in the bottom of the liner.

- The containers are placed in the lined picnic cooler.

- All samples must be shipped cooled to 4 degrees Celsius (°C) with ice. Ice is to be used in shipping soil samples or medium/high-level water samples.

- The cooler is filled with packing material (such as asbestos-free vermiculite, perlite, or absorbent padding), and the liner (garbage bag) is taped shut. Sufficient packing material should be used to prevent sample containers from making contact during shipment.

- A copy of the C-O-C form is placed inside a plastic bag. The bag is sealed and taped to the inside of the cooler lid. The last block on the C-O-C form should indicate the overnight carrier and airbill number. The airbill must be filled out before the samples are handed over to the carrier.

The laboratory should be notified if the sampler suspects that the sample contains any substance for which the laboratory personnel should take safety precautions.

- The cooler is closed and taped shut with strapping tape (filament-type).
- At least two signed custody seals are placed on the cooler, one on the front and one on the back. Additional seals may be used if the sampler or shipper thinks more seals are necessary. Place clear tape over the custody seals to help prevent them from being accidentally torn or ripped off.
- For security reasons the cooler should always be in the possession of Foster Wheeler Environmental or designated personnel until the cooler is handed over to the overnight carrier. A standard airbill is necessary for shipping environmental samples.

7.2 Sample Analytical Requirements

Sample containers, preservation techniques, sample volumes, holding times and analytical procedures will be in accordance with the requirements specified in the QAPP (Appendix C, Attachment 2).

8. FIELD QC PROGRAM

The objective of the field QC Program is to ensure that all field operations, sampling, and measurements produce results that are of known quality and in compliance with specified data quality objectives, and are traceable, technically accurate, legally defensible, and have definable characteristics.

Fundamental mechanisms for achieving established quality goals can be categorized as prevention, quality assessment, and correction, and include the following:

- Prevention of errors by planning and careful selection of methods, processes, and resources
- Quality assessment through a program of audits and surveillances
- Correction of processes to prevent recurrence of conditions adverse to quality
- Incorporation of new processes as they develop to increase quality

The following items are controlled activities to ensure effective implementation of the field sampling program:

- Written and approved Foster Wheeler Environmental SOPs for all field activities (see Exhibit A of this plan).
- Collection of field QC samples at the required frequency; these requirements are detailed in Section 4.2 of this plan.
- Equipment calibration in accordance with the approved procedures and manufacturer's recommendation; equipment calibration is included in the QAPP (Appendix C, Attachment 2).
- Documentation and record-keeping activities.
- Audits, surveillance activities, and a corrective action program.

9. SITE MANAGEMENT AND RECORD-KEEPING

9.1 Site Management

This section summarizes the various measures required to implement field sampling activities. Site access and security, temporary facilities and utilities, waste management, spill and discharge control measures, and contingency plans are some of the items that must be considered in developing project-specific plans. This section contains a general discussion of these considerations and broadly describes the elements associated with them. Each project-specific plan will address these topics on an individual basis, providing greater detail as required by the activities conducted at the site.

9.2 Site Access and Security

Cannon AFB maintains responsibility for all base access and security measures required to gain access to the Base. Site security at areas of concern undergoing closure activities will be performed in accordance with requirements presented in the SSHP.

9.3 Temporary Facilities

Temporary support facilities for closure operations will be identified in the project-specific addenda. Facilities may include office trailers, storage trailers, shower facilities, break trailers, temporary treatment units, connections to utilities, equipment storage yards, and access roads.

9.4 Record-Keeping

Field records sufficient to recreate all sampling and measurement activities will be maintained and will meet all Installation Restoration Program (IRP) Information Management Systems data loading

requirements. The requirements listed in this section apply to all measuring and sampling activities. Requirements specific to individual activities are included in the section that addresses each activity. The information will be recorded with indelible ink in a permanently bound notebook with sequentially numbered pages. These records will be archived in an easily accessible form and made available to the U.S. Air Force (USAF) upon request.

The following information will be recorded in the logbook for all activities:

- Location
- Date and time
- Identity of people performing activity and any visitors
- Weather conditions

A summary of all site activities and level of personnel protection will be recorded in the logbook. No erasures will be permitted. If an incorrect entry is made, the data will be crossed out with a single strike mark, and initialed and dated. At the completion of all entries for a given task or at the end of the day, the logbook will be signed and dated.

The following additional information will be recorded for all field measurements:

- The numerical value and units of each measurement
- The identity of and calibration results for each field instrument
- The following additional information will be recorded for all sampling activities:
- Sample type and sampling method
- The identity of each sample and depth(s), where applicable, from which it was collected
- The amount of each sample
- Sample description (e.g., color, odor, clarity)
- Identification of sampling devices

- Identification of conditions that might affect the representativeness of a sample (e.g., refueling operations, damaged casing)

10. HEALTH AND SAFETY

The Base-Wide HASP (USAF, 2000) and project-specific SSHP, provided by the Subcontractor, will be used during the soil sampling. Based on site-specific information and the levels of constituents in the soil, the subsequent sections are provided as a summary of health and safety protocol to be followed during the surface soil sampling.

10.1 Personal Protective Equipment

Level D personal protective equipment (PPE) will be used to conduct the soil sampling at Cannon AFB. The following items comprise Level D PPE that will be used during sampling activities:

- Sturdy pants and short- or long-sleeved shirt
- Leather or chemical-resistant work boots with a steel toe and shank
- Disposable nitrile outer gloves and latex inner gloves (required for sampling)
- Safety glasses

Gloves used to handle samples shall be removed and replaced prior to collecting a new sample.

10.2 Hazards

An AHA will be provided by the Subcontractor in the SSHP and present the potential physical, chemical, and biological hazards of the field program and the measures that will be taken to mitigate those hazards. Chemical exposure is expected to be minimal.

11. WASTE MANAGEMENT

Waste may be generated as a result of field sampling activities, although waste generation is not expected. Waste minimization techniques will be employed whenever possible. Waste generated during this field program will be characterized using the analytical results available from samples. Wastes that may be generated in the field are listed below:

- PPE
- Trash and general refuse

No liquid waste (decontamination) water will be generated. The management of these wastes will follow the Regulatory Compliance Plan included in Appendix F of the Work Plan.

12. REFERENCES

USACE

1996. *U.S. Army Corps of Engineers Engineering Manual (EM) 385-1-1, Safety and Health Requirements Manual.* September 1996.

2002. *Sewage Lagoons Closure Final Specifications.* U.S. Army Corps of Engineers, Omaha District, September 2002.

USAF

2000. *Final Basewide Health and Safety Plan for Cannon Air Force Base.* Cannon Air Force Base, New Mexico.

Exhibit A

Foster Wheeler Environmental Standard Operating Procedures

SOP 1—Decontamination Methods

SOP 2—Equipment Decontamination

SOP 3—Sample Handling and Documentation

SOP 1—DECONTAMINATION METHODS

Composite soil sampling will be accomplished as follows:

- Wear appropriate personal protective equipment as outlined in the SSHP (Appendix B of the Closure Work Plan). In addition, samplers will don new sampling gloves at each location.
- Use decontaminated stainless-steel sampling equipment for each sample collected for chemical analysis. Sampling equipment at each location will consist of the following:
  - — Stainless-steel pan (or bowl) or disposable aluminum pans (disposable aluminum pans can be used because soil samples are being analyzed for Toxicity Characteristic Leaching Procedure metals)
  - — Stainless-steel spoon or trowel
- Empty soil into a decontaminated stainless-steel or aluminum pan.
- Homogenize samples as described below:
  - — Remove any debris not considered part of the sample and thoroughly mix the remaining sample using a stainless-steel spoon.
  - — Scrape the soil in the pan from the sides and bottom of the pan or bowl and roll to the middle of the pan or bowl, and then mix.
  - — Quarter the sample. Each quarter of the sample should be mixed individually, rolled to the center of the container, and the entire sample mixed again before placing into sample containers.
- Fill sample container jars with soil for analyses using stainless-steel spatulas or spoons after homogenization of the soil, as presented above.
- Decontaminate sampling equipment according to the procedures outlined in SOP 2, Equipment Decontamination. Containerize disposable sampling equipment in plastic trash bags for disposal in a designated dumpster on Base.
- Place analytical samples in sample cooler, chill to 4°C, and ship samples to the laboratory within 24 hours.

- Fill out field notebook, sample labels, custody seals, and chain-of-custody (C-O-C) forms for analytical samples according to the procedures outlined in SOP 3, Sample Handling and Documentation.

SOP 2—EQUIPMENT DECONTAMINATION

Decontaminating Large Equipment

The following procedure will be used to decontaminate large pieces of equipment, such as backhoes or excavators:

- Wash the external surfaces of equipment with high-pressure hot water and a detergent solution consisting of 4 ounces of Liquinox (or equivalent no-phosphate, laboratory-grade detergent) mixed in 10 gallons of potable water. If necessary, scrub until all visible dirt, grease, oil, loose paint, rust flakes, etc., have been removed. Also wash the inside surfaces of the casing and auger flights as described above.
- Rinse with potable water.
- Perform this decontamination procedure before equipment is used and between each sampling location.

Decontaminating Sampling Equipment

The following procedure will be used to decontaminate devices such as split-spoons, spoons, spatulas, and stainless-steel bowls that come in direct contact with the samples:

- Wash and scrub with detergent solution formulated as described above.
- Rinse with potable water.
- Triple rinse with deionized, analyte-free water.
- Air dry.
- Wrap in aluminum foil.

Decontamination of sampling equipment will be kept to a minimum in the field; whenever possible, dedicated or disposable sampling equipment will be used. All large equipment will be decontaminated prior to leaving the site. Mobile or temporary decontamination stations will be constructed, as appropriate, to adequately capture and contain decontamination fluids. Decontamination fluids will be disposed as discussed in the Regulatory Compliance Plan, Appendix F of the Closure Work Plan. If the Cannon AFB decontamination pad or wash rack are available, all decontamination fluids will be disposed

in this facility. Personnel directly involved in equipment decontamination will wear appropriate personal protective equipment, including nitrile gloves and safety glasses or face shield.

SOP 3—SAMPLE HANDLING AND DOCUMENTATION

Labeling

All sample containers will be labeled. Labels may be partially completed prior to sample collection. The date, time, and sampler's name should NOT be completed until the time of sample collection. Self-adhesive sample labels containing all appropriate sample information, including sample identification, field sample number, sample type, and analyses requested, will be generated by the field sampling team. Sample labels will be completed with waterproof ink. Soil samples collected in stainless-steel liners will be capped and sealed immediately following collection and a completed label attached. Sample labels must be completed and attached prior to sample collection for soil samples collected in jars.

At a minimum, each numbered label must contain the following information:

- Project and facility
- Date and time of sample collection
- Analyses required
- Preservation used
- Sampler's initials
- Sample identification number

Sampling Containers

Certified, commercially clean sample containers will be obtained from the contract analytical laboratory. If appropriate, the bottles will be labeled by the laboratory to indicate the type of sample to be collected. Soil samples will typically be collected in glass vials, wide-mouth sample jars, or in stainless-steel liners. For samples collected in stainless-steel liners, the liners will be sealed by covering each end with a square of Teflon® tape and a plastic cap. Caps will be secured with electrical tape prior to affixing the sample label.

Sample Preservation

All samples will be stored on ice in an insulated cooler immediately following sample collection. Soil and sludge samples do not require additional preservation. Table 4-1 in Section 4 of the QAPP

(Appendix C, Attachment 2) lists appropriate sample containers for the specific matrix and analyses required for this project.

Sample Handling and Shipping

Sample containers will be placed in recloseable plastic storage bags and wrapped in protective packing material (if appropriate). Ice will be placed on top of the samples in a cooler for shipment to the laboratory. The drain on the cooler will be taped shut. Samples collected in glass containers will be packed in bubble packing or Styrofoam peanuts to ensure that no breakage occurs during shipment. Samples will be shipped by overnight express carrier for delivery to the analytical laboratory.

A completed C-O-C form for each cooler will be placed in a resealable plastic bag and taped to the inside of the cooler lid. Coolers will be wrapped with strapping tape at two locations to secure lids. Dated and signed custody seals will be placed on the outside of each cooler. Note that each cooler cannot exceed the weight limit set by the shipper.

Holding Times and Analyses

The holding time is specified as the maximum allowable time between sample collection and analysis and/or extraction, based on the analyte of interest, stability factors, and preservation methods. Allowable holding times are listed in the QAPP (Appendix C, Attachment 2). Samples should be sent by overnight courier service to the laboratory daily after collection. Chemical constituents that will be analyzed during the field investigation have been identified in the Closure Work Plan.

Sample Documentation and Tracking

This section describes documentation required in the field notes, Daily Quality Control Reports (DQCRs), and sample C-O-C requirements.

Field Notes

Documentation of observations and data acquired in the field will provide information on the acquisition of samples and also provide a permanent record of field activities. The observations and data will be recorded with waterproof ink in a permanently bound weatherproof field book with consecutively numbered pages and, if applicable, on field sampling data sheets.

The information in the field book will include the following, as a minimum. Additional information is included in the specific SOPs regarding the appropriate data sheets:

- Project name
- Location of sample and time collected
- Description of samples (matrix sampled)
- Number and volume of samples
- Sample methods or reference to the appropriate SOP
- Sample handling, including preservation, as appropriate for samples
- Field observations
- Personnel present
- Weather conditions

Changes or deletions in the field book will be lined out with a single strike mark, initialed, and dated by the person making the change, and remain legible. Sufficient information will be recorded to allow the sampling event to be reconstructed without relying on the collector's memory.

The person making the entry will sign each page of the field book. Anyone making entries in another person's field book will initial and date those entries.

Daily Quality Control Report

To supplement the information recorded in the field book, DQCRs will also be maintained to document daily field activities and will note any nonconformances and corrective actions taken at every sampling location. Details on the completion and submittal of DQCRs are provided in Appendix C of the Work Plan (CQC Plan).

Sample Chain-of-Custody

During field sampling activities, traceability of the sample must be maintained from the time the samples are collected until laboratory data are issued. Information on the custody, transfer, handling, and shipping of samples will be recorded on a C-O-C form. An example of a C-O-C form is presented in the QAPP, Attachment 2, of Appendix C of the Closure Work Plan. C-O-C forms will be generated in the field by

the field sampling team and will include site identification, field sample number, sample type, and analysis requested.

The sampler will sign the C-O-C when the sampler relinquishes the samples to anyone else. It is not necessary for Federal Express to sign C-O-Cs; however, the airbill will be retained by the sample handler for tracking purposes. A C-O-C form will be completed for each set of samples collected daily and will contain the following information:

- Sampler's signature
- Project name
- Date and time of sample collection
- Sample identification number
- Sample type/matrix
- Sample depth intervals (if applicable)
- Preservative used
- Analyses requested
- Number of containers
- Signature of persons relinquishing custody, dates, and times
- Signature of persons accepting custody, dates, and times (laboratory)
- Method of shipment (i.e., Federal Express)

The person responsible for delivery of the samples to the air carrier will sign the C-O-C form, retain the last copy of the C-O-C form, document the method shipment, and send the original and the second copy of the C-O-C form with the sample (taped in a resealable plastic bag to inner cooler lid). Upon receipt by the laboratory, the person receiving the samples will sign the C-O-C form and return the second copy to the Project Manager. Copies of the C-O-C forms and all custody documentation will be received and kept in the central files. The original C-O-C forms will remain with the samples until final disposition of the

samples by the laboratory. The analytical laboratory will dispose of the samples in an appropriate manner 60 to 90 days after data reporting.

Field Change Requests

Field Change Requests (FCRs) will be submitted to the USACE for approval if any deviation from the procedures or specifications contained in the Work Plan occurs. Details on the completion and submittal of FCRs are provided in Appendix C of the Work Plan (CQC Plan).

Attachment 2

Quality Assurance Project Plan

ATTACHMENT 2

QUALITY ASSURANCE PROJECT PLAN
FOR
CLOSURE CONSTRUCTION
AT SEWAGE LAGOONS

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Table 4-1. Sample Requirements

Table 6-1. Listing of Analytical Methods for Chemical Analysis

ACRONYMS AND ABBREVIATIONS

AA	Atomic Adsorption
AFB	Air Force Base
AFCEE	Air Force Center for Environmental Excellence
C-O-C	Chain-of-custody
CRDL	Contract Required Detection Limit
DMP	Data Management Plan
DQO	Data Quality Objective
EPA	U.S. Environmental Protection Agency
Foster Wheeler Environmental	Foster Wheeler Environmental Corporation
FSP	Field Sampling Plan
GC/MS	gas chromatography/mass spectrometry
HASP	Base-Wide Health and Safety Plan
ICP	Inductively Coupled Plasma
IDL	Instrument Detection Limit
IRP	Installation Restoration Program
IRPIMS	IRP Information Management Systems
LCS	Laboratory Control Standard
LCSD	Laboratory Control Standard Duplicate
MDL	Method Detection Limit
MSA	Method of Standard Additions
MS/MSD	matrix spike/matrix spike duplicate
µg/kg	microgram per kilogram
mg/kg	milligram per kilogram
PARCC	precision, accuracy, representativeness, completeness, and comparability
PCBs	Polychlorinated biphenyls
PQL	Practical Quantitation Limit
QAPP	Quality Assurance Project Plan
QA	quality assurance
QC	quality control
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Studies
RPD	Relative Percent Difference
SOP	Standard Operating Procedure
SOS	Scope of Services

ACRONYMS AND ABBREVIATIONS (Continued)

SVOCs	Semi-Volatile Organinc Compounds
SWMU	Solid Waste Management Unit
SWMU 101	Sewage Lagoons
TIC	tentatively identified compound
TPH	Total Petroleum Hydrocarbons
USACE	U.S. Army Corps of Engineers
USAF	U.S. Air Force
VOA	Volatile Organic Analysis
VOC	Vlatile Oganic Cmpound

1. INTRODUCTION

This Quality Assurance Project Plan (QAPP) has been prepared to provide a framework and basic criteria required to support environmental sampling activities at Cannon Air Force Base (AFB) in Clovis, New Mexico associated with the closure of Solid Waste Management Unit (SWMU) 101, Sewage Lagoons.

The purpose of this QAPP is to describe the policies, objectives, concepts, systems, and procedures to support the implementation of sampling activities at Cannon AFB. This QAPP identifies and describes the elements of the quality assurance/quality control (QA/QC) system integral to the closure of SWMU 101, Sewage Lagoons. Effective implementation of individual QA/QC requirements, procedures, instructions, and reports developed from this QAPP, together with project-specific addenda, will ensure that:

- All project activities are conducted in a safe manner protecting the public, Base personnel, property, and the environment
- All environmental data are of the appropriate type and are of known, acceptable, and defensible quality needed for their intended use
- All remedial/removal activities (e.g., waste collection, waste treatment, waste containment, waste storage, and waste transport) are performed in accordance with defined requirements and expectations
- All work is performed in compliance with governing regulatory and contractual requirements

The QAPP has been prepared in accordance with the requirements and guidelines established by the U.S. Environmental Protection Agency (EPA), the U.S. Army Corps of Engineers (USACE), and the U.S. Air Force (USAF) for data collection and program management. The references used in preparing this document are:

- EPA 1980, Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans, (QAMS-005/80, December 29, 1980 and revised February 1983)
- USACE 1990, Chemical Data Quality Management for Hazardous Waste Site Remedial Activities (ER 1110-1-263, October 1, 1990)

- EPA 1989, Resource Conservation and Recovery Act (RCRA) Facility Investigation Guidance, Volume. I: Development of an RFI Work Plan and General Considerations for RCRA Facility Investigations (EPA 530/SW-89-031, May 1989)

- Air Force Center for Environmental Excellence (AFCEE) 1993, Handbook for the Installation Restoration Program (IRP) Remedial Investigation/Feasibility Studies (RI/FS), September 1993

2. SUBCONTRACTOR QUALIFICATIONS

The analytical laboratory's qualifications will include current USACE certification (within two years). The analytical laboratory representative will have ultimate responsibility for all analyses performed at the analytical laboratory. The assigned laboratory representative is responsible for ensuring that work is performed according to USACE's Chemistry Scope of Services (SOS) and this QAPP.

3. QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA

Field and laboratory data will be collected during environmental restoration activities to be implemented at Cannon AFB. The overall QA objective is to develop and implement environmental restoration activities that will provide data of known and acceptable quality.

3.1 Data Quality Objectives

The requirements for Data Quality Objectives (DQOs) are described in Section 01450 of the Specifications (Appendix A of the Closure Work Plan) and are qualitative and quantitative statements that specify the quality of data generated to support decision making. DQOs are scoping and planning tools applicable to every data generation effort and are a necessary step in the development of project-specific plans. For each data-gathering task, DQOs will be developed during project scoping. These DQOs include a description of the purpose of the task, the specific activities to be performed, the intermediate and end uses of the generated data, and the resultant data quality which is required.

Based on the end use of the data, different levels of data quality may be required. Five analytical levels are available depending on intended use of the data and QA/QC methods required to achieve the desired level of quality. Of the five levels of analytical approach, the following level is applicable to achieving the goals of the environmental sampling required:

Analytical Level III: This provides confirmation data with QA/QC similar to Level IV, but contains less documentation. These analyses provide quantitative results and may cost less than

Level IV. Typically, the data packages for these analyses do not contain raw instrument output, but include the summaries of QA/QC sample results. Level III may be used when analyses require rigid, well-defined protocols, but where other information is available, so that a complete raw data package validation effort is not required. However, the laboratories will be required to retain, in the project file, the raw instrument data required to upgrade Level III data to Level IV, as necessary. Level III data provides sufficient quality for purposes of risk assessment, nature and extent of contamination, and corrective measures studies.

3.2 Data Quality Indicators

The PARCC (precision, accuracy, representativeness, completeness, and comparability) parameters are indicators of data quality. Ideally, the end use of the measurement data should define the necessary PARCC parameters. The following sections discuss data quality indicators as they apply to measurement of data, including field and laboratory analyses.

3.2.1 Precision

Precision is a measure of the degree to which two or more measurements are in agreement. Precision control limits (objectives) will be as specified by the analytical methods.

Precision will be determined through the comparison of matrix spikes and matrix spike duplicates (MS/MSD) for the organic analytical work performed at Cannon AFB. The laboratory will select one sample in 20 project samples and split the sample into three aliquots. The first aliquot will be analyzed routinely for organic target compounds while the aliquot(s) will be spiked with known quantities of the parameters of interest prior to analysis. The relative percent difference (RPD) will be calculated and used as an indication of the precision for the analyses performed.

Precision for the inorganic analyses will be evaluated by comparing laboratory duplicate analysis of an environmental sample. The laboratory will select one sample in every 20 project samples and split the samples into three aliquots. The first aliquot will be analyzed routinely for inorganic parameters, while the second aliquot will serve as a duplicate, and the third aliquot will be spiked with known quantities of target analytes prior to analysis. The RPD of the unspiked duplicate samples will be calculated and used as a measure of precision for the inorganic analyses.

3.2.2 Accuracy

Accuracy is the degree of agreement between an observed value and an accepted reference value.

3.2.2.1 Field Accuracy Objectives

Sampling accuracy will be determined by collecting and analyzing field and trip blanks and adhering to all sample handling, preservation, and holding times. For on-site field test kits and meters, accuracy will be determined by analysis of calibration standards prior to sample collection.

3.2.2.2 Laboratory Accuracy Objectives

Accuracy is expressed as the percent recovery of standards and matrix spikes. Accuracy control limits will be as specified by the analytical methods. Standards measure the bias of the analytical system—reagents, equipment, instrumentation, and analyst technique. Matrix and surrogate spikes measure sample matrix effects as well as the analytical system bias. In general, calibration and laboratory control standards are used to monitor and control the analytical system, while matrix spikes are used to screen for matrix effects.

System monitoring compounds (surrogates) will be spiked into all blanks, standards, and environmental samples (including MS/MSD samples) prior to purging or extraction. Surrogates are compounds that are chemically representative of the method target compounds. After analysis is performed, surrogate percent recoveries are calculated. These surrogate percent recoveries will show the efficiency by which the analytical system is measuring known amounts of different compounds. Surrogate recoveries can, however, be influenced by matrix interference. Therefore, data for different matrices are compiled by laboratories, and statistically based limits are established for solid and aqueous matrix percent recoveries.

Method blank analyses also monitor and control the bias of the analytical system by measuring trace levels of contamination. In general, method blanks containing target analyte(s) at levels greater than the detection limits trigger the need for corrective action.

Accuracy in the laboratory will be measured by analyzing matrix spikes at a frequency of one for every 20 project samples. In addition, quantifiable accuracy will be determined with each batch of samples prepared and analyzed by the use of laboratory control standards (LCS).

3.2.3 Representativeness

Representativeness expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition.

Representativeness in the laboratory is ensured by using the proper analytical procedures and meeting sample holding times. Analyzing and assessing field duplicated samples will be used to assess

representativeness as well as precision. Sampling networks are designed to provide data representative of facility conditions. During development of sampling networks, consideration is given to past site practices, existing analytical data, physical setting and processes, and constraints inherent to the environmental restoration program. The rationale of sampling networks is discussed in detail in the FSP. Representativeness will be ensured through the implementation of approved, consistent procedures.

3.2.4 Comparability

Comparability is an expression of the confidence with which one data set can be compared with another.

3.2.4.1 Measures to Ensure Comparability of Field Data

Comparability is dependent upon the proper design of the sampling program and will be satisfied by ensuring that the Field Sampling Plan (FSP) (Attachment 1, Appendix C of Closure Work Plan) is followed and that proper sampling techniques are used.

3.2.4.2 Measures to Ensure Comparability of Laboratory Data

Planned analytical data will be comparable when similar sampling and analytical methods are used and documented in the QAPP. Comparability is also dependent on similar QA objectives. To optimize comparability, EPA-established methods and protocols will be used whenever possible to collect and analyze samples. By using specific sampling and analytical procedures, including the reporting of the analytical data using common standard units, all data sets will be comparable at each specific site at Cannon AFB and between sites at Cannon AFB to ensure that decisions and priorities are based on a consistent data base.

All solid matrix results for the specified analytical methods will be reported on a dry weight basis. All organic analyses will be reported as micrograms per kilogram (μg/kg) for soil and most inorganic analyses will be reported in milligrams per kilogram (mg/kg) for soil.

3.2.5 Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions.

3.2.5.1 Field Completeness Objectives

Field completeness is a measure of the amount of valid measurements obtained from all the measurements taken in the project. Field completeness objectives for Cannon AFB projects will be greater than 90 percent.

3.2.5.2 Laboratory Completeness Objectives

Laboratory completeness is a measure of the amount of valid measurements obtained from all measurements taken in the project. The equation for completeness is presented in Section 8.1.3 of this QAPP. Laboratory completeness objectives for projects will be greater than 95 percent.

3.3 Level of Field Quality Control Effort

Temperature blanks, method blanks, field duplicates, standard reference material, and MS/MSD samples will be analyzed to assess the quality of the data resulting from the field sampling and analytical programs.

Method blank samples are generated within the laboratory and used to assess contamination resulting from laboratory procedures. Field duplicate samples are analyzed to check for sampling and analytical reproducibility. Matrix spikes provide information about the effect of the sample matrix on the digestion and measurement methodology. All matrix spikes are performed in duplicate and are hereinafter referred to as MS/MSD samples. One MS/MSD will be collected for every 20 or fewer investigative samples. MS/MSD samples are designated/collected for organic analyses only. Soil MS/MSD samples require extra volume for volatile organic compounds (VOCs) or extractable organics.

The general level of the QC effort will be one field duplicate/replicate and one equipment blank for every 20 or fewer investigative samples.

3.4 Laboratory Quality Assurance Program

All laboratories will provide a written QA Program, demonstrate MRD certification, and be approved by the USACE. In addition, the laboratories will have Standard Operating Procedures (SOPs) for the following:

- Sample receipt and logging
- Sample storage
- Preventing sample contamination
- Security for laboratory and samples
- Standards purity/preparation
- Maintaining instrument records and logbooks

- Sample analysis and data control systems
- Glassware cleaning
- Technical and managerial review of laboratory operation and data package preparation
- Internal review of quality assurance and quality control data
- Sample analysis, data handling, and reporting
- Chain-of-custody (C-O-C) procedures and document control
- Laboratory data validation/laboratory self-inspection system
- Data management and handling

4. FIELD INVESTIGATION PROCEDURES

4.1 Sampling Protocols

The purpose of sampling is to obtain specimens that represent the situation being studied. Specific protocols for sampling are presented in the FSP, Attachment 1 of Appendix C of the Closure Work Plan. These protocols describe procedures for acquiring samples that best represent the environmental matrix. Contamination of samples from external sources will be controlled through proper decontamination of sampling equipment as well as following good sampling techniques.

4.2 Sample Volume, Holding Times, Containers, and Preservation

The preservation, holding times, and the containers to be used will be specified in the project-specific plans. Table 4-1 lists the recommended sample volumes, sample containers, preservatives, and holding times for the analytical methods which may be used during the course of the environmental restoration activities.

Table 4-1. Sample Requirements

Matrix	Parameter	Container[1]	Preservation[2]	Maximum Holding Times	
				Extraction	Analysis
Soils/Sediments	Volatiles	2 x 40 mL G or 2 x 125 mL G, Septa vial	Ice to 4°C	—	14 d
Soils/Sediments	SVOCs, PCBs Pesticides	1 x 8 oz G	Ice to 4°C	14 d	40 d
Soils/Sediments	Metals, Cyanide, TPH	1 x 8 oz G	Ice to 4°C	—	6 mo[3], 14 d, 28 d
Soils/Sediments	Explosives	1 x 4 oz G	Ice to 4°C	14 d	40 d

Notes:

1 All containers must have Teflon-lined seals (Teflon-lined septa for volatile organic analysis [VOA] vials).
G = Glass d = day

2. Sample preservation will be done in the field immediately upon sample collection. If water samples are filtered in the field, differential pressure methods using 45 micron filters will be used, and preservatives added after filtration. VOA samples should never be filtered.

3. Total Recoverable Metals for water samples. Holding time for Hg is 28 days in glass; for Cr(VI) is 24 hours.

5. SAMPLE CUSTODY AND RECORD-KEEPING

The history of each sample and its handling is documented from its collection through all transfers of custody until it has reached an analytical laboratory. Internal laboratory records then document the custody of the sample through its final disposition.

5.1 Field Custody Procedures

5.1.1 Field Documentation

Field logbooks will provide the means of recording all data collection activities. When in situ or field measurements are made, the data are recorded directly in the field logbook, with identifying information (project code, station numbers, station location, date, time, samplers), field observations, and remarks.

Samples for laboratory analysis will be collected following the procedures provided in the FSP (Attachment 1 of Appendix C). The equipment used to collect samples will be noted in the field logbook, along with the time of sampling, sample description, depth or other location characteristics, and volume and number of containers. A sample identification number will be assigned prior to sample collection. The sample container is identified by a sample label. The information recorded on the sample label includes sampling location, date and time, type of analysis required, and preservation notes. The sample label also contains an appropriate place for designating the sample as a grab or a composite and identifying the type of sample (water, soil, etc.) collected for analyses. A typical sample label is shown in Figure 5-1.

Figure 5-1. Typical Sample Label

FWENC PROJECT: _____
SAMPLE NO. _____
DATE: __/__/__ TIME: _____HRS
MEDIUM: _____
TYPE: *GRAB* ☐ *COMPOSITE* ☐
PRESERVATION: _____
ANALYSIS: _____
SAMPLED BY: _____
LAB NO.: _____
REMARKS: _____

After collection, separation, identification, and preservation, the sample is maintained under C-O-C procedures until it is in the custody of the analytical laboratory, at which time the analytical laboratory will implement an internal C-O-C procedure. Samples will be traceable from the time they are collected until they or their derived data are used in the final report. In order to maintain and document sample possession, the following C-O-C procedure is implemented:

- Samples are collected as described in the FSP (Attachment 1, Appendix C). Only enough of the sample should be collected to provide a good representation of the medium being sampled. To the extent possible, the quantity and types of samples and the sample locations are determined before the actual fieldwork. As few people as possible should handle the samples.

- The field sampler is personally responsible for the care and custody of the samples collected until they are properly transferred or dispatched.

- Logbooks and other records are signed and dated.

- When photographs are taken of the sampling as part of the documentation procedure, the name of the photographer, date, time, site location, and site description are entered sequentially in the logbook as photos are taken. Once developed, the photographic prints will be serially numbered corresponding to the logbook descriptions.

When video documentation is used, audio documentation of the film, date, time, site location, and site description will be given.

Sample labels will be completed for each sample using waterproof ink unless prohibited by weather conditions (e.g., a logbook notation would explain that a pencil was used to fill out the sample label because a ball point pen would not function in freezing weather).

5.1.2 Transfer of Custody and Shipment

The following procedures will be implemented when transferring and shipping samples:

- Samples are accompanied by a C-O-C record. A typical C-O-C record is depicted in Figure 5-2. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the record. This record documents sample custody transfer from the sampler, often through another person, to the analyst in the laboratory.

Figure 5-2. Typical Chain-of-Custody Record

PROJ. NO.	PROJECT NAME														
SAMPLERS : (Signatures)															
STA.NO.	DATE	TIME	COMP	GRAB	STATION LOCATION	PRESERVATIVE	NO. OF CONTAINERS								REMARKS

Relinquished by: *(Signature)*	Date	Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date	Time	Received by: *(Signature)*	
Relinquished by: *(Signature)*	Date	Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date	Time	Received by: *(Signature)*	
Relinquished by: *(Signature)*	Date	Time	Received for Laboratory by: *(Signature)*	Remarks				

- Samples will be packaged properly for shipment and dispatched to the appropriate laboratory for analysis, with a separate custody record accompanying each shipment (e.g., one for each field laboratory, one for samples shipped, driven, or otherwise transported to the laboratory). Shipping containers will be sealed for shipment to the laboratory. The method of shipment, courier

name(s), air bill number, and other pertinent information will be entered in the "Remarks" section on the custody record.

- When samples are shipped to the laboratory, they must be placed in padlocked containers or containers sealed with custody seals. Custody seals include the signature of the individual shipping the samples. When samples are shipped, two or more seals are to be placed on each shipping container (such as a cooler), with at least one at the front and one at the back, located in a manner that would indicate if the container was opened in transit. Wide, clear tape will be placed over the seals to ensure that seals are not accidentally broken during shipment. Nylon packing tape may be used providing that it does not completely cover the custody seal. Completely covering the seal with this type of tape may allow the label to be peeled off. Alternatively, evidence tape may be substituted for custody seals.

- If samples are subject to interim storage before shipment, custody seals or evidence tape will be placed over the lid of the jar or across the opening of the storage box. Custody during shipping will be the same as described above. Evidence tape may also be used to seal the plastic bags or metal cans that are used to contain samples in the cooler or shipping container. Sealing individual sample containers assures that sample integrity will not be compromised if the outer container seals are accidentally broken.

- All shipments will be accompanied by the C-O-C record identifying its contents. The original C-O-C record will accompany the shipment and the copy will be retained in the project files.

- All shipments must be in possession of Foster Wheeler personnel until released to the carrier, and a receipt is obtained.

- If sent by mail, the package will be registered with return receipt requested. If sent by common carrier or air, proper documentation will be maintained.

5.2 Laboratory Custody Procedures

The laboratory will be responsible for custody and tracking of samples upon receipt at the facility. The laboratory will have a written QA program for all analytical activities. The following custody procedures provide the basic requirements to be implemented by the laboratory:

- A designated sample custodian accepts custody of the shipped samples and verifies that the information on the sample labels matches that on the C-O-C records. If discrepancies are observed, they are entered under the "Remarks" section and the field sampling team and/or

project management is notified immediately for resolution. The custodian then enters the sample label data into a bound logbook which is arranged by project code and station number.

- The laboratory custodian will use the sample label number and/or assign a unique laboratory number to each sample label and will assure that all samples are transferred to the proper analyst or stored in the appropriate secure area.

- The laboratory custodian stores the samples in a designated area. Appropriate analysts sign for and take samples from the storage area under controlled conditions. Laboratory personnel are responsible for the care and custody of samples from the time they are received until the sample is exhausted or returned to the custodian.

- When sample analyses and necessary quality assurance checks have been completed in the laboratory, the unused portion of the sample and the sample container must be disposed of as required.

- The laboratory will maintain records of all identifying sample labels and other QA documentation. Samples received by the laboratory will be retained until analyses and quality assurance checks are completed.

5.3 Record-Keeping

5.3.1 Field Records

Field records include completed copies of the C-O-C records, the site logbook(s), photographs, video tapes, documentation of reagent sources (i.e., decontamination water, preservatives, standards for field analyses), sample logsheets, soil boring logs, and copies of the completed shipping forms, as applicable.

A bound field notebook will be maintained by the sampling team leader to provide daily records of significant events, observations, and measurements during field investigations. All entries will be signed and dated. All members of the field investigation team are to use this notebook, which is to be kept as a permanent record. Observations or measurements that are taken in an area where contamination of the field notebooks may occur may be recorded in a separate bound and numbered logbook before being transferred to the project notebook. The original records are retained, and the delayed entry is noted as such.

Field notebooks are intended to provide sufficient data and observations to enable participants to reconstruct events that occurred during projects. The field notebook entries will be factual, detailed, and objective. A numbering system will be assigned to field notebooks for ease of reference and

reconstruction of field events. A record of the numbering system and the individuals assigned field notebooks will be maintained as well.

Unless restricted by weather conditions, all original data recorded in field notebooks and on sample labels, C-O-C records, and receipt-for-samples forms are written in waterproof black ink. These accountable, serialized documents will not be destroyed or thrown away, even if they are illegible or contain inaccuracies that require a replacement document.

If an error is made on an accountable document assigned to one person, that individual may make corrections by crossing out the error and entering the correct information. The erroneous information will not be obliterated. Any error discovered on an accountable document will be corrected by the person who made the entry. All corrections will be initialed and dated.

For all photographs taken, a photographic log will be maintained to record the date, time, subject, frame and roll number, and name of the photographer.

5.3.2 Laboratory Data Deliverables

Laboratories will submit all sample results and QC information as required by contract. The deliverables may include hard copies of the data packages and electronic data transfers. The laboratory will also comply with data archiving as required by contract.

6. ANALYTICAL PROCEDURES

Analytical methods for chemical analysis are taken principally from the latest revision and update of Test Methods for Evaluating Solid Waste, SW-846 Third Edition (EPA, 1986); Methods for Chemical Analysis of Water and Wastes, EPA Manual 600/4-79-020; and American Society for Testing and Materials, Annual Book of ASTM Standards, Volume 04.08. Table 6-1 will present analytical method reporting limits in the final version of the work plan once the subcontractor laboratory is selected.

7. DATA VALIDATION, REDUCTION, AND REPORTING

7.1 Data Validation

The following section describes the procedures pertaining to data validation of both the field and the analytical laboratory data. Data validation requirements are stipulated in Section 01450 of the Specifications (Appendix A).

Table 6-1. Listing of Analytical Methods for Chemical Analysis

Parameter	Method	Analyte[1]	Practical Quantitation Limit [2,3]
ICP Metals*	SW-846 3050/6010	Aluminum	
		Barium	
		Beryllium	
		Cadmium	
		Calcium	
		Cobalt	
		Copper	
		Iron	
		Magnesium	
		Manganese	
		Molybdenum	
		Nickel	
		Potassium	
		Silver	
		Sodium	
		Vanadium	
		Zinc	
Mercury (Cold Vapor AA)*	SW-846 7471		0.1
Arsenic (Graphite Furnace)*	SW-846 3050/7060		0.5
Selenium (Graphite Furnace)*	SW-846 3050/7740		0.5
Lead (Graphite Furnace)*	SW-846 3050/7421		0.5
Nitrate*	E353.2		--
Antimony*	SW-846 3050/7041(S)		0.5
Thallium*	SW-846 3050/7841(S)		0.1
Chromium*	SW-846 3050/7191(S)		0.5
Pesticides and PCBs**	SW-846 3550/8080(S)	Aldrin	
		Alpha-BHC	
		Beta-BHC	
		Delta-BHC	
		Gamma-BHC	
		Chlordane	
		4,4-DDD	
		4,4-DDE	
		4,4-DDT	
		Dieldrin	
		Endosulfan I	
		Endosulfan II	
		Endosulfan sulfate	
		Endrin	
		Endrin Aldehyde	
		Heptachlor	
		Heptachlor epoxide	
		Methoxychlor	
		Toxaphene	
		PCB-1016	
		PCB-1221	
		PCB-1232	
		PCB-1242	
		PCB-1248	
		PCB-1254	
		PCB-1260	

1. Instrument detection limits are reported for metals analytes only. The method detection limits are listed for all other analytes.
2. Practical quantitation limits as per SW-846 (Third Edition, Final Update).
3. Detection limits for soil samples are determined by adjusting for percent moisture and dilutions used for sample preparation.

7.2 Laboratory Data

Laboratory data will be validated according to procedures outlined in the current EPA Functional Guidelines for Evaluating the Organic and Inorganic Analyses (Functional Guidelines), EPA Region 6 guidance, USACE requirements and USAF guidance. For analytical methods with nonexistent data validation guidelines, SOPs will be developed prior to evaluation. These procedures will be approved by the USACE prior to implementation.

Criteria to be evaluated for organic analyses include, but are not limited to, a review of the C-O-C, holding times, instrument calibration, all blanks (including method, trip, ambient air, and equipment), laboratory verification of quantitation limits, preparatory batch control records, laboratory corrective actions, formula used for analyte quantitation, examples of analyte quantitation, instrument performance calibration, surrogate system monitoring compounds recovery, MS/MSD analyses, internal standards performance, compound identification, reported detection limits and tentatively identified compounds (TICs), as well as overall data completeness. Results which do not meet acceptable criteria as provided in the Functional Guidelines or SOPs will be qualified with the appropriate qualifier code.

Criteria to be evaluated for inorganic analyses include, but are not limited to, a review of the C-O-C, holding times, instrument calibration, all blanks (including preparatory, calibration, and equipment), laboratory verification of detection limits, preparatory batch control records, laboratory corrective actions, formula used for analyte quantitation, examples of analyte quantitation, instrument performance evaluation, inductively coupled plasma (ICP) interference check, MS/MSD analyses, laboratory control sample review, review of furnace analytical spike recovery or method of standard additions, serial dilution analyses, as well as overall data completeness. Results which do not meet acceptable criteria as provided in the Functional Guidelines or SOPs will be qualified with the appropriate qualifier code.

Following the validation procedure, a summary report will be prepared which briefly outlines the rationale for and the significance of all qualifier codes applied to the analytical data. The following data validation qualifiers may be added to the data based upon the merit of the QC results associated with the data:

U Value is a non-detect as reported by the laboratory, or has been qualified as a false positive based on contamination found in associated blanks.

R Value is considered to be unreliable and is unusable due to significant noncompliance with associated quality control criteria.

J Positive value is considered to be an estimate based on associated QC parameter exceedances.

UJ Detection limit is considered to be estimated based on associated QC parameter exceedances.

The summary report will be formatted to address usability issues and will be presented in a manner which will be easy to follow. The report will be prepared and submitted as stated in the Data Management Plan (DMP).

7.3 Field Records

Field documentation will ensure sample integrity and provide sufficient technical information to recreate each field event. All field data will be reviewed to ensure that:

- Proper field procedures are implemented
- Appropriate documentation is available for each activity
- Field instruments are calibrated as required
- Required number and type of field QC samples are collected
- Numerical value and units of each field measurement are documented
- Field equipment is decontaminated as specified

Any deficient condition that may potentially affect the sample integrity and/or data quality will be discussed with the field personnel immediately upon discovery. Field corrective measures will be implemented as discussed in the FSP. A report identifying all deficient conditions will be prepared and submitted as stated in the DMP.

8. DATA ASSESSMENT

The goal of the program is to provide analytical data of consistent and known quality for determining the nature and extent of contamination, assessing risks, instituting remedial actions, and/or identifying and mitigating threats to public health and the environment. Valid data collected for confirmation samples will be evaluated against New Mexico Environment Department risk-based soil screening levels according to state guidance..

9. REFERENCES

Air Force Center for Environmental Excellence (AFCEE)

1993. *Handbook for the Installation Restoration Program (IRP) Remedial Investigation/Feasibility Studies(RI/FS),* September 1993.

EPA

1980. *Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans*, (QAMS-005/80, December 29, 1980 and revised February 1983).

1989. *RCRA Facility Investigation Guidance, Volume. I: Development of an RFI Work Plan and General Considerations for RCRA Facility Investigations* (EPA 530/SW-89-031, May 1989).

USACE

1990. *Chemical Data Quality Management for Hazardous Waste Site Remedial Activities* (ER 1110-1-263, October 1, 1990).

1993. *General Chemistry Supplement to the Scope of Services*, December 1993.

Attachment 3

Three-Phase Inspection Forms

INSPECTION NOTIFICATION FORM

Date: _____

Preparatory: _____ Initial: _____

Follow-Up: _____ Completion: _____

Planned Definable Feature of Work to be Inspected: _____

_____

_____

Date of Planned Inspection: _____

_____ _____

Originator Date

_____ _____

QCM Signature Date

_____ _____

USACE QA Acknowledgment Date

PREPARATORY INSPECTION CHECKLIST FORM

REPORT NO.		DATE/SHIFT	
ITEM/ACTIVITY INSPECTED			
DRAWING REFERENCE	REV.	SPECIFICATION REFERENCE	REV.
PERMITS/LICENSES OBTAINED		YES/NO	REFERENCE NO.
WORK PLAN WRITTEN		YES/NO	REFERENCE NO.
QC INSPECTION PLAN WRITTEN		YES/NO	REFERENCE NO.
REQUIRED SUBMITTALS APPROVED		YES/NO	REFERENCE NO.
REQUESTS FOR INFORMATION ANSWERED		YES/NO	REFERENCE NO.
FCRs/DCNs APPROVED/ISSUED		YES/NO	REFERENCE NO.
NONCONFORMANCES DISPOSITIONED/CLOSED		YES/NO	REFERENCE NO.
MATERIAL/EQUIPMENT AVAILABLE		QUANTITY	CONDITION

Page 1 of 2

PREPARATORY INSPECTION CHECKLIST FORM

REPORT NO.	DATE/SHIFT
ITEM/ACTIVITY INSPECTED	
PREPARATORY SITE CONDITIONS	
CONTRACT VARIANCE	
ACTIVITIES/ITEMS REQUIRING COMPLETION	
COMMENTS	
MEETING ADDRESS	

NAME SIGNATURE TITLE

INITIAL INSPECTION CHECKLIST FORM

REPORT NO.			DATE/SHIFT
ITEM/ACTIVITY INSPECTED			
DRAWING REFERENCE	REV.	DRAWING REFERENCE	REV.
SITE CONDITIONS			

INSPECTION ATTRIBUTE	SPECIFICATION REFERENCE	ACCEPTANCE CRITERIA	INSPECTION RESULT	ACCEPT/ REJECT

REQUESTS FOR INFORMATION ISSUED/SUBJECT	REFERENCE NO.
FCRs ISSUED/SUBJECT	REFERENCE NO.
NONCONFORMANCES ISSUED/SUBJECT	REFERENCE NO.

REINSPECTION REQUIRED	YES	NO	

Page 1 of 2

INITIAL INSPECTION CHECKLIST FORM

DATE/SHIFT	REPORT NO.
ITEM/ACTIVITY INSPECTED	
COMMENTS	
CONTRACT VARIANCE	
ATTENDEES	

NAME SIGNATURE TITLE

FOLLOW-UP INSPECTION CHECKLIST FORM

DATE/SHIFT					REPORT NO.
PROJECT NAME/NUMBER					
ITEM/ACTIVITY INSPECTED					
DRAWING REFERENCE	REV.	DRAWING REFERENCE			REV.
INSPECTION ATTRIBUTE		SPECIFICATION REFERENCE	ACCEPTANCE CRITERIA	INSPECTION RESULT	ACCEPT/ REJECT
REQUESTS FOR INFORMATION ISSUED/SUBJECT				REFERENCE NO.	
FCRs ISSUED/SUBJECT				REFERENCE NO.	
NONCONFORMANCES ISSUED/SUBJECT				REFERENCE NO.	
REINSPECTION REQUIRED		YES	NO		
COMMENTS					

NAME SIGNATURE TITLE

Attachment 4

Daily Quality Control Report (DQCR) Forms

FOSTER WHEELER ENVIRONMENTAL
DAILY QUALITY CONTROL REPORT

Daily Report No: _____ Date: _____
Contract No.: DACW-45-94-D-0003
Project Title & Location: Workplan for the closure of SWMU 101 – Sewage Lagoons, Cannon AFB
Weather: Precipitation: _____ In.: _____ Temp. : °F

1. Contract/Subcontractors and Area of Responsibility:

NUMBER	TRADE	HOURS/ TOTAL	EMPLOYER	LOCATION/DESCRIPTION WORK
	Operators			
	Laborers			
	Superintendent			
	SHSO/CQC			

2. Operating Plant or Equipment (not hand tools):

Plant/Equipment	Date of Arrival Or Departure	Date of Safety Check	Hours Used	Hours Idle

3. Work performed today: (Indicate location and description of work performed by prime and/or subcontractors. When network analysis is used, identify work by NAS activity number).

4. Control Activities Performed:

Preparatory Inspections: Identify features of work and attach minutes.
Initial Inspections: Identify features of work and attach minutes.
Follow-up Inspections: List inspections performed, results of inspection compared to specification

5. Tests Performed and Test Results: Identify test requirement by paragraph number in specifications and/or sheet number in plans.

6. Material Received: Note inspection results and storage provided.

7. Submittals Reviewed:

(a) Submittal No.	(b) Spec/Plan Reference	(c) By Whom	(d) Action

8. Off-Site Surveillance Activities, Including Action Taken:

9. Job Safety: List items checked, results, instructions, and corrective actions taken.

10. Remarks: Instructions received or given. Conflict(s) in plans and/or specifications. Delays encountered.

Contractor's Verification: On behalf of the Contractor, I certify this report is complete and correct, and all materials and equipment used and work performed during this reporting period are in compliance with the contract plans and specifications, to the best of my knowledge, except as may be noted above.

CQC SYSTEM MANAGER DATE

SIGNATURE DATE

MATERIALS INSPECTION CHECKLIST

ITEM:				DATE:
Contract Specifications				
Material	**Qty**	**Condition**	**Testing**	**Comments**
STORAGE CONDITIONS:				
SUBMITTALS:				

MATERIAL/EQUIPMENT CERTIFICATIONS:
PREPARATORY SITE CONDITIONS:
CONTRACT VARIANCE:
COMMENTS:

ATTENDEES:			
			QC Representative Date
			QCM Date

REWORK ITEMS LIST

NUMBER	DATE IDENTIFIED	DESCRIPTION	CONTRACT REQUIREMENT (Spec. Section and Para. No., Drawing No. and Detail No., etc.)	ACTION TAKEN BY QC MANAGER	RESOLUTION	DATE COMPLETED

COMPLETION INSPECTION CHECKLIST

DATE: _____
MAJOR DEFINABLE FEATURE OF WORK: _____
LOCATION.: _____ SPEC SECTION: _____
(Refer to Final Follow-Up Inspection Checklist)

A. OPEN PUNCHLIST ITEMS FROM FINAL FOLLOW-UP INSPECTION CHECKLIST:

ITEM	DATE OF COMPLETION
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	

B. NEW PUNCHLIST ITEMS NOTED:

ITEM	DATE OF COMPLETION
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	

C. USACE QA NOTIFIED? Yes _____ No _____

On behalf of Foster Wheeler Environmental Corporation, I certify this activity is completely in accordance with the Contract Documents, based upon the information available to me.

_____
Quality Control Manager

Attachment 5

Work Notification Forms

FIELD CHANGE REQUEST

PROJECT	PROJ. NO.	FIELD CHANGE NO.

TO _____ DEPT. _____ LOCATION _____ DATE _____

RE: ☐ DRAWING NO. _____ TITLE _____

☐ SPEC NO. _____ TITLE _____

☐ OTHER. _____

1. DESCRIPTION (Items involved, submit sketch if applicable)_____

2. REASONS FOR CHANGE (If from disposition of nonconformance report, list report number)_____

3. RECOMMENDED DISPOSITION ☐ MINOR CHANGE ☐ MAJOR CHANGE

4. RESIDENT ENGINEER (Signature)	DATE	PROJECT SUPT. CONCURRENCE (Signature)	DATE

5. DISPOSITION

☐ NOT APPROVED (Give Reason)

☐ CONSIDERED MINOR CHANGE - Approval per Recommended Disposition - Design Documents will not be normally revised; field to maintain as-built records

☐ CONSIDERED MAJOR CHANGE - Action will be taken as prescribed on DCN -

LEAD DISCIPLINE ENGINEER OR DESIGNEE (Signature)	DATE	PROJECT ENGR OR DESIGNEE (Signature)	DATE

Project Engineer signs and returns to LDE for transmittal to Resident Engineer with copies to:

Project Manager _____

Project Supt. _____

Project Files _____

Others as Required _____

FOSTER WHEELER ENVIRONMENTAL CORPORATION

TERC CONTRACT NO.: DACW45-94-D-0003 *DELIVERY ORDER: 35*
PROJECT TITLE AND LOCATION: Work Plan for the Closure of SWMU 101 – Sewage Lagoons, Cannon AFB

DESIGN CHANGE NOTICE

PROJECT	PROJ. NO.	DESIGN CHANGE NO.

TO _____ DEPT. _____ LOCATION _____ DATE _____

RE: ☐ DRAWING NO. _____ TITLE _____
☐ SPEC NO. _____ PAGE _____
☐ OTHER. ANTICIPATED REVISION DATE OF FORMAL DOCUMENTS

☐ ENGINEERING "HOLD" PLACED ON CONSTRUCTION ACTIVITIES IN AREA DEFINED HEREIN PENDING RECEIPT OF FORMALLY REVISED DOCUMENT (S) AND/OR REVISED DCN, PE SIGNATURE NOT REQUIRED.
☐ RELEASED FOR CONSTRUCTION ON BASIS OF MODIFICATION (S) PRESCRIBED BY THIS DCN.

APPLICABLE DOCUMENTS WILL BE REVISED BY:
☐ HOME OFFICE
☐ AS-BUILT DRAWING BY RESIDENT ENGINEER'S STAFF
☐ SITE (Project Engineer to assign Open Engineering Item No.) _____
☐ OTHER _____

PROPOSED CHANGE

DESCRIPTION

_____

REASON FOR CHANGE

☐ FIELD CHANGE REQUEST (FCR No.) _____
☐ REQUIRED MODIFICATIONS TO DESIGN OR SPECIFICATION
☐ DISPOSITION OF NONCONFORMING ITEM
☐ CHANGES IN REGULATORY OR OTHER REQUIREMENTS
☐ OPERATIONAL EXPERIENCE
☐ OTHER _____

EXHIBITS ATTACHED ☐ NO ☐ YES - IF YES, CHECK APPLICABLE BOX(ES)
☐ COPIES OF MARKED-UP AREA OF DRAWING(S)
☐ FIELD CHANGE REQUEST (FCR No. _____)
☐ OTHER (Describe) _____

COMMENTS SCHEDULED ERECTED/PLACEMENT DATE(S) _____
ORIGINATOR _____ DATE _____

DISTRIBUTION (*Check as applicable and fill in name. Indicate with an asterisk (*) personnel who are to perform a QA review.*)

☐ Project Manager _____	☐ Health and Safety _____	☐ Chemical _____
☐ Project Engineer _____	☐ Construction _____	☐ Regulatory _____
☐ Architectural _____	☐ Electrical _____	☐ Structural _____
☐ CAD _____	☐ Environmental _____	☐ Science (Specify) _____
☐ Building _____	☐ I&C _____	☐ PQAE _____
☐ Mechanical _____	☐ Security _____	☐ Project Supt _____
☐ Process _____	☐ Estimating _____	☐ Vendor Supt _____
☐ Civil _____	☐ Quality Assurance _____	☐ Site Manager _____

NOTE: Personnel indicated with an asterisk (*) are to perform a QA review and inform Originator of any comments, or approve and sign, as applicable, by _____ (date).

LEAD DISCIPLINE ENGINEER OR DESIGNEE (Signature)	DATE	PROJECT ENGR OR DESIGNEE (Signature)	DATE

QA REVIEWER (if indicated above)		PROJECT MANAGER (After acceptance of all reviews)	
☐ COMMENTS (Attached) ☐ NO COMMENTS			
SIGNATURE	DATE	SIGNATURE	DATE

FIELD EVALUATION
☐ IMPLEMENT RECOMMENDED DISPOSITION ☐ DEFER RECOMMENDED DISPOSITION

_____ _____
RESIDENT ENGINEER (signature) DATE

NONCONFORMANCE REPORT

REPORT NO (1) _____

CLIENT OR PROJECT (2)		DRAWING NO/SPEC NO. (3)
SUPPLIER, CONSTRUCTION QC OR CONTRACTOR (4)	P. O. NO. (5)	
DESCRIPTION OF COMPONENT, PART OR SYSTEM (6)		

I. DESCRIPTION OF NONCONFORMANCE (7) *(Items involved, Specifications, Code or Standard to Which Items Do Not Comply, Submit Sketch (If Applicable)*

NAME AND SIGNATURE OF PERSON REPORTING NONCONFORMANCE (8)	TITLE/COMPANY	DATE (9)

II. RECOMMENDED DISPOSITION (10) *(Submit Sketch If Applicable)*

NAME AND SIGNATURE OF PERSON RECOMMENDING DISPOSITION (11)	TITLE/COMPANY	DATE (12)

III. EVALUATION OF DISPOSITION BY FOSTER WHEELER ENVIRONMENTAL. REASON OF DISPOSITION (13)

IV. CORRECTIVE ACTION (14) ☐ Required ☐ Not Required

V.(15) ☐ ENGINEERING	☐ QUALITY ASSURANCE	☐ CONSTRUCTION	☐ OTHER
NAME (SIGNATURE)	NAME (SIGNATURE)	NAME (SIGNATURE)	NAME (SIGNATURE)
DATE	DATE	DATE	DATE
☐ ACCEPTED ☐ REJECTED	☐ ACCEPTED ☐ REJECTED	☐ ACCEPTED ☐ REJECTED	☐ ACCEPTED ☐ REJECTED
☐ ACCEPTED WITH COMMENTS	☐ ACCEPTED WITH COMMENTS	☐ ACCEPTED WITH COMMENTS	☐ ACCEPTED WITH COMMENTS

VI. VERIFICATION OF DISPOSITION ☐ REQUIRED ☐ NOT REQUIRED (16)

(17) BY _____ SIGNATURE_____ TITLE _____ DATE _____

STOP WORK ORDER

REPORT NO (1) _____

CLIENT OR PROJECT (2)		DRAWING NO/SPEC NO. (3)
SUPPLIER, CONSTRUCTION QC OR CONTRACTOR (4)	P. O. NO. (5)	
DESCRIPTION OF COMPONENT, PART OR SYSTEM (6)		

I. DESCRIPTION OF STOP WORK NOTICE (7) *(Items involved, Specifications, Code or Standard to Which Items Do Not Comply, Submit Sketch (If Applicable)*

NAME AND SIGNATURE OF PERSON REPORTING STOP WORK NOTICE (8)	TITLE/COMPANY	DATE (9)

II.(10) ☐ ENGINEERING	☐ QUALITY ASSURANCE	☐ CONSTRUCTION	☐ OTHER
NAME (SIGNATURE)	NAME (SIGNATURE)	NAME (SIGNATURE)	NAME (SIGNATURE)
DATE	DATE	DATE	DATE
☐ ACCEPTED ☐ REJECTED	☐ ACCEPTED ☐ REJECTED	☐ ACCEPTED ☐ REJECTED	☐ ACCEPTED ☐ REJECTED
☐ ACCEPTED WITH COMMENTS	☐ ACCEPTED WITH COMMENTS	☐ ACCEPTED WITH COMMENTS	☐ ACCEPTED WITH COMMENTS

III. VERIFICATION OF DISPOSITION ☐ REQUIRED ☐ NOT REQUIRED (11)

(12) BY _____ SIGNATURE _____ TITLE _____ DATE _____

Attachment 6

Miscellaneous QC Forms

PHOTOGRAPH LOG SHEET

Photographer _____

Date Submitted _____ **Roll No.** _____

Frame	Date	Time	Location/Grid No.	Description/Work No.	Notes
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					
13.					
14.					
15.					
16.					
17.					
18.					
19.					
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21.					
22.					
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25.					
26.					
27.					
28.					
29.					
30.					
31.					
32.					
33.					
34.					
35.					
36.					

REQUEST FOR ENGINEERING INFORMATION

(REI)

Sheet ___ of ___

REI No. Issue Date_____ Closure Date_____

Work Area:_____Subcontractor:_____

Applicable Plans, Drawings, Specifications:_____

Information Requested:_____

Subcontractor Signature: _____ Date:_____

Foster Wheeler Environmental Response:_____

Project Engineer Signature:_____ Date:_____

Project Manager Signature:_____ Date:_____

Distribution:

AFB Project Manager	CQC Systems Manager
DOM	Site Superintendent
Task Manager/Engineer	USACE QA
QCM	Subcontractor: _____

REQUEST FOR INFORMATION

(RFI)

Sheet ___ of ___

RFI No. Issue Date_____ Closure Date_____

Work Area:_____

Applicable Plans, Drawings, Specifications:_____

Information Requested:_____

Project Quality Control Manager Signature: _____ Date: _____

USACE QA Response:_____

USACE QA Signature:_____Date:_____

Distribution:

AFB Project Manager	CQC Systems Manager
DOM	Site Superintendent
Task Manager/Engineer	USACE QA
QCM	Subcontractor: _____

PROBLEM IDENTIFICATION CONSTRUCTION DEFICIENCY NOTICE

Sheet ___ of ___

DCN No. Issue Date_____ Closure Date_____

Work Area or Feature Inspected: _____ Deficient Subcontractor: _____

Applicable Plans, Drawings, Specifications:_____

Description of Deficient Condition:

Site Manager's Signature:_____ Date:_____

Recommended Disposition: _____

Recommender's Signature:_____ Date:_____

Subcontractor Response:

Reinspection Required? Yes _____ No _____

Performed on _____

Acceptable? Yes _____ No _____

Distribution:

AFB Project Manager	CQC Systems Manager
DOM	Site Superintendent
Task Manager/Engineer	USACE QA
QCM	Subcontractor: _____

Attachment 7

Assignment Letters

FOSTER WHEELER ENVIRONMENTAL CORPORATION

January 31, 2003
TERC-035.001-03X-008

Ms. Kathy Omernik
Foster Wheeler Environmental Corporation
143 Union Blvd, Suite 1010
Lakewood, CO 80228

Subject: TERC Contract No. DACW45-94-D-0003, Delivery Order 35, WAD 1 Appointment as the Quality Control Program Manager (QCPM) for Delivery Order 35 Work Authorization Directive (WAD) 1, Cannon Air Force Base (AFB), New Mexico

Dear Ms. Omernik:

You have been appointed as the Quality Control Program Manager (QCPM) for the Delivery Order 35 WAD 1 construction effort at SWMU 101, Sewage Lagoons, Cannon Air Force Base, New Mexico. As QCPM, you will be responsible for he following activities:

- Project duties assigned by the TERC contract;
- Being the primary Foster Wheeler Environmental Quality Control (QC) management contact for the development, review and concurrence of quality program and procedures required by the project;
- Providing overall management of the site-specific Construction Quality Assurance Quality Control Plan including project Construction Quality Control (CQC) Addenda;
- Acting as the Foster Wheeler Environmental QC discipline lead to concur with QC personnel assigned to the project;
- Assuring the management of quality program and project quality records;

In addition, you will be required to audit QC testing to verify that any testing conducted is in accordance with the required specification, and prepare the necessary QC certification and documentation.

You will report directly to the Delivery Order Manager. You have the authority and responsibility for suspending work when conditions adverse to quality are identified and for directing the correction of all non-conforming work.

6605 UPTOWN BOULEVARD, N.E., SUITE 220, ALBUQUERQUE, NEW MEXICO 87110
TEL: 505-878-8900 FAX: 505-878-8933

This letter is effective immediately until modified by the Quality Control Program Manager with concurrence of the Foster Wheeler Environmental Delivery Order Manager, Cannon AFB Project Manager, and the USACE Quality Assurance Manager.

Sincerely,
Foster Wheeler Environmental Corporation

Larry Sexton
Foster Wheeler Environmental Quality
Control Program Manager

Carol Bieniulis
Delivery Order Manager

cc: P. Zamie, CAFB
T. Zink, USACE-Omaha
D. Russel, USACE-Albuquerque
R. Ederer, FWENC
S. Seyedian, FWENC
TERC Project File, Denver

FOSTER WHEELER ENVIRONMENTAL CORPORATION

February 3, 2003
TERC.035.001-03X-009

Mr. James Morning
Foster Wheeler Environmental Corporation
6605 Uptown Boulevard, N.E., Suite 220
Albuquerque, NM 87110

Subject: TERC Contract No. DACW45-94-D-0003, Delivery Order 35, WAD 1
Appointment as the Construction Quality Control Manager (CQM) for Delivery Order 35 Work Authorization Directive (WAD) 1, Cannon Air Force Base (AFB), New Mexico

Dear Mr. Morning:

You have been appointed as the Construction Quality Control Manager (CQM) for the Delivery Order 35 WAD 1 construction effort at SWMU 101, Sewage Lagoons, Cannon AFB, New Mexico. As CQM, you will be responsible for the following activities:

- Overall management of the site-specific Construction Quality Control (CQC) Plan including project CQC Plan addenda
- Final quality control report documentation
- Verification that testing is conducted in accordance with required specifications
- Preparation of necessary quality control certifications and documentation

You will report directly to the Quality Control Program Manager (QCPM) and Delivery Order Manager. You have the authority and responsibility for suspending work when conditions adverse to quality are identified and for directing the correction of all non-conforming work.

This letter is effective immediately until modified by the QCPM with concurrence of the Foster Wheeler Environmental Delivery Order Manager and Cannon AFB Project Manager.

Sincerely,
Foster Wheeler Environmental Corporation

Kathy Omernik
Quality Control Program Manager

143 Union Boulevard, Suite 1010, Lakewood, CO 80228-1824
Tel: 303-988-2202 Fax: 303-980-3539

KO/ld

cc: P. Zamie, CAFB
T. Zink, USACE-Omaha
D. Russel, USACE-Albuquerque
R. Ederer, FWENC
S. Seyedian, FWENC
TERC Project File, Denver

APPENDIX D

Spill Prevention Control and Countermeasures Plan

APPENDIX D

Contaminant Fate and Transport Modeling

1.0 INTRODUCTION

The transport of contaminants of concern (COC) through unsaturated zone materials was simulated over a 50-year period at the Sewage Lagoons located on the Cannon Air Force Base (AFB) in Clovis, New Mexico. The environmental model, Seasonal Soil Compartment Model (SESOIL) for Windows (Version 2.5), was used to estimate the migration of the COCs.

SESOIL is a one-dimensional vertical transport model for the unsaturated vadose zone. SESOIL simulates water transport, sediment transport, and contaminant fate for constituents introduced into the system either instantaneously or continuously. This model was developed for use by the U.S. Environmental Protection Agency (EPA) and Department of Energy (DOE). It has been revised and refined over time for application as a screening-level model to aid in exposure assessment and remediation projects by using fewer inputs for soil, climate, and chemical constituents than similar models (GSC, 1995).

2.0 METHODOLOGY

2.1 DETERMINATION OF COCS

Ten boreholes were advanced at the Sewage Lagoons at Cannon AFB. Five of the borings were uniformly located in the north lagoon (four in each of the corners of the lagoon and one in the center) and five in the south lagoon with the same configuration. In each of the boreholes, samples were taken from the surface sludge, 0 to 2 ft, 4 to 6 ft, and 8 to 10 ft. The samples were analyzed in the laboratory for 23 contaminants, including organics, pesticides and metals. Initially, any constituents that were detected were considered as a COC which would be modeled to simulate downward migration to groundwater. From the list of COCs, contaminants were eliminated from consideration if they did not have a federal or New Mexico groundwater standard. A risk assessment was performed by Foster Wheeler as part of this Corrective Measures Study (Appendix C). Contaminants that were not identified in the risk assessment were not considered as COCs to be modeled. Contaminant concentrations were compared to Basewide background levels. Any contaminant concentrations that did not exceed background levels were not considered as COCs in the modeling effort. Finally, the physical characteristics of the contaminant were

considered prior to inclusion in the fate and transport modeling. For example, arsenic, barium, chromium, and lead met all of the other criteria for model input COCs, but because of the insolubility of these metals, they were not included in the model simulations. The COCs simulated in the fate and transport modeling were gamma-BHC (lindane), heptachlor, nitrate, and total xylenes.

2.2 GENERAL ASSUMPTIONS

A conservative approach was taken to determine the potential for the COCs to migrate vertically through the vadose zone and contaminate groundwater to a level that would exceed the maximum contaminant level (MCL) of each COC. To remain conservative, the following general assumptions were made for site conditions and contaminant levels:

- Typical site concentrations were the maximum detected concentrations of COCs in sludge and/or soil samples.
- Depth to the water table was simulated as 290 ft below ground surface across the site.
- Saturated and unsaturated materials were homogeneous and isotropic.
- Initial site conditions assume evapotranspiration, runoff, and soil-to-air diffusion do not occur. All contaminants introduced to the system infiltrate the surface.

COCs at the site were determined based on positive concentrations from laboratory testing of field samples, the designation of an MCL for the contaminant, and solubility. The COCs chosen for the simulations were gamma-BHC (lindane), heptachlor, nitrate, and total xylenes.

3.0 INPUT PARAMETERS AND SPECIFIC ASSUMPTIONS

Processes simulated in the SESOIL model include three cycles: hydrologic, sediment, and pollutant. To closely approximate the actual site conditions SESOIL requires site-specific data for the following categories:

- Soil properties and compartments
- Climate
- Chemistry
- Pollutant load

The hydrologic cycle includes rainfall, surface runoff, infiltration, soil water content, evapotranspiration, and groundwater runoff. The sediment cycle includes sediment washload as a result of storms that produce enough precipitation to induce erosion from surface runoff. The pollutant cycle includes: advective transport, volatilization, adsorption/desorption, and degradation. Output from the model

provides information on water and sediment transport, contaminant fate, and migration through the vadose zone to groundwater.

3.1 SOIL COMPARTMENTS

SESOIL allows the user to compartmentalize the unsaturated and saturated soil column into discreet intervals based on the intrinsic soil characteristics or site-specific exposure scenarios. Geologic site characteristics were taken from the site-specific geotechnical data. The saturated zone occurs at a depth of 290 ft and is in the peripheral region of the Ogallala aquifer.

For purposes of this report, the soil column was subdivided into three layers. Two layers represent the unsaturated zone at depth intervals of 0 to 10 ft for Layer 1 and 10 to 290 ft for Layer 2, while Layer 3 represented the saturated zone from 290 ft to 310 ft. Table D-1 provides the soil parameter input. A schematic diagram representing the compartments in the SESOIL model as they apply to the sewage lagoon site is presented in Figure D-1. A summary of soil parameters required for the model include the following:

Parameter	Value	Site-specific Data?
Bulk density	1.63 g/cc	Yes
Intrinsic permeability	1.79E-9 cm^2	Yes
Disconnectedness index	9	No
Effective porosity	0.33	No
Organic carbon content	0.17 %	Yes
Cation exchange capacity	0	No
Freundlich equation exponent	1	No

The SESOIL User's Guide was followed to determine disconnectedness index values. Based on the soil classification from field samples, appropriate index values were assigned and averaged (GSC, 1995). Assumptions were made to determine the effective porosity. Density values from field data and assumed values of specific gravity were used to calculate the porosity of the soil samples. Porosity values were reduced 15 percent to represent the effective porosity of the samples. The final values of effective porosity were averaged among the samples to represent the entire unsaturated layer. Cation exchange capacity and the Freundlich exponent were assumed values based on recommendation from the SESOIL manual (GSC, 1995).

3.2 CLIMATE

Climatological data are required for the hydrologic cycle of the model. Meteorological and climatological data were acquired through the SESOIL climate database for Clovis, New Mexico (Table

D-2). The SESOIL climate database considers data prior to 1993. However, because of the age of the database data, it was compared to more recent data obtained through Internet access of the Western Regional Climate Center (WRCC [Table D-3]), in which data ranged from 1995 to 1999. Monthly averages for the following parameters were gathered from the various sources and included the following:

Parameter	Value	Site-specific Data?
Air temperature	Monthly variability See Table D-2	Yes
Cloud cover		Yes
Humidity		Yes
Short wave albedo		Yes
Evapotranspiration		Assumed zero
Precipitation		Yes
Average storm duration		Yes
Number of storms		Yes
Average month length		Yes

References for site-specific values and assumptions are listed on Table D-3.

No significant differences were detected in the different data sets. Therefore, because of accessibility and the need for less assumptions (i.e., albedo is provided by the SESOIL database, but could not be obtained externally), the SESOIL database climate data was used in the simulations. Both the SESOIL database and WRCC data sets are provided in Tables D-2 and D-3, respectively.

3.3 CHEMISTRY

Analyte-specific information was input for the pollutant cycle of the model. Model runs were completed for heptachlor, lindane, nitrate, and total xylenes. The following parameters were entered into the model for each COC:

Parameter	Value	Chemical-specific data?
Solubility	Chemical specific See Table D-4	Yes
K_h (diffusion coefficient)		Yes/no
Henry's constant		Yes/no
K_{oc}(carbon adsorption coefficient)		Yes/no
K_d (soil adsorption coefficient)		Yes/no
Molecular weight		Yes
Hydrolysis and biodegradation		No
Complexation		No

References for analyte-specific values and assumptions are listed in Table D-4. Literature on nitrate activity coefficients is unavailable because of its negative ionic state. Therefore, activity coefficients were all assumed zero, meaning the entire contaminant remains in solution and travels at the rate of advancing groundwater. For the simulations of lindane and heptachlor, either K_{oc} or K_d values were used (Table D-4).

3.4 POLLUTANT LOAD

The algorithm utilized by SESOIL for the pollutant load requires the user to determine the pollutant load concentration, the layer that will receive the pollutant, and the area of pollutant application. Pollutant load was calculated for the model as a function of concentration, soil bulk density, and soil intrinsic permeability. Maximum concentrations of each COC was used to calculate pollutant load.

The first layer of the soil column (0 to 10 ft) was designated to receive the pollutant. This is consistent with actual data collected from the Cannon AFB Sewage Lagoons that indicates the highest concentrations of COC occurring in soil/sludge samples. Based on site history, an instantaneous release of the contaminant, within the first layer during the first month of model simulation was assumed and is a realistic approach to actual conditions of the site.

The pollutant application area is the areal extent of soil where contamination occurred. The pollutant application area represented the 14.38-acre area of the south sewage lagoon.

Information entered into the model for the pollutant cycle are presented below for the pollutant load concentration, the layer that will receive the contaminant, and the area of pollutant application for each of the model runs includes the following:

Pollutant	Years Simulated	Layer to Receive Pollutant	Application Area	Instantaneous Loading	Sampling Location
Heptachlor	50	1	5.819E8 cm^2	Yes	Soil 0 to 1 ft
Lindane	50	1	5.819E8 cm^2	Yes	Sludge 0 to 1 ft
Nitrate	50	1	5.819E8 cm^2	Yes	Sludge 0 to 1 ft
Total xylenes	50	1	5.819E8 cm^2	Yes	Sludge 0 to 1 ft

References for site-specific pollutant load values and assumptions are listed in Table D-5.

3.5 GROUNDWATER MIXING

The saturated zone was modeled at a depth of 290 ft below ground surface (bgs). SESOIL provides a groundwater mixing model (Summer's Model) to estimate concentrations of contaminants in groundwater as a function of time. Necessary parameters to be entered into the mixing model are presented in Table D-6. Hydraulic gradient was calculated from well data available for the site (Cannon AFB, 1999). Permeability was determined from geotechnical laboratory data of soil samples collected during the CMS field program.

3.6 EXTREME PRECIPITATION

The initial simulation was performed for each COC with climate data for Clovis, New Mexico, from the SESOIL climate database. The first simulation will be referred to as current, normal conditions. Additional precipitation was added on Simulations 2 and 3 to evaluate the effects on transport of the COCs as infiltration increases during periods of high precipitation. Simulation 2 included the SESOIL database monthly precipitation and the precipitation from a 100-year, 24-hour storm for the first month of each year. Simulation 3 included the SESOIL database monthly precipitation and the precipitation from a 100-year, 24-hour storm for the first 6 months of each year. The rainfall produced for a 100-year, 24-hour storm was determined to be 6 in (15.24 cm.) for the region, (from the National Oceanic and Atmospheric Administration [NOAA], 2000).

4.0 INITIAL MODEL SIMULATIONS

A descriptive summary of the Simulations follows:

- Simulation 1—Current, normal climate conditions
- Simulation 2—Normal climate with the addition of the precipitation from 1 to 100 years, 24-hour storm, every year.
- Simulation 3—Normal climate with the addition of the precipitation from 6 to 100 years, 24-hour storms, every year.

Each simulation was performed independently for each particular COC for a total of 4 model executions per simulation condition. Other than the precipitation, the variables remained the same for all simulations for each COC. The simulations were performed for the duration of 50 years.

4.1 RESULTS OF INITIAL MODEL SIMULATIONS

Various input parameters and the corresponding maximum pollution depths are presented in Table D-7.

4.1.1 Simulation 1

Pollution depth vs. time plots are presented for each of the COCs for the first simulation (current, normal conditions) in Figures D-2 and D-3. The simulations used the SESOIL database climate for Clovis, New Mexico. None of the contaminants migrated to groundwater during the 50-year simulation. Nitrate is very soluble and extremely mobile and migrates deeper within the vadose zone compared to the other COCs, as illustrated in Figure D-3. For illustrative purposes, the average annual concentration of nitrate in the subsurface is plotted as a function of time at various depths in Figure D-4. Concentrations of nitrate dissolved in the aqueous phase, adsorbed on the soil matrix, and present in the gas phase within the soil pore space are represented at 3,000 cm (98.4 ft), 6,000 cm (196.9 ft), and 8,823.96 cm (289.5 ft [6 in above the water table]) after 50 years of simulation under normal, current conditions.

4.1.2 Simulation 2

Results of the second set of simulations are presented in Figures D-5 through D-7 in the same formats as described for the first simulations. The difference between Simulations 1 and 2 is the addition of one 100-year, 24-hour storm event the first month of each year for the second simulation. None of the contaminants reach the groundwater after 50 years of simulation.

4.1.3 Simulation 3

Results of the third set of simulations are presented in Figures D-8 through D-10 in the same formats as described for the first simulations. The difference between Simulations 1 and 3 is the addition of six 100-year, 24-hour storm events the first 6 months of each year for the third simulation. Heptachlor, lindane, and xylenes do not reach groundwater after 50 years of simulation. Nitrate reaches groundwater after approximately 45 years of simulation. After 50 years, nitrate concentration in the groundwater is estimated at 233 μg/ml (ppm).

COC	Maximum Pollution Depth (ft)		
	Simulation 1	Simulation 2	Simulation 3
Heptachlor	0.02	0.02	0.03
Lindane	0.04	0.05	0.06
Nitrate	230	250	290
Total Xylenes	53	60	79

Note: Groundwater is located at 290 ft bgs.

4.1.4 Conclusions of Initial Model Simulations

50-Year Simulations

Results of the simulations completed for conservative conditions in Simulations 1 and 2 indicate that COCs do not reach groundwater after 50 years of simulation and therefore do not contribute to the degradation of groundwater because of sludge and soil contained within the Sewage Lagoons. For the extreme precipitation events modeled in Simulation 3, nitrate is the only COC modeled that reached groundwater within 50 years. The contaminant reached groundwater after 45 years into the simulation.

The precipitation required to cause nitrate to migrate to the groundwater was demonstrated in the third simulation with approximately 3.4 times the normal rainfall for 50 consecutive years. The simulation did not include runoff of any of the precipitation nor surface evapotranspiration; all rainfall was available to infiltrate to the subsurface. The volume of the groundwater aquifer was represented as the area of the south lagoon (14.38 acres) with a vertical depth of 20 ft. This is a conservative estimate of the water available in the aquifer for mixing (dilution) of the contaminant.

The model did not consider a vertical distribution of contamination deeper than 10 ft. Any contamination present at a depth greater than 10 ft would reduce the distance necessary for migration to groundwater.

Extended Simulation Time

Because of the high mobility of nitrate, an extended simulation of greater than 50 years was performed to determine when nitrate would enter groundwater. Under current, normal conditions (Simulation 1) nitrate was simulated to reach groundwater after 65 years. In the 65th year of simulation nitrate concentration in the groundwater was 60.98 μg/mL (ppm). The concentrations rose steadily for the next 5 years to 196.6, 219.0, 241.4, 263.7, and 285.9 μg/mL (ppm) after 70 years of simulation. The maximum contaminant level for nitrate is 10 ppm, as dictated by the EPA. As previously mentioned, groundwater mixing parameters were conservatively represented.

5.0 PERIPHERAL MODELING Constant pressure head of 3'

Subsequent to initial model simulations, a less conservative and more realistic approach was applied to the modeling vadose zone migration based on past conditions at the sewage lagoons. From 1965 to 1998, the sewage lagoons at Cannon AFB were maintained to contain standing water (standing pressure head). For purposes of modeling a realistic approach to migration and evaluating the infiltration rate, a constant head needs to be applied to the site conceptual model since it is this pressure head which serves as a driving mechanism for downward contaminant migration.

The SESOIL model is limited on boundary condition input parameters and cannot accommodate a constant pressure head at the ground surface. SESOIL's primary function is to determine contaminant migration based on general parameters that do not allow for simulation of the mechanics of unsaturated flow which take into account the progression of wetting front of the contaminated leachate. The program VS2DTI (version 1.1) was used to more accurately approximate the time of wetting front arrival at the groundwater aquifer. In order to simulate the progression of the wetting front through the vadose zone, assumptions were made based on site-specific conditions and the general properties of the soils typical in this area.

Based on site-specific data available during previous investigations, a constant 3 ft of standing water pressure head was assumed to exist on top of the sludge in both lagoons. This positive pressure head was present for approximately 35 years to prevent the sludge from drying out and being susceptible to wind transport. The positive pressure head would have contributed significantly to the transport of sludge constituents to the groundwater aquifer. A numerical modeling approximation of the wetting front advance was performed from site data using VS2DTI.

5.1 VS2DTI

VS2DTI is a graphical software package for modeling flow and transport in variably saturated porous media. The program is an updated graphical interactive version of VS2D, developed by the U.S. Geological Survey (Lappala, 1987). The program solves single-phase flow by combining the law of conservation with a nonlinear form of Darcy's law extended to accommodate variably saturated porous media.

The program provides choices for the user when determining relationships between saturated and unsaturated flow parameters. For these simulations, the relationship used to describe the relative hydraulic conductivity was derived by van Genuchten (1980) and is supported in this model (Lappala et al, 1987). An upstream weighting method was used when determining an average relative hydraulic conductivity throughout the model domain.

5.1.1 Soil Characteristics

Field data from the sewage lagoons was used to estimate the most appropriate soil types available in the VS2DTI soil library. A distinction was made between the upper soil/sludge layer and the remaining soil strata to the groundwater aquifer. The top 10 ft of soil which contained the lagoon sludge was described in the model as a silty clay. The soil strata from 10 ft below ground surface (bgs) to the groundwater aquifer at 290 ft bgs was represented as a clay loam.

The actual soil defined from drilling logs were composed of heterogeneous layers of sands, silts and clays. Comparisons of values for saturated hydraulic conductivity and soil classifications between field values, and the VS2DTI soil library were used to approximate the model geometry and soil types. Table D-8 lists the VS2DTI flow parameters used to describe the silty clay and clay loam. K_{zz} and K_{hh} represent the vertical and horizontal coefficients of saturated hydraulic conductivity, respectively. Specific storage (Ss) is the fluid storage due to fluid and porous medium-specific compressibilities under saturated conditions. The porosity of a material represents the ratio of the volume of void space to the total volume. The residual moisture content (RMC), α, and β represent curve fitting parameters.

Soil Type	Depth (feet bgs)	K_{zz}/K_{hh}	Saturated K_{hh} (feet/day)	Ss (feet^{-1})	Porosity	RMC	α (feet^{-1})	β
Silty clay	0 - 10	1	0.0158	0	0.36	0.07	0.152	1.09
Clay loam	10 - 290	1	0.205	0	0.41	0.095	0.579	1.31

An important, and often difficult, parameter to determine for the model simulation is the initial moisture profile of the soil. The reported gravimetric soil moisture contents from field samples were converted to equivalent pressure head potentials using the moisture characteristic curves for the soils (Figure D-11). Figure D-12 illustrates the relationship between pressure head and unsaturated hydraulic conductivity. An equilibrium pressure head profile was estimated from the groundwater table (h=0 ft) to a minimum value of -1.64 ft. Above 288.36 ft. bgs, the pressure head remained at -1.64 ft. This represented an initial volumetric moisture content of approximately 35% and a gravimetric moisture content of approximately 22% for the soils.

5.1.2 Simulation Description

The model simulation time is determined by a maximum number of time steps. This model simulation time was manipulated so that the equivalent number of years was long enough for the wetting front to advance to the groundwater table. The ground surface (representing the sewage lagoons) maintained a 3-ft positive pressure head for the duration of the simulation. The simulation represented a one-dimensional soil column, where the column wall boundary condition assumed no lateral flow and the groundwater table boundary condition allowed seepage, thus allowing all infiltrating water to exit the system into the aquifer.

5.1.3 VS2DTI Results

Based on the input parameters and boundary conditions applied to the VS2DTI model, water released at the sewage lagoons and allowed to infiltrate, reached the groundwater aquifer after approximately 2.7 years, yielding an average infiltration rate of 107.4 ft per year.

vice ~ 45 yrs in 1-dim. model

To verify the validity of the VS2DTI results, the same conceptual site model was assumed to be a saturated soil column of 290 ft with 3 ft of positive pressure driving infiltrating groundwater through the system. Using Darcy's Law, the estimated travel time for water at the surface to reach the aquifer is 5.4 years. Solution of the VS2DTI unsaturated model provided the additional gradient component of matric suction in the unsaturated soil; therefore, the wetting front is expected to reach the groundwater in time less than 5.4 years.

The important attribute of the VS2DTI simulation is the ability to solve for the wetting front arrival time under the influence of the constant 3 ft of positive pressure head. This result was used to help calibrate nitrate migration using the SESOIL model.

5.2 ADDITIONAL SESOIL MODELING

The sewage lagoons at Cannon AFB contained a layer of sludge at the ground surface which contained elevated concentrations of nitrate. To prevent drying of the sludge layer, approximately 3 ft of positive pressure head as wastewater effluent or potable water was maintained in the lagoons from 1965 until 1999. The concentration of nitrate in the groundwater aquifer sampled from a well adjacent to the lagoons, measured 12 mg/L of nitrate in March 2000, at which time, the water within the lagoons had been removed. 12ppm Nitrate > 10ppm limit (WQCC)

The SESOIL model was used to determine the nitrate concentration in the sewage lagoon sludge that produced a groundwater concentration of approximately 12 mg/L after 35 years of operation. SESOIL was also used to verify whether elimination of the positive pressure head (removing standing surface water) from the lagoons would limit the transport mechanism through the vadose zone, thus reducing nitrate levels in groundwater over time.

5.2.1 Infiltration Calibration

SESOIL does not allow the user to designate a positive pressure head or a flux rate as a boundary condition. The user may increase infiltration into the ground surface by increasing precipitation. The results of VS2DTI estimated that the leachate wetting front reached groundwater after approximately 2.7 years. To represent the effect of the 3-ft positive pressure head on the lagoons, precipitation amounts were increased within the SESOIL input file until the model predicted wetting front arrival at the groundwater aquifer after 2 to 3 years of simulation time. To approximate infiltration that equates to 2 to 3 years, a precipitation rate of 99 centimeters per month (cm/month) was used in the SESOIL model simulations.

5.2.2 Loading Rate Calibration

To calibrate the model for initial sludge concentration, the instantaneous loading rate was manipulated until the groundwater concentration measured 12.7 mg/L after 35 years of simulation time. This required a loading concentration of 644.6 mg/kg (10,500 $\mu g/cm^2/day$) in the sludge layer, which is a concentration that is much greater than the results obtained from field samples.

The model reached steady state conditions after 9 to 10 years of simulation time. The groundwater concentration remained constant at 12.7 mg/L from 10 years to the simulation termination at 50 years. This simulation will be referred to as CAL2.

The required precipitation required to simulate the 3-ft positive pressure head (99 cm/month) and the estimated sludge concentration (644.6 mg/kg) were used to simulate migration through the vadose zone under current conditions where the lagoons are dry. The increased precipitation of 99 cm/month, which represents 3 ft of ponded water on the lagoons, was applied for 10 years to allow the system to achieve a steady state. After 10 years, the current normal precipitation conditions and climate data for the area were used. This represented the year 2000, when the sewage lagoons were allowed to dry. This simulation will be referred to as EXP1.

Three additional simulations were performed to predict groundwater nitrate concentrations with soil loading values directly related to field sample data. Only field samples with nitrate concentrations greater than 5.0 mg/kg were considered. The average nitrate concentrations in sludge and soil samples were calculated as 66.25 mg/kg and 154.88 mg/kg for only the sludge samples. The current New Mexico Environmental Department (NMED) soil-screening level (SSL) of 10 mg/kg was also considered. These three soil concentration values corresponded to instantaneous loading rates of 1079.2 $\mu g/cm^2/day$, 2523.0 $\mu g/cm^2/day$, and 488.7 $\mu g/cm^2/day$, respectively. Model simulations using these loading rates produced, after 10 years steady-state groundwater concentrations, 1.3 mg/L, 3.05 mg/L, and 0.59 mg/L, respectively. These simulations will be referred to as LAGAVG (lagoon average), SLUAVG (sludge average), and STATE (NMED SSL value), respectively.

A final simulation was performed to understand the transport of the nitrate to groundwater under precipitation events normal to the region. The loading concentration of 644.6 mg/kg (10,500 $\mu g/cm^2/day$) in the sludge layer was combined with the predicted annual climate for Clovis, NM from the SESOIL climate database. The final simulation was performed for 100 years and is referred to as FINAL.

5.2.3 SESOIL Results

Results of the three additional simulations at increased precipitation (LAGAVG, SLUAVG, and STATE) are presented in Figure D-13. The groundwater aquifer concentration in ppm is plotted as a function of simulation time. All of the simulations reach a steady after approximately 9 years of simulation, except EXP1. The estimated groundwater concentrations at this steady state are proportional to the loading rates.

EXP1 maintained excessive precipitation (as the other simulations) from 0 to 9 years. The climate was returned to normal conditions on the tenth year. After 10 years, results from the EXP1 simulation show a minor decrease, and then a gradual increase in groundwater concentration to an asymptotic value of approximately 185 ppm. This is attributed to the decrease in water infiltrating to the groundwater; and thus, an increase in constituent concentration.

Figure D-14 illustrates the result of the FINAL simulation. Depth of wetting front (ft) is plotted on the left, vertical axis as a function of time. Groundwater aquifer nitrate concentration (ppm) as a function of time is plotted on the right, vertical axis. The wetting front with the nitrate concentration reaches the groundwater aquifer after 74 years. At 74 years, the groundwater aquifer nitrate concentration steadily increases.

5.3 CONCLUSIONS OF PERIPHERAL MODELING

The described simulations were intended to help determine the parameters most significant for promoting constituent transport to groundwater. An attempt was made to understand the effects of maintaining a positive pressure head on the system, and determine the effects of removing this pressure head.

It was determined from the described simulations that excessive amounts of infiltrating water are necessary to provide the transport mechanism required to greatly affect groundwater concentrations. The earliest simulations assuming normal climatic conditions predicted that the constituents of concern would not reach groundwater after 50 years. The final simulation assuming normal climatic conditions predicted a breakthrough of nitrate after 74 years. These simulations have conservative and less conservative components. They are conservative because they do not allow for the removal of soil moisture. There is no lateral movement of water or evapotranspiration occurring. The least conservative aspect of the simulations involves the initial soil moisture content of the soil. After 35 years of standing water present in the lagoons at the top of the soil column, the subsurface should be very moist, thus enabling contaminant transport in the unsaturated zone to occur faster than the wetting front illustrated by SESOIL

at normal climatic conditions. The soil moisture throughout the subsurface would already contain a concentration of nitrate, which cannot be replicated in the SESOIL simulations.

Increasing the precipitation infiltration in an effort to represent the ponded water in the lagoons illustrates that the positive pressure head could enhance transport of constituents enough to be a concern. The positive pressure head created from ponded water in the sewage lagoons, could have provided this mechanism. Removal of the pressure head combined with the effects of evapotranspiration and contaminant decay should greatly limit nitrate flux to groundwater. The excessive amounts of water infiltrating from standing water at the surface would also contribute to diluting nitrate and reducing the nitrate concentration, illustrated by the SESOIL simulations with excessive precipitation. The results indicate an asymptotic nitrate concentration that has a magnitude dependent only on the loading rate. When the precipitation values are decreased, the aquifer concentrations begin to rise and has a direct effect on the Summers mixing model to account for groundwater concentrations in the SESOIL model. A trend in nitrate concentrations in groundwater over time is not possible to observe in the SESOIL results since, degradation or decay was assumed to not occur in the model.

The simulations have shown that effects on the groundwater aquifer were realistic under the 3 ft positive pressure head, but limiting infiltrating water and preventing standing water from existing at the sewage lagoons will significantly reduce the ability of the nitrate to reach the groundwater aquifer.

6.0 REFERENCES

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Table D-1 Cannon AFB Sewage Lagoons
SESOIL Soil Parameters Input

SOIL	Model Units	Model Input	Assumption	Reference
Bulk Density	g/cm^3	1.63		average of samples tested from the site - Western Technologies Inc. - April, 2000
Intrinsic Permeability	cm^2	1.79E-09		calculated from permeability of field samples
Disconnectedness index		9		estimated from SESOIL User's Guide - General Sciences Corp., 1995
Effective porosity		0.33		15% reduction from calculated porosity, based on an assumed Specific Gravity
Organic carbon content	%	0.1667		Average value of tested field samples
Cation exchange capacity	meq/100g	0	yes	
Freundlich eqn. Exponent		1	yes	

Model Compartments	
# Layers	2

Layer-specific Data	Layer 1	Layer 2	Layer 3	Reference
Composition	soil/sludge	*		
Thickness	304.8 cm (10 ft.)	8534.4 cm (280 ft.)	609.6 cm (20 ft.)	
Condition	unsaturated	unsaturated	saturated	

*composite values of SM, CL, and SC samples

Table D-2 Cannon AFB Sewage Lagoons
SESOIL Climate Database Input

Clovis 3 SSW - SESOIL Climate Data

CLIMATE	Units	October	November	December	January	February	March	April	May	June	July	August	September
Air temperature	degrees C	13.78	7.06	2.89	1.83	3.94	6.83	12.5	17.39	22.33	24.44	23.67	19.72
Cloud cover		0.40	0.40	0.50	0.55	0.50	0.50	0.50	0.50	0.40	0.55	0.35	0.30
Humidity		0.5	0.55	0.55	0.5	0.55	0.5	0.45	0.45	0.45	0.55	0.55	0.5
Albedo		0.25	0.26	0.27	0.28	0.27	0.27	0.26	0.25	0.25	0.25	0.25	0.25
Evapotranspiration	cm/day	0	0	0	0	0	0	0	0	0	0	0	0
Precipitation	cm	3.43	1.39	1.05	0.98	1.17	1.32	1.69	4.14	5.56	7.04	6.53	4.3
Storm duration	days	0.33	0.2	0.27	0.23	0.29	0.25	0.19	0.2	0.23	0.22	0.23	0.29
# Storms		2.34	1.47	1.51	1.09	1.38	1.76	1.67	3.13	3.76	4.42	4.38	2.63
Length	days	30.4	30.4	30.4	30.4	30.4	30.4	30.4	30.4	30.4	30.4	30.4	30.4

Table D-3 Cannon AFB Sewage Lagoons
SESOIL Climate Input
(used for comparison to SESOIL database)

Climate Data Obtained from Various Sources

CLIMATE	Units	October	November	December	January	February	March	April	May	June	July	August	September	Assumption
Air temperature	degrees C	14.61	11.04	4.04	6.76	8.28	10.38	12.71	18.66	23.22	24.94	24.52	19.79	no
Cloud cover		0.25	0.25	0.25	0.20	0.20	0.20	0.30	0.30	0.20	0.40	0.50	0.40	yes
Humidity		0.552	0.523	0.633	0.555	0.437	0.685	0.517	0.593	0.639	0.607	0.613	0.698	no
Albedo		0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	yes
Evapotranspiration	cm/day	0	0	0	0	0	0	0	0	0	0	0	0	yes
Precipitation	cm	0.9398	0.0254	1.3208	3.7592	0	2.794	5.8928	6.4262	3.2766	6.4008	10.6172	6.1976	no
Storm duration	days	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	yes
# Storms		1	1	6	1	0	2	5	7	7	3	7	3	no
Length	days	31	30	31	31	28	31	30	31	30	31	31	30	yes

	Reference
Air temperature	WRCC* - Clovis, NM Average of Daily Max. and Min. for 1999
Cloud cover	estimated
Humidity	WRCC - Multiple readings daily - Clovis, NM 1999
Albedo	Eagleson, 1980
Evapotranspiration	conservatively assumed 0.0 as an initial value - SESOIL calculated evapotranspiration rates at approximately 15% of reported average class A pan rates from 1951 to 1995
Precipitation	WRCC - Clovis, NM for 1999
Storm duration	estimated
# Storms	each daily precipitation record considered as 1 storm
Length	days of the month

* Western Regional Climate Center

Table D-4 Cannon AFB Sewage Lagoons
SESOIL Chemical Parameters Input

Decision Matrix for Assessing Contaminants to be used in SESOIL Modeling
Cannon AFB Sewage Lagoons

1) Contaminants detected in Soil/Sludge field samples
2) Contaminants that have a greater concentration in the soil than the background concentrations listed in the Risk Assessment
3) Contaminants that have a defined groundwater standard (State or Federal)
4) Solubility in water

1 Contaminants	Matrix	Units	Max. conc.	Contaminants Detected in Risk Assess.	2 Background Concentration (mg/kg)	3 Water Standard (ppm)	4 Solubility (mg/L-water)
4,4'-DDE	soil/sludge	Ug/kg	120			none	4.00E-02
4,4'-DDT	soil/sludge	Ug/kg	170			none	3.10E-03
ALPHA-BHC	soil/sludge	Ug/kg	2.200	ALPHA-BHC	not available	none	1.63
ALPHA-CHLORDANE	soil/sludge	Ug/kg	32			0.002	5.60E-02
ARSENIC	soil/sludge	mg/kg	13.900	ARSENIC	5.9	0.05	1.00E-02
BARIUM	soil/sludge	mg/kg	2.010	BARIUM	165		1.00E-02
BETA-BHC	soil/sludge	Ug/kg	100			none	7.00E-01
CADMIUM	soil/sludge	mg/kg	12.800	CADMIUM	not available	0.005	1.00E-02
CHROMIUM	soil/sludge	mg/kg	1.500.000	CHROMIUM	1.500	0.1	1.00E-01
DIELDRIN	soil/sludge	Ug/kg	89			0.002	1.86E-01
ENDRIN ALDEHYDE	soil/sludge	Ug/kg	20			0.002	2.60E-01
GAMMA-BHC (LINDANE)	soil/sludge	Ug/kg	62	GAMMA-BHC (LINDANE)	not available	0.0002	[illegible]
GAMMA-CHLORDANE	soil/sludge	Ug/kg	66			0.002	5.60E-02
HEPTACHLOR	soil/sludge	Ug/kg	59	HEPTACHLOR	not available	0.0002	3.50E-01
HEPTACHLOR EPOXIDE	soil/sludge	Ug/kg	59			0.0002	3.50E-01
LEAD	soil/sludge	mg/kg	1.05	LEAD	15	0.05	1.00E-02
M/P-XYLENES	soil/sludge	Ug/kg	110	M/P-XYLENES	not available	0.002	1.00E-02
MERCURY	soil/sludge	mg/kg	3.890			0.002	5.60E-02
METHYLENE CHLORIDE	soil/sludge	Ug/kg	450			0.005	13000
NITRATE/NITRITE-N	soil/sludge	mg/kg	1.185.000	NITRATE/NITRITE-N	not available	10	[illegible]
PCB-1260	soil/sludge	mg/kg	380			?	
SELENIUM	soil/sludge	mg/kg	1.330.000	SELENIUM	0.61	0.05	[illegible]
SILVER	soil/sludge	mg/kg	105			0.005	insoluble
TOTAL ORGANIC CARBON	soil/sludge	mg/kg	3300				

Contaminant	Solubility (mg/L-water)	Kh (diff. In air) (cm^2/sec)	Henry's Const. (m^3-atm/mole)	Koc (ads. On carbon)	Kd (ads. On soil)	molecular weight (g/mole)	log Kow
GAMMA-BHC (LINDANE)	[A]7	[2]0	[A]0.000000493	[D]837.4	[C]817.3	[A]290.83	[A]3.24
HEPTACHLOR	[A]0.056	[2]0	[A]0.00148	[E]5896.6	[F]2000	[A]373.32	[A]4.4
M/P-XYLENES	[1]851	[2]0	[1]0.0067	[1]196	[4]0	[1]106	[3]2.77
NITRATE/NITRITE-N	[G]1183000	[2]0	0	0	0	[G]80	0

*Use Kd or Koc

[A]EPA Handbook of RCRA Ground-Water Monitoring Constitiuents, September 1992
Provided by Carol [1]EPA Region 9 PRG Table, October 1998
[2]GSC, 1994 (assume soil-to-air diffusion does not occur)
[3]Mabey et al., 1982; EPA, 1992
[4]GSC, 1994 (if using K_{oc} set K_d to zero)
[C]Calculated from: log K_d = 1.01 log K_{ow} - 0.36 EPA Soil Screening Guidance: Technical Background Document, May 1996, PB96-963502
[D]Calculated from: ln K_{oc} = ln K_{ow} - 0.7301 Fetter, 1993 "Contaminant Hydrogeology" - Pg. 134 Equation (T9)
[E]Calculated from: log K_{oc} = 0.544 log K_{ow} + 1.377 Fetter, 1993 "Contaminant Hydrogeology" - Pg. 134 Equation (T4)
[F]EPA TA-0016, June, 1987 - Processes, Coefficients, and Models for Simulating Toxic Organics and Heavy Metals in Surface Waters
[G]CRC Handbook of Chemistry and Physics, 65th Edition, 1985, CRC Press - Pg. B-72 - values listed for ammonium nitrate

Table D-5 Cannon AFB Sewage Lagoons
Site-Specific Pollutant Load Values

APPLICATION	Model Units	Model Input	Assumption	Reference
# Years		50	Yes	
# Soil layers		2	Yes	
Application area	cm^2	5.82E+08	No	Site Drawing
Latitude	degrees N	34.4	No	

LOADING TYPE (choose one)	
Instantaneous	X
Continuous	

Entered for 1st month of 1st year in top layer

Pollutant added to Layer 1	Concentration Ug/g	Load $Ug/cm^2/month$
heptachlor	0.0035	25.83
lindane	0.052	1.74
nitrates	486	2.41E+05
xylenes	0.11	54.65

Table D-6 Cannon AFB Sewage Lagoons
SESOIL Groundwater Mixing Input

Summers Model Groundwater Mixing

APPLICATION	Model Units	Model Input	Assumption	Reference
Saturated Hydraulic Conductivity	cm/day	15	No	Geotechnical data, April 2000
Horizontal Hydraulic Gradient	cm/cm	0.002	No	Cannon AFB, 1999
Thickness of Groundwater Mixing Zone	cm	610.0	Yes	Well screen interval = 20 ft
Width of Contaminated Zone Perpendicular to Groundwater Flow Direction	cm	28956	No	Widest point of south lagoon
Background Concentration of the Contaminant in the Aquifer	Ug/mL	0	Yes	

Table D-7 Cannon AFB Sewage Lagoons
SESOIL Simulations

Cannon AFB
Sewage Lagoons
SESOIL Input Parameters

Simulation Desc.	Chemical	Climate Data From SESOIL Database	1 -24 hr.-100 yr. Storm per year	6 -24 hr.-100 yr. Storm per year	50 year Simulation	Depth to GW 290 ft.	Max. Pollution Depth (m)	Max. Pollution Depth (ft.)	Groundwater Concentration (Ug/mL)
1	heptachlor	X			X	X	0.006	0.02	
1	lindane	X			X	X	0.014	0.04	
1	nitrate	X			X	X	68.840	225.85	
1	xylenes	X			X	X	16.160	53.02	
2	heptachlor	X	X		X	X	0.006	0.02	
2	lindane	X	X		X	X	0.015	0.05	
2	nitrate	X	X		X	X	77.180	253.22	
2	xylenes	X	X		X	X	18.400	60.37	
3	heptachlor	X		X	X	X	0.008	0.03	
3	lindane	X		X	X	X	0.020	0.06	
3	nitrate	X		X	X	X	88.390	289.99	233
3	xylenes	X		X	X	X	24.150	79.23	

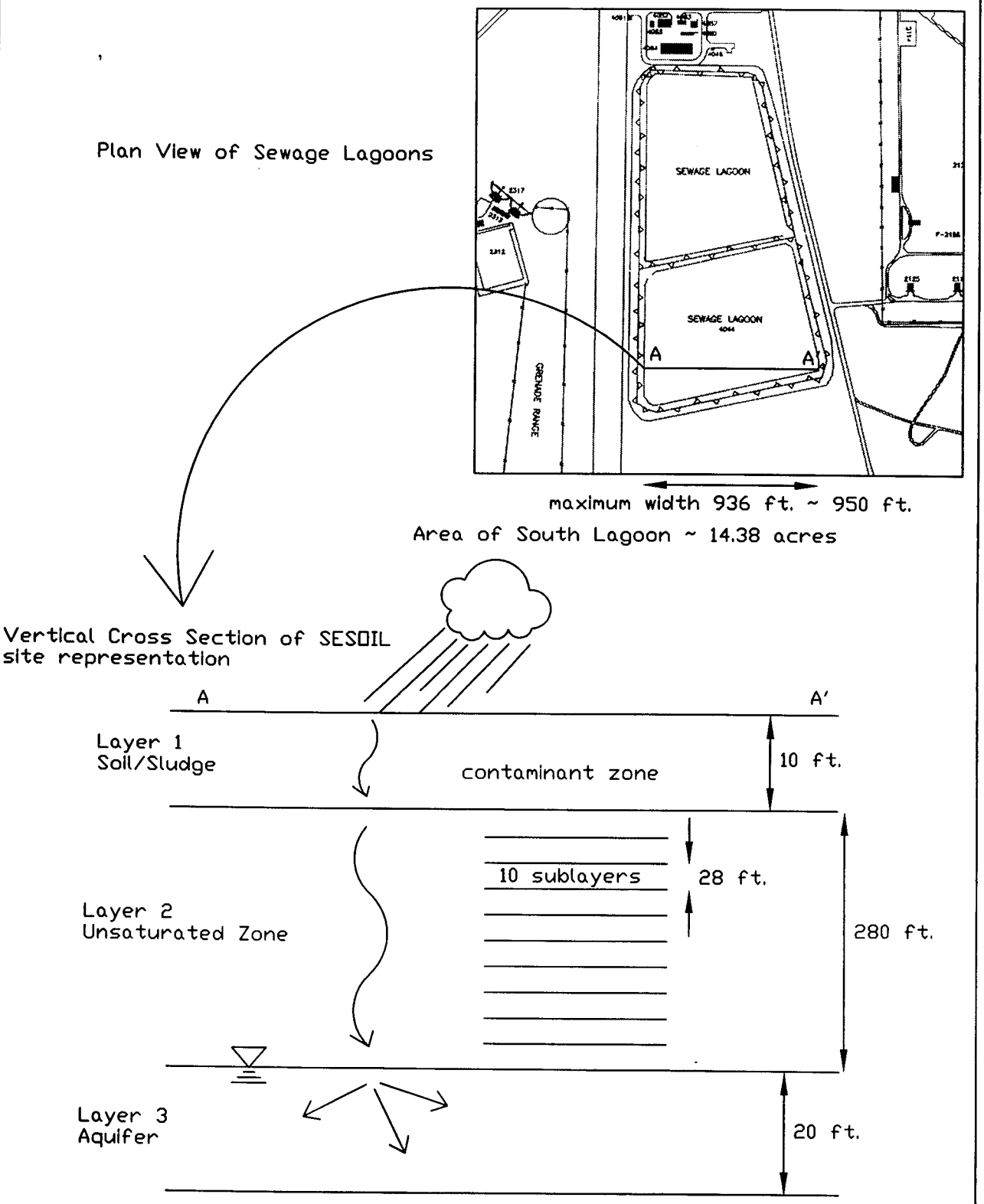

Figure D-1a Site Conceptual Model

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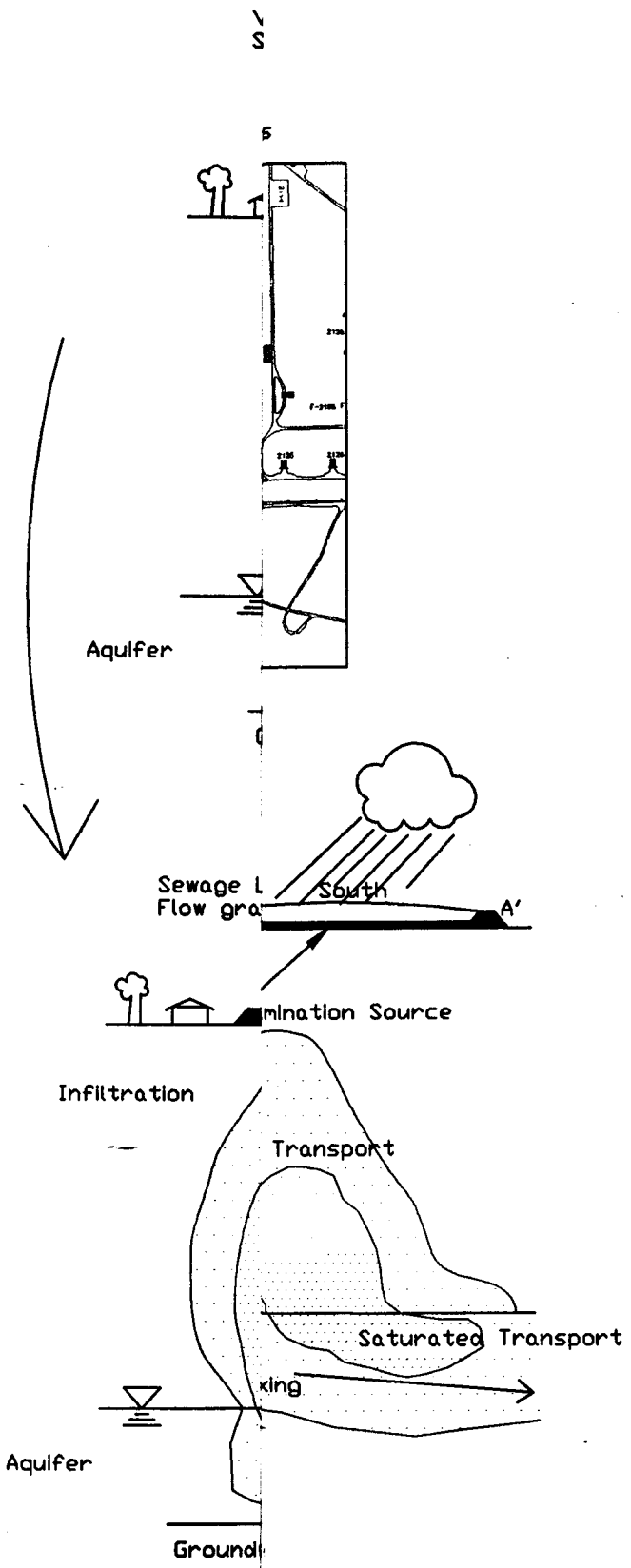

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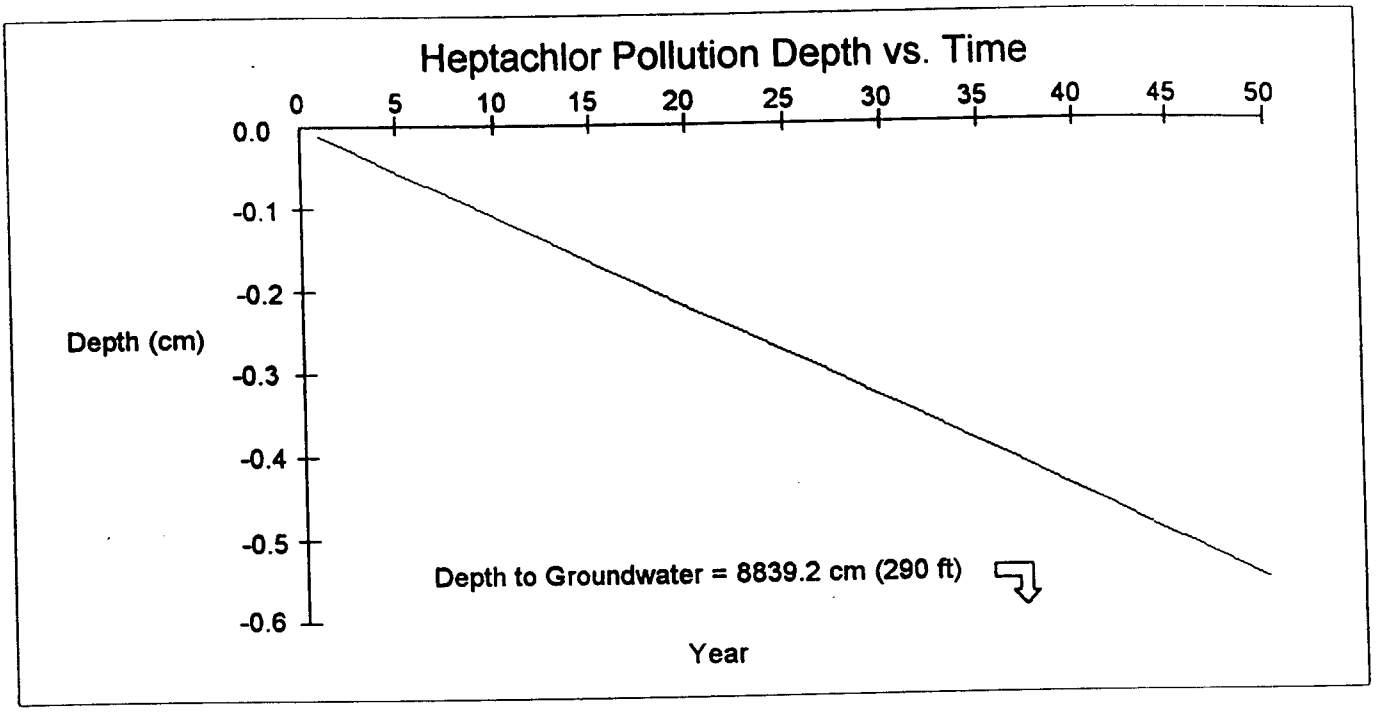


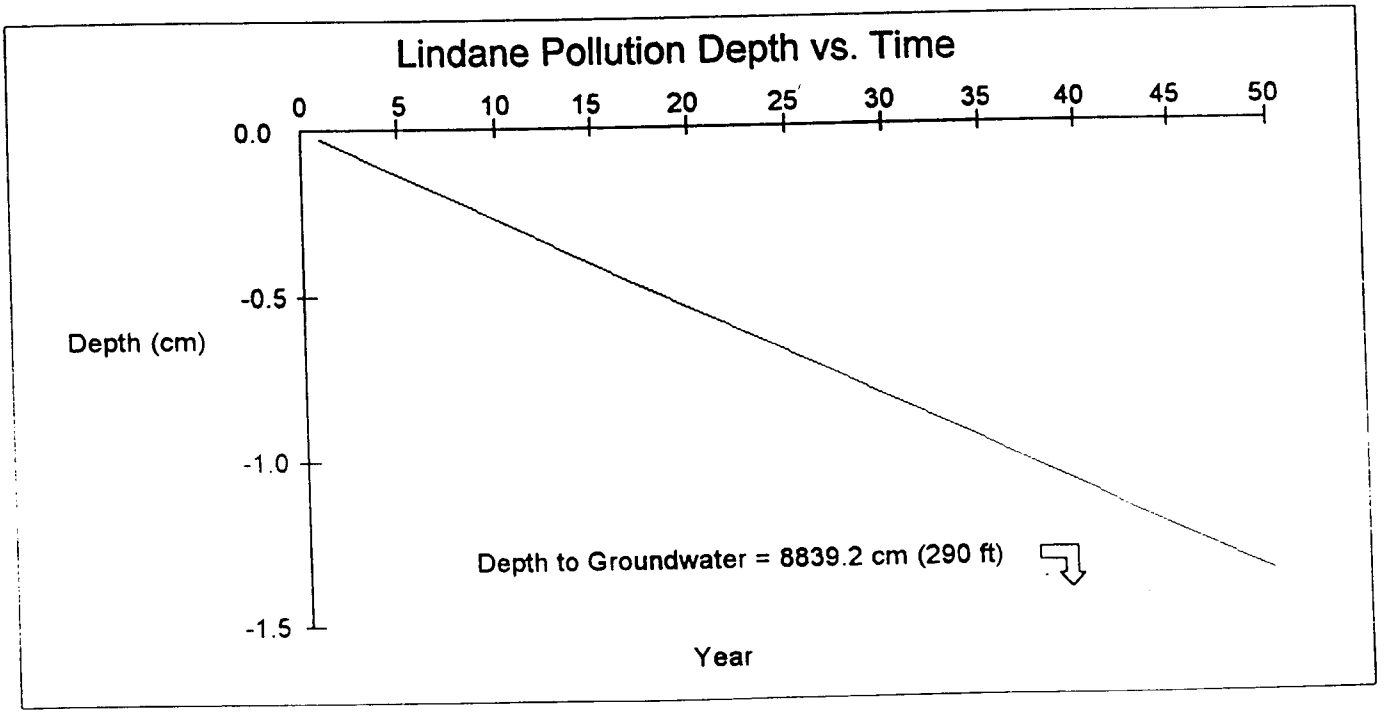
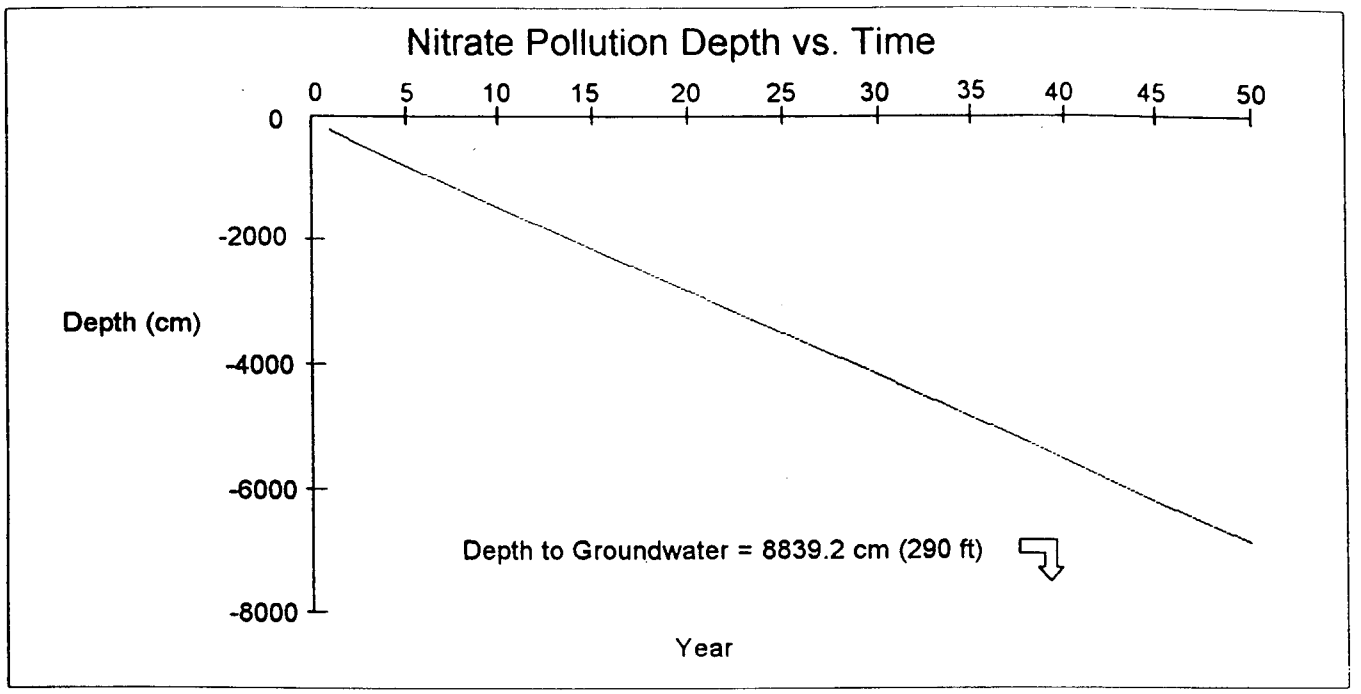


Figure D-2. Cannon AFB Sewage Lagoons Simulation 1



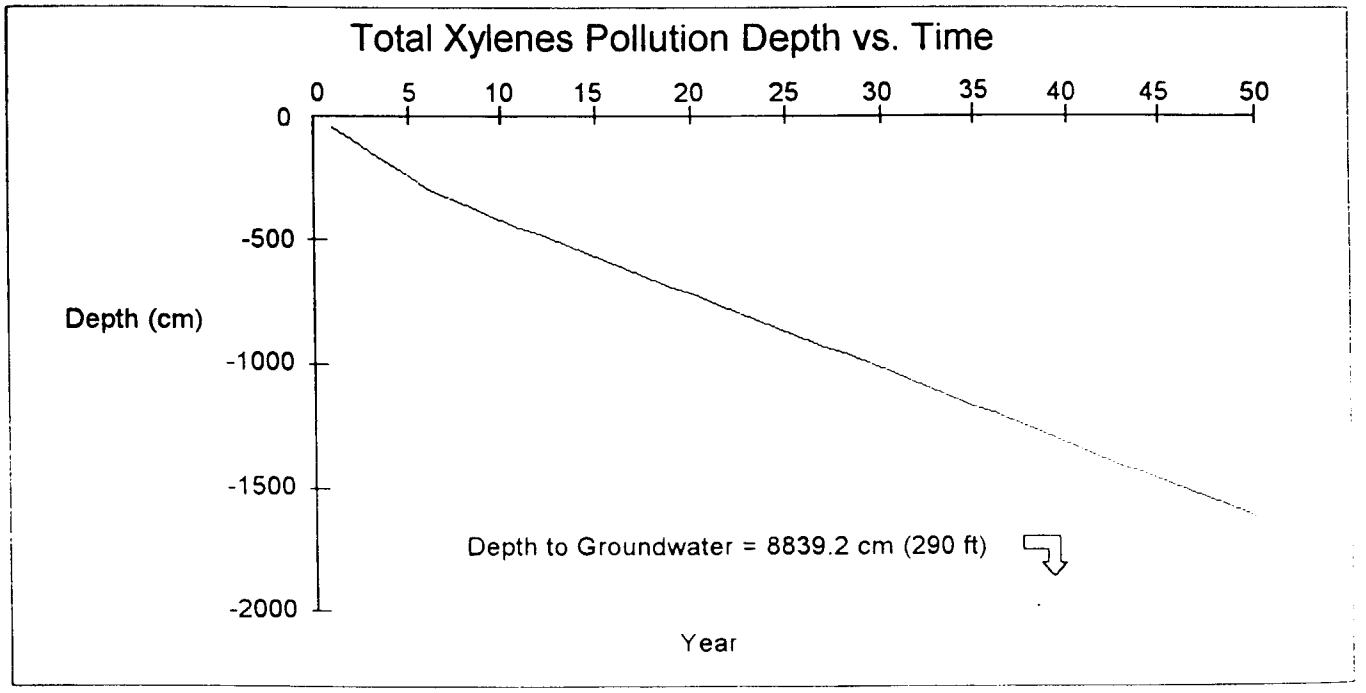
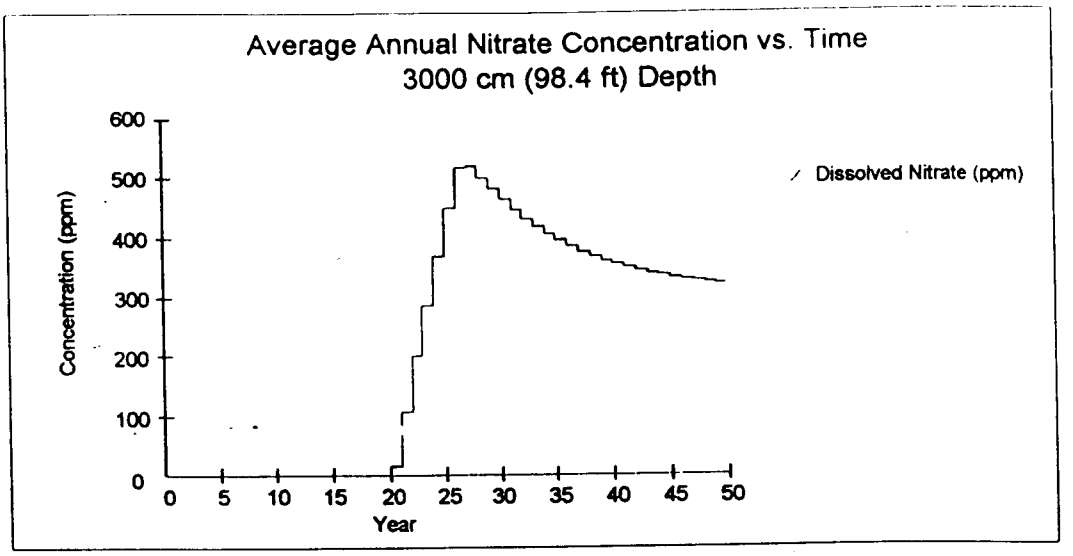
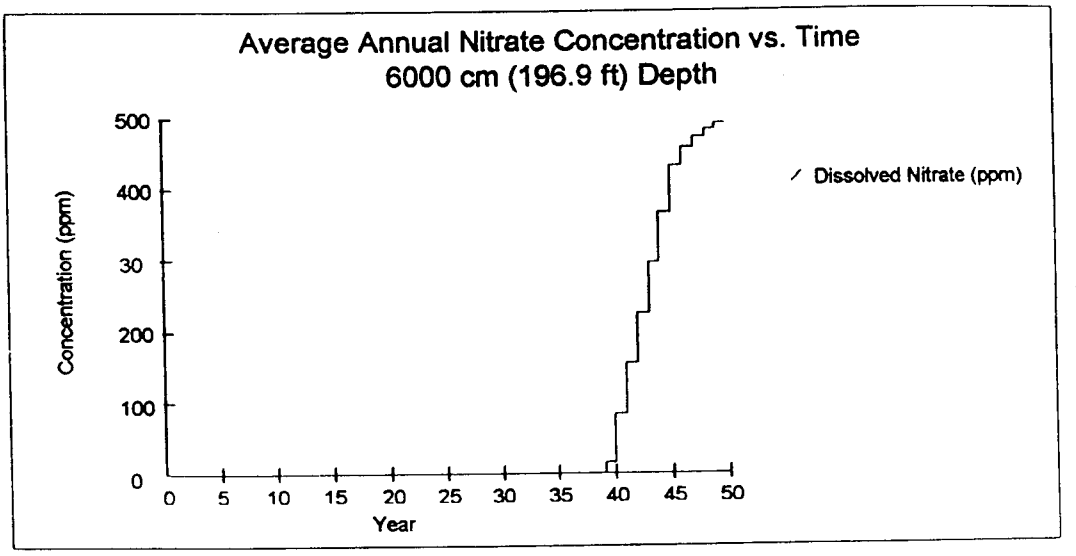


Figure D-3. Cannon AFB Sewage Lagoons Simulation 1





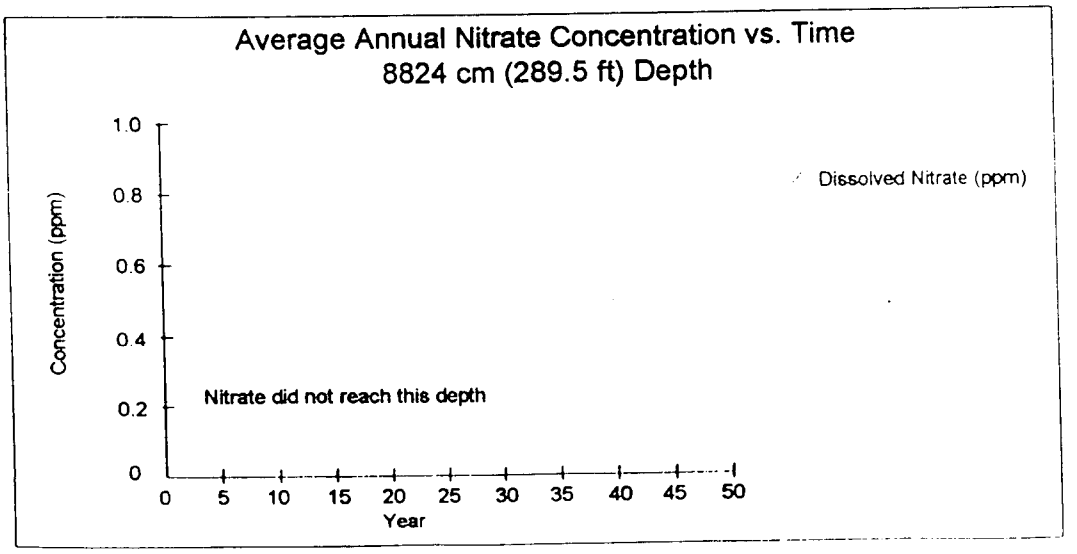
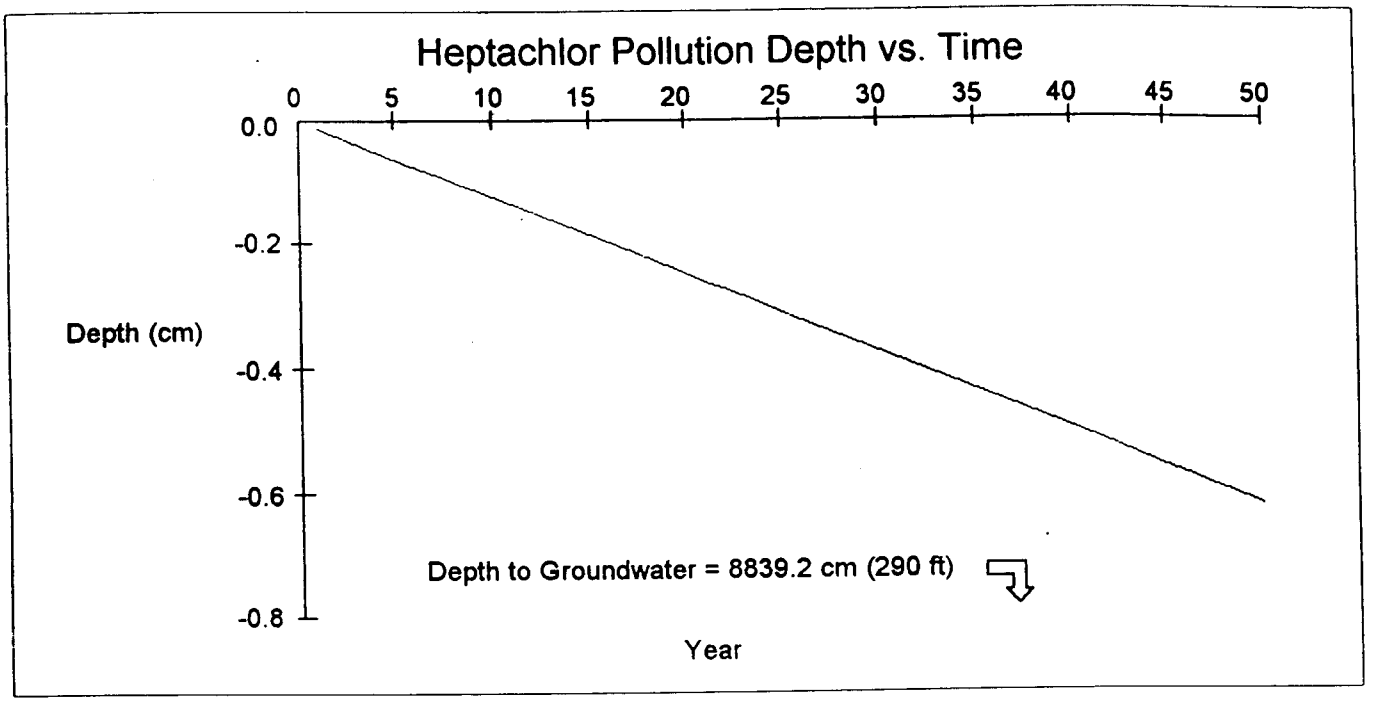


Figure D-4. Cannon AFB Sewage Lagoons Simulation 1



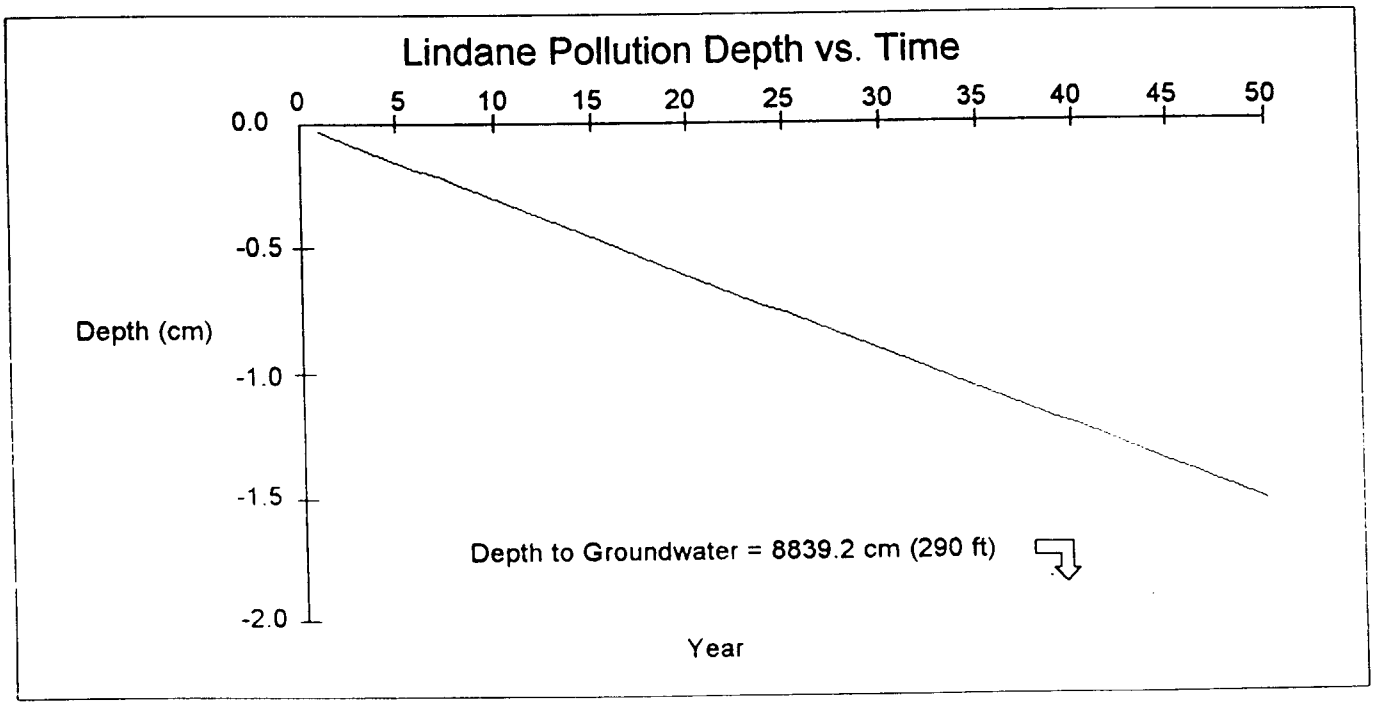
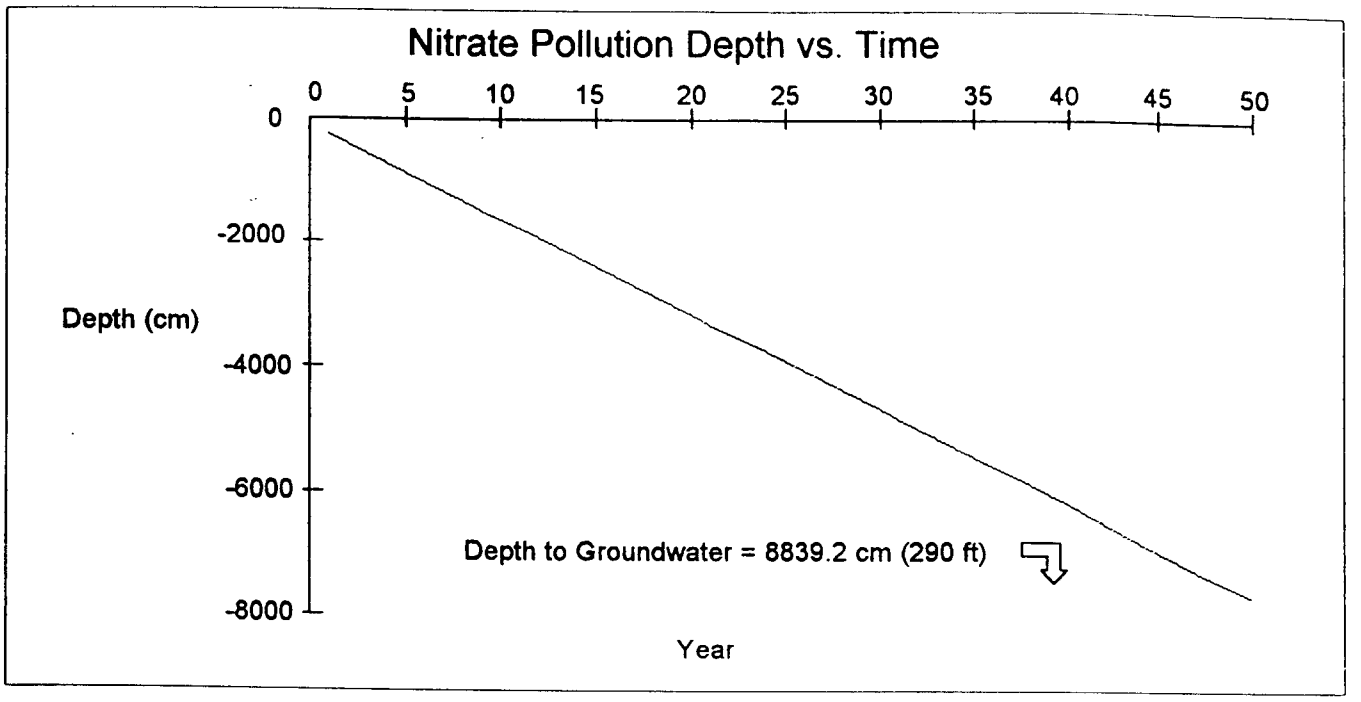


Figure D-5. Cannon AFB Sewage Lagoons Simulation 2



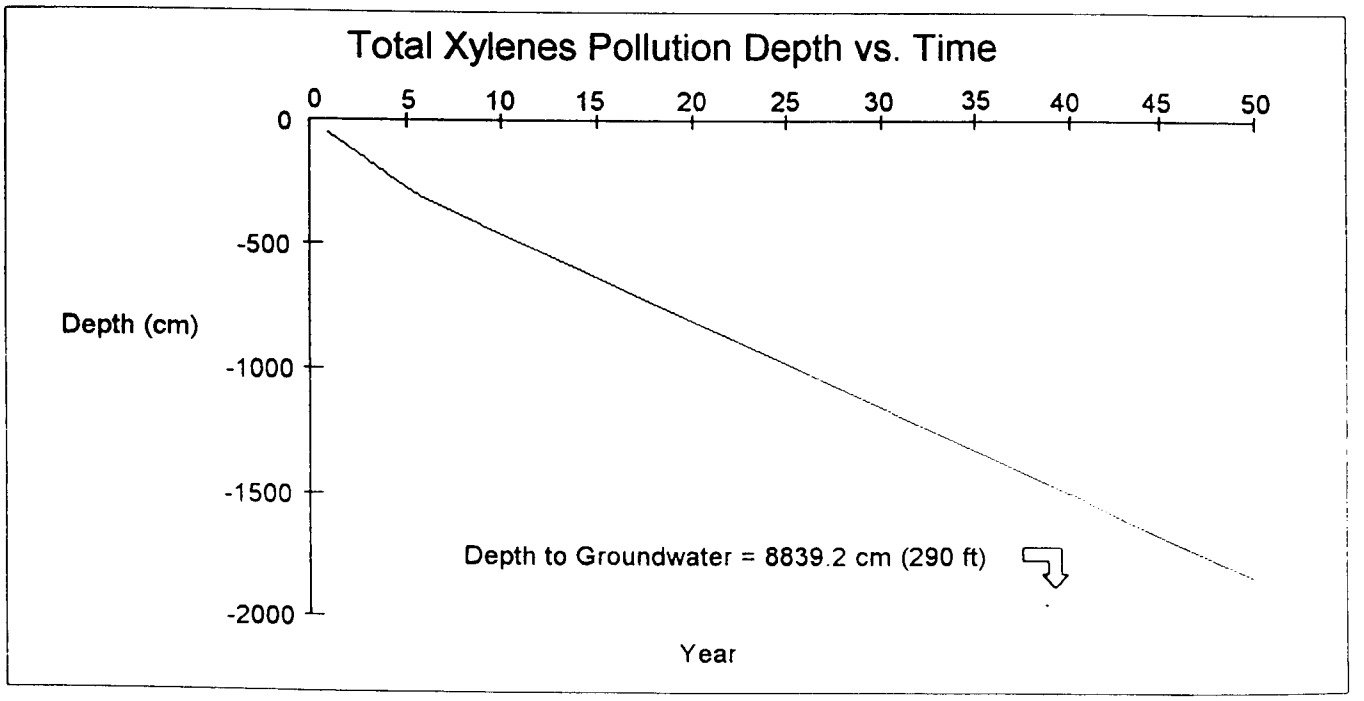
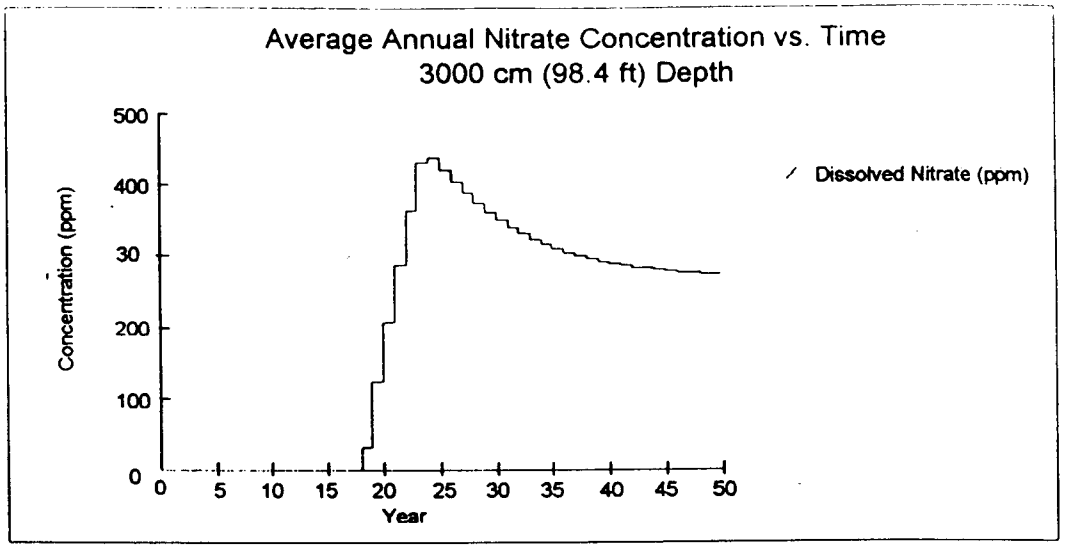
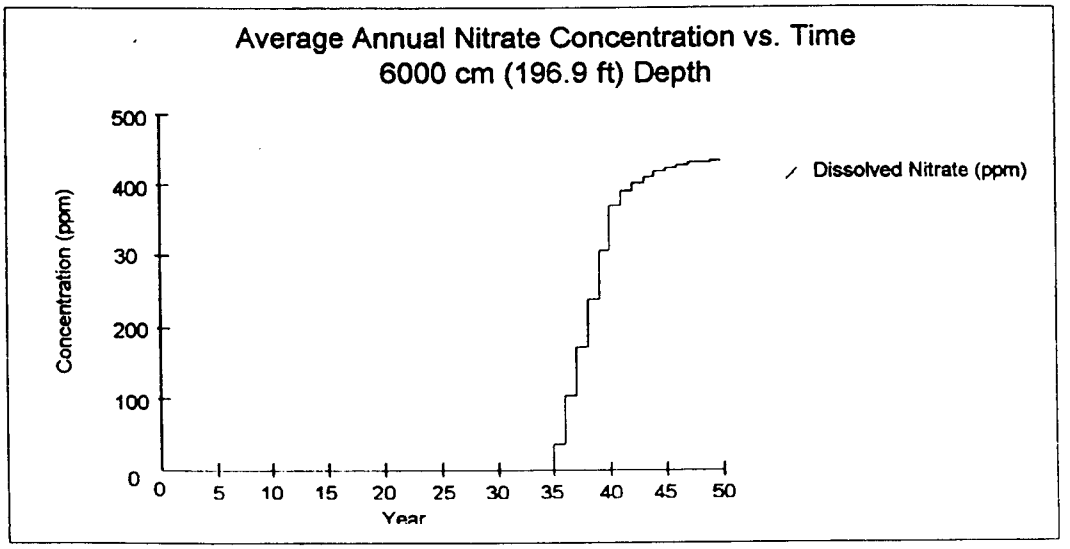


Figure D-6. Cannon AFB Sewage Lagoons Simulation 2





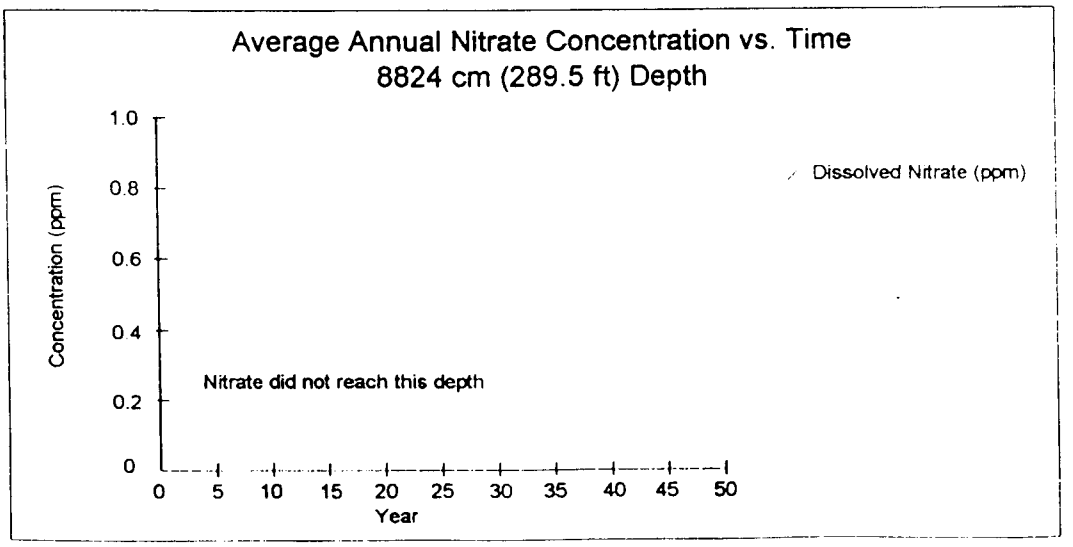
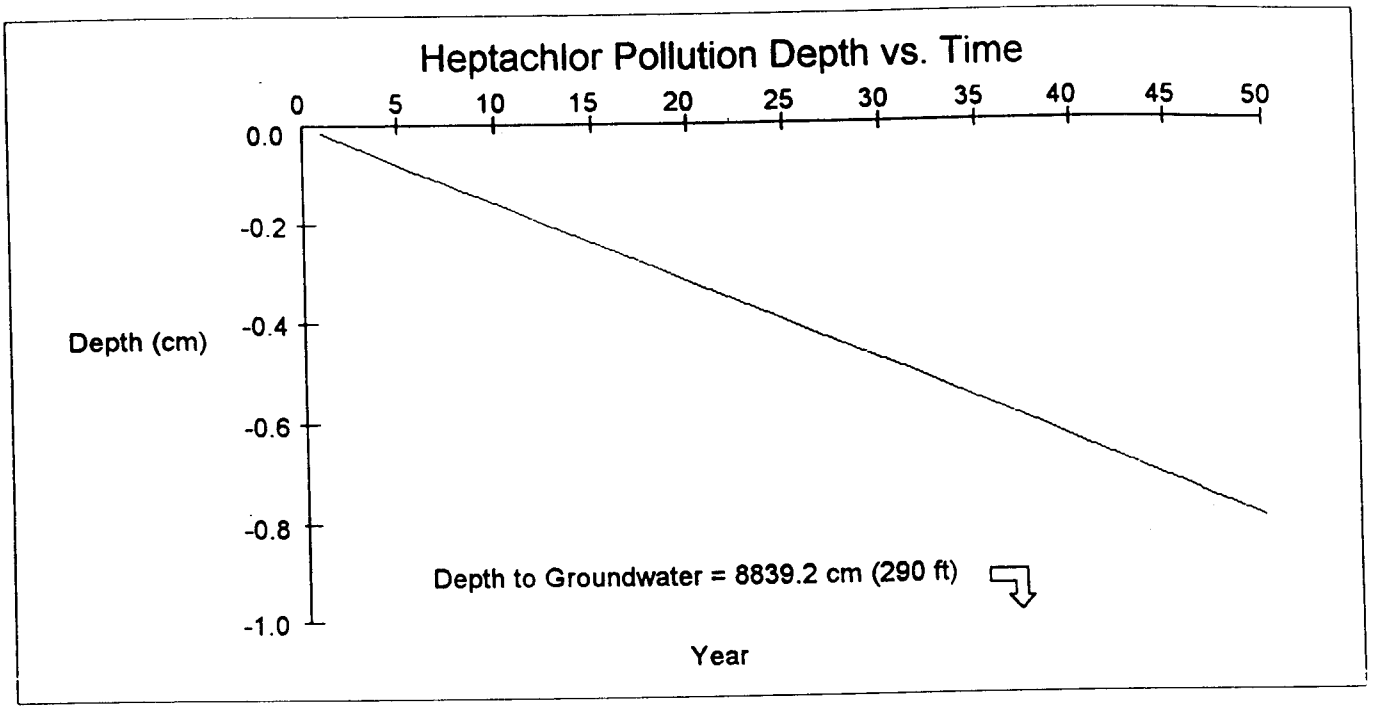


Figure D-7. Cannon AFB Sewage Lagoons Simulation 2



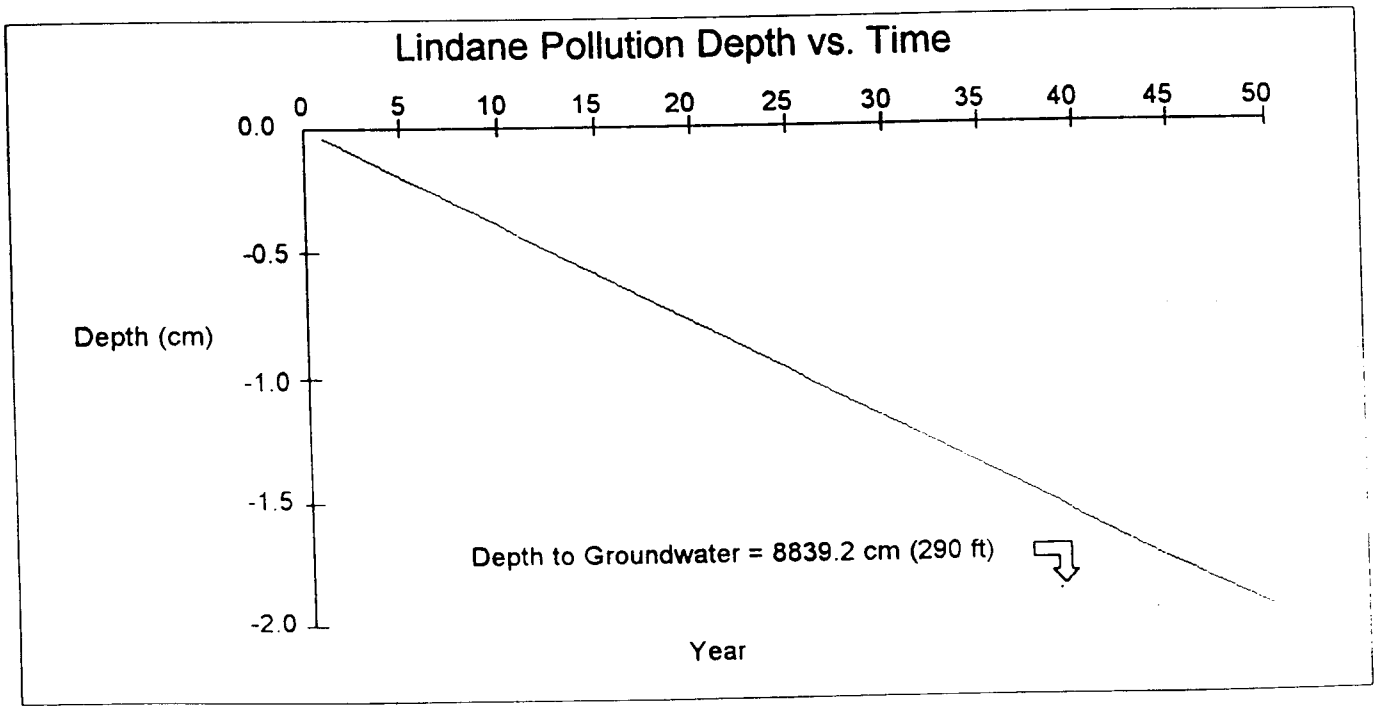
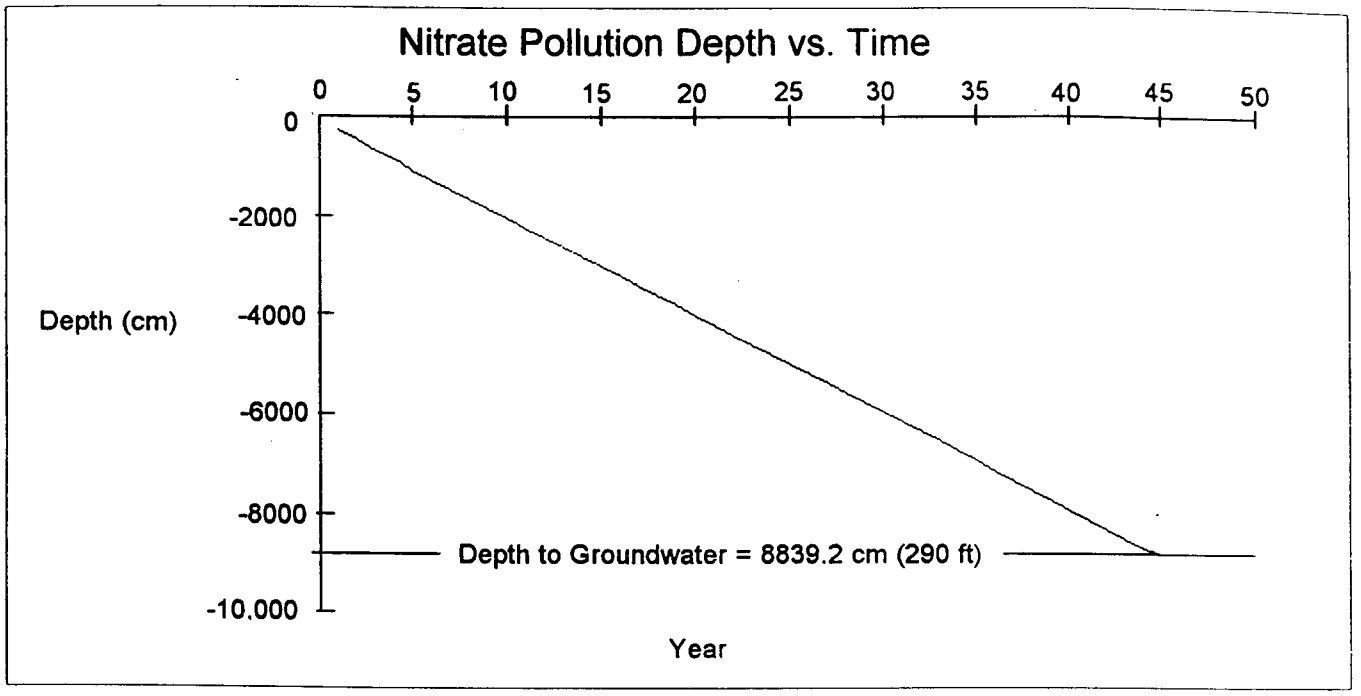


Figure D-8. Cannon AFB Sewage Lagoons Simulation 3



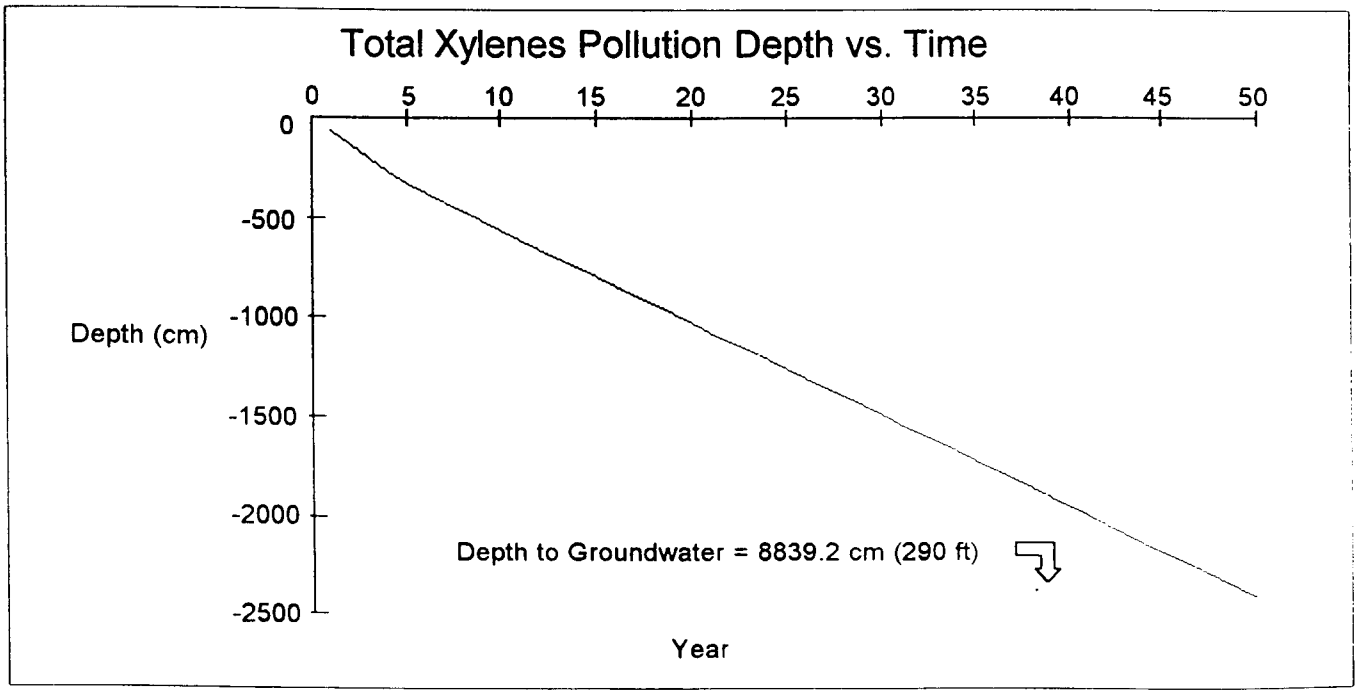
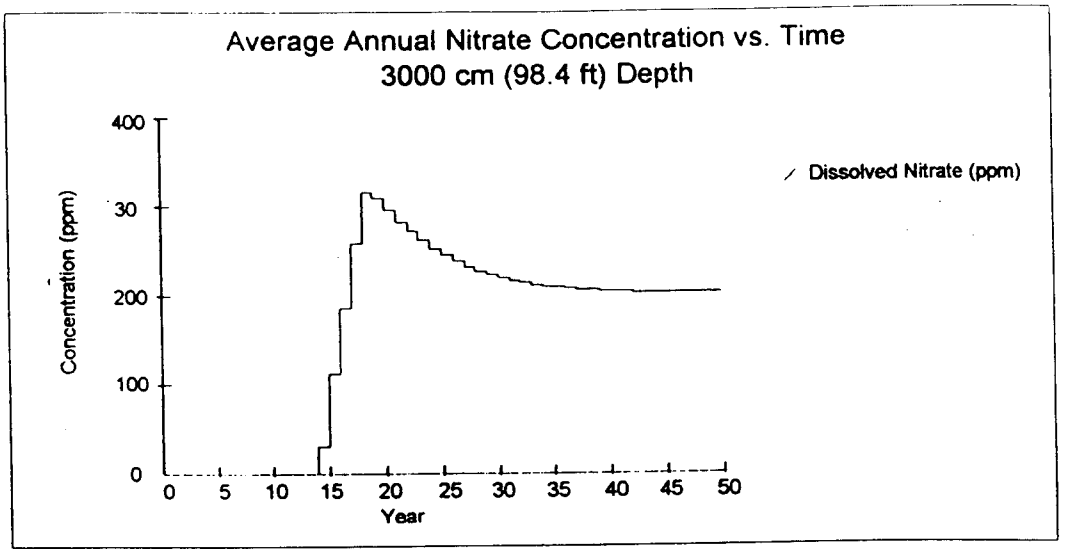
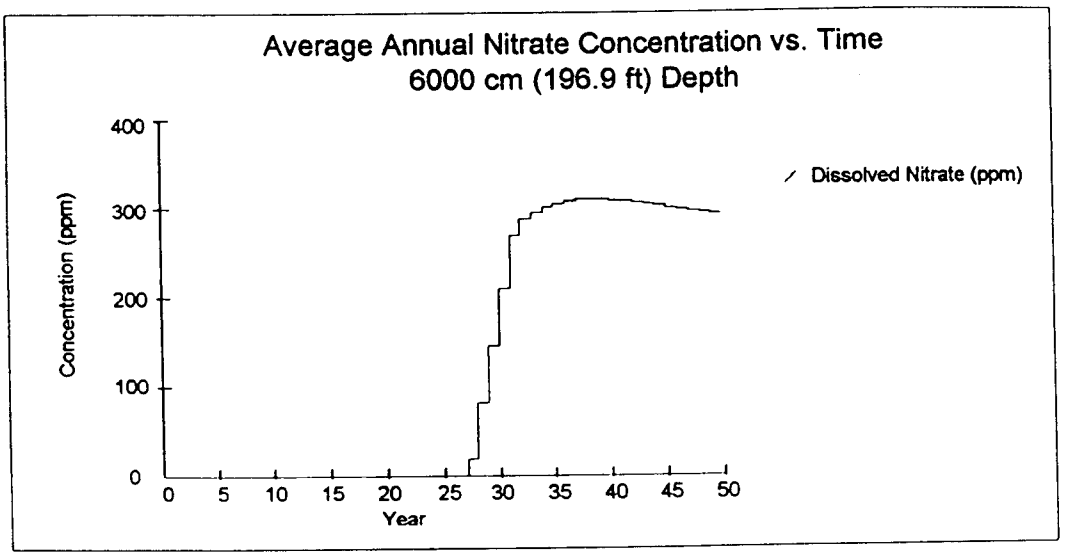


Figure D-9. Cannon AFB Sewage Lagoons Simulation 3





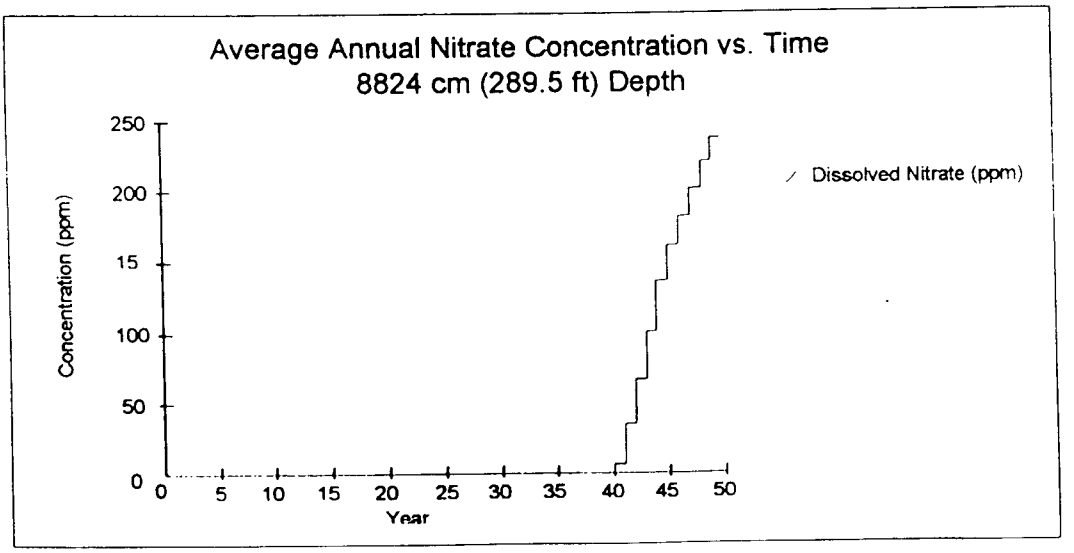


Figure D-10. Cannon AFB Sewage Lagoons Simulation 3

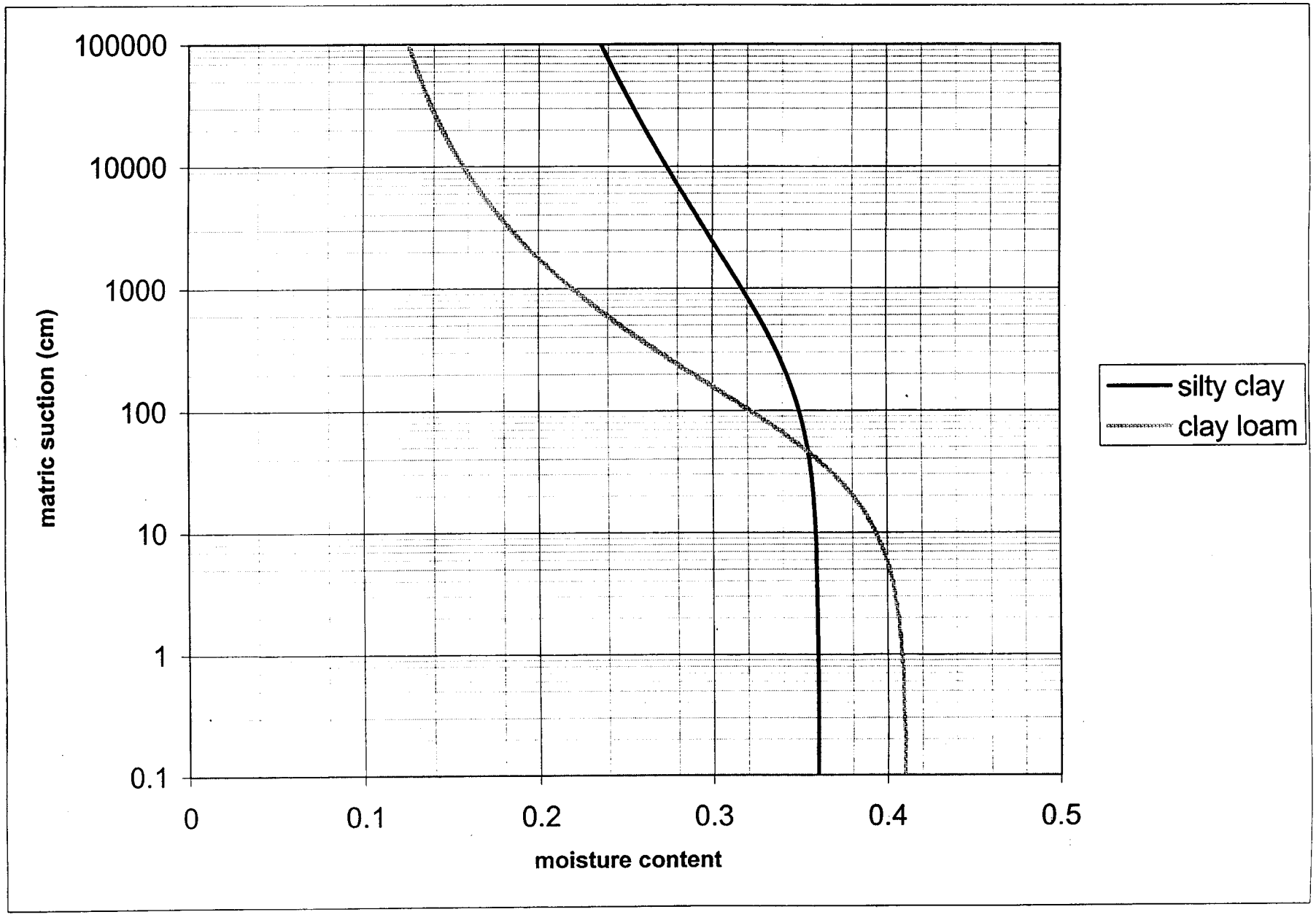


Figure D-11. Moisture Characteristic Curves for VS2DTI Simulated Soils

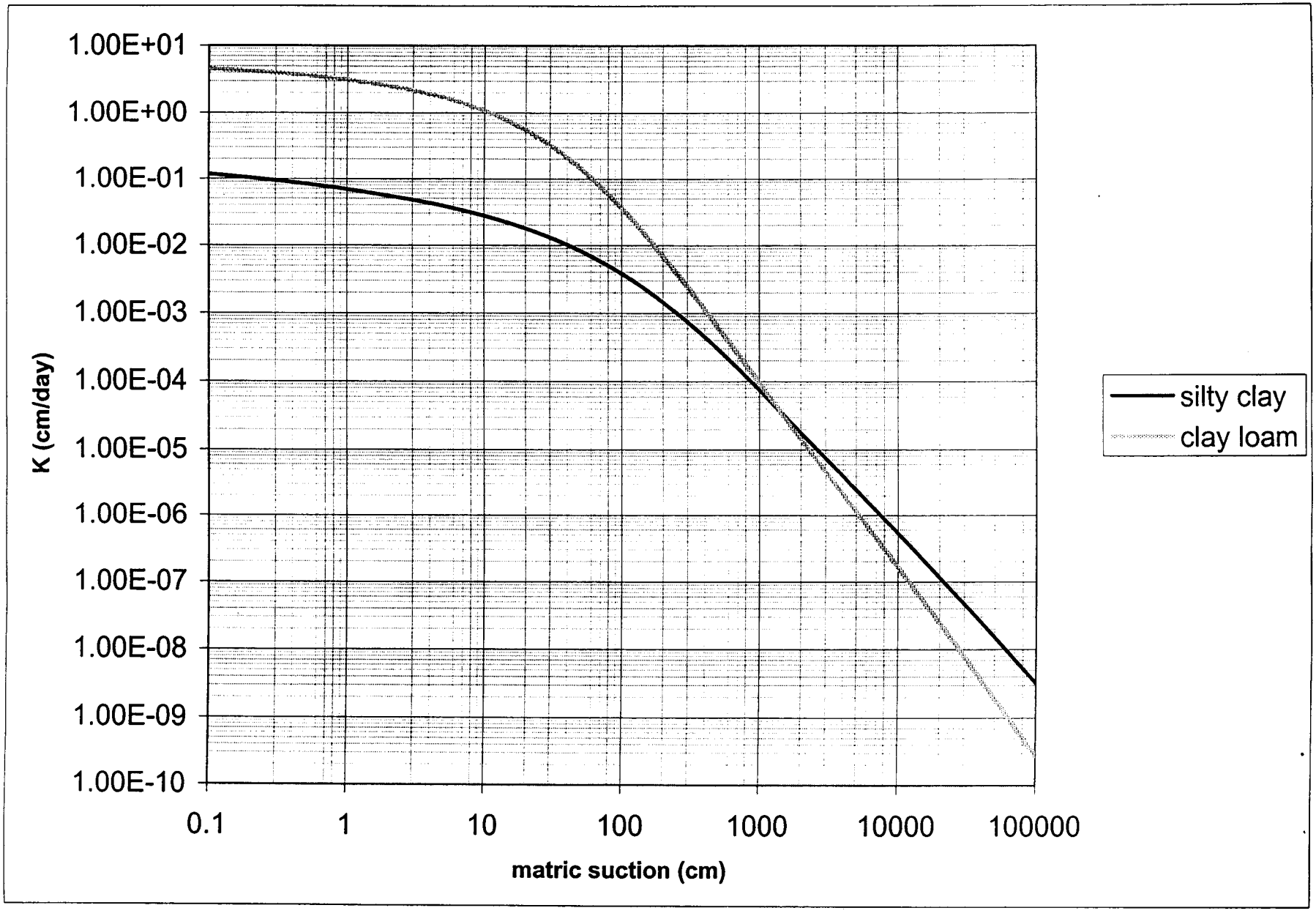


Figure D-12. Unsaturated hydraulic conductivity as a function of matric suction for VS2DTI simulated soils

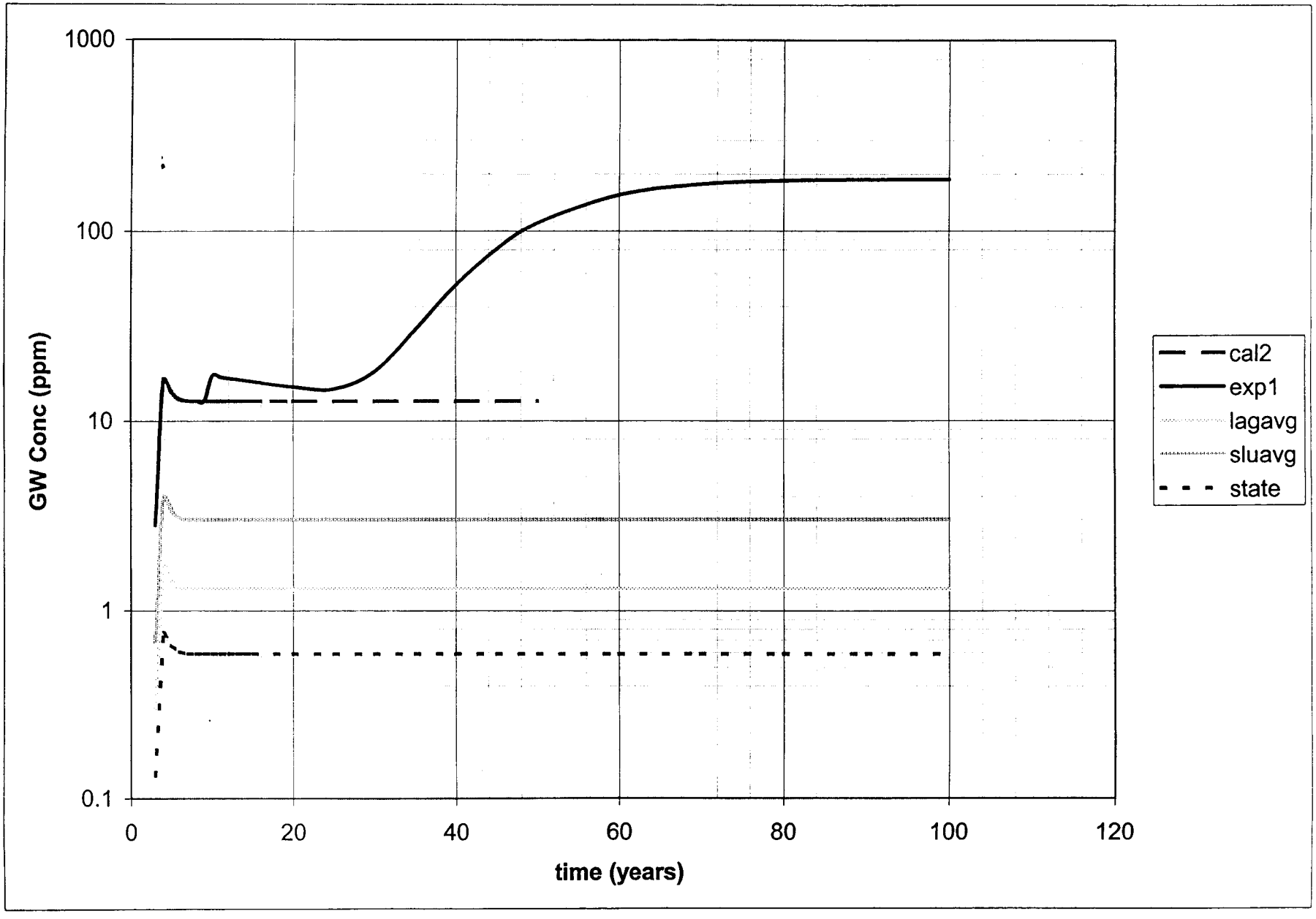


Figure D-13. Groundwater aquifer concentrations for simulations

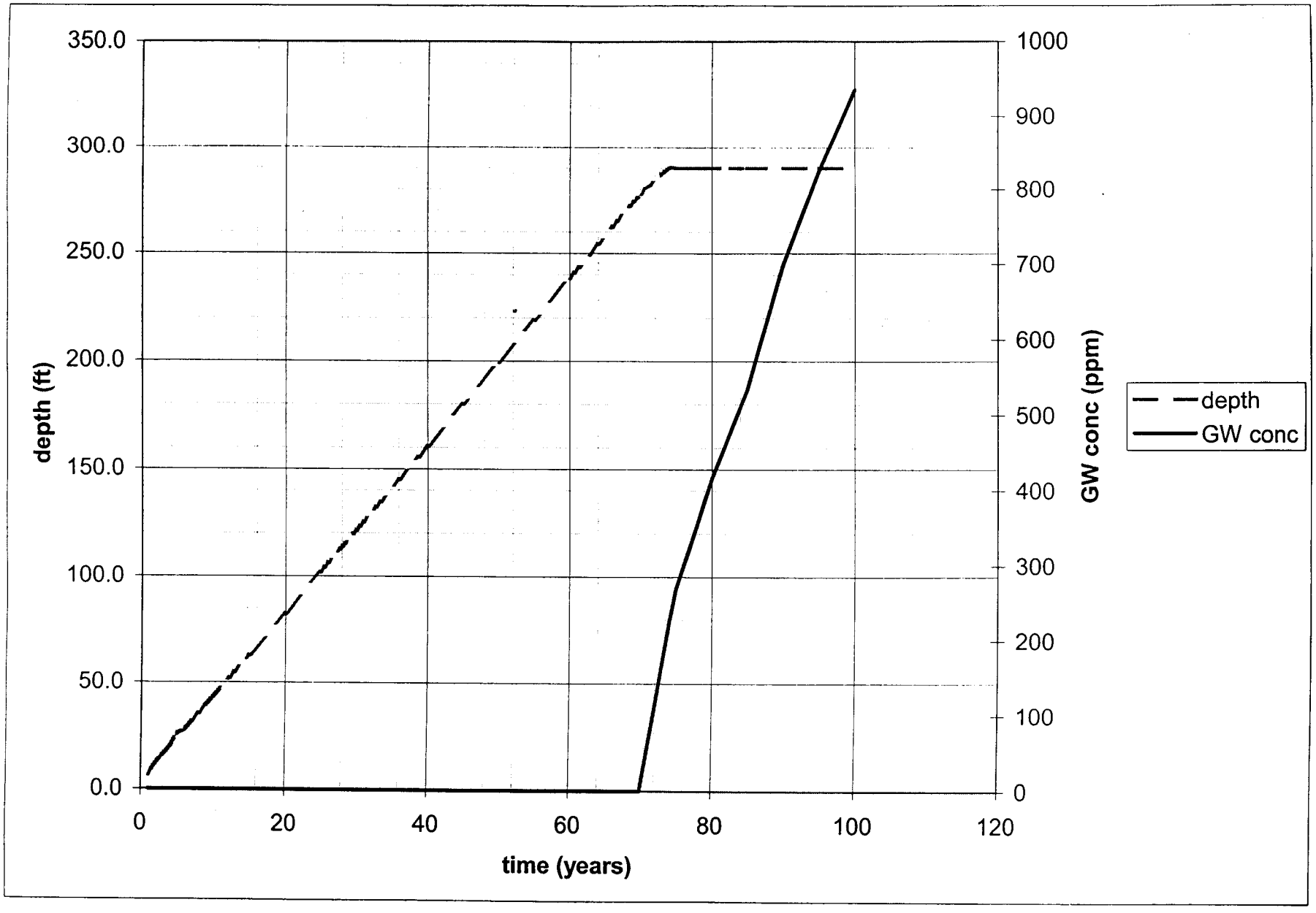


Figure D-14. "final" Simulation
CAFB Lagoons - Normal Precipitation - 644.6 mg/kg Soil

D R Timmons

HELP MODEL ANALYSIS OF ALTERNATIVE COVERS FOR SWMU 101 – SEWAGE LAGOONS CANNON AFB

1. Overview and Objective

Former sewage lagoons were identified as SWMU 101 in the Cannon AFB Hazardous Waste Permit dated November 14, 1989. The sewage lagoons, located on the east side of Cannon AFB, consist of two, unlined surface impoundments that were used from 1966 to 1998. The lagoons, with a total surface area of approximately 35 acres, were operated in series to contain sanitary and industrial waste from base facilities. Sewage was discharged to the lagoons through 15" diameter steel discharge pipes. Concrete slabs approximately 4 inches in thickness comprise the interior 4H:1V side slopes of both lagoons. Overflow pipes are located in the south corners of the north lagoon and in the north corners of the south lagoon to prevent the lagoons from being overtopped. Wastewater discharge to the lagoons was terminated in 1998 when a new wastewater treatment plant began operation. The lagoons are not currently covered with earthen or man-made materials. At closure, the contaminated material in the north lagoon will be excavated and placed in the south lagoon. A soil cover will then be placed over the south lagoon. The soil cover will be approximately 17 acres in size and will be graded to provide a minimum slope of 2 percent which will prevent surface water from ponding above the former lagoon.

The purpose of this document is to evaluate the appropriate method of closure for the SWMU 101 sewage lagoons. The United States Environmental Protection Agency (USEPA) Hydrologic Evaluation of Landfill Performance (HELP) v3.07 model [Schroeder, 1997] was used to compare the effectiveness of an alternative cover design with the prescriptive cover described in the Resource Conservation and Recovery Act (RCRA) Subtitle D requirements for closure of municipal solid waste landfills.

2. Regulatory Requirements

The New Mexico Environment Department (NMED) typically requires the use of the HELP model to demonstrate the adequacy of an alternative cover design. Requirements for demonstrating the feasibility of an alternative to the RCRA Subtitle D cover are outlined in the Guidance Document for Performance Demonstration for an Alternative Cover Design under Section 502.A.2 of the New Mexico Solid Waste Management Regulations (20 NMAC 9.1) Using HELP Modeling.

3. Water Balance Analysis

The water balance analysis presented in this calculation package uses the USEPA HELP Model. The HELP model is a quasi-two-dimensional, sequential water-routing code used to predict the performance of landfill cover and liner systems. Details of the HELP model and the specific input parameters used in the computer simulations are described below.

3.1. The HELP Model

The HELP model simulates daily moisture routing through a landfill system by modeling two general hydrologic processes: surface processes and subsurface processes. The program assesses the water balance of the system in a sequential fashion beginning with infiltration into the top of the cover. The SCS curve number method [USDA/SCS, 1985] is used to calculate the amount of rainfall that is shed as runoff from the site. The difference between runoff and precipitation is assumed to be infiltration.

Once the amount of infiltration is calculated, the program calculates the daily evapotranspiration from the evaporative zone. The evaporative zone is, by default, divided into seven segments. Vertical drainage is then calculated one subprofile at a time, starting at the top. A water balance calculation that considers soil moisture storage, infiltration into the top of the segment, and drainage through the bottom of the segment is performed for each subprofile. Drainage is considered to be driven solely by gravity and upward water movement due to suction gradients are not allowed.

3.2. Input Parameters

Input parameters for the HELP Model include soil properties, weather data, vegetation data, program control variables, and initial conditions. The following sections discuss the selection process for input parameters. Soil properties required for input to the HELP Model consist of:

- layer type;
- layer thickness;
- porosity;
- field capacity;
- wilting point; and
- saturated hydraulic conductivity.

3.3. Initial Conditions

Initial moisture content conditions were specified based on procedures in the NMED guidance document for evaluating alternative cover designs. The guidance document recommends that the initial moisture content of the soil be set to the wilting point moisture content plus 25 percent of the difference between the field capacity moisture content and the wilting point moisture content.

Default conditions were used for porosity, field capacity, and wilting point for each of the material textures selected.

4. Soil Borrow Sources

4.1. Barrier Layer

Two borrow sources are proposed for use as barrier layer material for the soil cover. The Keel stockpile resulted from excavation beneath the NE-SW runway to replace the center portion of the runway during the spring and summer of 2001. The keel stockpile is located immediately west of the former sewage lagoons. The Valley stockpile is located at Fort Sumner, New Mexico, approximately 50 miles west of Cannon AFB. These materials will be used to create the barrier layer with approximately 60 percent of the barrier layer from the Keel stockpile and approximately 40 percent from the Valley source. Table 1 summarizes the geotechnical properties (classification and hydraulic conductivity testing) of each borrow source. A complete set of laboratory test results for the barrier layer borrow sources is provided in Attachment 1.

Table 1
Summary
Geotechnical Engineering Properties
Alternative Cover Barrier Layer Borrow Sources

Sample ID	Soil[1] Class.	Liquid Limit (%)	Plastic Index (%)	Max. Density (pcf)[2]	Opt. Moisture (%)[2]	Specific Gravity	Ksat[3] (cm/s)
Keel Stockpile	Silty Sand with Gravel (SM)	NP	NP	119.2	12.3	2.71	1.3E-04
Valley Stockpile	Brown Sandy Silt (ML)	NP	NP	113.6	15.3	2.70	1.8E-04

Notes:
(1) Soil classifications based on ASTM D 2487
(2) Maximum density and optimum moisture content based on ASTM D 698
(3) Ksat represents saturated hydraulic conductivity based on ASTM D 5084

An average hydraulic conductivity value of 1.5E-04 cm/sec was used for the alternative cover HELP modeling runs. This value represents the weighted average hydraulic conductivity of both borrow sources.

4.2 Biotic Barrier Layer

The source of the biotic barrier layer is expected to be crushed concrete with a significant fraction of the material consisting of sands and fines. Based on the gradation curves, the biotic barrier layer material classified as a poorly graded sand with gravel (SP) to poorly graded gravel with sand. Gradation data for the biotic barrier layer material is shown in Attachment 2. Soil Type 1 (Poorly Graded Sand) from the HELP model default soil types was selected to model the biotic barrier layer. The default hydraulic conductivity value of 1E-02 cm/sec was used for the HELP modeling runs.

5. Prescriptive Cover

The prescriptive cover used in the HELP model runs consisted of two layers. The upper layer was a 6-inch topsoil layer, and the lower layer was an 18-inch barrier layer. Based on guidance from NMED, HELP soil type 15 was used for the barrier layer and the permeability of the layer was modified to 1E10-5 cm/sec. HELP Soil Type 5 was used for the topsoil layer. This is the same soil type as was used for the topsoil layer of the alternative cover analysis. Soil properties used to model the prescriptive cover are shown below:

LAYER 1 (TOPSOIL LAYER)
TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 5

THICKNESS	= 6.00 INCHES
POROSITY	= 0.4570 VOL/VOL
FIELD CAPACITY	= 0.1310 VOL/VOL
WILTING POINT	= 0.0580 VOL/VOL
INITIAL SOIL WATER CONTENT	= Calculated = .0763
EFFECTIVE SAT. HYD. COND.	= 1.0E-03 CM/SEC

LAYER 2 (BARRIER LAYER)
TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 15

THICKNESS	= 18.00 INCHES
POROSITY	= 0.4750 VOL/VOL
FIELD CAPACITY	= 0.3780 VOL/VOL
WILTING POINT	= 0.2650 VOL/VOL
INITIAL SOIL WATER CONTENT	= Calculated = .2930 VOL/VOL
EFFECTIVE SAT. HYD. COND.	= 1.0E-05 CM/SEC

6. Alternative Covers

An alternative cover configuration was modeled using HELP to compare its effectiveness to the prescriptive cover. The alternative cover used in the model consisted of the following three layers from top to bottom:

- 6-inch thick top soil layer,
- 18-inch thick biotic barrier layer, and
- 18-inch thick barrier layer.

Soil properties used for modeling the alternative cover system are shown below:

LAYER 1 (TOPSOIL LAYER)
TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 5

THICKNESS	= 6.00 INCHES
POROSITY	= 0.4570 VOL/VOL
FIELD CAPACITY	= 0.1310 VOL/VOL
WILTING POINT	= 0.0580 VOL/VOL
INITIAL SOIL WATER CONTENT	= Calculated = .0763 VOL/VOL
EFFECTIVE SAT. HYD. COND.	= 1E-03 CM/SEC

LAYER 2 (BIOTIC BARRIER LAYER)
TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 1

THICKNESS	= 18.00 INCHES
POROSITY	= 0.4170 VOL/VOL
FIELD CAPACITY	= 0.0450 VOL/VOL
WILTING POINT	= 0.0180 VOL/VOL
INITIAL SOIL WATER CONTENT	= Calculated = .0248 VOL/VOL
EFFECTIVE SAT. HYD. COND.	= 1E-02 CM/SEC

LAYER 3 (BARRIER LAYER)
TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 5

THICKNESS	= 18.00 INCHES
POROSITY	= 0.4570 VOL/VOL
FIELD CAPACITY	= 0.1310 VOL/VOL
WILTING POINT	= 0.0580 VOL/VOL
INITIAL SOIL WATER CONTENT	= Calculated = .0763 VOL/VOL
EFFECTIVE SAT. HYD. COND.	= 1.5E-04 CM/SEC

7. Other HELP Input Data

The following is a summary of the input data used for the HELP runs for both the prescriptive and alternative covers. The source of the weather data was EarthInfo, Inc. EarthInfo, Inc. collects data from the National Climatic Data Center (NCDC) for weather stations nationwide.

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 5 WITH A POOR STAND OF GRASS, A SURFACE SLOPE OF 3.% AND A SLOPE LENGTH OF 300. FEET.

SCS RUNOFF CURVE NUMBER	=	77.20
FRACTION OF AREA ALLOWING RUNOFF	=	100.0 PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	17.000 ACRES
EVAPORATIVE ZONE DEPTH	=	20.0 INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	4.560 INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	9.392 INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	4.058 INCHES
INITIAL SNOW WATER	=	0.000 INCHES
INITIAL WATER IN LAYER MATERIALS	=	5.732 INCHES
TOTAL INITIAL WATER	=	5.732 INCHES
TOTAL SUBSURFACE INFLOW	=	0.00 INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM Clovis New Mexico

STATION LATITUDE	=	34.40 DEGREES
MAXIMUM LEAF AREA INDEX	=	1.60
START OF GROWING SEASON (JULIAN DATE)	=	95
END OF GROWING SEASON (JULIAN DATE)	=	303
EVAPORATIVE ZONE DEPTH	=	20.0 INCHES
AVERAGE ANNUAL WIND SPEED	=	13.70 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	55.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	52.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	57.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	57.00 %

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1984 THROUGH 1988

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.19	0.41	0.67	0.86	3.13	4.28
	2.25	4.31	3.15	2.19	0.87	1.09
STD. DEVIATIONS	0.15	0.51	1.05	0.47	0.85	1.21
	0.91	2.61	1.62	1.74	1.18	0.76

Figure 1 shows the cumulative precipitation for the years 1984 through 1988.

Note: solar radiation data was synthetically generated using coefficients for Amarillo, Texas and station latitude = 34.40 degrees

8. Results

HELP runs were executed to compare the performance of the prescriptive cover against the proposed alternative cover design. A summary of the HELP Model results are shown in Table 2. The complete print-out of HELP model results for both the prescriptive and alternative covers are shown in Attachment 3. The HELP run results shown in the table indicate the percentage of total precipitation that percolates through the bottom of the cover (i.e., 18-inch thick barrier layer).

TABLE 2
RESULTS FROM HELP MODEL RUNS

Cover Type	Permeability Values Modeled			HELP Run Results
	Top Soil Permeability (cm/s)	Biota Barrier Perm. (cm/s)	Barrier Layer Perm. (cm/s)	Percolation Through Landfill Cover (%)
Prescriptive	1E-03	NA	1E-05	4.24
Alternative	1E-03	1E-02	1.5E-04	9.90

Figure 2 shows a plot of the cumulative percolation through the bottom of the prescriptive and alternative covers.

9. Conclusions

The results shown in Table 2 indicate that the alternative cover, which includes a biotic barrier, is nearly equivalent to the prescriptive cover in preventing the infiltration of precipitation. The estimated percolation through the prescriptive cover is probably unrealistically low because the permeability of the prescriptive cover barrier layer is not a representative estimate of the long-term permeability of the layer. Due to desiccation cracking and freeze/thaw damage, the long-term permeability of this layer would be expected to increase significantly over time, resulting in a higher rate of infiltration than shown by the HELP model run results.

INSERT DISCUSSION OF CONTAMINANT MIGRATION TEST RESULTS. ZINK

Based on the modeling effort described above, an alternative cover consisting of the following is proposed for use in closure of the SWMU 101 sewage lagoons:

- A silty sand topsoil layer with a permeability of 1E-03 cm/sec,
- A crushed concrete biotic barrier layer that contains a large percentage of sand and fines and has a permeability of 1E-03 cm/sec, and
- A barrier layer consisting of silty or clayey sand with a permeability of approximately 1.5E-05 cm/sec. ?

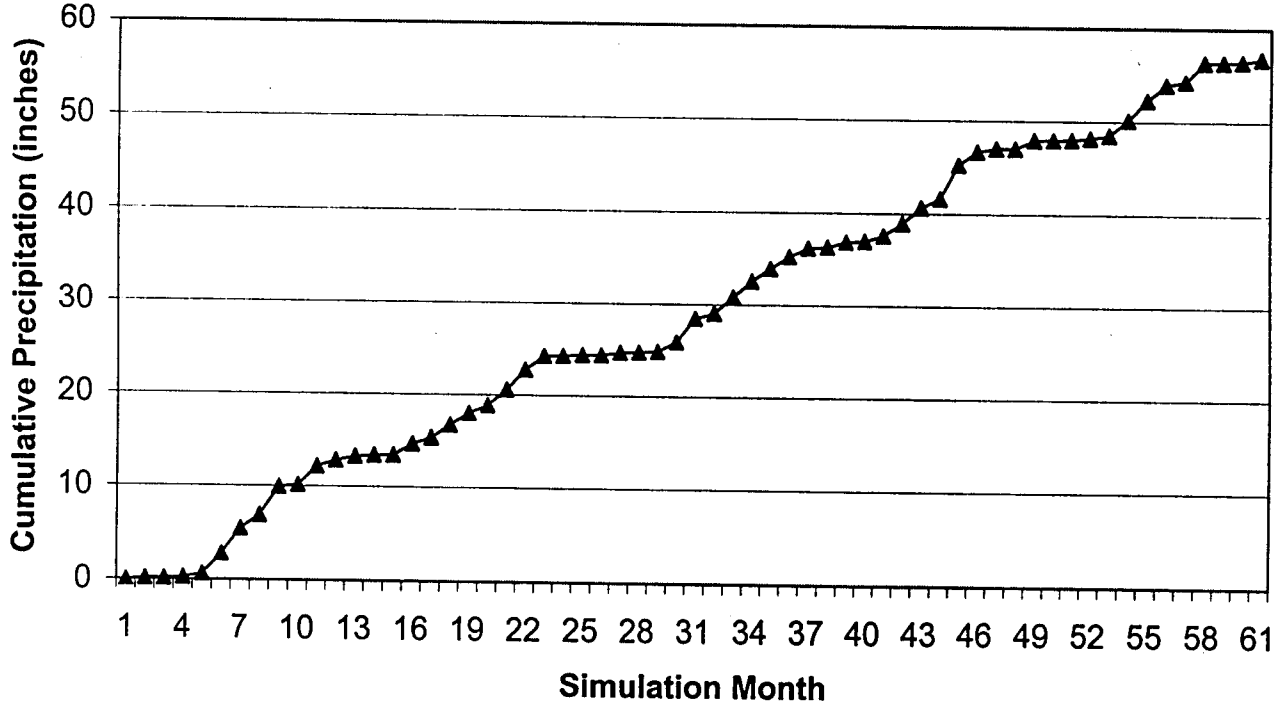
10. References

1. New Mexico Environment Department, 1998, Guidance Document for Performance Demonstration for Alternative Cover Design under Section 502.A.2 of the New Mexico Sold Waste Management Regulations (20 NMAC 9.1) Using HELP Modeling and Performance Demonstration for an Alternative Liner Design under Section 306.A.2 of the New Mexico Solid Waste Management Regulations (20 NMAC 9.1) Using HELP Modeling.

2. Schroeder, P.R., T.S. Dozier, P.A. Zappi, B.M. McEnroe, J.W. Sjostrom, and R.L Peyton, 1994, "The Hydrologic Evaluation of Landfill Performance (HELP) Model: Engineering Documentation for Version 3," EPA/600/R-94/168b.

3. EarthInfo, Inc. Weather Data Files from National Climatic Data Center (NCDC).

Figure 1
Cumulative Precipitation 1984 - 1988
CAFB - Clovis, NM



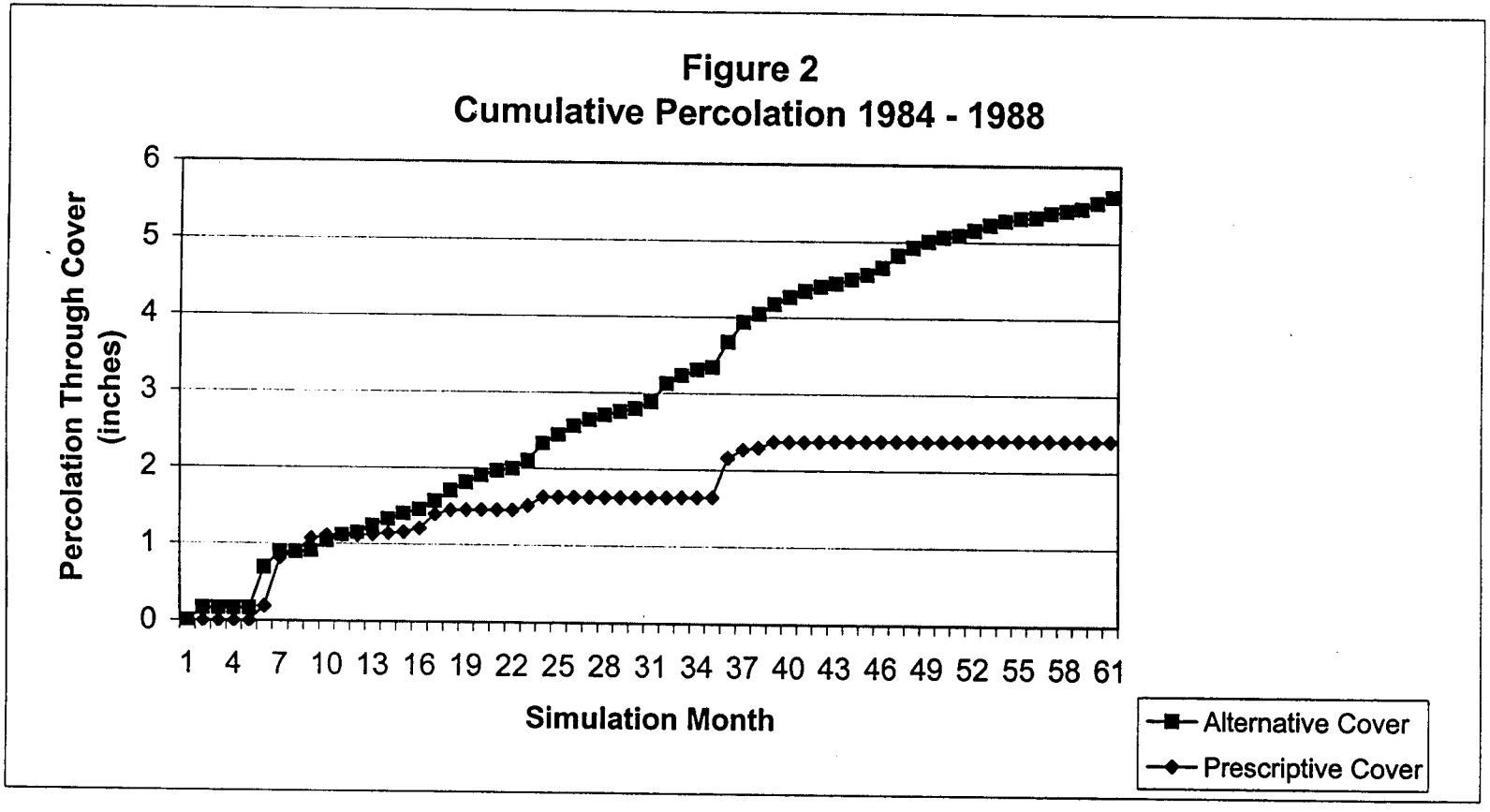


Figure 2
Cumulative Percolation 1984 - 1988
Percolation Through Cover (inches)
0
1
2
3
4
5
6
1 4 7 10 13 16 19 22 25 28 31 34 37 40 43 46 49 52 55 58 61
Simulation Month
Alternative Cover
Prescriptive Cover

ATTACHMENT 1
BARRIER LAYER GEOTECHNICAL TEST RESULTS

Physical Properties of Aggregates

Terracon
2111 South 156th Circle
Omaha, Nebraska 68130
Ph (402) 330-2202
Fax (402) 330-7606

Client Name: U.S. Army Corps of Engineers
Address: Omaha District
106 South 15th Street
Omaha, Nebraska 68102-1618
Project Name: Cannon AFB
Location: New Mexico

Sampled By: _____ Date: _____
Submitted By: RSC Date: 3/18/2002

Project No: 05026303 Date of Report: 4/11/2002
Sample No: Keel Area Bulk NA
Brown Silty Sand With Gravel (SM)

Reviewed By: _____

Sieve Analysis, ASTM C136

Sieve Size	% Accumulative Passing	% Accumulative Retained	Specification Min	Specification Max.
6"				
5"				
4"				
3"				
2"				
1-1/2"	100	0		
1"				
3/4"	99.9	0.1		
1/2"				
3/8"	86.6	13.4		
#4	75.3	24.7		
#8				
#10	66.3	33.7		
#16				
#20	59.2	40.8		
#30	56.4	43.6		
#40	53.5	46.5		
#50	49.9	50.1		
#80	37.6	62.4		
#100	32.9	67.1		
#200	16.9	83.1		

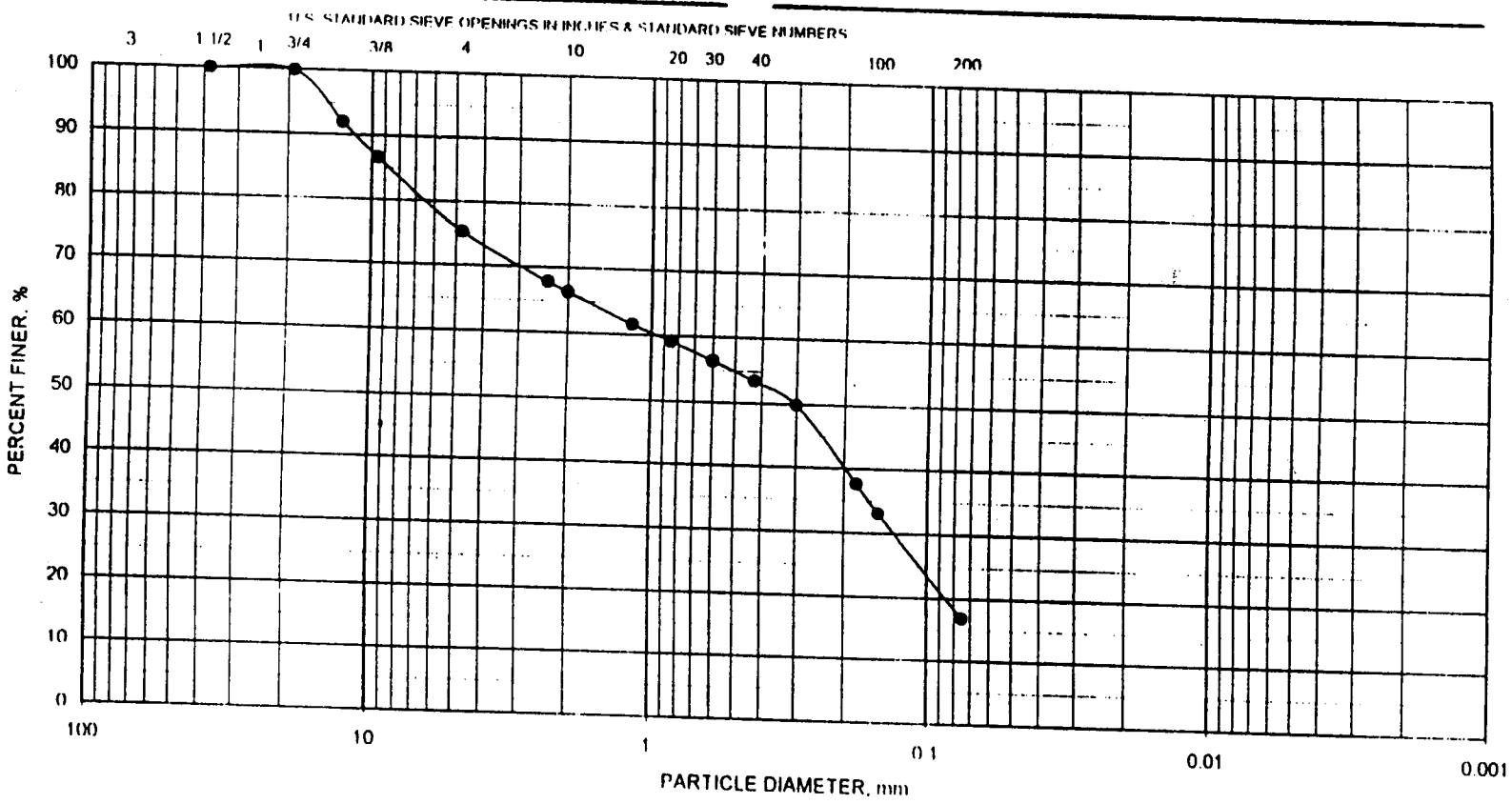
Test Standards are ASTM unless otherwise indicated

Test		Standard	Results	Specification
Fineness Modulus		C125		
Dry Rodded Unit Wt, pcf		C29		
Lightweight Pieces, %		C123		
Clay Lumps & Friable, %		C142		
Organic Impurities		C40		
Sand Equivalent Value		C2419		
LA Abrasion, % Grade		C131		
Soundness-Mg, %loss		C88		
Soundness-Na, %loss		C88		
Fractured Face, % by Wt.				
One or more				
Two or more				
Liquid Limit		D4318	NP	
Plastic Limit		D4318	NP	
Plasticity Index		D4318	NP	
D60				
D30				
D10				
Gs			2.71	
Specific Gravity	Absorption, %			
	Bulk (Dry)			
	Bulk (SSD)			
	Apparent			

Comments:

Copies to

Attachment 1



GRAVEL		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

GRAIN SIZE DISTRIBUTION CURVE

BORING NO	SAMPLE NO	DEPTH, feet	ASTM DESCRIPTION	UNIFIED SYMBOL	NAT WC, %	ATTERBERG LIMITS LL	PL	PI
Bulk	Keel Area	NA	Brown Silty Sand With Gravel (SM)			NP	NP	NP

PROJECT Cannon AFB

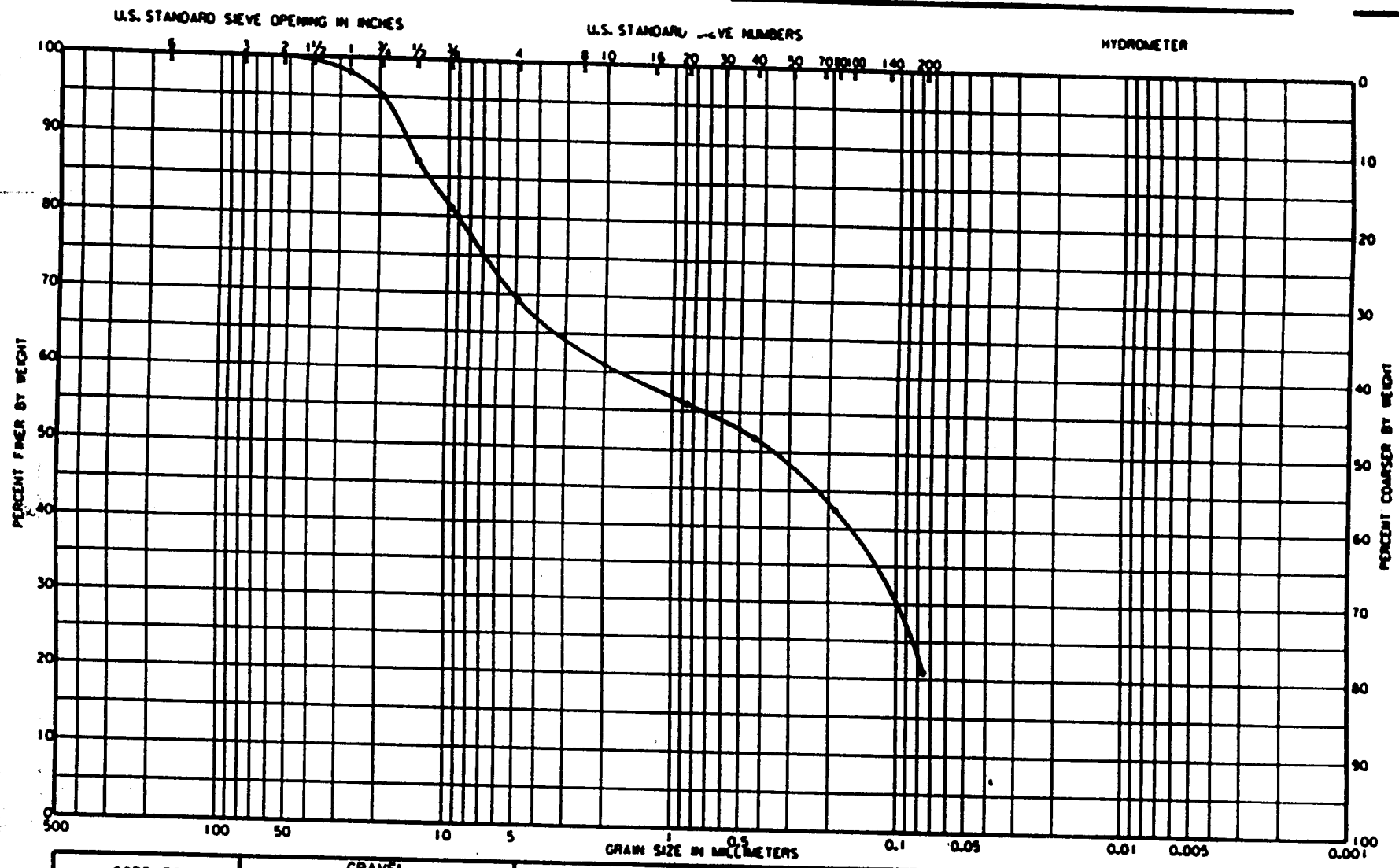
Keel Area

JOB NO. 05026303 DATE 4/9/2002

Terracon

Attachment 1

SA.xls



Sample No.	Elev. or Depth	Classification	Nat w %	LL	PL	PI
X	X	SILTY SAND WITH GRAVEL SM				

Project CANNON A.F.B.

Area KEEL AREA

Boring No. ORIGINAL MATERIAL WITH +3/4"

Date 3/12/02

GRADATION CURVES

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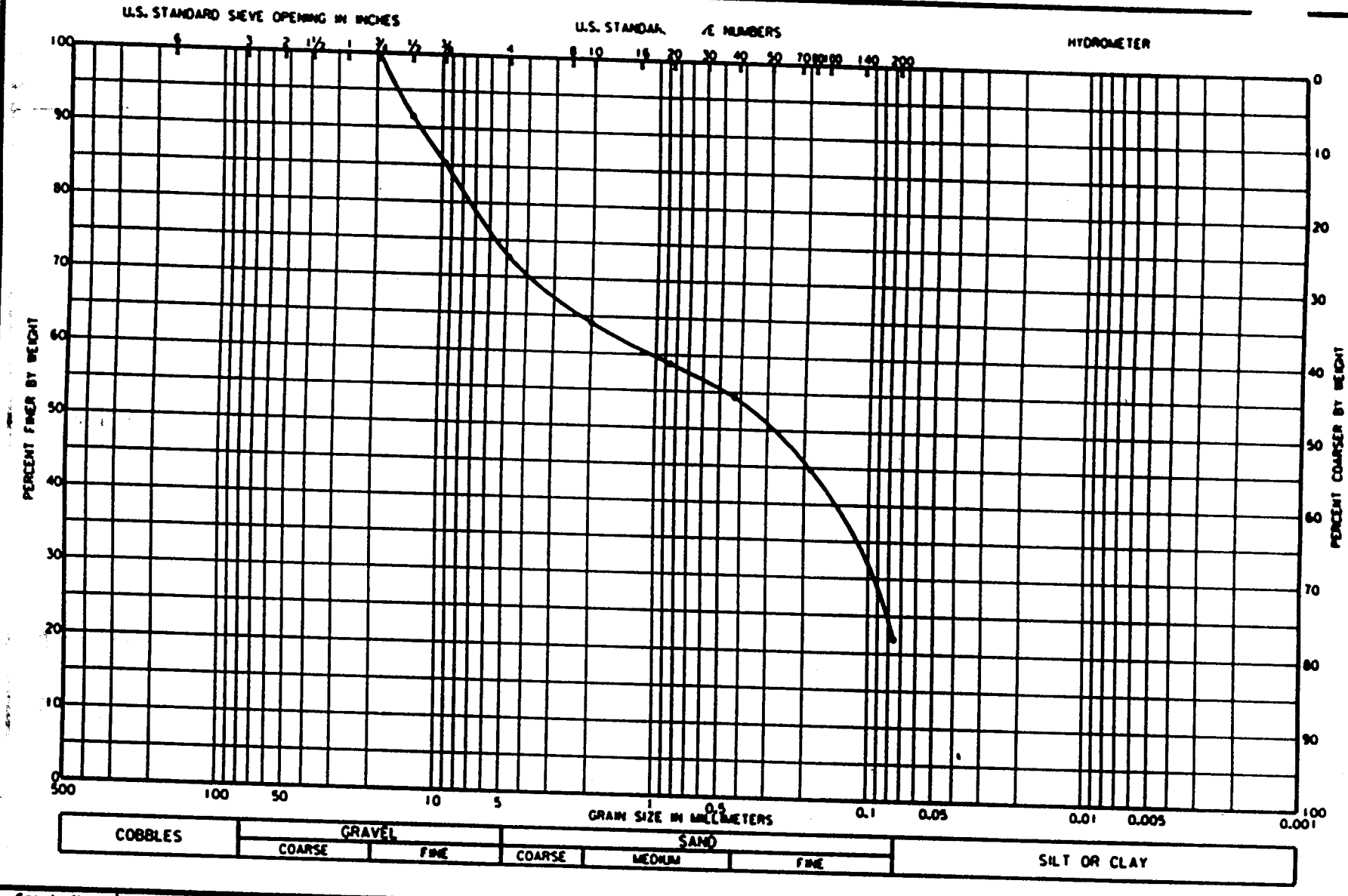
Attachment 1



Sample No.	Elev. or Depth	Classification	Nat w %	LL	PL	PI
%	%	SILTY SAND WITH GRAVEL SM				

Project CANNON A.F.B.

Area KEEL AREA

Boring No. ORIGINAL MATERIAL WITHOUT +3/4"

Date 3/12/02

GRADATION CURVES

Attachment 1

...\My Documents\lessrock..dgn 04/15/2002 09:18:37 AM

Terracon

Laboratory Compaction Characteristics of Soil

2211 South 156th Circle
Omaha, Nebraska 68130
(402) 330-2202

Client Name: U.S. Army Corps of Engineers
Project Name: Cannon A.F.B.
Location: New Mexico

Source Material: Keel Area
Sample Description: Brown Silty Sand With Gravel

Material Designation: A Sample date: 3/18/2002
Test Method: ASTM D698
Test Procedure: C
Sample Preparation: Dry
Rammer: X Mechanical ___ Manual

Project No: 05026303 Date: 4/3/2002

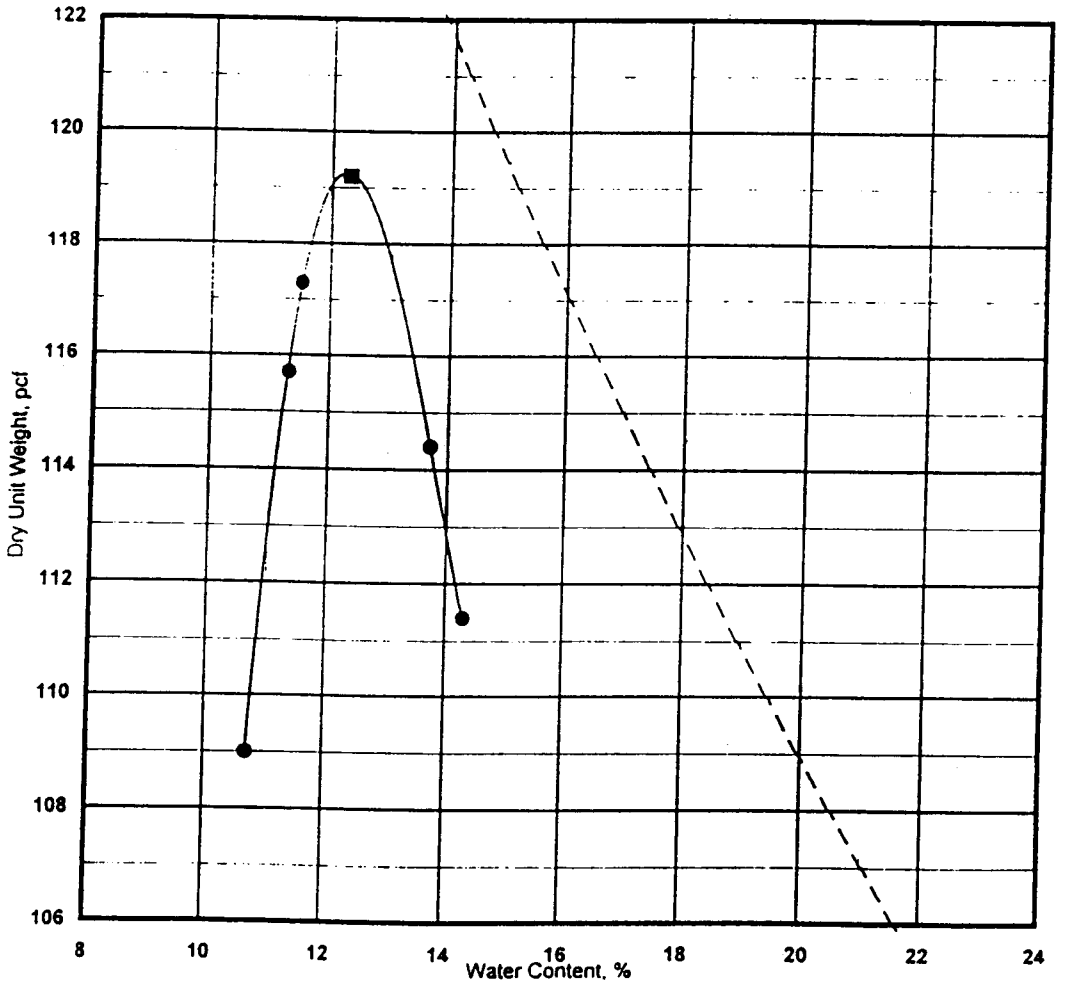
TEST RESULTS

Maximum Dry Unit Wt. 119.2 pcf
Optimum Water Content: 12.3 %

Liquid Limit: N.P Plastic Limit: N.P.
Plasticity Index: N.P.
% passing # 200 sieve: 16.9

Reviewed by: _____

Zero air voids for specific gravity of 2.68



• Data Points ■ Max. Dry Unit Wt. and Opt. Water Content - - - - Zero Air Voids

Attachment 1

PERMEABILITY - FLEXIBLE WALL TRIAXIAL
FALLING HEAD CALCULATION

Test Method: ASTM D 5084 — Date: 4/9/2002

Project: Cannon AFB — Job No: 05026303

Boring No: Bulk — Sample No: Keef Area — Depth ft: NA

Wet Wt., gms	Wt	450.57	Diameter of specimen, cm	D	7.178
DWW, pcf	WW	113.9	Area of specimen, sq cm	A	40.446
DCW, pcf	DW	107.9	Initial height of specimen, cm	L	5.342
Specific gravity	G_s	2.7	Initial vol. of spec., cc	V_i	236.236
Vol. of solids, cc = W_s / G	V_s	151.41	Initial void ratio = V_v / V_s	e	0.561
Back pressure, intake Buret, psi	P_1	97	Back pressure, output buret, psi	P_2	94

Initial readings		1	2	3	4	5
Reading of burette 1, cc	p1	0	5	0	5	0
Reading of burette 2, cc	p2	10	5	10	5	10
Initial head, bottom, cm 50.3+(p1-*2.0) - P_1*70.34	h1	6873.3	6863.3	6873.3	6863.3	6873.3
Initial head, top, cm 50.3+(p2-*2.0) - P_2*70.34	h2	6642.3	6652.3	6642.3	6652.3	6642.3
Initial head, cm = h1-h2	h_i	231.0	211.0	231.0	211.0	231.0
Final reading of burette 1, cc	$p1_f$	5	10	5	10	5
Final reading of burette 2, cc	$p2_f$	5	0	5	0	5
	h_f	211.0	191.0	211.0	191.0	211.0
Quantity of flow, cc	Q	5	5	5	5	5
Elapsed time, mins.	t	0.42	0.42	0.4	0.42	0.38
Water temperature, deg. C	T	24.1	24.1	24.1	24.1	24.1
Viscosity correction factor (1)	R_t	0.90	0.90	0.90	0.90	0.90
Coefficient of permeability (2) cm/sec	k_{20}	1.2E-04	1.3E-04	1.2E-04	1.3E-04	1.3E-04
Ratio of outflow to inflow		1.00	1.00	1.00	1.00	1.00
Permeability, % var. from avg.		-8.14	1.01	-3.55	1.01	1.53

WATER CONTENT DATA	Initial	Final
Container No.	735	S-1A
Wet Wt + Tare (gm)	97.29	581.73
Dry Wt + Tare (gm)	89.77	494.56
Tare Wt. (gm)	16.14	89.89
Dry Wt. of Soil (gm)	73.63	404.67
Wt. of Water (gm)	7.52	37.17
Water Content (gm)	10.2	21.5

n	0.359 %
Initial, s	49.20 %
Final, s	100.00 %
Pocket Pen.	tsf

Average permeability, last 4 entry

1.3E-04 cm/sec
or
1.3E-06 m/sec

(1) Correction factor for viscosity of water at 20 C calculated as (-0.02452*T+1.495), per ASTM D 5084

(2) $k20 = \frac{a \times L \times Rt}{2 \times A \times t} \ln(hi/hf)$

where L = height of specimen or distance between piezometer taps if used.
a = AVERAGE CROSS SECTONAL AREA OF PIEZOMETERS — a/2 is calculated as Q/(hi-hf)

(3) Calculations are based on a distance of approximately 50.3 cm from the "0" reading on the burettes to the middle of the sample and a burette area of about 0.5 sq cm. (Small diameter burettes)

Description: BROWN SILTY SAND WITH GRAVEL (SM) — B = 0.98 — Non-Plastic

Technician: RSC — Computed by: RSC — Checked by:

TERRACON

(test-sbt 6-27-95)

Attachment 1

Physical Properties of Aggregates

Terracon
2111 South 156th Circle
Omaha, Nebraska 68130
Ph (402) 330-2202
Fax (402) 330-7606

Client Name: U.S. Army Corps of Engineers
Address: Omaha District
106 South 15th Street
Omaha, Nebraska 68102-1618
Project Name: Cannon AFB
Location: New Mexico

Sampled By: _____ Date: _____
Submitted By: RSC Date: 3/18/2002

Project No: 05026303 Date of Report: 3/28/2002
Sample No: Valley Sample Jar NA
Brown Sandy Silt (ML)

Reviewed By: _____

Sieve Analysis, ASTM C136

Sieve Size	% Accumulative Passing	% Accumulative Retained	Specification Min	Specification Max
6"				
5"				
4"				
3"				
2"				
1-1/2"				
1"				
3/4"				
1/2"				
3/8"				
#4	100	0		
#8				
#10	99.9	0.1		
#16				
#20	99.9	0.1		
#30	99.8	0.2		
#40	99.7	0.3		
#50	99.4	0.6		
#80	89.9	10.1		
#100	82.9	17.1		
#200	58.7	41.3		

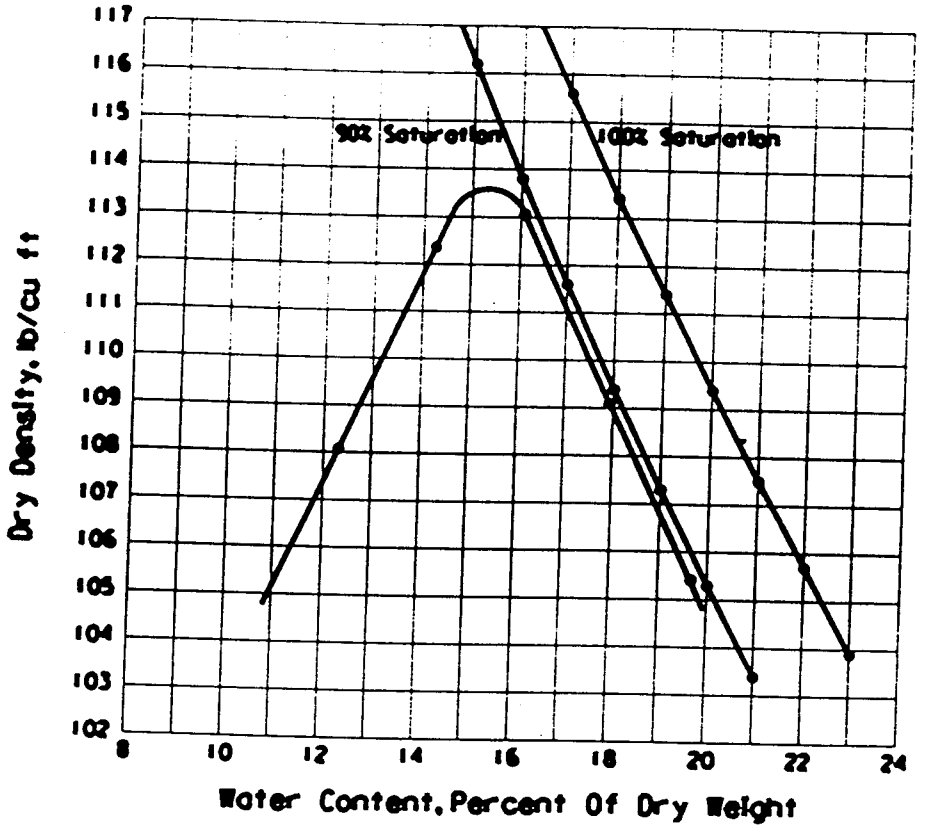
Test Standards are ASTM unless otherwise indicated

Test		Standard	Results	Specification
Fineness Modulus		C125		
Dry Rodded Unit Wt. pcf		C29		
Lightweight Pieces, %		C123		
Clay Lumps & Friable, %		C142		
Organic Impurities		C40		
Sand Equivalent Value		C2419		
LA Abrasion, %	Grade	C131		
Soundness-Mg, %loss		C88		
Soundness-Na, %loss		C88		
Fractured Face, % by Wt.				
One or more				
Two or more				
Liquid Limit		D4318	NP	
Plastic Limit		D4318	NP	
Plasticity Index		D4318	NP	
D60				
D30				
D10				
Gs			2.70	
Specific Gravity	Absorption, %			
	Bulk (Dry)			
	Bulk (SSD)			
	Apparent			

Comments:

Copies to

Attachment 1



Standard compaction test

25 blows per each of 3 layers, with 5.5 lb rammer and

12 inch drop 4 inch diameter mold

Sample Number	Elev. or Depth	Classification	G_s	LL	PL	% > No. 4	% > 3/4 in.
Valley			2.70				

SAMPLE NUMBER				
Natural Water Content, percent				
Optimum Water Content, percent	15.32%			
Max. Dry Density, lbs/cu ft	113.58 p.c.f.			

REMARKS:

PROJECT CANNON A.F.B. VALLEY SAMPLE

BORING NO. SAMPLE NO.

DEPTH ELEV.

LABORATORY OA DATE 3/15/02

COMPACTION TEST REPORT

...\My Documents\Valleymix.dgn 04/15/2002 09:16:25 AM

Attachment 1

PERMEABILITY - FLEXIBLE WALL TRIAXIAL
FALLING HEAD CALCULATION

Test Method: ASTM D 5084 — Date: 3/26/2002

Project: Cannon AFB — Job No: 05026303

Boring No: Bulk — Sample No: Valley Sample — Depth: NA

Wet Wt. gms.	Wt	441.03	Diameter of specimen, cm		D	7.178
DWW, pcf	WW	116.4	Area of specimen, sq cm		A	40.446
DCW, pcf	CW	102.3	Initial height of specimen, cm		L	5.342
Specific gravity	G_s	2.7	Initial vol. of spec., cc		V	236.286
Vol. of solids, cc = W_s / G	V_s	143.59	Initial void ratio = (V - V_s) / V_s		e	0.646
Back pressure, intake Buret, psi	P_1	97	Back pressure, output buret, psi		P_2	94
Initial readings		1	2	3	4	5
Reading of burette 1, cc	p1	0	5	0	5	0
Reading of burette 2, cc	p2	10	5	10	5	10
Initial head, bottom, cm 50.3+(p1-10.0) + P_1*70.34	n1	5873.3	5863.3	5873.3	5863.3	5873.3
Initial head, top, cm 50.3+(p2-10.0) + P_2*70.34	n2	5642.3	5652.3	5642.3	5652.3	5642.3
Initial head, cm = n1-n2	n	231.0	211.0	231.0	211.0	231.0
Final reading of burette 1, cc	$p1_f$	5	10	5	10	5
Final reading of burette 2, cc	$p2_f$	5	0	5	0	5
	h_f	211.0	191.0	211.0	191.0	211.0
Quantity of flow, cc	Q	5	5	5	5	5
Elapsed time, mins.	t	0.3	0.3	0.28	0.28	0.28
Water temperature, deg. C	T	23.4	23.4	23.4	23.4	23.4
Viscosity correction factor (1)	R_t	0.92	0.92	0.92	0.92	0.92
Coefficient of permeability (2) cm/sec	k_{20}	1.7E-04	1.3E-04	1.3E-04	2.0E-04	1.3E-04
Ratio of outflow to inflow		1.00	1.00	1.00	1.00	1.00
Permeability, % var. from avg.		-9.52	-0.50	-3.05	6.61	-3.05

WATER CONTENT DATA	Initial	Final
Container No	73	S-8
Wet Wt + Tare (gm)	77.16	570.37
Dry Wt. + Tare (gm)	69.75	473.20
Tare Wt. (gm)	15.88	85.83
Dry Wt. of Soil (gm)	53.87	387.37
Wt. of Water (gm)	7.41	97.17
Water Content (gm)	13.3	25.1
n	0.392 %	
Initial S	57.53 %	
Final S	100.00 %	
Pocket Pen.	tsf	

Average permeability, last 4 intrv.

1.3E-04 cm/sec
or
1.8E-06 m/sec

(1) Correction factor for viscosity of water at 20 C calculated as (-0.02452*T+1.495), per ASTM D 5084

(2) $k_{20} = \frac{a \times L \times R_t}{2 \times A \times t} \ln(h_i/h_f)$

where L = height of specimen or distance between piezometer taps if used.
a = AVERAGE CROSS SECTIONAL AREA OF PIEZOMETERS — a/2 is calculated as Q/(hi-hf)

(3) Calculations are based on a distance of approximately 50.3 cm from the "0" reading on the burettes to the middle of the sample and a burette area of about 0.5 sq cm. (Small diameter burettes)

Description: BROWN SANDY SILT (ML) — B = 0.98 — Non-Plastic

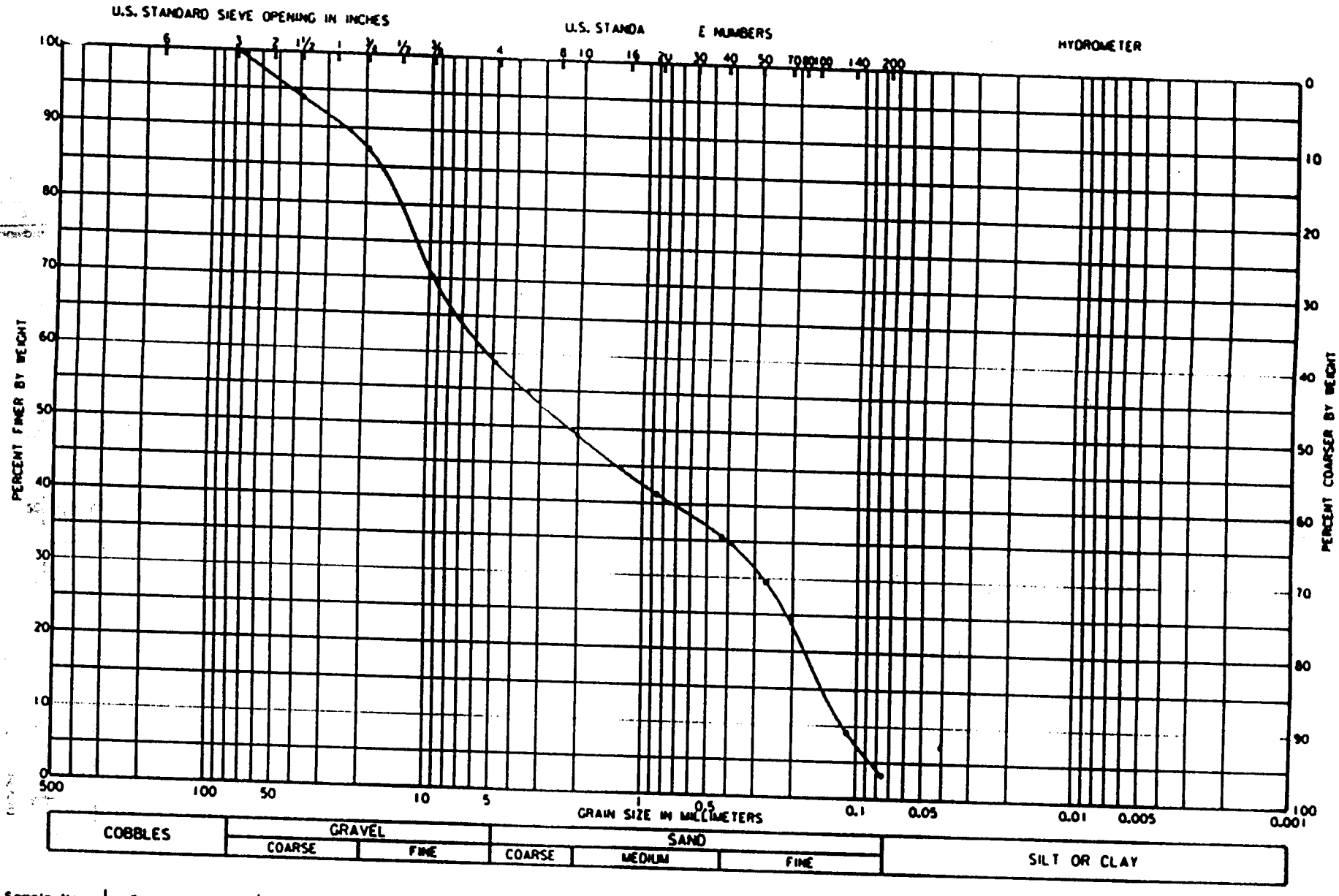
Technician: RSC — Computed by: RSC — Checked by:

TERRACON

ext-sor5-27-35

Attachment 1

ATTACHMENT 2
BIOTIC BARRIER LAYER GEOTECHNICAL TEST RESULTS



Sample No.	Elev. or Depth	Classification	Nat w %	LL	PL	PI
1		POORLY-GRADED SAND WITH GRAVEL SP				

Project SEWAGE LAGOONS CLOSURE PROJECT

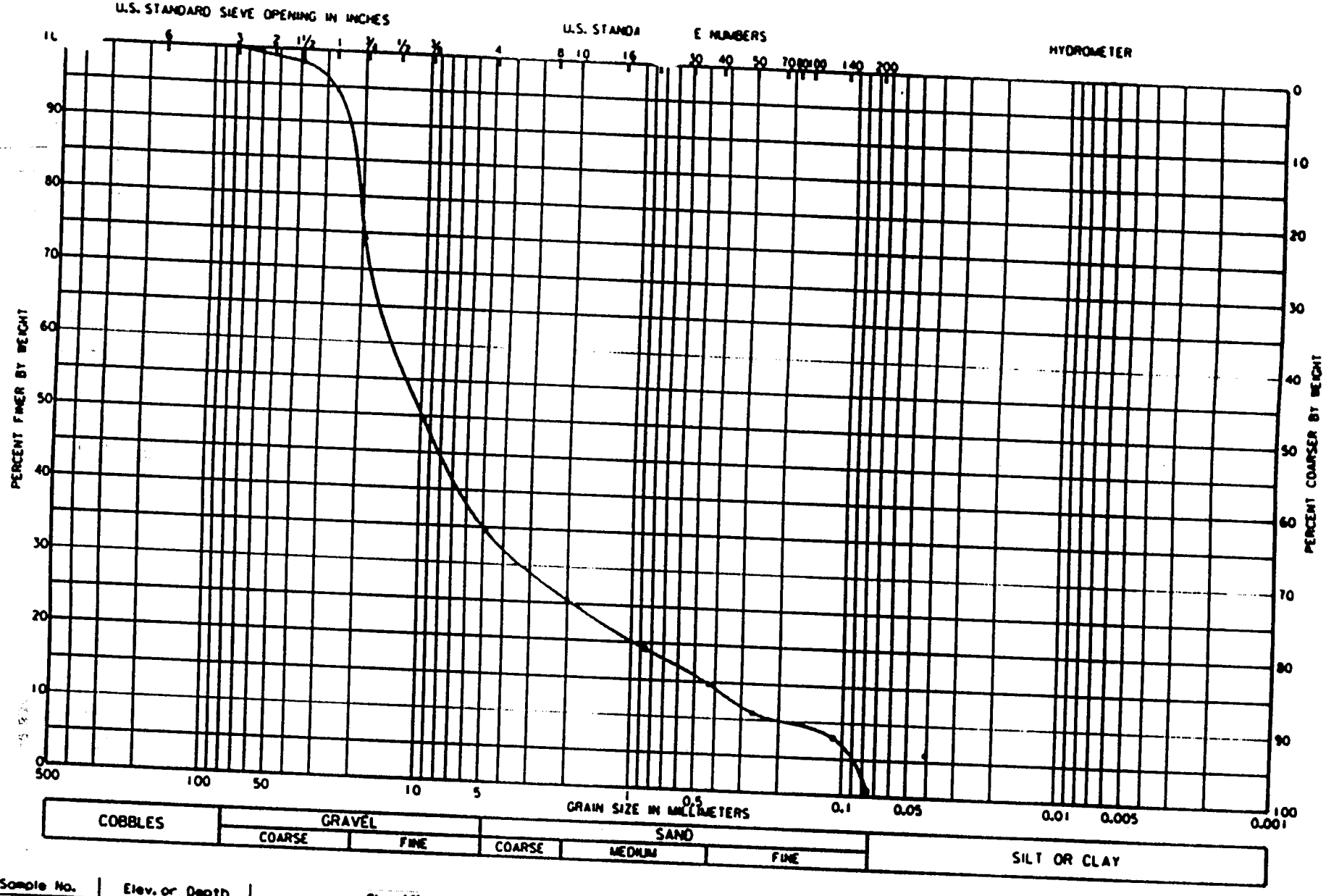
Site CANNON AFB, NEW MEXICO

SAMPLE 1 - LANDFILL 25 STOCKPILE MATERIAL

Date 5/7/02

GRADATION CURVE

Attachment 2



Sample No.	Elev. or Depth	Classification	Nat w %	LL	PL	PI
2		POORLY-GRADED GRAVEL WITH SAND GP				

Project SEWAGE LAGOONS CLOSURE PROJECT

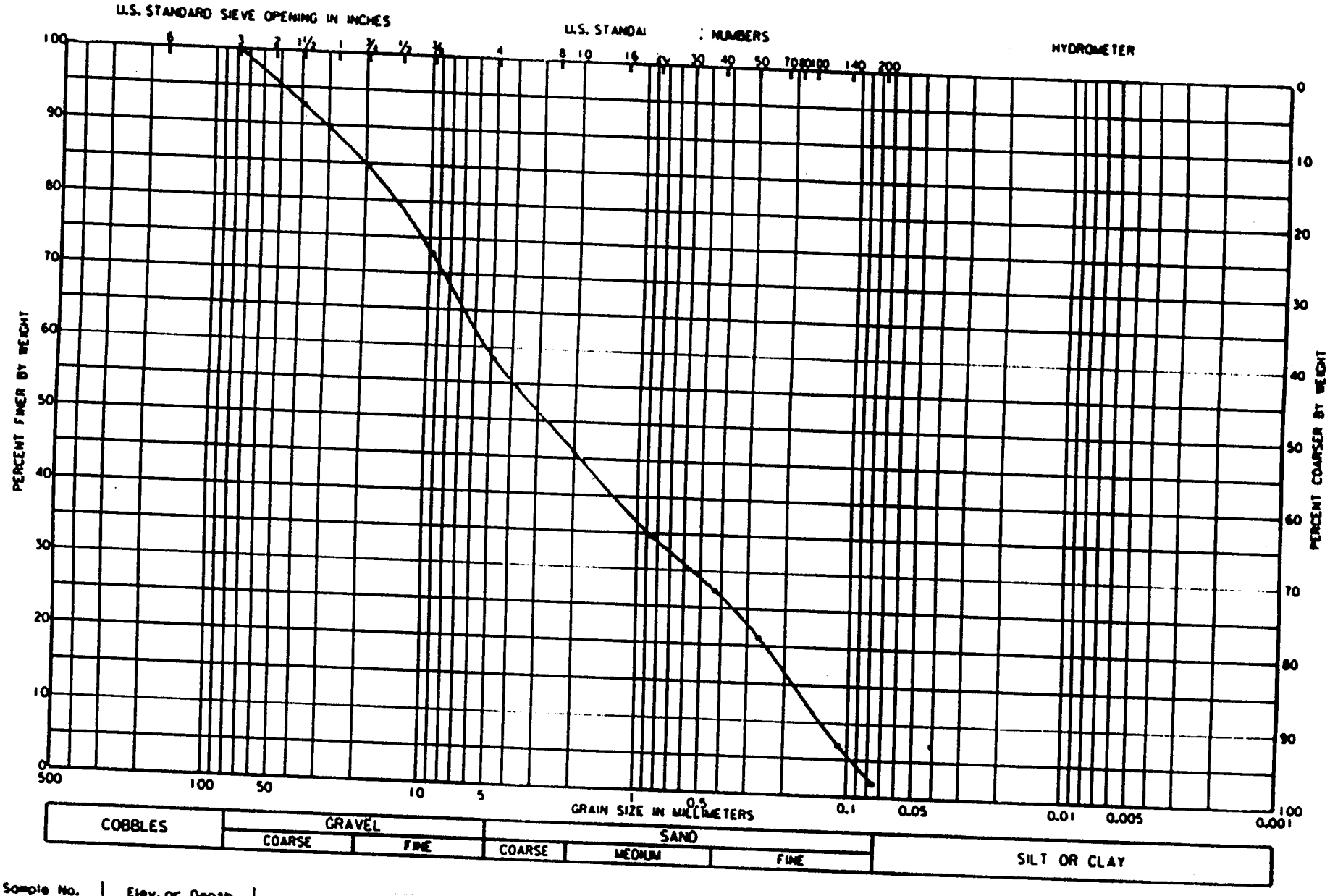
Site CANNON AFB, NEW MEXICO

SAMPLE 2 - LANDFILL 25 STOCKPILE MATERIAL

Date 5/7/02

GRADATION CURVE

Attachment 2



Sample No.	Elev. or Depth	Classification	Nat w %	LL	PL	PI
3		POORLY-GRADED SAND WITH GRAVEL SP				

Project SEWAGE LAGOONS CLOSURE PROJECT

Site CANNON AFB, NEW MEXICO

SAMPLE 3 - LANDFILL 25 STOCKPILE MATERIAL

Date 5/7/02

GRADATION CURVE

Attachment 2

ATTACHMENT 3
HELP RUN RESULTS

```
******************************************************************************
******************************************************************************
**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                    USAE WATERWAYS EXPERIMENT STATION                     **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************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TEMPERATURE DATA FILE:        C:\HELP 307\CAFBT5.D7
SOLAR RADIATION DATA FILE:    C:\HELP 307\CAFBS5.D13
EVAPOTRANSPIRATION DATA:      C:\HELP 307\CAFBE5.D11
SOIL AND DESIGN DATA FILE:    C:\HELP 307\CAFB1.D10
OUTPUT DATA FILE:             C:\HELP 307\CAFB1.OUT


TIME:   1:28     DATE:   5/ 5/2002


******************************************************************************

     TITLE:  Prescriptive Cover

******************************************************************************


     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER
              WERE SPECIFIED BY THE USER.


                                  LAYER  1
                                  --------

                 TYPE 1 - VERTICAL PERCOLATION LAYER
                     MATERIAL TEXTURE NUMBER   0
          THICKNESS                    =      6.00   INCHES
          POROSITY                     =      0.4570 VOL/VOL
          FIELD CAPACITY               =      0.1310 VOL/VOL
          WILTING POINT                =      0.0580 VOL/VOL
          INITIAL SOIL WATER CONTENT   =      0.0763 VOL/VOL
          EFFECTIVE SAT. HYD. COND.    =  0.100000005000E-02 CM/SEC


                                  LAYER  2
                                  --------

                 TYPE 1 - VERTICAL PERCOLATION LAYER
                     MATERIAL TEXTURE NUMBER   0
          THICKNESS                    =     18.00   INCHES
          POROSITY                     =      0.4750 VOL/VOL
          FIELD CAPACITY               =      0.3780 VOL/VOL
          WILTING POINT                =      0.2650 VOL/VOL
          INITIAL SOIL WATER CONTENT   =      0.2930 VOL/VOL
          EFFECTIVE SAT. HYD. COND.    =  0.999999975000E-05 CM/SEC
```

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 5 WITH A POOR STAND OF GRASS, A SURFACE SLOPE OF 3.% AND A SLOPE LENGTH OF 300. FEET.

SCS RUNOFF CURVE NUMBER	=	77.20	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	17.000	ACRES
EVAPORATIVE ZONE DEPTH	=	20.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	4.560	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	9.392	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	4.058	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	5.732	INCHES
TOTAL INITIAL WATER	=	5.732	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
Clovis New Mexico

STATION LATITUDE	=	34.40	DEGREES
MAXIMUM LEAF AREA INDEX	=	1.60	
START OF GROWING SEASON (JULIAN DATE)	=	95	
END OF GROWING SEASON (JULIAN DATE)	=	303	
EVAPORATIVE ZONE DEPTH	=	20.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	13.70	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	55.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	52.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	57.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	57.00	%

NOTE: PRECIPITATION DATA FOR Clovis NEW MEXICO
WAS ENTERED FROM A EARTH INFO CLIMATEDATA.

NOTE: TEMPERATURE DATA FOR Clovis NEW MEXICO
WAS ENTERED FROM A EARTH INFO CLIMATEDATA.

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR AMARILLO TEXAS
AND STATION LATITUDE = 34.40 DEGREES

****

MONTHLY TOTALS (IN INCHES) FOR YEAR 1984

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC

PRECIPITATION	0.29	0.00	0.18	0.82	4.43	5.56
	2.96	6.17	0.46	4.18	1.37	0.81
RUNOFF	0.000	0.000	0.000	0.000	0.514	0.225
	0.000	0.133	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.570	0.208	0.075	0.147	2.139	4.872
	3.801	5.286	0.638	1.856	1.373	1.461
PERCOLATION/LEAKAGE THROUGH LAYER 2	0.0000	0.0000	0.0000	0.0000	0.3839	1.2834
	0.1824	0.3519	0.0847	0.0015	0.0003	0.0178

****

****

MONTHLY TOTALS (IN INCHES) FOR YEAR 1985

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.31	0.08	2.54	1.31	2.94	2.66
	1.75	3.47	4.49	3.14	0.07	0.20
RUNOFF	0.000	0.000	0.027	0.000	0.000	0.028
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.504	0.279	1.428	0.595	4.286	3.793
	1.261	3.573	3.106	2.923	0.558	0.397
PERCOLATION/LEAKAGE THROUGH LAYER 2	0.0399	0.0384	0.1037	0.3884	0.1141	0.0047
	0.0055	0.0061	0.0007	0.1195	0.2282	0.0000

****

****

MONTHLY TOTALS (IN INCHES) FOR YEAR 1986

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.00	0.70	0.07	0.22	2.15	5.27
	1.15	3.59	3.60	2.89	2.72	1.90
RUNOFF	0.000	0.000	0.000	0.000	0.000	0.139
	0.000	0.000	0.000	0.007	0.004	0.000
EVAPOTRANSPIRATION	0.244	0.526	0.191	0.249	1.229	6.635
	1.280	3.021	2.436	2.680	1.674	1.091
PERCOLATION/LEAKAGE THROUGH LAYER 2	0.0000	0.0000	0.0017	0.0024	0.0033	0.0021
	0.0016	0.0099	0.0019	0.0019	1.0630	0.2276

****

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MONTHLY TOTALS (IN INCHES) FOR YEAR 1987

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.29	1.18	0.18	1.33	2.73	3.52
	1.99	7.52	2.95	0.72	0.01	1.86
RUNOFF	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.063	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	1.111	0.750	0.353	1.513	3.161	4.420
	2.153	5.077	3.682	0.973	0.400	0.865
PERCOLATION/LEAKAGE THROUGH LAYER 2	0.0567	0.1538	0.0044	0.0020	0.0065	0.0166
	0.0000	0.0020	0.0013	0.0049	0.0000	0.0005

****

****

MONTHLY TOTALS (IN INCHES) FOR YEAR 1988

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.05	0.10	0.36	0.62	3.38	4.40
	3.39	0.82	4.23	0.04	0.16	0.68
RUNOFF	0.000	0.000	0.000	0.000	0.000	1.771
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.632	0.440	0.364	0.285	0.508	4.758
	5.535	0.755	3.297	0.660	0.327	0.404
PERCOLATION/LEAKAGE THROUGH LAYER 2	0.0006	0.0079	0.0176	0.0102	0.0003	0.0000
	0.0013	0.0004	0.0004	0.0004	0.0000	0.0000

****

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1984 THROUGH 1988

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	0.19	0.41	0.67	0.86	3.13	4.28
	2.25	4.31	3.15	2.19	0.87	1.09
STD. DEVIATIONS	0.15	0.51	1.05	0.47	0.85	1.21
	0.91	2.61	1.62	1.74	1.18	0.76
RUNOFF						
TOTALS	0.000	0.000	0.005	0.000	0.103	0.433
	0.000	0.039	0.000	0.001	0.001	0.000

STD. DEVIATIONS	0.000	0.000	0.012	0.000	0.230	0.753
	0.000	0.059	0.000	0.003	0.002	0.000

EVAPOTRANSPIRATION

TOTALS	0.612	0.440	0.482	0.558	2.265	4.896
	2.806	3.542	2.632	1.818	0.867	0.844
STD. DEVIATIONS	0.316	0.214	0.542	0.560	1.505	1.059
	1.842	1.833	1.203	1.002	0.615	0.457

PERCOLATION/LEAKAGE THROUGH LAYER 2

TOTALS	0.0195	0.0400	0.0255	0.0806	0.1016	0.2614
	0.0382	0.0741	0.0178	0.0256	0.2583	0.0492
STD. DEVIATIONS	0.0270	0.0655	0.0443	0.1721	0.1650	0.5714
	0.0806	0.1554	0.0374	0.0525	0.4606	0.1000

****

****

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1984 THROUGH 1988

	INCHES		CU. FEET	PERCENT
PRECIPITATION	23.39	(3.283)	1443520.6	100.00
RUNOFF	0.582	(0.7467)	35920.72	2.488
EVAPOTRANSPIRATION	21.761	(2.4117)	1342895.62	93.029
PERCOLATION/LEAKAGE THROUGH LAYER 2	0.99167	(0.90754)	61195.734	4.23934
CHANGE IN WATER STORAGE	0.057	(1.4440)	3508.26	0.243

25.2 mm/yr prescriptive

****

****

PEAK DAILY VALUES FOR YEARS 1984 THROUGH 1988

	(INCHES)	(CU. FT.)
PRECIPITATION	2.75	169702.500
RUNOFF	1.768	109074.6250
PERCOLATION/LEAKAGE THROUGH LAYER 2	0.204363	12611.25590
SNOW WATER	2.75	169702.5000

5.2mm/day pk

MAXIMUM VEG. SOIL WATER (VOL/VOL) 0.4051

MINIMUM VEG. SOIL WATER (VOL/VOL) 0.2029

****

****

FINAL WATER STORAGE AT END OF YEAR 1988

LAYER	(INCHES)	(VOL/VOL)
1	0.8515	0.1419
2	5.1645	0.2869
SNOW WATER	0.000	

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**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                    USAE WATERWAYS EXPERIMENT STATION                     **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
**                                                                          **
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TEMPERATURE DATA FILE:        C:\HELP 307\CAFBT5.D7
SOLAR RADIATION DATA FILE:    C:\HELP 307\CAFBS5.D13
EVAPOTRANSPIRATION DATA:      C:\HELP 307\CAFBE5.D11
SOIL AND DESIGN DATA FILE:    C:\HELP 307\C3SP.D10
OUTPUT DATA FILE:             C:\HELP 307\C3SP.OUT


TIME:   1:24     DATE:   5/ 5/2002


******************************************************************************

    TITLE:  Alternative Cover

******************************************************************************


    NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER
             WERE SPECIFIED BY THE USER.


                                LAYER  1
                                --------

              TYPE 1 - VERTICAL PERCOLATION LAYER
                  MATERIAL TEXTURE NUMBER   0
        THICKNESS                    =      6.00   INCHES
        POROSITY                     =      0.4570 VOL/VOL
        FIELD CAPACITY               =      0.1310 VOL/VOL
        WILTING POINT                =      0.0580 VOL/VOL
        INITIAL SOIL WATER CONTENT   =      0.0763 VOL/VOL
        EFFECTIVE SAT. HYD. COND.    =  0.100000005000E-02 CM/SEC


                                LAYER  2
                                --------

              TYPE 1 - VERTICAL PERCOLATION LAYER
                  MATERIAL TEXTURE NUMBER   1
        THICKNESS                    =     18.00   INCHES
        POROSITY                     =      0.4170 VOL/VOL
        FIELD CAPACITY               =      0.0450 VOL/VOL
        WILTING POINT                =      0.0180 VOL/VOL
        INITIAL SOIL WATER CONTENT   =      0.0248 VOL/VOL
        EFFECTIVE SAT. HYD. COND.    =  0.999999978000E-02 CM/SEC
```

LAYER 3

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	18.00	INCHES
POROSITY	=	0.4570	VOL/VOL
FIELD CAPACITY	=	0.1310	VOL/VOL
WILTING POINT	=	0.0580	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0763	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.150000007000E-03	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 5 WITH A POOR STAND OF GRASS, A SURFACE SLOPE OF 3.% AND A SLOPE LENGTH OF 300. FEET.

SCS RUNOFF CURVE NUMBER	=	77.20	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	17.000	ACRES
EVAPORATIVE ZONE DEPTH	=	20.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	0.805	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	8.580	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	0.600	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	2.278	INCHES
TOTAL INITIAL WATER	=	2.278	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
Clovis New Mexico

STATION LATITUDE	=	34.40	DEGREES
MAXIMUM LEAF AREA INDEX	=	1.60	
START OF GROWING SEASON (JULIAN DATE)	=	95	
END OF GROWING SEASON (JULIAN DATE)	=	303	
EVAPORATIVE ZONE DEPTH	=	20.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	13.70	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	55.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	52.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	57.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	57.00	%

NOTE: PRECIPITATION DATA FOR Clovis NEW MEXICO
WAS ENTERED FROM A EARTH INFO CLIMATEDATA.

NOTE: TEMPERATURE DATA FOR Clovis NEW MEXICO
WAS ENTERED FROM A EARTH INFO CLIMATEDATA.

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR AMARILLO TEXAS
AND STATION LATITUDE = 34.40 DEGREES

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MONTHLY TOTALS (IN INCHES) FOR YEAR 1984

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.29	0.00	0.18	0.82	4.43	5.56
	2.96	6.17	0.46	4.18	1.37	0.81
RUNOFF	0.000	0.000	0.000	0.000	0.335	0.161
	0.000	0.131	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.453	0.030	0.074	0.148	2.332	4.261
	3.016	4.618	0.361	2.204	1.254	1.321
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.3294	0.0000	0.0000	0.0000	1.0993	2.0910
	0.1976	1.4005	0.0773	0.0623	0.2776	0.1462

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MONTHLY TOTALS (IN INCHES) FOR YEAR 1985

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.31	0.08	2.54	1.31	2.94	2.66
	1.75	3.47	4.49	3.14	0.07	0.20
RUNOFF	0.000	0.000	0.021	0.000	0.000	0.025
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.486	0.268	1.257	0.549	4.188	3.076
	1.294	3.702	2.908	2.828	0.472	0.376
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.1165	0.0616	0.3612	0.3446	0.1812	0.0834
	0.0453	0.0738	0.1391	0.8500	0.1620	0.1855

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MONTHLY TOTALS (IN INCHES) FOR YEAR 1986

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.00	0.70	0.07	0.22	2.15	5.27
	1.15	3.59	3.60	2.89	2.72	1.90

RUNOFF	0.000	0.000	0.000	0.000	0.000	0.132
	0.000	0.000	0.000	0.001	0.000	0.000
EVAPOTRANSPIRATION	0.025	0.441	0.128	0.137	0.531	5.606
	1.291	3.009	2.505	3.042	1.480	1.081
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.0749	0.0212	0.0132	0.0107	0.0086	0.0051
	0.0000	0.0000	0.0002	0.0002	0.0000	0.0587

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MONTHLY TOTALS (IN INCHES) FOR YEAR 1987

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.29	1.18	0.18	1.33	2.73	3.52
	1.99	7.52	2.95	0.72	0.01	1.86
RUNOFF	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.062	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.950	0.722	0.333	1.495	3.119	3.524
	2.052	4.711	3.698	0.970	0.392	0.882
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.0708	0.1851	0.1523	0.1526	0.1133	0.0768
	0.1145	0.1545	0.1960	0.3293	0.2137	0.1615

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MONTHLY TOTALS (IN INCHES) FOR YEAR 1988

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.05	0.10	0.36	0.62	3.38	4.40
	3.39	0.82	4.23	0.04	0.16	0.68
RUNOFF	0.000	0.000	0.000	0.000	0.000	1.757
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.624	0.425	0.319	0.194	0.336	4.130
	5.132	0.745	3.357	0.572	0.086	0.338
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.1083	0.0616	0.1435	0.1468	0.1153	0.0755
	0.0389	0.1026	0.0667	0.0506	0.1563	0.1579

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1984 THROUGH 1988

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	0.19	0.41	0.67	0.86	3.13	4.28
	2.25	4.31	3.15	2.19	0.87	1.09
STD. DEVIATIONS	0.15	0.51	1.05	0.47	0.85	1.21
	0.91	2.61	1.62	1.74	1.18	0.76
RUNOFF						
TOTALS	0.000	0.000	0.004	0.000	0.067	0.415
	0.000	0.039	0.000	0.000	0.000	0.000
STD. DEVIATIONS	0.000	0.000	0.009	0.000	0.150	0.753
	0.000	0.058	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION						
TOTALS	0.508	0.377	0.422	0.504	2.101	4.119
	2.557	3.357	2.566	1.923	0.737	0.800
STD. DEVIATIONS	0.334	0.254	0.480	0.579	1.660	0.958
	1.604	1.619	1.312	1.105	0.599	0.433
PERCOLATION/LEAKAGE THROUGH LAYER 3						
TOTALS	0.1400	0.0659	0.1340	0.1309	0.3035	0.4664
	0.0792	0.3463	0.0959	0.2585	0.1619	0.1420
STD. DEVIATIONS	0.1078	0.0717	0.1454	0.1396	0.4491	0.9088
	0.0780	0.5920	0.0746	0.3547	0.1028	0.0487

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1984 THROUGH 1988

	INCHES		CU. FEET	PERCENT
PRECIPITATION	23.39	(3.283)	1443520.6	100.00
RUNOFF	0.525	(0.7292)	32411.03	2.245
EVAPOTRANSPIRATION	19.972	(2.4797)	1232486.25	85.381
PERCOLATION/LEAKAGE THROUGH LAYER 3	2.32451	(2.07743)	143445.547	9.93720
CHANGE IN WATER STORAGE	0.570	(2.4136)	35177.59	2.437

59.0 mm/yr avg alternative cover

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PEAK DAILY VALUES FOR YEARS 1984 THROUGH 1988

	(INCHES)	(CU. FT.)
PRECIPITATION	2.75	169702.500
RUNOFF	1.755	108307.0160
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.679969	41960.91410 17.3mm/yr pk.
SNOW WATER	2.75	169702.5000

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.2232
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0300

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FINAL WATER STORAGE AT END OF YEAR 1988

LAYER	(INCHES)	(VOL/VOL)
1	0.7164	0.1194
2	0.5640	0.0313
3	3.8474	0.2137
SNOW WATER	0.000	

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SPILL PREVENTION CONTROL AND COUNTERMEASURES PLAN FOR CLOSURE CONSTRUCTION AT SEWAGE LAGOONS

Prepared for:

27 CE/CEV
Cannon Air Force Base, NM
and
HQ ACC/CEV
Langley Air Force Base, VA

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Under Contract No. DACW45-94-D-0003

Delivery Order No. 35, Work Authorization Directive 1

U.S. Army Corps of Engineers
Omaha District
Omaha, Nebraska

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Figure D-1. Sewage Lagoons Site Location Map

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Table D-1. Emergency Contacts
Table D-2. Potential Facility Discharge from Sewage Lagoons

ACRONYMS AND ABBREVIATIONS

AFB	Air Force Base
CFR	Code of Federal Regulations
CP	Command Post
DOM	Delivery Order Manager
EHS	Environmental Health and Safety
ESQ	Environmental Safety and Quality
Foster Wheeler Environmental	Foster Wheeler Environmental Corporation
ft	foot/feet
HDPE	high-density polyethylene
POL	petroleum, oil, and lubricants
RA	Remedial Action
RQ	Reportable Quantity
RS	Regulatory Specialist
SHSO	Site Health and Safety Officer
SPCCP	Spill Prevention Control and Countermeasures Plan
SWMU	Soild Waste Management Unit
SWMU 101	Sewage Lagoon
USACE	U.S. Army Corps of Engineers

1. INTRODUCTION

This Spill Prevention Control and Countermeasures Plan (SPCCP) was prepared in accordance with U.S. Environmental Protection Agency Oil Pollution Prevention Regulations (Title 40 of the Code of Federal Regulations [CFR] Part 112) to address the potential for spills from an aboveground 2,000-gallon diesel fuel storage tank (size to be determined when subcontractor is selected) located at the Cannon Air Force Base (AFB) Solid Waste Management Unit (SWMU) 101, Sewage Lagoons, construction project site. This plan also addresses prevention of spills and releases from 55-gallon storage drums for petroleum, oil, and lubricants (POL) and antifreeze also located at the site construction staging area. The SPCCP is required because the amount of diesel stored at this location exceeds the 1,320-gallon capacity threshold [as specified in 40 CFR 112.1(d)(2)(ii)]. Project activities will require the use of heavy earth-moving and material-handling equipment, such as excavators, bulldozers, front-end loaders, and compactors. Operation of this equipment requires the use of a temporary storage tank to store diesel fuel.

Fuel storage, equipment fueling, and maintenance are activities identified as having the greatest potential for spills and releases. To minimize this risk, the SPCCP will be implemented in conjunction with the Closure Work Plan and the Site Safety and Health Plan (Appendix B). The SPCCP addresses the potential for spills and releases from the temporary diesel storage tank and equipment fueling and maintenance areas and emphasizes spill prevention through the use of Best Management Practices consisting of the following:

- Good housekeeping and on-site management practices and implementation of preventative maintenance procedures
- Use of secondary containment and liners for selected areas such as fuel storage
- Inspections

Training

The SPCCP complies with existing laws and regulations pertaining to safety standards, fire prevention, and pollution prevention and provides an explicit, comprehensive, balanced spill prevention plan. The Task Manager has full approval of the Base and Foster Wheeler Environmental Corporation (Foster Wheeler Environmental) management to commit the resources necessary to implement the SPCCP. The SPCCP describes the actions Foster Wheeler Environmental and subcontractor personnel will take in response to leaks, spills, or discharges of fuel, lubricants, or antifreeze. The plan also describes:

- Types of materials typically managed at the site
- Spill prevention measures
- Emergency response procedures
- Designated on-site emergency coordinator and spill/release coordinator and their responsibilities
- Evacuation plans
- Spill incident reporting procedures

Foster Wheeler Environmental will determine the potential risk of harm to the environment for facilities described in this plan and for which this plan is to be implemented. A copy of this SPCCP will be maintained in the Foster Wheeler Environmental Site Construction Manager's vehicle or U.S. Army Corps of Engineers (USACE) field office and made available to site and project personnel.

2. FACILITY INFORMATION

The Sewage Lagoons were identified as SWMU 101 in the Cannon AFB Hazardous Waste Permit dated November 14, 1989. The out-of-service sewage lagoons consist of two unlined surface impoundments that were used from 1966 to 1998 for treatment of base sanitary and industrial waste (Figure D-1). The lagoons have a combined surface area of approximately 39 acres and were constructed with unlined earthen bottoms and concrete-lined banks. When the new wastewater treatment plant began operation in 1998, wastewater was no longer discharged to the lagoons.

Construction staging and support facilities will be located south of the lagoons. The construction Subcontractor will submit a plan for location of temporary support facilities.

3. EMERGENCY CONTACT NUMBERS

Numerous federal, state, and local regulatory requirements govern spill/release reporting and response activities. Depending on the circumstances, reporting may be deemed necessary under federal (Clean Water Act; Comprehensive Environmental Response, Compensation, and Liability Act; Superfund Amendments and Authorization Acts Title III; Resource Conservation and Recovery Act; Toxic Substances Control Act), state, and/or local spill-reporting programs. Some programs specify minimum quantities, others do not; some programs apply to virtually any spill, others are very specific. If

hazardous materials are spilled or emitted into the air, federal and related state and local laws must be followed to protect the environment. New Mexico law requires that any discharge of oil, antifreeze, or other water contaminant in a quantity that may, with reasonable probability, injure or be detrimental to human health, animal or plant life, or property or that may unreasonably interfere with the public welfare or the use of the property be reported as soon as possible, but no more than 24 hours after the event.

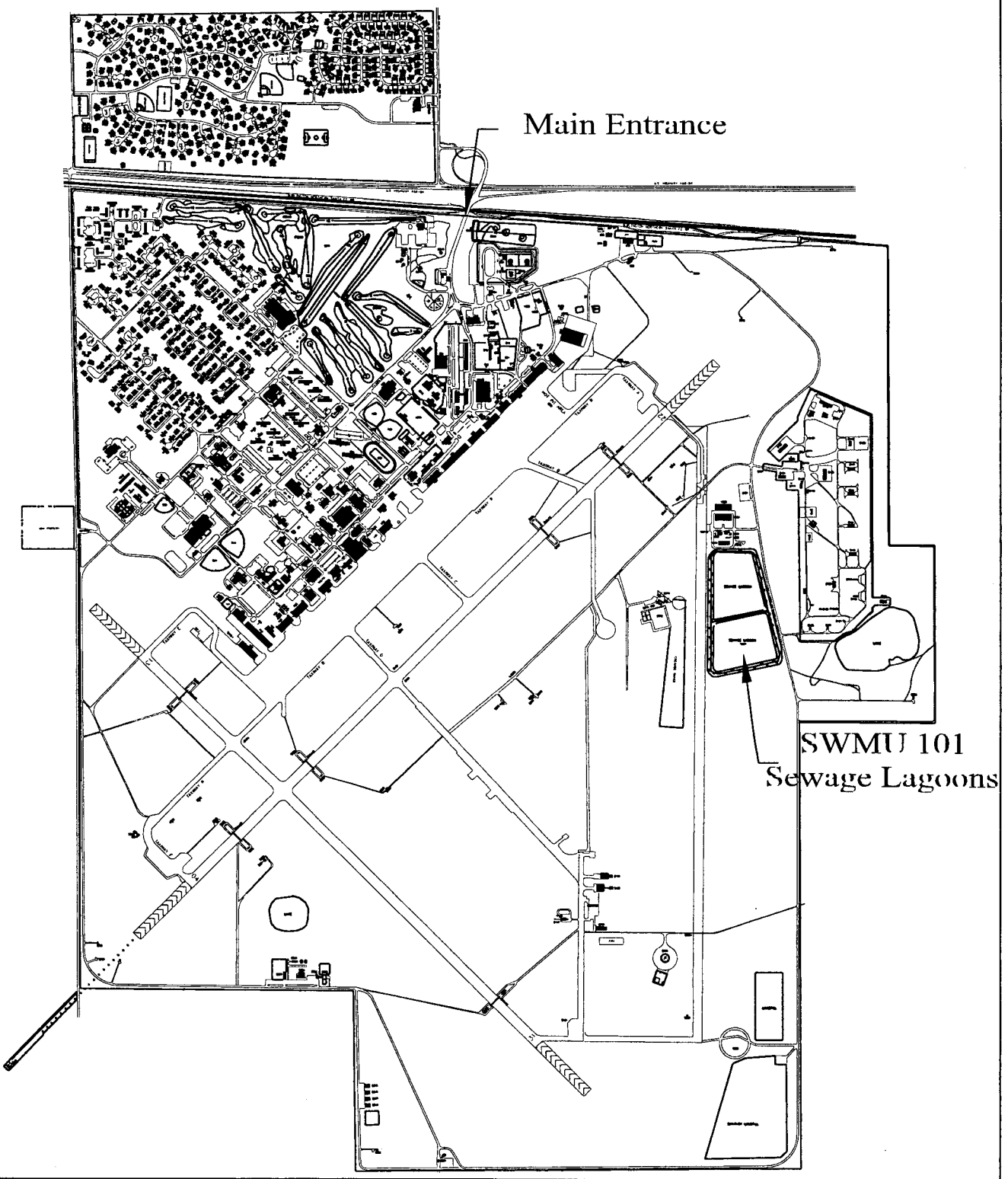
If a diesel spill or release occurs, the following priorities must be established:

- Protect people from injury by isolating the affected area to prevent unnecessary exposure and contamination of personnel and, if necessary, evacuate personnel from the area of the release.
- Prevent contamination of soil, water, and air by using absorbent pads/material and containment, as practical.
- Protect property from damage.
- Report the release to appropriate authorities.

The required response will depend on several factors, i.e., the source, type, and quantity of materials released and into what media the material was released (air, soil, or water). As mentioned, New Mexico law requires any unplanned or threatened discharge of hazardous substances or oil be reported unless there is a reasonable belief that no significant present or future threat is posed to human health and safety or to the environment or if the release quantity is below a specified threshold quantity. Reporting requirements for spills or releases of diesel fuel at the site will be determined on a case-by-case basis. If a release is to be reported, the following actions will be taken.

The Site Health and Safety Officer (SHSO) will be designated as the Foster Wheeler Environmental Spill and Release Reporter. This individual will receive training in the Foster Wheeler Environmental Health and Safety (EHS) Program procedure EHS 1-7, Incident Reporting and Investigation. If a spill or release occurs, the SHSO will immediately notify the Delivery Order Manager (DOM) and the project Regulatory Specialist (RS). The DO Manager will immediately notify the Cannon AFB On-Site Representative at (505) 784-4348, the Cannon AFB Emergency Spill Response Coordinator, the Cannon AFB Fire Prevention and Protection Branch, and the Safety and Environmental Office.

Site personnel must contact the Foster Wheeler Environmental DO Manager. If the DO Manager cannot be located, the RS must be contacted. Following is a summary of contacts regarding spill reporting and notification.



1000 500 0 1000 2000 3000

SCALE IN FEET

FOSTER WHEELER
ENVIRONMENTAL CORPORATION

N

Closure of
SWMU 101 - Sewage Lagoons
Cannon Air Force Base, New Mexico
U.S. Army Corps of Engineers, Omaha District

Sewage Lagoons Site
Location Map

Date: 01/30/03	Figure D-1
File Name: Fig D-1_Final	

The DO Manager or RS must immediately notify the Foster Wheeler Environmental Safety and Quality (ESQ) Regional Compliance Manager at (949) 756-7534 of any spills and/or releases. A written incident report must be submitted within 24 hours. Emergency contact information is provided in Table D-1.

Table D-1. Emergency Contacts

Contact	Title	Affiliation	Telephone Number
James Morning	On-Site Spill Reporting Coordinator/SHSO	Foster Wheeler Environmental	(505) 430-2307
Carol Bieniulis	DO Manager	Foster Wheeler Environmental	(505) 878-8924 (505) 301-4715
Craig O'Rourke	Regulatory Compliance Specialist	Foster Wheeler Environmental	(949) 756-7511
Jayne Fitzgerald	ESQ Regional Manager	Foster Wheeler Environmental	(949) 756-7534
Pete Zamie	On-Site Representative	Cannon AFB	(505) 784-1092
Gene Smith	Cannon AFB Emergency Spill Response Coordinator	Cannon AFB	(505) 784-6391
Cannon AFB Fire Prevention and Protection Branch		Cannon AFB	(505) 784-4490 or (505) 784-2578
Cannon AFB Safety and Environmental Office		Cannon AFB	(505) 784-4472 or (505) 784-1146
Subcontractor Representative - TBD		TBD	TBD

TBD To be determined

If Cannon AFB or Foster Wheeler Environmental is required to notify an agency, the notification and subsequent reporting will be made to the following agencies:

New Mexico Environment Department
Surface Water Quality Bureau
Santa Fe, New Mexico
(505) 827-2981 (8 a.m.–5 p.m.)
(505) 827-9329 (24 hour)

National Response Center (for any release where a reportable quantity [RQ] is exceeded)
(800) 424-8802
RQ (oil and diesel) = 25 gallons
RQ (antifreeze) = 5,000 pounds

4. POTENTIAL FACILITY DISCHARGES AND SPILL PREVENTION MEASURES

This section presents information on the potential sources of contamination and the preventive measures used to minimize the chance of a spill.

4.1 Potential Facility Discharge

Table D-2 lists potential contamination sources or pieces of equipment and the total quantity of liquid that could be discharged. These sources are located within two separate secondary containment units (one for the diesel storage tank and the other for the containers of POL); the units are in the form of a 40-mil high-density polyethylene (HDPE)-lined and bermed area. This table will be updated to reflect the subcontractor tanks and storage facility for the project.

Table D-2. Potential Facility Discharge from Sewage Lagoons

Description	Contents	Reportable Quantities
Steel tank	Diesel (2,000 gallons)	25 gallons (oil and diesel)
Metal drum	Antifreeze (55 gallons)	5,000 pounds
Metal drum	Motor oil (55 gallons)	25 gallons (oil and diesel)
Metal drum	Hydraulic oil (55 gallons)	Not applicable

4.2 Spill Prevention Measures

As previously indicated, the sources of POL, diesel, and antifreeze at the sewage lagoons will likely include one aboveground 2,000-gallon diesel fuel tank, 55-gallon drums of motor oil, hydraulic oil, and antifreeze. The tanks and the containers of hydraulic oil, motor oil, and antifreeze are stored within secondary containment in the form of a 40-mil HDPE-lined and bermed area. Generally, minor spills or leaks are contained within the area of the tank or containment structure. Spills and leaks typically occur when tanks overflow, when drums and pumps leak, or during loading/unloading activities. A much less likely spill event would be the complete failure of a tank or storage drum.

Spill prevention measures will include the following:

- All oil/diesel/antifreeze transfer operations will be manually controlled. Personnel performing the transfer will remain in the area during the transfer to monitor the operation and check for any pipe, valve, or pump leaks and overflows.
- Equipment will be grounded and bonded during the transfer of liquids.
- Tanks and storage drums will be inspected regularly for leaks, structural damage, corrosion, etc. Inspections must be documented in the field logbook.

4.2.1 Loading/Unloading Operations

Diesel Fuel Tanks. The vendor tanker truck will park parallel to the secondary containment when filling the diesel tanks. The tanker driver will connect a fill hose from the tanker to the diesel tank's top-mounted opening. A Foster Wheeler Environmental or subcontractor representative will be on site during

this activity and will inspect all hose connections and tanker valving prior to unloading of product. Additional measures to be taken during loading/unloading activities will include:

- "Sticking" the tank to verify the volume remaining and to help the driver ensure that the tank is not overfilled.
- Using grounding for truck and tank.
- Inspecting the tanker valves to ensure that there are no leaks prior to disconnecting any hoses or moving the tanker. The Foster Wheeler Environmental or subcontractor representative will perform the inspection.

Oil/Antifreeze Drums. New motor oil and hydraulic oil and antifreeze are stored in closed 55-gallon drums and various approved 5-gallon containers placed on wooden pallets within the secondary containment area. Material safety data sheets for each type of oil and antifreeze will be maintained at the USACE field office. Drums will be placed into and removed from delivery trucks and into the secondary containment area by hand, forklift, or clamp truck. A Foster Wheeler Environmental or subcontractor representative will visually inspect drums for leaks and damage before and after unloading.

4.2.2 Resources Available for Spill Response/Remediation

The project site is adequately equipped to meet preparedness and prevention requirements by maintaining a communication system, on-site equipment suitable for emergency response, and accessibility to off-site resources. The on-site equipment enables Foster Wheeler Environmental and subcontractor personnel to respond to emergency incidents that may arise and allows them to contain the release until, if necessary, the Base Fire Department can remedy the situation.

Foster Wheeler Environmental personnel will be equipped with a communications network that can be linked to both on-site and off-site resources. Off-site communications are available via the local telephone system. Telephones will be located in the USACE field office, the Site Construction Manager's vehicle, and the Site Health and Safety Officer's vehicle. On-site communications will be conducted by telephone and/or two-way radio.

Primary emergency response equipment available at the project site includes the following:

- Large drip pans
- Stationary ABC-type fire extinguisher at the diesel tank storage area

- Emergency eyewash
- First-aid kit
- Personal protective equipment, including Tyvek® coveralls, rubber gloves and booties, and, respirators
- Shovels and rakes for spill control
- Spill containment pack, which includes absorbent pads/material
- Department of Transportation-approved recovery drums.

As a standard safety practice, personnel managing oils and lubricants will be required to wear the following minimum safety equipment:

- Hard hat and safety glasses
- Sturdy steel-toed work boots
- Work uniforms, as appropriate

In addition to being provided spill control/response equipment, Foster Wheeler Environmental personnel are trained to respond effectively to emergencies by familiarizing themselves with site emergency procedures, emergency equipment, and emergency communication systems. During this training, pollution control is stressed. Spill prevention control procedures are further explained during these sessions.

4.2.3 Spill Response Actions for Specific Units

The diesel storage tank requires special consideration in the SPCCP. If the tank ruptures, the following actions will be taken:

- The tank will be isolated and removed from service.
- Tank contents will be evacuated, if possible, to drums.
- Any free liquid within the secondary containment berm on the ground surrounding the tank will be pumped to another tank (air pumps or by vacuum truck) or to 55-gallon drums.
- Absorbent materials will be used to contain spills, where applicable.

If any 55-gallon drum leaks or releases, the following measures will be taken:

- Absorbent materials, sandbags, and/or soil will be used to dike-contain the release.
- Any free liquid accumulated within the secondary containment area as a result of a drum release or rupture will be pumped to a spare drum maintained at the site for such a purpose.

In addition, appropriate response actions specified in the Closure Work Plan and the Site Safety and Health Plan will be implemented as necessary. These actions include the following:

- Management of released hazardous materials
- Post-emergency procedures (dealing with the removal and storage of cleanup materials and residues)

5. CONTAINMENT, DIVERSIONARY STRUCTURES, AND EQUIPMENT

This plan relies on secondary containment to prevent the release of diesel fuel and oil products to federal or state waters. Provided these controls are properly operated and maintained, the potential for release is considered very low.

The primary containment for the 2,000 gallons of diesel fuel is a new carbon-steel tank. The motor oil, hydraulic oil, and antifreeze are contained in new 55-gallons steel drums and various approved 5-gallon containers.

The 2,000-gallon tank is supported above a 40-mil HDPE-lined and bermed area by a steel frame designed to adequately support a full tank. The tank is accessed through a top opening surrounded by a sheet metal spill guard. The top-mounted access port is padlocked when not in use. The diesel tank is an atmospheric tank in which the pressure in the tank is balanced via an atmospheric vent to equal the ambient pressure outside the tank. The tank is equipped with a drain valve, which is not used for unloading and is blinded off with a threaded steel plug. There is no aboveground or buried piping connected to the tank. Foster Wheeler Environmental or subcontractor personnel shall monitor transfer of product at all times to prevent overfilling of fuel tanks.

A hand pump will be used to pump oil and antifreeze from the 55-gallon drums. Drip pans are used during the transfer of petroleum products to mitigate the potential for drips and spills to leach into the ground. In lieu of drip pans, absorbent pads/materials, plastic sheeting, or other suitable means are

acceptable. Foster Wheeler Environmental or subcontractor personnel shall monitor transfer of product at all times to prevent overfilling tanks.

A warning sign with the following legend will be posted at the diesel tank:

FLAMMABLE
NO SMOKING OR OPEN FLAME WITHIN 50 FEET
DIESEL FUEL

The secondary containment provided for the diesel tank and drums is in excess of 2,000 gallons and consists of a bermed area lined with a 40-mil HDPE liner. The secondary containment area is slightly sloped to the corner to allow collected liquid to accumulate, thus facilitating easy removal. Any liquid falling into the containment is drained to this low area, where it can be pumped (hand pump) or removed using absorbent materials.

6. DEMONSTRATION OF IMPRACTICABILITY

This section is not applicable to activities being conducted at the sewage lagoons.

7. CONFORMANCE WITH GUIDELINES

The SPCCP requires conformance with 40 CFR 112.7 guidelines that are applicable to onshore remedial activities using portable tanks. These activities involve facility drainage, bulk storage tanks, facility tank car and tank truck loading and unloading, security, and personnel training.

7.1 Facility Drainage

The current surface water drainage pattern for the southern portion of the site (equipment and fuel staging area) consists of overland flow to the south into a flat basin area. Drainage from the diesel fuel, antifreeze, and oil storage area is restrained by a secondary containment structure, which prevents spills or leakage of material from this area. Accumulated stormwater in the containment area will be emptied mechanically. However, the stormwater will be examined before emptying to ensure that no diesel fuel, antifreeze, or oil is discharged along with it. If there is any product release to the secondary containment area, absorbent pads/material will be used to remove *de minimis* quantities. Any larger quantities will be manually pumped into steel drums. Because it is relatively flat around the secondary containment area, no further engineering controls will be necessary. In the unlikely event of a release from the secondary containment unit, the release will remain in place where the spill occurs. However, if there is a major release from the secondary containment, earth-moving equipment, which is used during project

construction activities, will be deployed to the storage area and used to dike the area ahead of the spill for containment and later recovery or disposal of the spilled material and impacted soil.

Rainwater collected in secondary containment areas may be discharged to the ground provided:

- A visual inspection of the secondary containment unit and accumulated rainwater confirms that there is no film or sheen on, or discoloration of, the surface of the water or signs of POL releases or sludge or emulsion deposited beneath the surface of the water.
- The results of the inspection are documented in the daily operating log or equivalent.
- Records of the discharge are noted in the daily operating log or equivalent. Discharge records shall consist of, at a minimum,

  — Approximate amount of discharge

  — Date and time of discharge

  — Description of discharge characteristics (i.e., free of oil/antifreeze and discoloration)

Spilled petroleum products, antifreeze, or contaminated rainwater in the secondary containment will be collected using absorbent material and/or pads, portable pumps, and/or vacuum trucks and stored in recovery drums until the appropriate management method is determined in accordance with the Regulatory Compliance Plan (Appendix F).

7.2 Bulk Storage Tanks

The bulk storage tanks and drums used for oil, antifreeze, and diesel storage are constructed from compatible materials (e.g., steel). Secondary containment is furnished for the temporary 2,000-gallon tank and the 55-gallon drums of POL addressed in this plan.

7.3 Facility Tank Car and Tank Truck Loading/Unloading

This section is not applicable to activities being carried out at the sewage lagoon site.

7.4 Security

The Base will control site access, which is limited to authorized personnel, visitors, and emergency response personnel. Any individual attempting to access the site must be approved by Base personnel at the main gate for identification and clearance before entering. Authorized personnel include project team personnel, Cannon AFB, and USACE personnel. The Foster Wheeler Environmental Site Construction Manager and Cannon AFB personnel must approve other visitors. Authorized personnel and visitors

requiring site access for more than 48 consecutive hours must meet training requirements. Delivery personnel, vendors, truck drivers, and utility company personnel will be allowed on site without training but only under the supervision of Cannon AFB or Foster Wheeler Environmental personnel. The Work Plan provides further site access and security requirements. Temporary fencing may also be used during construction to control site access.

8. PERSONNEL TRAINING AND SPILL PREVENTION PROCEDURES

Site personnel are trained to respond effectively to emergencies by familiarizing themselves with emergency procedures, equipment, and communication systems. Personnel who handle, sample, or come in contact with hazardous materials must undergo basic on-the-job training, 40-hour Occupational Safety and Health Administration training (with 8-hour refresher training, as needed), supervisor training, Department of Transportation training, waste management training, and cardiopulmonary resuscitation/first-aid training. The training will always stress pollution control and waste minimization; spill prevention control procedures are further explained during these sessions. In addition, Foster Wheeler Environmental and subcontractor personnel will review procedures for handling diesel fuel and drums containing new product. Documentation of personnel training will be maintained at the project site.

9. SPCCP AMENDMENTS

The SPCCP shall be amended when one of the following events occurs:

- The facility changes in its design, construction, operation, maintenance, or other circumstances in a way that increases the potential for a diesel or POL spill.
- The plan fails in an emergency.
- The list of site and local emergency numbers changes.
- The project duration extends more than 5 years.

10. RELATIONSHIP TO OTHER REGULATORY REQUIREMENTS

This SPCCP meets the requirements of 40 CFR Part 112. The SPCCP, in conjunction with the Work Plan and Site Safety and Health Plan, addresses the applicable regulatory requirements regarding spills/releases of chemicals for this site.

11. CERTIFICATION AND MANAGEMENT APPROVAL

The certification by a Professional Engineer and approval from management, which is outlined below, meets the requirements established by 40 CFR Part 112.

11.1 Professional Engineer Certification

I hereby certify that I have examined the Equipment and Designed Application thereof, and being familiar with the 40 CFR Part 112 requirements of the *Spill Prevention Control and Countermeasures Plan*, attest that the following plan has been carefully developed and prepared in accordance with good engineering practices, including consideration of applicable industry standards, and with the requirements of the SPCC rule.

Printed Name of Registered Professional Engineer: Robert G. Ederer

Signature of Registered Professional Engineer:

Registration Number: NMLE 12467

State: New Mexico

Date: 02/07/2003

(expires 2 years from date or upon revocation)

Seal:

ROBERT G. EDERER
NEW MEXICO
12467
02/07/03
REGISTERED PROFESSIONAL ENGINEER

11.2 Management Approval

The following plan has been prepared in accordance with Federal Environmental Protection Agency Regulations, 40 CFR Part 112, *Spill Prevention Control and Countermeasures Plan*, has full management approval, and will be implemented as described herein.

Project Manager's Printed Name: Carol L. Bieniulis

Project Manager's Signature: Carol L Bieniulis

Title: Delivery Order Manager

Date: 2/7/03

APPENDIX E

Stormwater Pollution Prevention Plan

STORMWATER POLLUTION PREVENTION PLAN
FOR
CLOSURE CONSTRUCTION
AT SEWAGE LAGOONS

Prepared for:

27 CE/CEV
Cannon Air Force Base, NM
and
HQ ACC/CEV
Langley Air Force Base, VA

Prepared by:

Foster Wheeler Environmental Corporation
6605 Uptown Boulevard, Suite 220
Albuquerque, New Mexico 87110

Under Contract No. DACW45-94-D-0003

Delivery Order No. 35, Work Authorization Directive 1

U.S. Army Corps of Engineers
Omaha District
Omaha, Nebraska

February 2003

PREFACE

"We, the undersigned, certify under penalty of law that this document and all attachments were prepared under my direction and supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based upon my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Carol Bieniulis
Foster Wheeler Environmental Corporation
Delivery Order Manager

Robert Ederer, PE
Foster Wheeler Environmental Corporation
Project Engineer

Max Pastor
U.S. Army Corps of Engineers
Contracting Officer's Representative

Lt. Col. John C. Bower
27th Civil Engineering Squadron
Commander

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ACRONYMS AND ABBREVIATIONS

AFB	Air Force Base
Area A	South Lagoon
Area B	North Lagoon
BMP	Best Management Practice
CFR	Code of Federal Regulations
CMS	Corrective Measures Study
CO	Contracts Officer
CWA	Clean Water Act
EPA	U.S. Environmental Protection Agency
Foster Wheeler Environmental	Foster Wheeler Environmental Corporation
ft	foot/feet
IRP	Installation Restoration Program
NMED	New Mexico Environmental Department
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NRC	National Response Center
POL	petroleum, oil, lubricants
RCP	Regulatory Compliance Plan
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RQ	reportable quantity
SWMU	Solid Waste Management Unit
SWMU 101	Sewage Lagoons
SWPPP	Stormwater Pollution Prevention Plan
TSS	total suspended solids
USAF	U.S. Air Force
VOCs	Volatile Organic Compounds

1. INTRODUCTION

This Stormwater Pollution Prevention Plan (SWPPP) addresses construction services for the closure of Solid Waste Management Unit (SWMU) 101, the Sewage Lagoons, at Cannon Air Force Base (AFB), New Mexico. This SWPPP describes the stormwater management and erosion control objectives and the required maintenance and inspection procedures to be used during project activities.

To improve the quality of stormwater discharges, Congress passed the Water Quality Act of 1987. This act added a provision to the Clean Water Act (CWA) directing the U.S. Environmental Protection Agency (EPA) to establish regulations for stormwater discharges under the National Pollutant Discharge Elimination System (NPDES) program. In 1990, EPA published final regulations that established permitting requirements for stormwater discharges associated with industrial activities. The regulations are provided in Title 40 of the Code of Federal Regulations (CFR) 122.26.

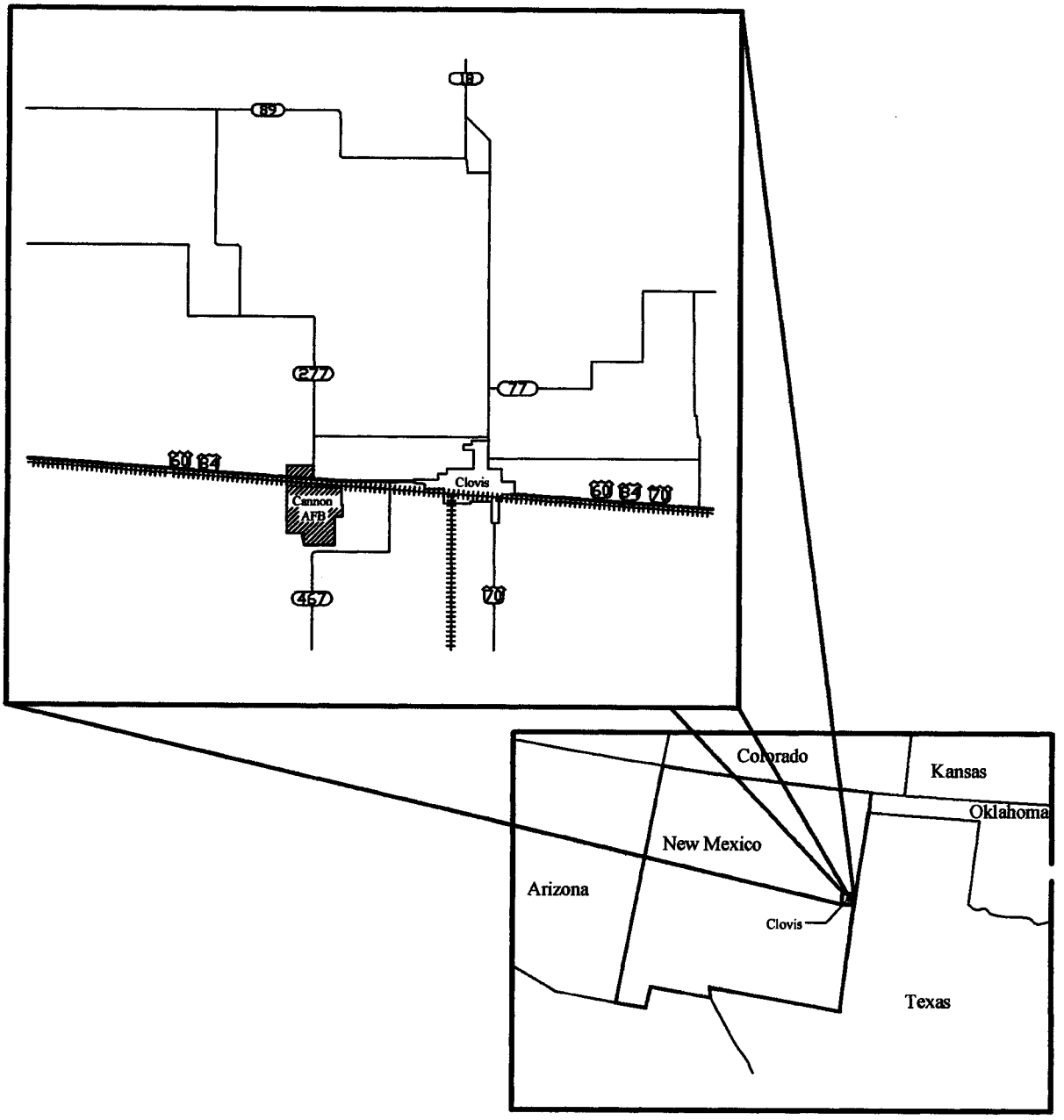
1.1 Site Location and Description

Detailed descriptions of the site are provided in Section 2 of the Work Plan. Figure E-1 depicts the location of Cannon AFB, New Mexico and Figure E-2 shows the location of SWMU 101 (Sewage Lagoons) and offsite drainage.

1.1.1 Sewage Lagoon Description/Background

The Sewage Lagoons were identified as SWMU 101 in the Cannon AFB Hazardous Waste Permit dated November 14, 1989. The out-of-service sewage lagoons consist of two unlined surface impoundments that were used from 1966 to 1998 for treatment of base sanitary and industrial waste (Figure E-2). The lagoons have a combined surface area of approximately 39 acres and were constructed with unlined earthen bottoms and concrete-lined banks. When the new wastewater treatment plant began operation in 1998, wastewater was no longer discharged to the lagoons.

In 1992, SWMU 101 was investigated during the Resource Conservation and Recover Act (RCRA) Facility Investigation (RFI). The RFI indicated that the sludge depth was approximately 2 feet (ft) and the average water depth ranged from 3.5 to 4.5 ft (Woodward-Clyde, 1992; E&E, 1998). As of May 2000, Foster Wheeler Environmental Corporation (Foster Wheeler Environmental) personnel noted that there was no free-standing water in the lagoons. At the time of the RFI, SWMU 101 was not included in the Cannon AFB RCRA Part B Permit. The regulatory requirement for this unit was resolved by Cannon AFB, the EPA, and the New Mexico Environmental Department (NMED). As a result of the RFI, the



Not Drawn to Scale

FOSTER WHEELER ENVIRONMENTAL CORPORATION

N

Closure of
SWMU 101 – Sewage Lagoon
Cannon Air Force Base, New Mexico
U.S. Army Corps of Engineers, Omaha District

Base Location Map

Date: 01/30/03	Figure E-1
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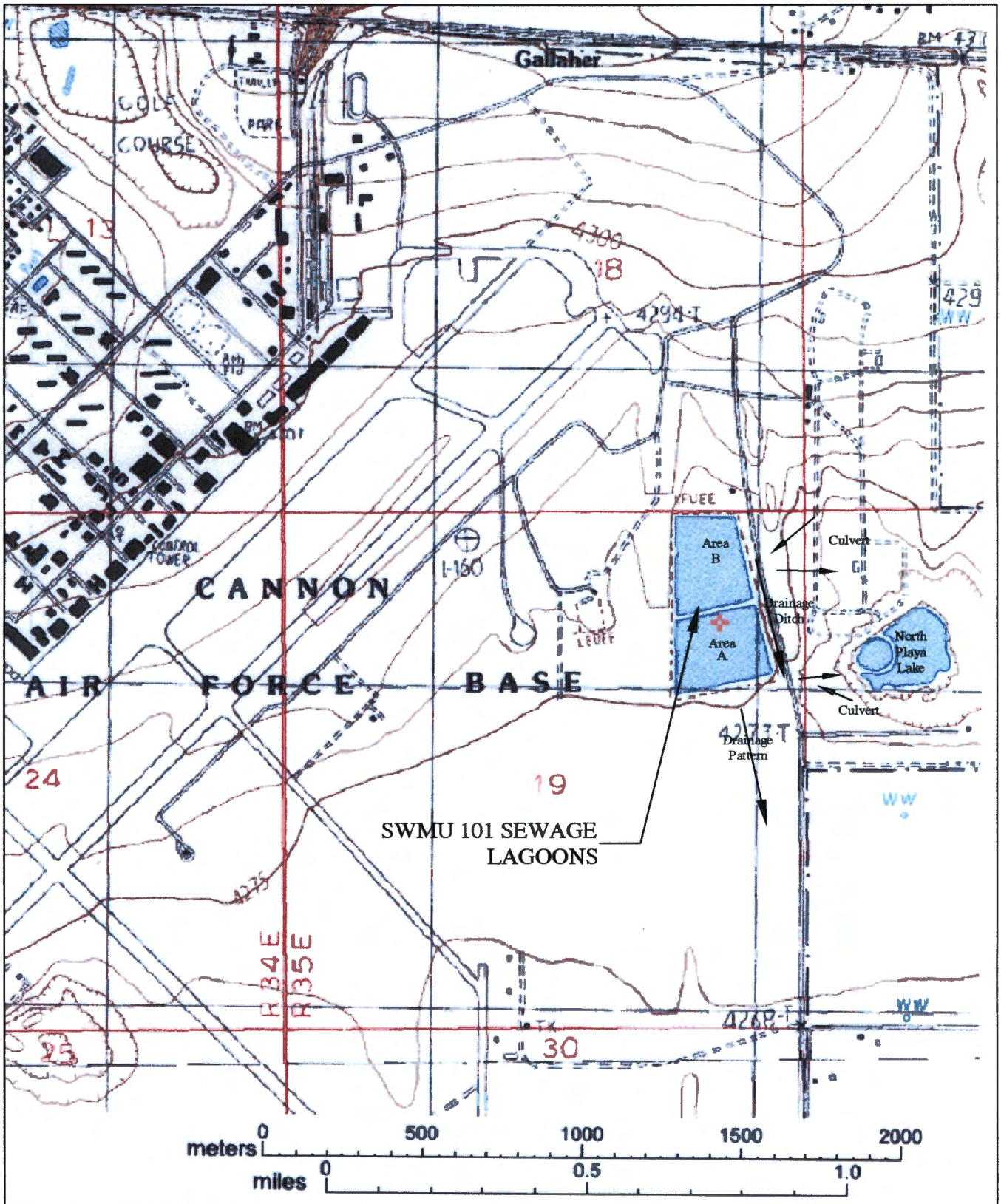

FOSTER WHEELER ENVIRONMENTAL CORPORATION

N

Closure of
SWMU 101 – Sewage Lagoons
Cannon Air Force Base, New Mexico
U.S. Army Corps of Engineers, Omaha District

Location Map and
Off-Site Drainage

Date: 01/16/03

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Figure E-2

only recommendation for the Sewage Lagoons was to continue annual groundwater monitoring for volatile organic compounds (VOCs), metals, pesticides, nitrate, sulfate, and total dissolved solids. According to the RFI report, a recommendation was made for an interim monitoring program to support site closure until the regulatory framework was resolved. Groundwater monitoring is conducted annually at the Sewage Lagoons to comply with RCRA requirements.

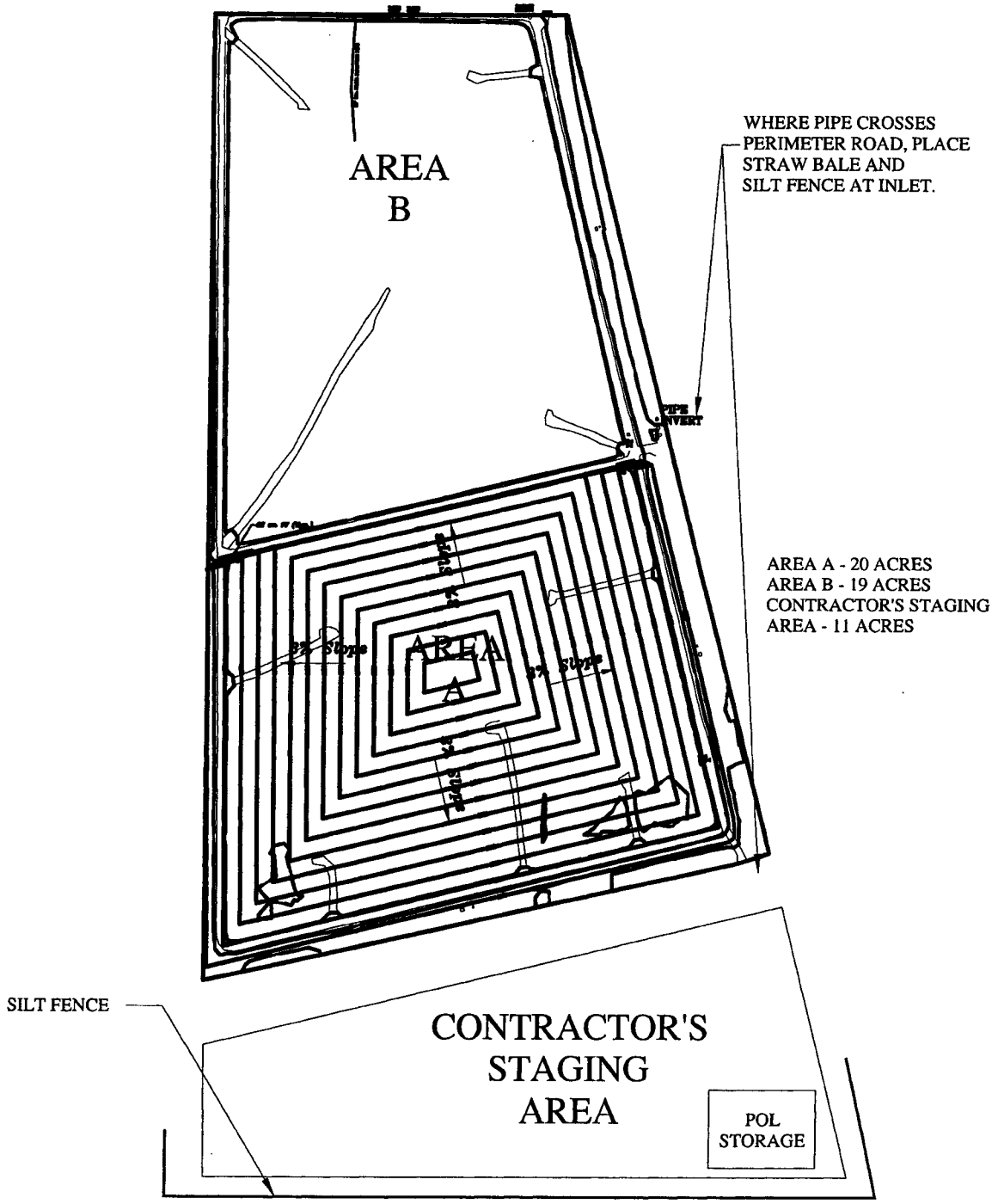
A Corrective Measures Study (CMS) for SWMU 101 (USMF, 2001) identified and evaluated potential corrective action alternatives. Human health and ecological risk assessments were conducted as part of the CMS. An ecological survey of the area was also conducted to support the risk assessment. All noncancer and cancer risks from contaminants in soil and sludge were below the target limits. Only arsenic exceeded the target risk in sludge and soil in the north and south lagoons.

Risk to potential ecological receptors exists even at background concentrations. A potential exposure for burrowing animals would still exist in the south lagoon. To prevent exposure to ecological receptors, sludge removal, in-place consolidation, and closure with an engineered cover has been designed for closing SWMU 101.

1.2 Project Description

The following major construction activities will be performed at the site:

- Clearing and grading for set-up of temporary facilities (field office, sanitation, fueling, and equipment lay down)
- Utility clearance
- Temporary erosion and sediment control using BMPs (Figure E-3)
- Demolish concrete and piping identified on the Drawings (Appendix A) and consolidate in south lagoon (Area A)
- Excavate sludge and contaminated soil from north lagoon (Area B) and place in Area A according to the Specifications (Appendix A)
- Construct cover system over Area A as shown in the Specifications and on the Drawings (Appendix A)



NOT TO SCALE

FOSTER WHEELER
ENVIRONMENTAL CORPORATION

N

Closure of
SWMU 101 – Sewage Lagoons
Cannon Air Force Base, New Mexico
U.S. Army Corps of Engineers, Omaha District

Location of
Anticipated BMPs

Date: 01/30/03

File Name: Fig E-3_Final.dwg

Figure E-3

- Seed and mulch the entire cover system, construction staging, and equipment lay-down areas according to the specifications (Appendix A)
- Required inspections and testing
- A detailed description of these construction activities is provided in Section 3.3 of the Work Plan.

1.3 Purpose

The goal of this plan is to minimize the potential impacts to surface water quality that may result from construction activities at the Sewage Lagoons during the construction activities. The SWPPP has been prepared in accordance with appropriate regulations and will incorporate Best Management Practices (BMPs) as presented in Attachment 1.

1.3.1 Regulatory Framework

In 1972, the CWA was passed to prohibit the discharge of any pollutants to U.S. waters from a point source unless an NPDES permit authorizes that discharge. The initial thrust to improve water quality under the NPDES program focused on reduction of pollutants in discharges of industrial process wastewater and municipal sewage. Since then, it became evident that diffuse or nonpoint sources of water pollution are major contributors to water quality degradation.

To improve the quality of stormwater discharges, Congress passed the Water Quality Act of 1987 that added a provision to the CWA directing the EPA to establish regulations for stormwater discharges under the NPDES program. In 1990, EPA published final regulations that established permitting requirements for stormwater discharges associated with industrial activities. The regulations are provided in Title 40 of CFR 122.26. In 1998, EPA published Reissuance of NPDES General Permits for Stormwater Discharges from Activities in Region 6 (Attachment 2). The completed Notice of Intent (NOI) for Stormwater Discharges Associated with Construction Activity under a NPDES General Permit is provided as Attachment 3. Foster Wheeler Environmental will submit a completed Notice of Termination when construction activities are complete. Attachment 4 includes a table for construction schedule documentation.

1.3.2 Stormwater Pollution Prevention Plan Overview

This SWPPP identifies sources of site pollution and describes the measures to prevent or control discharges of potential stormwater pollutants in site stormwater runoff. The SWPPP also outlines site-

specific BMPs that will be used to minimize the quantity of pollutants entering surface water. The provisions contained in this SWPPP shall be implemented as part of the conditions for the project-specific stormwater discharge permit.

A copy of the SWPPP will be kept with Foster Wheeler Environmental personnel at the project site. The plan will be available upon request to authorized regulatory agency personnel and updated as necessary, based on project activities. A copy of the NOI and project description will be posted in the Foster Wheeler Environmental field office.

1.4 Pollution Prevention Team

Specific members of the project team have responsibilities regarding stormwater management. These individuals are key onsite personnel who are familiar with the site and the construction activities relating to the project.

The project team includes personnel from management, safety, and construction. The team is responsible for the following activities:

- Implementing all SWPPP requirements
- Being aware of changes made during construction activities and determining if any subsequent changes must be made to the SWPPP
- Overseeing routine materials inventory and recommending ways to minimize or eliminate hazardous materials
- Implementing and overseeing employee training and the inspection program
- Identifying potential pollutant sources and making recommendations to alleviate areas of potential stormwater concern
- Coordinating the implementation of BMPs, reviewing the effectiveness of the SWPPP, and updating the plan as necessary

Table E-1 identifies the project personnel who have been assigned to the team, along with their telephone numbers and responsibilities.

Table E-1. Project Points of Contact

Name	Title	Telephone	Responsibilities
Rob Ederer	Task Manager	(505) 878-8925	Supervise implementation of the SWPPP, inspections, and housekeeping
Shannon Inglee	Field Engineer	(505) 301-6134	Oversee implementation of the SWPPP, record-keeping, housekeeping, and training; maintain current SWPPP
James Morning	Health & Safety Officer/Construction Quality Control Manager	(505)301-4716 (mobile)	Oversee spill prevention, preventative maintenance, and material inventory
TBD	Subcontractor	TBD	Perform housekeeping and maintenance

SWPPP Stormwater Pollution Prevention Plan

2. POLLUTANT SOURCE ASSESSMENT

The SWPPP provides descriptions of potential sources that may be reasonably expected to add significant amounts of pollutants to stormwater discharges or that may result in discharges of pollutants. Figure E-3, the site plan map for the Sewage Lagoons, identifies pollutant sources and helps in determining stormwater management opportunities. The map and the assessment of pollutant sources facilitates the use of a risk-based approach by targeting the most important pollution sources that may require preventive and/or corrective action.

2.1 Site Assessment

Information about the environmental setting, including physical setting (physiography/topography and cultural geography), geologic setting (surface soil and geology), and hydrology (surface water and groundwater) for the sewage lagoons is summarized in the RFI report (Woodward Clyde, 1992).

The sewage lagoons have undulating terrain with ground surfaces composed of primarily silty-sand and sandy-silt soil cover. Areas of heavy vegetation are interspersed throughout the perimeter of the site, with most of the site being relatively flat and clear of heavy vegetation. The non-lagoon portions of the site are primarily covered in native grasses.

2.2 Endangered Species and Historic Preservation Information

The U.S. Air Force (USAF) has determined that Installation Restoration Program (IRP) remedial actions are exempt from environmental assessments and other National Environmental Policy Act requirements because of public participation inherent to the IRP. Cultural and natural resource requirements, however, are still applicable.

The Biological Survey of Cannon Air Force Base, New Mexico, with Emphasis on Potential Occurrence of Endangered, Threatened, Candidate, and Sensitive Species (USAF, 1996) identified six federally listed endangered, threatened, and candidate species; one state endangered species; and one state rare and sensitive species that potentially occur on Cannon AFB. The survey concluded that the American peregrine falcon (*Falco peregrinus anatum*), Arctic peregrine falcon (*Falco peregrinus tundrius*), bald eagle (*Haliaeetus leucocephalus*), whooping crane (*Grus americana*), and Baird's sparrow (*Ammodramus bairdii*) have a low potential of occurrence, while the mountain plover (*Charadrius montanus*) and swift fox (*Vulpes velox*) have a moderate potential of occurrence. The tall plains spurge (*Euphorbia strictior*) is not expected to occur due to the historic use of the area for agriculture.

There are no known cultural resources located within the sewage lagoon boundaries.

2.3 Materials Inventory

Table E-2 presents an inventory of anticipated significant materials used or stored on site that have a potential for contributing pollutants to stormwater runoff. The table also includes information relating to storage locations, quantities, likelihood of contact with stormwater, and a description of material management practices for each material listed.

Table E-2. Inventory of Significant Materials Used or Stored On Site

Material	Purpose	Location	Quantity Stored	Likelihood of Contact with Stormwater	Material Management Practice
Motor oil	Engine lubrication	Construction staging area	55-gallon drums	Low, during unloading only	Stored outside, in lined/bermed area
Diesel fuel	Fuel for earth-moving equipment	Construction staging area	One 2,000-gallon tank	Low, during unloading only	Stored outside, in lined/bermed area
Hydraulic fluid	Earth-moving equipment lubrication	Construction staging area	55-gallon drums	Low, during unloading only	Stored outside, in lined/bermed area
Transmission fluid	Transmission lubrication	Construction staging area	55-gallon drums	Low, during unloading only	Stored outside, in lined/bermed area
Antifreeze	Engine coolant	Construction staging area	55-gallon drums	Low, during unloading only	Stored outside, in lined/bermed area
Used oil	Recycling	Construction staging area	55-gallon drums	Low, during unloading only	Stored outside, in lined/bermed area
Trash/solid waste	Waste for disposal	Construction staging area	20-yard roll-off	Low	Stored outside, with cover
Used oil filters	Recycling	Construction staging area	55-gallon drums	Low	Stored outside, in lined/bermed area

The above-listed materials are all to be recycled to the maximum extent possible.

This table will be updated whenever new materials are used or stored or when quantities of existing materials are changed by more than 20 percent or they are no longer used at the site. The location of these potential pollution sources is indicated on Figure E-3.

Most of the exposed materials will be located within lined, bermed areas located near the staging area. Hazardous waste is not expected to be generated during construction activities. Nonhazardous waste generated during project activities may include:

- Used oil
- Used antifreeze
- Used hydraulic fluid
- Used transmission fluid
- Spent oil filters
- Trash

Methods and locations for the onsite storage and materials management practices used to minimize contact of these materials with stormwater are presented in the following subsections.

2.3.1 Material Storage Areas

There will be a single storage area for all of the petroleum, oil, and lubricants (POL) to be used on site. The POL storage area and the diesel fuel storage tank will be located within the staging area. Both areas will be constructed with a liner and a secondary containment berm.

2.3.2 Loading and Unloading Areas

The greatest risk associated with the material management is during the loading and unloading of materials to and from storage areas. Bulk POL are to be unloaded from the delivery trucks by hydraulic lift and transferred to the storage area. The loading/unloading areas are uncontained. Once the materials are stored in the POL storage area, they are contained in a lined, bermed containment unit. Diesel fuel transfer operations will involve pumping of diesel fuel from tanker trucks directly into the 2,000-gallon diesel fuel tank. Equipment will be fueled directly from the 2,000-gallon diesel fuel tank.

2.3.3 Construction Areas

Construction activities will involve the removal of steel and Poly-Vinyl Chloride piping, concrete slabs, and concrete berms, excavation and consolidation of sewage sludge, construction of a cover system, biota barrier, and vegetative cover, and site restoration and revegetation.

2.3.4 Vehicle Maintenance Area

Vehicles and heavy equipment undergoing routine maintenance will be serviced in a designated area. Where practical, BMPs, e.g., catch pans and other spill prevention measures, will be employed to minimize the chances of a release of POL during vehicle servicing.

2.4 Existing Stormwater Runoff Quality

No existing stormwater runoff quality sampling has been performed at this site.

2.5 Assessment Summary

The potential project pollutant risks are identified in Table E-3. The risks associated with these areas range from low probability to a moderate possibility of a release/spill to secondary containment or to the environment (if no secondary containment present).

Table E-3. Potential Pollutant Sources at Sewage Lagoons

Source of Pollutant	Pollutant of Concern
New/used POL drums/oil filters	New/waste oil, grease, ethylene glycol, and other POL
Diesel fuel (storage and loading/unloading)	Naphthalene
Loading/unloading	TSS, new/waste oil, grease, ethylene glycol, and other POL
Earthwork	TSS
Concrete stockpiling	TSS
Stormwater runon	TSS

POL petroleum, oil, and lubricants
TSS total suspended solids

Nonstormwater-related pollutant sources are discussed in further detail in the following subsections.

2.5.1 Diesel Fuel

Diesel fuel will be delivered to, stored in, and dispensed from a 2,000-gallon storage tank located in the construction staging area. This tank is elevated above grade and does not pose a risk for release unless the tank ruptures or a spill occurs during filling or dispensing. Spills of this nature are discussed in the Spill Prevention Control and Countermeasures Plan (Appendix D). The low velocity sheet flow movement of stormwater around the secondary containment areas does not pose a risk for fuel release and resulting stormwater pollution.

2.5.2 Petroleum, Oil, and Lubricants

All POLs in the form of equipment oils, hydraulic fluids, transmission fluid, antifreeze, and greases will be stored in small quantities in the materials storage area. These materials will be stored in containers on pallets in a designated area underlain with a liner and surrounded by a containment berm. The management of POL in accordance with this SWPPP will not pose a risk of stormwater pollution.

3. BEST MANAGEMENT PRACTICES

Operational and maintenance BMPs (nonstructural) are the procedures, inspections, plans, and activities that prevent or reduce the contact of potential pollutants with stormwater. Structural BMPs are the physical systems and protection measures that are constructed as part of the stormwater management and pollution protection system. A complete listing of applicable BMPs is provided as Attachment 1 to this appendix.

3.1 Nonstructural Best Management Practices

The following subsections describe nonstructural BMPs that will be used for stormwater management controls. Table E-4 provides a summary of the BMPs.

3.1.1 Good Housekeeping

Good housekeeping practices will help maintain a clean and orderly work environment and will minimize accidental spills that can be caused by the mishandling of chemicals or work equipment and should reduce safety hazards to employees.

The following housekeeping measures are or will be implemented in an effort to prevent pollutants from entering stormwater discharges:

- Operation and Maintenance Practices—Proper operation and maintenance practices ensure equipment is working well and reduce the potential for spills and releases to enter the environment.

- Material Storage Practices—The aboveground diesel fuel storage tank will be located within a secondary containment area large enough to hold, at a minimum, 110 percent of the volume of the tank (2,200-gallon).

Table E-4. Summary of Nonstructural Best Management Practices

BMP	Brief Description of Activities
Good Housekeeping	Catch pans will be used under vehicles to collect leaking fluids during fuel loading/unloading and equipment maintenance.
	Garbage and waste materials will be regularly picked up and properly disposed.
	Adequate aisle space will be provided to facilitate material transfer and easy access for inspections.
	Containers will be stored on pallets to prevent corrosion.
	POL will be manually transferred between containers via funnel.
	Used POL will be stored in covered drums on pallets.
	Material safety data sheets will be maintained at the U.S Army Corps of Engineers field office.
	Containers of hazardous materials will be labeled with the name of the material, expiration date, and health hazards, and the containers will be compatible with the material being stored in them.
	Containers will be kept closed except when being filled/unfilled.
	Used fluids will be promptly transferred to the proper container; full drip pans or other open containers will not be left uncovered. Drip pans and containers will be emptied and cleaned.
Preventative Maintenance	Equipment and areas that have the potential for failures or spills will be identified.
	Regularly scheduled maintenance and repair of equipment will be performed.
	Equipment will be operated according to the manufacturer's recommendations.
Visual Inspections	Containers, the POL container storage area, and diesel storage tank will be inspected weekly, maintained, and replaced if leaking.
	Regular housekeeping inspections will be conducted.
	Stormwater control structures will be inspected after each major storm event and at a minimum, biweekly.
	Monthly inspections of spill response and fire prevention equipment will be performed.
	Vehicles found to be leaking fluids will be immediately repaired.
	Vehicle maintenance and loading/unloading areas will be inspected for proper implementation of control measures.
Spill Prevention and Response	Hazardous material storage areas will have secondary containment.
	Proper material transfer procedures will be used to reduce spills.
	Emergency spill response equipment will be maintained at the site.
Employee Training	Employees will be trained on the components and goals of the SWPPP, spill prevention and response, good housekeeping procedures, material handling, and inspections.
Sediment and Erosion Control	Native vegetation will be disturbed to the least extent possible during project activities.
	Temporary drainage and/or diversion channels will be used during construction.
	Where appropriate, disturbed areas will be revegetated as soon as feasible after construction.
Record-Keeping and Reporting	Spills and releases will be documented using the Health and Safety Incident Report.
	A separate record-keeping system will be implemented to document housekeeping and preventative maintenance inspections.
	Project records will be maintained in the U.S. Army Corps of Engineers field office and become part of the project files.
Construction Sequencing	Construction will be sequenced to minimize amount and duration of soil exposure to wind, rain, runoff, and vehicle tracking, which can lead to erosion.

BMP Best Management Practice
POL Petroleum, oil, and lubricants
SWPPP Stormwater Pollution Prevention Plan

- Material Inventory Procedures—Frequent personnel training in good housekeeping techniques minimizes the potential for materials being mishandled. Motivating employees to reduce spillage and minimize waste is an effective pollution prevention technique.

Employee Participation
Site personnel will be involved in good housekeeping practices to:

- Discuss good housekeeping measures at daily tailgate safety meetings
- Distribute information on good housekeeping practices during employee training sessions

Employees will be informed of activities that could lead to contamination of stormwater and the importance of carefully conducting these activities in areas that do not discharge into storm drainage areas.

3.1.2 Preventive Maintenance

Earthworking equipment and site vehicles will be maintained in good working condition. Preventive maintenance involves routine inspections and testing of equipment. Equipment will be maintained and inspected on a regular basis and according to the manufacturer's recommended practices.

3.1.3 Visual Inspections

Designated site personnel will conduct inspections. These employees will report to the pollution prevention team member responsible for inspections (Field Engineer). Table E-5 is a summary schedule of the various inspections that must be performed at the site. The biweekly inspections and inspections following storm events of disturbed areas of the site, stormwater control structures, areas used for storage of materials, and vehicle site entry and exit points, and inspections of spill response equipment are the "official" inspections required under the storm water permit. These inspections require a report and a certification indicating whether any non-compliance issues were noted, which require a modification of the SWPPP, or whether the inspection indicates the facility is found to be operating in accordance with the SWPPP. The record-keeping and reporting program for these inspections is discussed in Section 3.1.6. In addition to the "official" inspections conducted pursuant to the permit and the other inspections to be conducted pursuant to Table E-5, as part of the BMPs for the facility, informal inspections of structural BMPs, equipment, POL and hazardous materials storage areas, and general housekeeping will also be routinely conducted.

Table E-5. Inspection Schedule

Inspection	Minimum Frequency
Inspect disturbed areas of the site, stormwater control structures, areas used for storage of materials, and vehicle site entry and exit points.	Biweekly (and after applicable storm events)
Inspect spill response equipment	Monthly
Inspect fire prevention equipment	Monthly
Task Manager and Environmental Safety Supervisor conduct site inspection	Monthly

The documentation of the inspections and maintenance of these records is described below.

3.1.4 Spill Prevention and Response

Suspended solids are a contributor to stormwater pollution in stormwater runoff from spills and leaks. Because of facility drainage, exposed materials, and site activities, spills are most likely to occur at the loading/unloading areas and the diesel storage tank area. Spills can occur from overfilling the diesel tank or containers, hose/nozzle malfunctions, equipment damage, or human error.

The best way to manage a spill is to prevent it from happening. The following management procedures will be used to prevent a spill:

- Personnel will be trained in proper materials management.
- Tank/container filling and material transfer practices will be used to reduce probability of spills.
- Regular visual inspections will be conducted to identify tank/container problems and other potential spill indicators.

If a spill does occur during construction activities and spill prevention measures fail, site personnel will respond to prevent stormwater contamination by implementing the following procedures:

- Approach the spill from upwind to an area where the spill material can be identified.
- Shut down vehicles in the immediate area.
- Determine the source, type, and quantity of material spilled.
- Identify and assess the hazard, isolate and evacuate the area of impact based on an assessment of quantity of material spilled and the resulting threat to life.

Follow spill-reporting notification as indicated in the Work Plan's Regulatory Compliance Plan (RCP) (Appendix F) as follows:

- For large spills (more than 110 gallons):
  - Evacuate the area within 150 ft.
  - Follow spill reporting notification as indicated in the RCP (Appendix F).
  - Attempt to contain spilled material and prevent discharge outside of secondary containment. If not in a contained area, use available equipment to form a berm around the spill area.
  - For the cleanup of large spills, notify the Cannon AFB Fire Department.
- For small spills (less than 110 gallons):
  - Move personnel out of the spill area.
  - Attempt to contain spilled material.
  - Retain contaminated material in covered drums that are appropriately labeled and placed in a designated waste storage area.
  - Notify Cannon AFB.
- At a minimum, the following emergency spill equipment shall be maintained at the site:
  - Absorbent material
  - Large drip pans
  - A spark-resistant shovel
  - A 55-gallon drum with bolt-on lid
  - Barricade tape
  - Personal protective equipment, to include Tyvek® suits, booties, gloves, and safety goggles
  - Warning tape or signs

— Fire extinguisher

For Hazardous material spills, the following notifications shall occur:

Foster Wheeler personnel will immediately notify the Contracting Officer (CO) and Mr. John Rebman, 27th Civil Engineer Squadron Environmental Flight (505-784-1099) when a release containing a hazardous substance in an amount equal to or in excess of a reportable quantity (RQ) established under either 40 CFR 117 or 40 CFR 302, occurs during a 24-hour period. Foster Wheeler Environmental personnel will assist Mr. Rebman in obtaining all information deemed necessary to notify the National Response Center (NRC) and the EPA. In general, notification will be made by the 27th CE Environmental Flight, however, should an RQ release occur on a weekend or holiday, Foster Wheeler Environmental will notify the NRC. The CO and the Environmental Flight will be notified the next duty day after notification. The NRC may be contacted at 800-424-8802. The SWPPP will be modified within 14 calendar days of knowledge of the release to provide a description of the release, the circumstances leading to the release, and the date of the release. In addition, the plan will be reviewed to identify measures to prevent the reoccurrence of such releases and to respond to such releases, and the plan shall be modified where appropriate. Should an RQ spill occur over the weekend or on a holiday, Foster Wheeler will notify the NRC within 24 hours of being aware of the release. Mr. Rebman will be notified of the spill the next duty day, including all details of the spill and what information was passed to the NRC.

3.1.5 Employee Training

An employee-training program will be implemented at the site to inform employees of the goals and components of the SWPPP. The training program will consist of:

- The Work Plan and associated plans contained within its appendices (i.e., the SWPPP and the Spill Prevention Control and Countermeasures Plan) (Appendix D)
- Daily tailgate meetings covering stormwater pollution prevention techniques
- An onsite spill reporting coordinator who will be trained on the proper reporting requirements according to the RCP (Appendix F)

3.1.6 Record-Keeping and Reporting

Record-keeping represents a good operating practice because it can increase the efficiency of site operations and the effectiveness of BMPs. A record-keeping system will help site personnel minimize

incident recurrence, correctly respond with the correct cleanup response, and comply with regulatory requirements.

Spills and releases will be documented using the Foster Wheeler Environmental Health and Safety Incident Report, which is contained in the Site Safety and Health Plan, (Appendix B). The incident report will describe the quality and quantity of non-stormwater discharges.

A separate record-keeping system has been established to document housekeeping and preventative maintenance inspections from the "official" inspections required by the permit. These inspections will be documented on the forms noted in Figures E-4 and E-5. Figure E-4 will be used to assess the housekeeping and preventative maintenance inspections. Figure E-5 will be used for "official" inspections of the in-place SWPPP components.

3.1.7 Sediment and Erosion Control (Applicable BMPs—ESC2, 21, 30, 31, and 52—Attachment 1)

Approximately 50 acres will be disturbed during construction (39 acres in the sewage lagoons and 11 acres for the construction staging area). The preconstruction runoff coefficient is estimated to be 0.3 for the site. Existing site vegetation will be preserved until construction commences, and the existing vegetation will be preserved where feasible. Post-construction runoff coefficient is estimated to be 0.4 while the vegetation reestablishes.

During construction activities, cover material will be stockpiled in a generally uncompacted condition prior to placement and will be subject to erosion. BMPs will include diversion of drainage from the stockpile areas and from stabilized areas around disturbed areas; the use of temporary berms around the stockpiles, drains, and/or swales to divert site runoff around the construction site; and erosion and dust control measures.

3.1.8 Construction Sequencing (Applicable BMP—ESC1—Attachment 1)

Construction sequencing, which is a BMP in itself, consists of phased construction activities as outlined in the Work Plan. Construction will be sequenced to minimize the amount and duration of soil exposed to erosion by wind, rain, runoff, and vehicle tracking.

Figure E-4. Erosion, Sediment, and Pollution Control Checklist

Inspector _____ Date _____

Area Inspected _____ Approximate Area _____

CONTAINED MATERIAL STATUS

Check that all material containers are intact and are not leaking and all containment elements are in place and in good condition.

❒ Diesel Fuel
❒ Lubricants
❒ Other _____

STABILIZATION PRACTICES

Stabilization practices will be initiated on all disturbed areas where construction activity will be permanently or temporarily ceased for a period of more than 14 calendar days. Stabilization measures to be used include:

❒ Silt Fencing
❒ Straw Bales
❒ Temporary Seeding
❒ Permanent Seeding
❒ Mulching
❒ Geotextiles
❒ Other _____

STRUCTURAL PRACTICES

Flows from upstream areas will be diverted from exposed soils. Measures to be used include:

❒ Earth Dike
❒ Drainage Swale
❒ Training Dike
❒ Other _____

DRAINAGE LOCATIONS SERVING LESS THAN 10 DISTURBED ACRES

❒ Sediment controls are needed and will include the following:
- ❒ Sediment basin
- ❒ Hay bales in anticipated drainage paths
- ❒ Silt fence along all sideslope and downslope boundaries

DRAINAGE LOCATIONS SERVING 10 OR MORE DISTURBED ACRES

❒ A sediment basin will be installed
❒ A sediment basin cannot be constructed; the following sediment controls will be installed:
- ❒ Hay bales in anticipated drainage paths
- ❒ Silt fence along all sideslope and downslope boundaries

SEDIMENT BASIN RUNOFF STORAGE CALCULATION

_____	Acres area draining to the sediment basin
×	
3600	Cubic feet of storage/acre
=	
_____	Cubic feet of storage required for the basin

Observed Conditions:

_____

Changes required to the SWPPP:

_____

Figure E-5. Stormwater Pollution Prevention Plan Inspector Report

Sewage Lagoons
Cannon Air Force Base, Curry County, New Mexico

Inspector Name & Title:_____ Date:_____
Days since last rainfall:_____ Amount of rainfall:_____

Erosion Control Measures

1. Stabilized construction entrances:	Yes	No
• Does sediment get tracked onto aprons and road?		
• Is the gravel clean or filled with sediment?		
• Does all traffic use the construction entrances?		
Problems observed with the construction entrances:		
2. Silt fences (on soil):	Yes	No
• Is the bottom of the silt fence fabric buried?		
• Is the silt fence fabric in good condition?		
• Are the stakes intact?		
• How deep is the sediment at the silt fence?		
Problems observed with the silt fences:		
Maintenance required for the silt fences:		
Maintenance to be performed by (Subcontractor name and date):		
3. Inlet protection barriers (on soil):	Yes	No
• Are straw bales intact?		
• Is the bottom of the straw bales buried?		
How deep is the sediment at the barriers?		
Problems observed with the barriers:		
Maintenance required for the barriers:		
Maintenance to be performed by (Subcontractor name and date):		

Figure E-5. Stormwater Pollution Prevention Plan Inspector Report (Concluded)

Sewage Lagoons
Cannon Air Force Base, Curry County, New Mexico

4. Inlet protection barriers or silt fences (on pavement):	Yes	No
• Are straw bales intact?		
• Are sandbags located adjacent to the bales?		
• Are sandbags pushed together, maximizing contact area at sandbag ends?		
How deep is the sediment at the barriers/fences?		
Maintenance required for the barriers:		
Maintenance to be performed by (Subcontractor name and date):		
5. Changes required to the Storm Water Pollution Prevention Plan (provide reason for each required change), if any:		
6. Incidents of non-compliance noted from the inspection, if any:		

Inspector's Name

Inspector's Signature

Date

Certification that the facility is in compliance with the Stormwater Pollution Prevention Plan and the EPA Region 6, NPDES General Storm Water Permit for Discharges from Construction Activities:

"I certify under penalty of law that this document and all attachments were prepared under my direction and supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based upon my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Authorized Representative

3.2 Structural Best Management Practices

Based on the evaluation of potential pollution sources, structural BMPs will be necessary for the following areas:

- POL storage area
- Diesel tank storage area
- Loading/unloading area
- Vehicle maintenance area
- Construction areas and temporary soil stockpiling areas
- Dust and particulates

The BMPs for each of these areas are described in the following sections.

3.2.1 POL Storage Area (Applicable BMP—CA32—Attachment 1)

POL materials necessary for vehicle and equipment maintenance and use will be stored on site within a lined and bermed area (minimum 110 percent storage volume capacity), to prevent any uncontrolled discharges or spills. All POL will be securely stored in sealed containers at the POL storage area to prevent uncontrolled discharges of spilled materials. If a spill occurs during onsite material transfer activities, the individual noting the spill will be responsible for contacting the Site Health and Safety Officer, who is responsible for managing the cleanup and making the necessary notifications.

3.2.2 Diesel Storage Tank Area (Applicable BMP—CA31—Attachment 1)

During project construction activities, diesel fuel will be stored on site in a 2,000-gallon aboveground storage tank, adjacent to the crusher at the southern end of the landfill. The tank will be contained within secondary containment to prevent any uncontrolled discharges or spills. To comply with the Spill Prevention Control and Countermeasures Plan (Appendix D), accumulated stormwater will be pumped from the bermed area after storms after visual inspection verifies that a sheen is not present on the accumulated water. If a spill occurs during onsite fueling or fuel transfer activities, the individual noting the spill will be responsible for contacting the Site Health and Safety Officer, who is responsible for managing the cleanup and making the necessary notifications.

3.2.3 Vehicle Maintenance Area (Applicable BMP—CA32—Attachment 1)

All heavy equipment and site vehicles are inspected at the beginning and end of each day for oil and lubricant leaks. Leaking equipment will be repaired or removed from service. Excessive greasing of components will be avoided and accumulated grease will be wiped off and the contaminated rags properly disposed of off site. To prevent uncontrolled discharges of spilled materials, POL will be securely stored in containers at the POL storage area. Site vehicle maintenance will be performed in designated, controlled areas at the southern end of the Sewage Lagoons. Used oil and empty oil filters generated from vehicle and equipment maintenance activities will be collected by the equipment maintenance subcontractor, who, in turn, will be responsible for transporting to an approved offsite recycling facility.

3.2.4 Construction Areas (Applicable BMPs—ESC2, 10, 24, 41, and 50—Attachment 1)

In addition to the measures outlined in previous sections, the following measures will be applied to construction activities at the site:

- Silt fencing and straw bales will be used as a sediment trapping and/or a filtering device for the storm culverts which convey water to North Playa Lake. These structures BMPs will be left in place following construction activities until such time as vegetation has been adequately reestablished. During construction, the general contractor will have responsibility for maintaining these structures, but after the contractor files the Notice of Termination following completion of the construction activities, Cannon AFB will takeover the inspection and maintenance of these BMPs until vegetation has been sufficiently reestablished.

- Existing vegetation will be preserved to help minimize surface disturbance and serve as erosion controls. Disturbed areas will be reseeded to provide long-term stabilization of the site.

- The construction site entrance will be stabilized to provide a significant reduction in the amount of sediment (dust and mud) tracked off site.

3.2.5 Loading/Unloading Area (Applicable BMP—CA10—Attachment 1)

In addition to the BMPs, precautions will be taken to prevent spills or releases during diesel and POL loading and unloading operations. Spill control equipment will be available in the immediate vicinity.

3.2.6 Dust and Particulates (Applicable BMP—ESC21—Attachment 1)

Dust control measures will be used to stabilize soil from wind erosion and reduce dust generated from the following construction activities:

- Clearing and grading
- Construction vehicle traffic on site
- Sediment tracking onto paved roads
- Maintaining areas of unstabilized soil stockpiles

Dust control measures, water from vehicle washing, and water from irrigation activities will be the only nonrainfall discharges associated with this project. A water truck will be used for dust control and provide water for compaction of soil fill. Only the amount of water needed to suppress dust will be applied and no runoff from dust suppression activities is anticipated. In addition to wet suppression (watering), preventive dust-control measures include minimizing surface areas to be disturbed and limiting onsite vehicular traffic to 15 miles per hour.

4. WASTE MANAGEMENT

Residuals and waste may potentially be generated during the construction activities. Waste management involves the following four steps:

- Characterization
- Handling and storage
- Transportation
- Disposal

Procedures for waste management are contained in the RCP (Appendix F).

5. SWPPP REVISIONS AND MODIFICATIONS

This SWPPP will be amended or modified, as appropriate if the following conditions occur:

- There is a change in design, construction, operation, or maintenance which has significant effect on the discharge of pollutants to the waters of the United States which has not been addressed in the SWPPP.

- Official Inspections or investigations by site operators, local, State, or Federal officials indicate the SWPPP is proving ineffective in eliminating or significantly minimizing pollutants.

- Discharge of hazardous substances or oil, which requires the SWPPP to be modified within 14 calendar days of knowledge of the release.

- If notified that the SWPPP does not meet the minimum requirements of 40 CFR 122, the SWPPP will be updated within 7 calendar days of the receipt of the notification.

6. CERTIFICATION AND MANAGEMENT APPROVAL

The following approval from management conforms to the requirements of 40 CFR Part 122.

6.1 Management Approval

I certify under penalty of law that this document and all attachments are prepared under my direction or supervision. The Stormwater Pollution Prevention Plan has full management approval and will be implemented as described herein.

Delivery Order Manager's Printed Name: Carol Bieniulis
Delivery Order Manager's Signature: Carol L Bieniulis
Title: Delivery Order Manager
Date: 02/10/03

7. REFERENCES

E&E (Ecology and the Environment, Inc.)
1998. *Phase III Sludge Management Compliance Evaluation and Requirements Identification.* 1998.

USAF (U.S. Air Force)
1996. *Biological Survey of Cannon Air Force Base, New Mexico, with Emphasis on Potential Occurrence of Endangered, Threatened, Candidate, and Sensitive Species.*

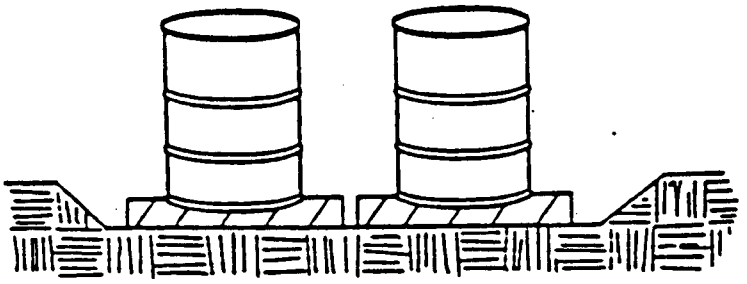
2001. *Revised Final Corrective Measure Study for SWMU 101-Sewage Lagoons.* Cannon Air Force Base, Clovis, New Mexico.

Woodward Clyde
1992. *Remedial Investigation Report for 18 Solid Waste Management Units.* Cannon Air Force Base, Clovis, New Mexico. October.

Attachment 1

Best Management Practices

ACTIVITY: MATERIAL DELIVERY AND STORAGE



Objectives

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- Control Site Perimeter
- Control Internal Erosion

Targeted Pollutants

- ◒ Sediment
- ◒ Nutrients
- ◒ Toxic Materials
- ◒ Oil & Grease
- ◒ Floatable Materials
- ○ Other Construction Waste

● Likely to Have Significant Impact
○ Probable Low or Unknown Impact

Implementation Requirements

- ○ Capital Costs
- ○ O&M Costs
- ○ Maintenance
- ◒ Training
- ○ Suitability for Slopes >5%

● High ○ Low

CA10

Best Management Practices

DESCRIPTION

Prevent or reduce the discharge of pollutants to storm water from material delivery and storage by minimizing the storage of hazardous materials on-site, storing materials in a designated area, installing secondary containment, conducting regular inspections, and training employees and subcontractors.

This best management practice covers only material delivery and storage. For other information on materials, see CA11 (Material Use), or CA12 (Spill Prevention and Control). For information on wastes, see the waste management BMPs in this chapter.

APPROACH

The following materials are commonly stored on construction sites:

- Soil,
- Pesticides and herbicides,
- Fertilizers,
- Detergents,
- Plaster or other products,
- Petroleum products such as fuel, oil, and grease, and
- Other hazardous chemicals such as acids, lime, glues, paints, solvents, and curing compounds.

Storage of these materials on-site can pose the following risks:

- Storm water pollution,
- Injury to workers or visitors,
- Groundwater pollution, and
- Soil contamination.

Therefore, the following steps should be taken to minimize your risk:

- Designate areas of the construction site for material delivery and storage.
  - Place near the construction entrances, away from waterways
  - Avoid transport near drainage paths or waterways
  - Surround with earth berms (see ESC30, Earth Dike.)
  - Place in an area which will be paved
- Storage of reactive, ignitable, or flammable liquids must comply with the fire codes of your area. Contact the local Fire Marshal to review site materials, quantities, and proposed storage area to determine specific requirements. See the Flammable and Combustible Liquid Code, NFPA30.
- For a quick reference on disposal alternatives for specific wastes, see Table 4.2, CA40, Employee/Subcontractor Training.
- Keep an accurate, up-to-date inventory of materials delivered and stored on-site.
- Keep your inventory down.

- Minimize hazardous materials on-site storage.
- Handle hazardous materials as infrequently as possible.
- During the rainy season, consider storing materials in a covered area. Store materials in secondary containments such as an earthen dike, horse trough; or even a children's wading pool for non-reactive materials such as detergents, oil, grease, and paints. Small amounts of material may be secondarily contained in "bus boy" trays or concrete mixing trays.
- Do not store chemicals, drums, or bagged materials directly on the ground. Place these items on a pallet and, when possible, in secondary containment.
- If drums must be kept uncovered, store them at a slight angle to reduce ponding of rainwater on the lids and to reduce corrosion.
- Try to keep chemicals in their original containers, and keep them well labeled.
- Train employees and subcontractors.
- Employees trained in emergency spill cleanup procedures should be present when dangerous materials or liquid chemicals are unloaded.
- If significant residual materials remain on the ground after construction is complete, properly remove materials and any contaminated soil (See CA22). If the area is to be paved, pave as soon as materials are removed to stabilize the soil.

REQUIREMENTS

- Cost (Capital, O&M)
  - All of the above are low cost measures.
- Maintenance
  - Keep the designated storage area clean and well organized.
  - Conduct routine weekly inspections and check for external corrosion of material containers.
  - Keep an ample supply of spill cleanup materials near the storage area.

LIMITATIONS

- Storage sheds often must meet building and fire code requirements.

REFERENCES

Best Management Practices and Erosion Control Manual for Construction Sites; Flood Control District of Maricopa County, AZ, September 1992.

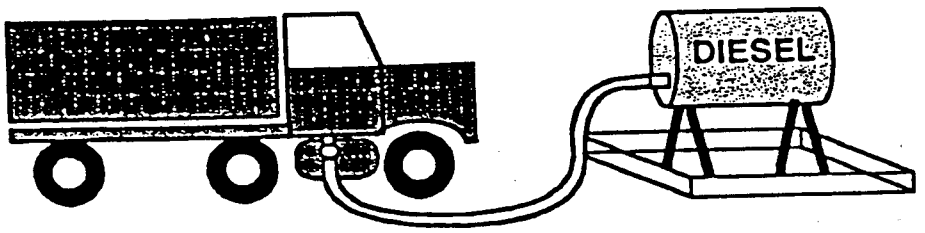
Blueprint for a Clean Bay-Construction-Related Industries: Best Management Practices for Storm Water Pollution Prevention; Santa Clara Valley Nonpoint Source Pollution Control Program, 1992; Santa Clara Valley Nonpoint Source Pollution Control Program, 1992.

Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

Storm Water Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

CA10

ACTIVITY: VEHICLE AND EQUIPMENT FUELING



Objectives

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- Control Site Perimeter
- Control Internal Erosion

Targeted Pollutants

- ○ Sediment
- ○ Nutrients
- ◒ Toxic Materials
- ◒ Oil & Grease
- ○ Floatable Materials
- ○ Other Construction Waste

● Likely to Have Significant Impact
○ Probable Low or Unknown Impact

Implementation Requirements

- ◒ Capital Costs
- ○ O&M Costs
- ◒ Maintenance
- ◒ Training
- ○ Suitability for Slopes >5%

● High ○ Low

CA31

Best Management Practices

DESCRIPTION

Prevent fuel spills and leaks, and reduce their impacts to storm water by using off-site facilities, fueling in designated areas only, enclosing or covering stored fuel, implementing spill controls, and training employees and subcontractors.

APPROACH

- Use off-site fueling stations as much as possible. Fueling vehicles and equipment outdoors or in areas where fuel may spill/leak onto paved surfaces or into drainage pathways can pollute storm water. If you fuel a large number of vehicles or pieces of equipment, consider using an off-site fueling station. These businesses are better equipped to handle fuel and spills properly. Performing this work off-site can also be economical by eliminating the need for a separate fueling area at your site.
- If fueling must occur on-site, use designated areas, located away from drainage courses, to prevent the runon of storm water and the runoff of spills.
- Discourage "topping-off" of fuel tanks.
- Always use secondary containment, such as a drain pan or drop cloth, when fueling to catch spills/leaks.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- Use adsorbent materials on small spills rather than hosing down or burying the spill. Remove the adsorbent materials promptly and dispose of properly.
- Carry out all Federal and State requirements regarding stationary above ground storage tanks.
- Avoid mobile fueling of mobile construction equipment around the site; rather, transport the equipment to designated fueling areas. With the exception of tracked equipment such as bulldozers and perhaps forklifts, most vehicles should be able to travel to a designated area with little lost time.
- Train employees and subcontractors in proper fueling and cleanup procedures.
- For a quick reference on disposal alternatives for specific wastes, see Table 4.2, CA40, Employee/Subcontractor Training.

REQUIREMENTS

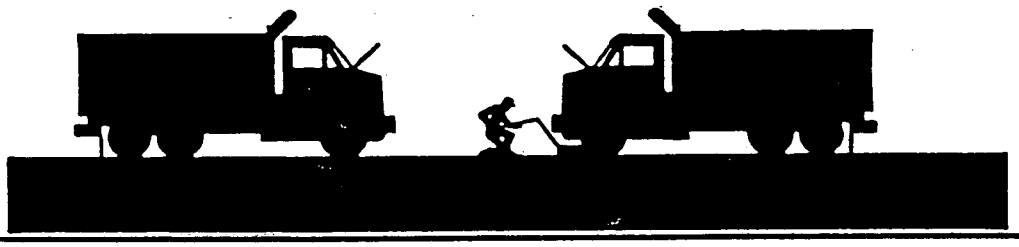
- Costs (Capital, O&M)
  - All of the above measures are low cost, except for the capital costs of above ground tanks that meet all local environmental, zoning, and fire codes.
- Maintenance
  - Keep ample supplies of spill cleanup materials on-site.
  - Inspect fueling areas and storage tanks on a regular schedule.

LIMITATIONS

- Sending vehicles/equipment off-site should be done in conjunction with ESC24 (Stabilized Construction Entrance).

ACTIVITY: VEHICLE AND EQUIPMENT MAINTENANCE

Graphic: North Central Texas COG, 1993



Objectives

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- Control Site Perimeter
- Control Internal Erosion

DESCRIPTION

Prevent or reduce the discharge of pollutants to storm water from vehicle and equipment maintenance by running a "dry site". This involves using off-site facilities, performing work in designated areas only, providing cover for materials stored outside, checking for leaks and spills, containing and cleaning up spills immediately, and training employees and subcontractors.

APPROACH

- Keep vehicles and equipment clean, don't allow excessive build-up of oil and grease.
- Use off-site repair shops as much as possible. Maintaining vehicles and equipment outdoors or in areas where vehicle or equipment fluids may spill or leak onto the ground can pollute storm water. If you maintain a large number of vehicles or pieces of equipment, consider using an off-site repair shop. These businesses are better equipped to handle vehicle fluids and spills properly. Performing this work off-site can also be economical by eliminating the need for a separate maintenance area.
- If maintenance must occur on-site, use designated areas, located away from drainage courses, to prevent the runon of storm water and the runoff of spills.
- Always use secondary containment, such as a drain pan or drop cloth, to catch spills or leaks when removing or changing fluids.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- Use adsorbent materials on small spills rather than hosing down or burying the spill. Remove the adsorbent materials promptly and dispose of properly.
- Regularly inspect on-site vehicles and equipment for leaks, and repair immediately.
- Check incoming vehicles and equipment (including delivery trucks, and employee and subcontractor vehicles) for leaking oil and fluids. Do not allow leaking vehicles or equipment on-site.
- Segregate and recycle wastes, such as greases, used oil or oil filters, antifreeze, cleaning solutions, automotive batteries, hydraulic, and transmission fluids.
- Train employees and subcontractors in proper maintenance and spill cleanup procedures.
- For a quick reference on disposal alternatives for specific wastes, see Table 4.2, CA40, Employee/Subcontractor Training.

REQUIREMENTS

- Costs (Capital, O&M)
  - All of the above are low cost measures.
- Maintenance
  - Keep ample supplies of spill cleanup materials on-site.
  - Inspect maintenance areas on a regular schedule.

Targeted Pollutants

- ○ Sediment
- ○ Nutrients
- ◒ Toxic Materials
- ◒ Oil & Grease
- ○ Floatable Materials
- ○ Other Construction Waste

● Likely to Have Significant Impact
○ Probable Low or Unknown Impact

Implementation Requirements

- ○ Capital Costs
- ○ O&M Costs
- ○ Maintenance
- ◒ Training
- ○ Suitability for Slopes >5%

● High ○ Low

CA32

Best Management Practices

LIMITATIONS

- Sending vehicles/equipment off-site should be done in conjunction with ESC24 (Stabilized Construction Entrance).

Outdoor vehicle or equipment maintenance is a potentially significant source of storm water pollution. Activities that can contaminate storm water include engine repair and service, particularly changing or replacement of fluids, and outdoor equipment storage and parking (dripping engines). For further information on vehicle or equipment servicing, see CA30, Vehicle and Equipment Cleaning, and CA31, Vehicle and Equipment Fueling.

Listed below is further information if you must perform vehicle or equipment maintenance on-site.

Waste Reduction

Parts are often cleaned using solvents such as trichloroethylene, 1,1,1-trichloroethane, or methylene chloride. Many of these parts cleaners are harmful and must be disposed of as a hazardous waste. Reducing the number of solvents makes recycling easier and reduces hazardous waste management costs. Often, one solvent can perform a job as well as two different solvents. Also, if possible, eliminate or reduce the amount of hazardous materials and waste by substituting non-hazardous or less hazardous materials. For example, replace chlorinated organic solvents (1,1,1-trichloroethane, methylene chloride, etc.) with non-chlorinated solvents. Non-chlorinated solvents like kerosene or mineral spirits are less toxic and less expensive to dispose of properly. Check list of active ingredients to see whether it contains chlorinated solvents. The "chlor" term indicates that the solvent is chlorinated. Also, try substituting a wire brush for solvents to clean parts.

Recycling/Disposal

Separating wastes allows for easier recycling and may reduce disposal costs. Keep hazardous and non-hazardous wastes separate, do not mix used oil and solvents, and keep chlorinated solvents (like 1,1,1-trichloroethane) separate from non-chlorinated solvents (like kerosene and mineral spirits). Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around.

Oil filters disposed of in trash cans or dumpsters can leak oil and contaminate storm water. Place the oil filter in a funnel over a waste oil recycling drum to drain excess oil before disposal. Oil filters can also be recycled. Ask your oil supplier or recycler about recycling oil filters.

Do not dispose of extra paints and coatings by dumping liquid onto the ground or throwing it into dumpsters. Allow coatings to dry or harden before disposal into covered dumpsters.

Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries, even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

Do not bury used tires.

REFERENCES

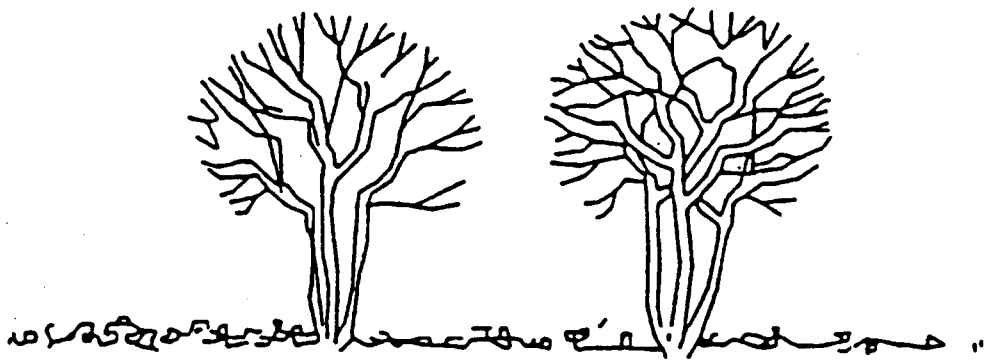
Best Management Practices and Erosion Control Manual for Construction Sites; Flood Control District of Maricopa County, AZ, September 1992.

Blueprint for a Clean Bay-Construction-Related Industries: Best Management Practices for Storm Water Pollution Prevention; Santa Clara Valley Nonpoint Source Pollution Control Program, 1992.

Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

CA32

BMP: PRESERVATION OF EXISTING VEGETATION



Objectives

- Housekeeping Practices
- Contain Waste
- (Minimize Disturbed Areas)
- (Stabilize Disturbed Areas)
- (Protect Slopes/Channels)
- (Control Site Perimeter)
- Control Internal Erosion

GENERAL DESCRIPTION

Carefully planned preservation of existing vegetation minimizes the potential of removing or injuring existing trees, vines, shrubs and/or grasses that serve as erosion controls.

SUITABLE APPLICATIONS

- Areas within site where no construction activity occurs, or occurs at a later date.
- Sensitive areas where natural vegetation exist and should be preserved, such as: steep slopes, watercourses, and building sites in wooded areas.
- Areas where local, state and federal government requires preservation, such as: vernal pools, wetlands, marshes, certain oak trees, etc.

INSTALLATION/APPLICATION CRITERIA

- Clearly mark, flag or fence vegetation or areas where vegetation should be preserved.
- Prepare landscaping plans which include as much existing vegetation as possible and state proper care of this vegetation both during and after construction.
- Define and protect with berms, fencing, signs, etc., a setback area from vegetation to be preserved. Setback area size should be based on the location, species, size, age and potential impact of adjacent construction activities or permanent improvements.
- Proposed landscaping plans which do not include plant species that compete with the existing vegetation.
- Do not locate construction traffic routes, spoil piles, etc., where significant adverse impact on existing vegetation may occur.

REQUIREMENTS

- Maintenance
  - Inspection and maintenance requirements for protection of vegetation are low.
  - During construction the limits of grading or disturbance should be clearly marked at all times.
  - Irrigation or maintenance of native trees or vegetation should conform to specifications on the Landscape Plan.
- Cost
  - There is little cost associated with preserving existing vegetation if properly planned during the project design, and may yield aesthetic benefits which enhance property values.

LIMITATIONS

- Requires forward planning by the owner/developer, contractor and design staff.
- For sites with diverse topography, it is often difficult and expensive to save existing trees while grading the site satisfactorily for the planned development.

Targeted Pollutants

- ● Sediment
- ○ Nutrients
- ○ Toxic Materials
- ○ Oil & Grease
- ○ Floatable Materials
- ○ Other Construction Waste

● Likely to Have Significant Impact
○ Probable Low or Unknown Impact

Implementation Requirements

- ○ Capital Costs
- ○ O&M Costs
- ○ Maintenance
- ○ Training
- ● Suitability for Slopes >5%

● High ○ Low

ESC2

Best Management Practices

Additional Information — Preservation of Existing Vegetation

The best way to prevent excessive erosion is to not disturb the land. On a construction site, where extensive land disturbance is necessary, a reasonable BMP would be to not disturb land in sensitive areas of the site which need not be altered for the project to be viable (e.g., natural watercourses, steep slopes), and to design the site to incorporate particularly unique or desireable existing vegetation into the site landscaping plan. Clearly marking and leaving a buffer area around these unique areas will both help to preserve these areas as well as take advantage of natural erosion prevention and sediment trapping in naturally vegetated areas.

Existing vegetation to be preserved on the site must be protected from mechanical and other injury while the land is being developed. The purpose of protecting existing vegetation is to insure the survival of desirable vegetation for shade, beautification, and erosion protection. Mature vegetation has extensive root systems that help to hold soil in place, thus reducing erosion. Also, vegetation helps to keep soil from drying rapidly and becoming susceptible to erosion. To effectively save existing vegetation, no disturbances of any kind should be allowed within a defined area around the vegetation. For trees, no construction activity should occur within the drip line of the tree.

The following criteria may be used for deciding which vegetation will remain on the site:

- Aesthetic values: Consideration should be given to foliage, flowering habits, bark and crown characteristics (for trees).
- Freedom from disease and rot.
- Life span of trees: Short-lived trees need not be preserved.
- Environmental values: Habitat; screening; and buffers.
- Sudden exposure: Save vegetation which grows in direct sunlight and is able to withstand radiated heat from proposed buildings and pavement.
- Space needed: Sufficient space must be provided between the vegetation and any structures, electric and telephone lines, water and sewer lines, driveways and streets. Mark trees and shrubs with bright paint or ribbon so there is no doubt as to which trees and shrubs are to be left and protected from damage during construction.

Saving existing vegetation and mature trees on-site, beautifies the area and may save money by reducing new landscaping requirements. Mature trees also increase property values and satisfy consumer aesthetic needs.

Preserving and protecting existing vegetation can often result in more stable soil conditions during construction. Careful site planning and identification of plantings to preserve can provide erosion and sedimentation controls during construction, and contribute to the aesthetics of the development. For example, in Sacramento County a tree ordinance has been adopted that protects the native California Oak tree. Provisions to protect the tree and its root system during construction must be specified in the project plans, and an area must be provided where the soil stability may not be disturbed. No grading or construction storage within the tree dripline is allowed.

Installation/Application

Building sites may be planned to integrate existing vegetation and trees. Construction impacts must be considered. Trench width for pipe construction projects and the location of permanent structures, such as buildings, needs to be considered when preserving existing vegetation, including mature trees and their root system. Native vegetation should be preserved since it is able to adapt to the climate. The USDA Soil Conservation Service should be contacted about existing vegetation for sites throughout California. Mature trees are generally preferable to newly planted trees because of the greater soil stabilization provided by the extensive root system of a mature tree.

ESC2

Additional Information — Preservation of Existing Vegetation

Methods for protecting existing vegetation and trees:

- Stake off root system limits (drip line of tree). Some counties limit construction within 5 feet of the tree drip line.
- Fence off the area to be preserved or along the tree drip line.
- Flag or mark trees to remain in place.
- Tree wells and retaining walls (permanent) help preserve existing vegetation, but must be large enough to protect the root system (see below).
- For the California Oak tree, no trenching or irrigation should be allowed within the driplines of the tree, since both these activities are detrimental to the preservation of the tree.
- Where grading under trees is necessary, excavation and fill should be limited to 1 foot within the driplines.

REFERENCES

Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Maricopa County, Arizona, September 1992.

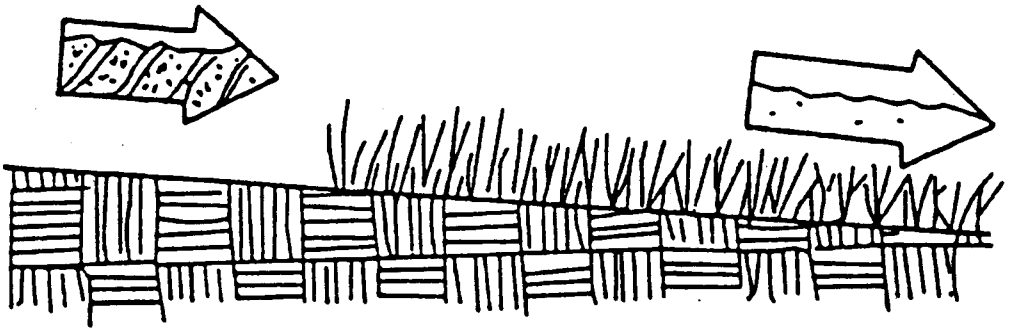
County of Sacramento Tree Preservation Ordinance - September 1981.

Stormwater Management Water for the Puget Sound Basin, Washington State Department of Ecology, The Technical Manual - February 1992, Publication # 91-75.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency - November 1988.

ESC2

BMP: SEEDING AND PLANTING



Objectives

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- (Stabilize Disturbed Areas)
- (Protect Slopes/Channels)
- Control Site Perimeter
- Control Internal Erosion

GENERAL DESCRIPTION

Seeding of grasses and plantings of trees, shrubs, vines and ground covers provide long-term stabilization of soil. In some areas, with suitable climates, grasses can be planted for temporary stabilization.

SUITABLE APPLICATIONS

- Appropriate for site stabilization both during construction and post-construction.
- Any graded/cleared areas where construction activities have ceased.
- Open space cut and fill areas.
- Steep slopes.
- Spoil piles.
- Vegetated swales.
- Landscape corridors.
- Stream banks.

INSTALLATION/APPLICATION CRITERIA

Type of vegetation, site and seedbed preparation, planting time, fertilization and water requirements should be considered for each application.

Grasses:

- Ground preparation: fertilize and mechanically stabilize the soil.
- Tolerant of short-term temperature extremes and waterlogged soil conditions.
- Appropriate soil conditions: shallow soil base, good drainage, slope 2:1 or flatter.
- Develop well and quickly from seeds.
- Mowing, irrigating, and fertilizing are vital for promoting vigorous grass growth.

Trees and Shrubs:

- Selection Criteria: vigor, species, size, shape & wildlife food source.
- Soil conditions: select species appropriate for soil,drainage & acidity.
- Other Factors: wind/exposure, temperature extremes, and irrigation needs.

Vines and Ground Covers:

- Ground preparation: lime and fertilizer preparation.
- Use proper seeding rates.
- Appropriate soil conditions: drainage, acidity, slopes.
- Generally avoid species requiring irrigation.

Targeted Pollutants

- ● Sediment
- ◒ Nutrients
- ◒ Toxic Materials
- ○ Oil & Grease
- ○ Floatable Materials
- ○ Other Construction Waste

● Likely to Have Significant Impact
○ Probable Low or Unknown Impact

Implementation Requirements

- ◒ Capital Costs
- ◒ O&M Costs
- ◒ Maintenance
- ◒ Training
- ◒ Suitability for Slopes >5%

● High ○ Low

ESC10

Best Management Practices

REQUIREMENTS

- Maintenance
  - Shrubs and trees must be adequately watered and fertilized and if needed pruned.
  - Grasses may need to be watered and mowed.
- Cost: Average annual cost for installation and maintenance (2-year useful life, source: EPA, 1992)
  - Seeding: $300 per acre, appropriate for flat slopes and stable soils.
  - Seeding with Mulching: $1,100 per acre, appropriate for moderate to steep slopes and/or erosive soils.
  - Trees, shrubs, vines, and ground cover: Cost, applicability based on species used and terrain features.

LIMITATIONS

- Permanent and temporary vegetation may not be appropriate in dry periods without irrigation.
- Fertilizer requirements may have potential to create storm water pollution if improperly applied.

ESC10

Additional Information — Seeding and Planting

Permanent seeding of grasses, sodding, and planting of trees, shrubs, vines and ground covers can provide long-term stabilization of soil. Permanent seeding and planting contributes to long-term site aesthetics and helps reduce erosion by reducing the velocity of runoff, allowing infiltration to occur, filtering sediments, and by holding soil particles in place.

Seeding and planting should be applied as soon as final grading is done to all graded and cleared areas of the construction site where plant cover is ultimately desired. For example, vegetation may be established along landscaped corridors and buffer zones where they may act as filter strips (see TC6 in Chapter 5 of the Municipal Handbook). Additionally, vegetated swales, steep and/or rocky slopes and stream banks can also serve as appropriate areas for seeding and plantings.

Installation/Application Criteria

Application of appropriate vegetation must consider: the seedbed or plantbed, proper seasonal planting times, water requirements fertilizer requirements and availability of the selected vegetation within the project's region. Permanent plantings during the construction stage of projects require careful coordination between the local agency inspectors, project managers, construction managers, and landscape contractor. Protocols for coordination and implementation procedures regarding site access, construction staging, and short- and long-term planting areas should be developed prior to the construction bid process. Where possible, these protocols should be established by and remain the responsibility of the site owner.

Because of the many available types of plants and ground covers and because site conditions and land use vary so widely within California, a set of general guidelines is included for installation/application of grasses, trees and shrubs, vines and ground covers. However, your local municipality, Soil Conservation Service, agricultural extention, or other resources should be consulted on appropriate species, planting requirements, and maintenance needs for your climate and soils.

Grasses

Grasses, depending on the type, provide short-term soil stabilization during construction or can serve as long- term/ permanent soil stabilization for disturbed areas. In general, grasses provide low maintenance to areas that have been cleared, graded and mechanically stabilized.

Selection:

The selection of the grass type is determined by the climate, irrigation, mowing frequency, maintenance effort and soil-bed conditions. Although grasses provide quick germination and rapid growth, they also have a shallow root system and are not as effective in stabilizing deep soils, where trees, shrubs and deep rooted ground covers may be more appropriate. Several grasses are adaptable to the various California climates. The figure at the end of these fact sheets shows appropriate grasses for regions within California. Blue grass is well adapted throughout California except for in the valley regions. The blue grass is found on dry, sandy soils that have good drainage. Bermuda grass, on the other hand is well adapted in the valley region where soils are dry, coarse and heavier. Specific seed mix and/or varieties for each site should be provided by an approved/qualified plant materials specialist.

ESC10

Additional Information — Seeding and Planting

Planting:
The following steps should be followed to ensure established growth:

1. Select the proper grass for the site.
2. Prepare the seedbed; soil should be fertilized and contain good topsoil or soil at least a 2:1 or flatter slope.
3. Broadcast the seedings in the late fall or early spring. In the late fall, seedings should be planted by mid- September to have established grass by the October rainy season.
4. Initial irrigation will be required often for most grasses, with follow-up irrigation and fertilization as needed. Mulching may be required in dry climates or during drought years.

Trees & Shrubs

Selection:
Trees and shrubs, when properly selected, are low maintenance plantings that stabilize adjacent soils, moderate the adjacent temperatures, filter air pollutants, and serve as a barrier to wind. Some desirable characteristics to consider in selecting trees and shrubs include: vigor, species, age, size and shape, and use as a wildlife food source and habitat.

Trees and shrubs to be saved should be clearly marked so that no construction activity will take place within the dripline of the plant. The sites for new plantings should be evaluated. Consider the prior use of the land: adverse soil conditions such as poor drainage or acidity; exposure to wind; temperature extremes; location of utilities, paved areas, and security lighting and traffic problems.

Transplanting:
Time of Year - Late fall through winter (November to February) is the preferred time for transplanting in most of California.

Preparation - Proper digging of a tree/shrub includes the conservation of as much of the root system as possible. Soil adhering to the roots should be damp when the tree is dug, and kept moist until re-planting. The soil ball should be 12 inches in diameter for each inch of diameter of the trunk.

Site preparation - Refer to landscape plans and specifications for site and soil preparation, and for ability to coordinate construction strategy with permanent vegetation.

Supporting the trunk - Many newly planted trees/shrubs need artificial support to prevent excessive swaying.

Watering - Soil around the tree should be thoroughly watered after the tree is set in place. When the soil becomes dry, the tree should be watered deeply, but not often. Mulching around the base of the tree is helpful in preventing roots from drying out.

Vines & Ground Covers

Selection:
Vines, ground covers, and low growing plants, that can quickly spread, come in many types, colors, and growth habits. Some are suitable only as part of a small maintained landscape area, while some can stabilize large areas with little maintenance. Flowers, which provide little long-term erosion control may be planted to add color and varietal appearances.

ESC10

Best Management Practices

Additional Information — Seeding and Planting

Caution should be exercised in the non-native vegetation because of impacts to native vegetation on adjacent lands. For example, species that may be planted at the construction site can quickly spread and compete with originally undisturbed vegetation such as the California Poppy and California buckwheat, both of which complete poorly with introduced grasses (e.g., planting wild oats is illegal in California). In addition to stabilizing disturbed soil, vines and ground covers can perform the following functions:

1. Provide attractive cover that does not need mowing.
2. Help to define traffic areas and control pedestrian movement.

Site Preparation:
Ground covers are plants that naturally grow very close together, causing severe competition for space nutrients and water. Soil for ground covers should be well prepared. The entire area should be spaded, disced, or rototilled to a depth of six to eight inches. Two to three inches of organic material, such as good topsoil or peat, should be spread over the entire area.

Planting:
The following steps will help ensure good plant growth.

1. Make the plantings following the contours of the land.
2. Dig the holes 1/3 larger than the plant root ball.
3. Know what depth to place the plants.
4. Use good topsoil or soil mixture with a lot of organic matter.
5. Fill hole 1/3 to 1/2 full, shake plants to settle soil among roots, then water.
6. Leave saucer-shaped depression around the plant to hold water.
7. Water thoroughly and regularly.
8. Space plants according to the type of plant and the extent of covering desired.

Materials:
There are many different species of vines and ground covers from which to choose, but care must be taken in their selection. It is essential to select planting materials suited to both the intended use and specific site characteristics. The plants discussed in this handbook are those which are known to be adapted to California, and commonly available from commercial nurseries. Additional information can be obtained from local nurserymen, landscape architects, and extension agents. An approved low water use plant list may be obtained from the State Department of Water Resources or the Soils Conservation Service.

Requirements
Maintenance

General requirements include:

- Grass maintenance should be minimal to none. Irrigation and regular fertilizing may be required for some types of grasses. Mowing is only required in areas where aesthetics or fire hazards are a concern.
- Young trees should receive an inch of water each week for the first two years after planting. The tree should be watered deeply, but not more often than once per week.
- Transplanted trees should be fertilized on an annual basis.
- Proper pruning, watering, and application of fertilizer is necessary to maintain healthy and vigorous shrubs. A heavy layer of mulch applied around the shrubs reduces weeds and retains moisture.
- Trim old growth as needed to improve the appearance of ground covers. Most covers need once-a-year trimming to promote growth.

ESC10

Additional Information — Seeding and Planting

Limitations

- Construction activities are likely to injure or kill trees unless adequate protective measures are taken. Direct contact by equipment is the most obvious problem, but damage is also caused by root stress from filling, excavation, or compacting too close to trees.
- Temporary seeding can only be viable when adequate time is available for plants to grow and establish.
- Over fertilizing of plants may cause pollution of storm water runoff.
- Irrigation source and supply may be limiting.

REFERENCES

Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Maricopa County, September 1992.

"Draft - Sedimentation and Erosion Control, An Inventory of Current Practices", U.S.E.P.A., April, 1990.

Guides for Erosion and Sediment Controls in California, USDA Soils Conservation Service - January 1991.

Kiowa Engineering, Interim Erosion and Sedimentation Control for Construction Activities, Urban Drainage and Flood Control District, Denver, Colorado.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, Jun 1981.

Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group Working Paper, USEPA, April, 1992.

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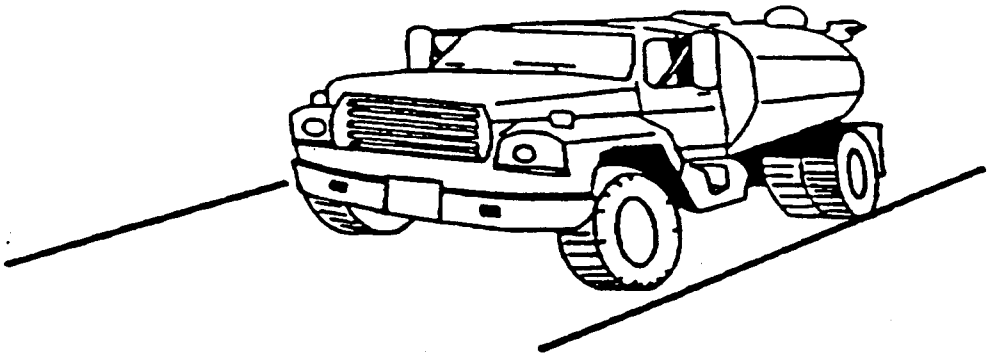
ESC10

BMP: DUST CONTROLS



Objectives

- (Housekeeping Practices)
- Contain Waste
- (Minimize Disturbed Areas)
- (Stabilize Disturbed Areas)
- Protect Slopes/Channels
- (Control Site Perimeter)
- Control Internal Erosion

Targeted Pollutants

- ● Sediment
- ○ Nutrients
- ◒ Toxic Materials
- ◒ Oil & Grease
- ○ Floatable Materials
- ○ Other Construction Waste

● Likely to Have Significant Impact
○ Probable Low or Unknown Impact

Implementation Requirements

- ○ Capital Costs
- ◒ O&M Costs
- ◒ Maintenance
- ○ Training
- ○ Suitability for Slopes >5%

● High ○ Low

ESC21

Best Management Practices

GENERAL DESCRIPTION

Dust control measures are used to stabilize soil from wind erosion, and reduce dust generated by construction activities.

SUITABLE APPLICATIONS

- Clearing and grading activities.
- Construction vehicle traffic on unpaved roads.
- Drilling and blasting activities.
- Sediment tracking onto paved roads.
- Soil and debris storage piles.
- Batch drop from front end loaders.
- Areas with unstabilized soil.
- Final grading/site stabilization usually is sufficient to control post-construction dust sources.

INSTALLATION/APPLICATION CRITERIA

- Schedule construction activities to minimize exposed area (See ESC 1).
- Quickly stabilize exposed soils using vegetation, mulching, spray-on adhesives, calcium chloride, sprinkling, and stone/gravel layering (See ESC 10 and 11).
- Identify and stabilize key access points prior to commencement of construction (See ESC 24).
- Minimizing the impact of dust by anticipating the direction of prevailing winds.
- Direct most construction traffic to stabilized roadways within the project site (See ESC 23).

REQUIREMENTS

- Maintenance
  - Most dust control measures require frequent, often daily, attention.
- Cost
  - Installation costs for water/chemical dust suppression are low, but annual costs may be quite high since these measures are effective for only a few hours to a few days.

LIMITATIONS

- Watering prevents dust only for a short period and should be applied daily (or more often) to be effective.
- Overwatering may cause erosion.
- Oil should not be used for dust control because the oil may migrate into drainageway and/or seep into the soil.
- Certain chemically-treated subgrades may make soil water repellant, increasing runoff.

Additional Information — Dust Controls

California's mediterranean climate, with short wet seasons and long hot dry seasons, allow the soils to thoroughly dry out. During these dry seasons, construction activities are at their peak, and disturbance and exposed areas are increasingly subject to wind erosion, sediment tracking and dust generated by construction equipment.

Dust control, as a BMP, is a practice that is already in place for many construction activities. Los Angeles, the North Coast and Sacramento, among others have enacted dust control ordinances for construction activities that cause dust to be transported beyond the construction project property line. Recently, the State Air Resources Control Board has, under the authority of the Clean Air Act, started to address air quality in relation to inhalable particulate matter less than 10 microns (PM-10). 90% of these small particles are considered to be dust. Existing dust control regulations by local agencies, municipal departments, public works department, and/or public health departments are in place in some regions within California. For jurisdictions that have no formal dust control regulations and/or standards, Sections 10, 17 and 18 of CalTrans' Standard Specifications provide detailed provisions for dust control practices.

Many local agencies require dust control in order to comply with local nuisance laws, opacity laws (visibility impairment) and the requirements of the Clean Air Act. The following are measures that local agencies may have already implemented as requirements for dust control from contractors:

- Construction & Grading Permits: Require provisions for dust control plans;
- Opacity Emission Limits: Enforce compliance with California air pollution control laws;
- Increase overall enforcement activities: Priority given to cases involving citizen complaints;
- Maintain Field Application Records: Require records of dust control measures from contractor;
- Stormwater Pollution Prevention Plan: (SWPPP): Integrate dust control measures into SWPPP.

Dust Control Practices

Dust control BMP's generally stabilize exposed surfaces and minimize activities that suspend or track dust particles. Table ESC21.1 shows which Dust Control BMPs apply to site conditions which cause dust. For heavily traveled and disturbed areas, wet suppression (watering), chemical dust suppression, gravel or asphalt surfacing, temporary gravel construction entrances, equipment wash-out areas, and haul truck covers can be employed as dust control applications. Permanent or temporary vegetation and mulching and sand fences can be employed for areas of occasional or no construction traffic. Preventive measures would include minimizing surface areas to be disturbed, limiting on-site vehicle traffic to 15 miles per hour, and controlling the number and activity of vehicles on a site at any given time.

Many of the reasonably available control measures for controlling dust from construction sites can also be implemented as BMPs for storm water pollution prevention. Those BMPs include:

- Pave, vegetate, or chemically stabilize access points where unpaved traffic surfaces adjoin paved roads.
- Provide covers for haul trucks transporting materials that contribute to dust.
- Provide for wet suppression or chemical stabilization of exposed soils.
- Provide for rapid clean-up of sediments deposited on paved roads. Furnish stabilized construction road entrances and vehicle wash down areas.
- Stabilize unpaved haul roads, parking and staging areas. Reduce speed and trips on unpaved roads.
- Implement dust control measures for material stockpiles.
- Prevent drainage of sediment laden storm water onto paved surfaces.
- Stabilize abandoned construction sites using vegetation or chemical stabilization methods.
- Limit the amount of areas disturbed by clearing and earth moving operations by scheduling these activities in phases.

For the chemical stabilization, there are many products available for chemically stabilizing gravel roadways and stockpiles. The types of chemicals available and recommendations for their use are tabulated in Table ESC 21.2, Commonly Used Chemicals for Dust Control.

ESC21

Additional Information — Dust Controls

In addition, there are many other BMPs identified in this handbook that provide dust control including:

- Seeding and Plantings (ESC 10)
- Mulching (ESC 11)
- Construction Road Stabilization (ESC 23)
- Stabilized Construction Entrances (ESC 24)

Limitations

- Oil treated subgrades should not be used because the oil may migrate into drainageways and/or seep into the soil.
- Chemically treated subgrades may make the soil water repellant, interfering with long-term infiltration, and the vegetation/re-vegetation of the site. Some chemical dust suppressants may be subject to freezing and may contain solvents and should be handled properly.
- Asphalt, as a mulch tack or chemical mulch, requires a 24 hour curing time to avoid adherence to equipment, worker shoes, etc. Application should be limited because asphalt surfacing may eventually migrate into the drainage system.
- In compacted areas, watering and other liquid dust control measures may wash sediment or other constituents into the drainage system.

REFERENCES

Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Maricopa County, Arizona, September 1992.

California Air Pollution Control Laws, California Air Resources Board, 1992.

CalTrans, Standard Specifications, Sections 10, "Dust Control"; Section 17, "Watering"; and Section 18, "Dust Palliative".

Prospects for Attaining the State Ambient Air Quality Standards for Suspended Particulate Matter (PM10), Visibility Reducing Particles, Sulfates, Lead, and Hydrogen Sulfide, California Air Resources Board, April 1991.

Sacramento County, Winterization Ordinance & Dust Control Ordinance (example).

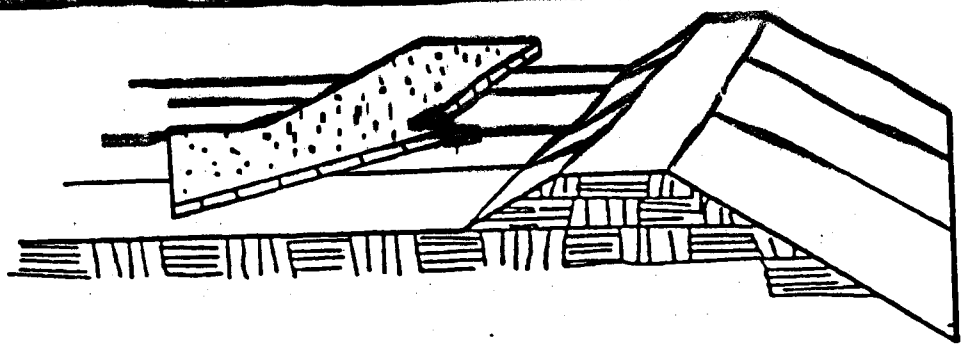
USDA Soil Conservation Service, "Guides for Erosion and Sediment Control".

ESC21

TABLE ESC 21.1 DUST CONTROL BMPs FOR GIVEN SITE CONDITIONS

SITE CONDITION	DUST CONTROL BMPs								
	Permanent Vegetation	Mulching	Wet Suppression (Watering)	Chemical Dust Suppression	Gravel or Asphalt Surfacing	Sand Fences	Temporary Gravel Construction Entrances/Equipment Wash Down	Haul Truck Covers	Minimize Extent of Area Disturbed
Disturbed Areas not Subject to Traffic	X	X	X	X	X				X
Disturbed Areas Subject to Traffic			X	X	X				X
Material Stock Pile Stabilization			X	X		X			X
Demolition			X				X	X	
Clearing/Excavation			X	X					X
Truck Traffic on Unpaved Roads			X	X	X			X	
Mud/Dirt Carry-Out					X		X		

BMP: EARTH DIKE



Objectives

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- Control Site Perimeter
- Control Internal Erosion

GENERAL DESCRIPTION

The temporary earth dike is a temporary berm or ridge of compacted soil, used to divert runoff or channel water to a desired location.

SUITABLE APPLICATIONS

Earth dikes are typically used to divert concentrated runoff through disturbed areas into another BMP (e.g., sediment basins), to divert runoff away from disturbed or unstable slopes, to divert runoff from off-site and undisturbed areas around disturbed areas, and as a containment for construction materials and wastes. The dikes should remain in place until the disturbed areas are permanently stabilized. The dikes must be on-site and must safely convey anticipated flood flows.

INSTALLATION/APPLICATION CRITERIA

- All dikes should be compacted by earth-moving equipment.
- All dikes should have positive drainage to a stabilized outlet.
- Top width may be wider and side slopes may be flatter at crossings for construction traffic.
- Dikes should direct sediment-laden runoff into a sediment trapping device.
- Dikes should be stabilized with vegetation, chemicals, or physical devices.

REQUIREMENTS

- Maintenance
  - Inspect periodically and after every significant rainfall; repair as necessary.
- Cost
  - Cost ranges from $15 to $55 per foot for both earthwork and stabilization and depends on availability of material, site location, and access.

LIMITATIONS

Dikes should not be used for drainage areas greater than 10 acres, or along slopes greater than 10 percent. For larger areas more permanent drainage structures should be built. All drainage structures should be built in compliance with local municipal requirements.

- Earth dikes may create more disturbed area on site and become barriers to construction equipment.
- Earth dikes must be stabilized immediately, which adds cost and maintenance concerns.
- Diverted storm water may cause downstream flood damage.
- Dikes should not be constructed of soils which may be easily eroded.
- Regrading the site to remove the dike may add additional cost.

Targeted Pollutants

- ● Sediment
- ○ Nutrients
- ◒ Toxic Materials
- ◒ Oil & Grease
- ○ Floatable Materials
- ◒ Other Construction Waste

● Likely to Have Significant Impact
○ Probable Low or Unknown Impact

Implementation Requirements

- ◒ Capital Costs
- ○ O&M Costs
- ◒ Maintenance
- ○ Training
- ◒ Suitability for Slopes >5%

● High ○ Low

ESC30

Best Management Practices

Additional Information — Earth Dike

The temporary earth dike is a berm or ridge of compacted soil, located in such a manner as to divert storm water to a sediment trapping device or stabilized outlet, thereby reducing the potential for erosion and offsite sedimentation. Earth dikes can also be used to divert runoff from off-site and from undisturbed areas away from disturbed areas, and to divert sheet flows away from unprotected slopes.

An earth dike does not itself control erosion or remove sediment from runoff; a dike prevents erosion by directing runoff to an erosion control device such as a sediment trap or directing runoff away from an erodible area. Temporary diversion dikes should not adversely impact adjacent properties and must conform to local floodplain management regulations, and should not be used in areas with slopes steeper than 10%.

- The advantages of the temporary earth dike include the ability to handle flows from large drainage areas.
- Once stabilized, earth dikes require relatively little maintenance. Additionally, the earth dikes are relatively inexpensive to install since the soil material required for construction may be available on-site, and can be constructed as part of the initial grading operations, while the equipment is on-site.
- Uses on-site materials.

Installation/Application Criteria

Temporary earth dikes are a practical, inexpensive BMP used to divert storm water runoff. Temporary diversion dikes should be installed in the following manner:

1. All dikes should be compacted by earth-moving equipment.
2. All dikes should have positive drainage to an outlet.
3. All dikes should have 2:1 side slopes, 18 inches minimum height, and a minimum top width of 24 inches. Top width may be wider and side slopes may be flatter at crossings for construction traffic.
4. The outlet from the earth dike must function with a minimum of erosion. Runoff should be conveyed to a sediment trapping device such as a sediment trap (ESC 55) or sediment basin (ESC 56)when either the dike channel or the drainage area above the dike are not adequately stabilized.
5. Temporary stabilization may be achieved using seed and mulching for slopes less than 5%, and either rip-rap or sod for slopes in excess of 5%. In either case, stabilization of the earth dike should be completed immediately after construction or prior to the first rain.
6. If riprap is used to stabilize the channel formed along the toe of the dike, the following typical specifications apply:

CHANNEL GRADE	RIPRAP STABILIZATION
0.5-1.0%	4" Rock
1.1-2.0%	6" Rock
2.1-4.0%	8" Rock
4.1-5.0%	8-12" Riprap

7. The stone riprap, recycled concrete, etc. used for stabilization should be pressed into the soil with construction equipment.
8. Filter cloth may be used to cover dikes in use for long periods.
9. Construction activity on the earth dike should be kept to a minimum.

REFERENCES

Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Maricopa County, Arizona, September 1992.

"Draft - Sedimentation and Erosion Control, An Inventory of Current Practices", U.S.E.P.A., April, 1990.

ESC30

Additional Information — Earth Dike

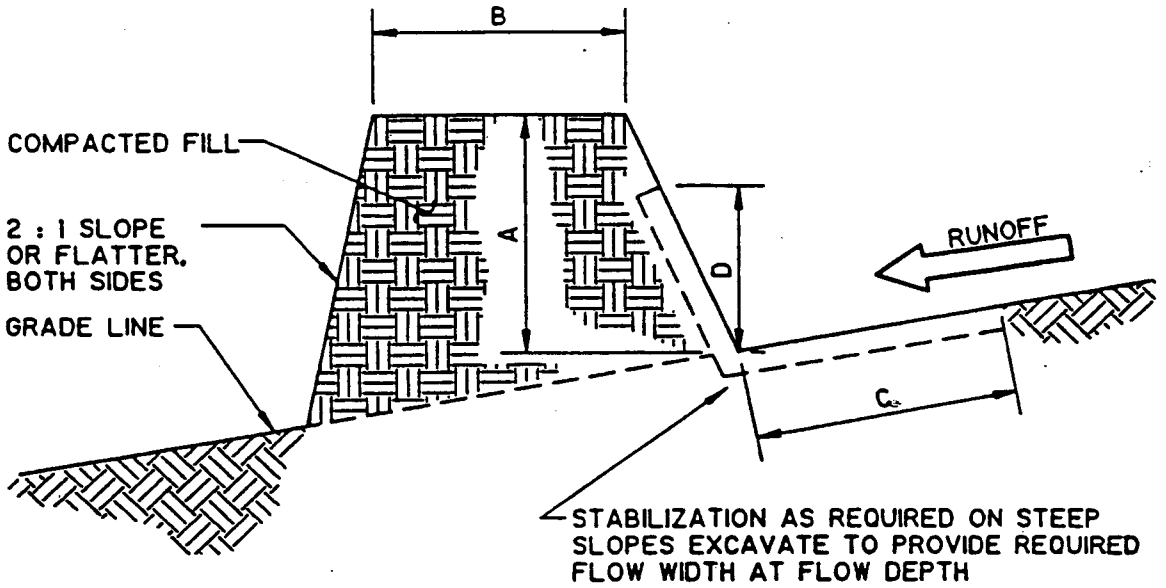
Erosion and Sediment Control Handbook, S.J. Goldman, K. Jackson, T.A. Bursetynsky, P.E., McGraw Hill Book Company.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, June 1981.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency - November 1988.

ESC30

Additional Information — Earth Dike



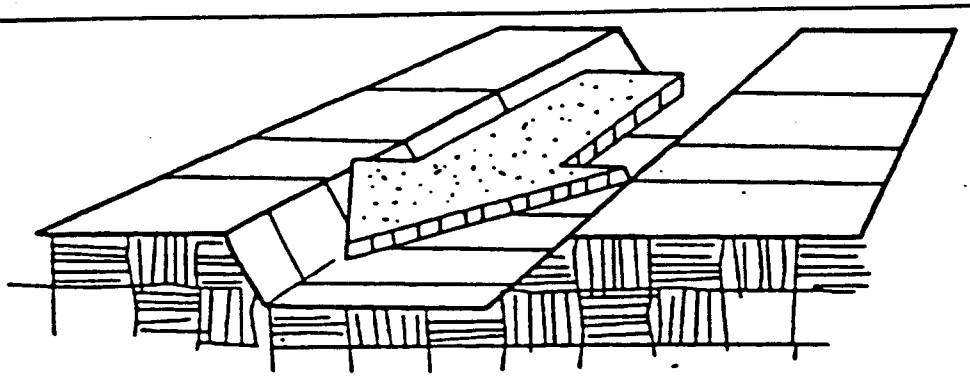
REQUIREMENTS BASED ON UPSTREAM DRAINAGE AREA

	DIKE 1 (5 ACRES OR LESS)	DIKE 2 (5-10 ACRES)
A-DIKE HEIGHT	18"	36"
B-DIKE WIDTH	24"	36"
C-FLOW WIDTH	4'	6'
D-FLOW DEPTH	8"	15"

TEMPORARY DIVERSION DIKE

ESC30

BMP: TEMPORARY DRAINS AND SWALES



Objectives

- *Housekeeping Practices*
- *Contain Waste*
- *Minimize Disturbed Areas*
- *Stabilize Disturbed Areas*
- *Protect Slopes/Channels*
- *Control Site Perimeter*
- *Control Internal Erosion*

GENERAL DESCRIPTION

Temporary drains and swales are used to divert off-site runoff around the construction site, divert runoff from stabilized areas around disturbed areas, and direct runoff into sediment basins or traps.

SUITABLE APPLICATIONS

Temporary drains and swales are appropriate for diverting any upslope runoff around unstabilized or disturbed areas of the construction site:

- Prevent slope failures.
- Prevent damage to adjacent property.
- Prevents erosion and transport of sediments into water ways.
- Increases the potential for infiltration.
- Diverts sediment-laden runoff into sediment basins or traps.

INSTALLATION/APPLICATION CRITERIA

Temporary drainage swales will effectively convey runoff and avoid erosion if built properly:

- Size temporary drainage swales using local drainage design criteria.
- A permanent drainage channel must be designed by a professional engineer (see the local drainage design criteria for proper design).
- At a minimum, the drain/swale should conform to predevelopment drainage patterns and capacities.
- Construct the drain/swale with an uninterrupted, positive grade to a stabilized outlet.
- Provide erosion protection or energy dissipation measures if the flow out of the drain or swale can reach an erosive velocity.

REQUIREMENTS

- Maintenance
  - Inspect weekly and after each rain.
  - Repair any erosion immediately.
  - Remove sediment which builds up in the swale and restricts its flow capacity.
- Cost
  - The cost of a drainage swale increases with drainage area and slope. Typical. swales for controlling internal erosion are inexpensive.

LIMITATIONS

- Temporary drains and swales or any other diversion of runoff should not adversely impact upstream or downstream properties.
- Temporary drains and swales must conform to local floodplain management requirements.

Targeted Pollutants

- ● *Sediment*
- ○ *Nutrients*
- ○ *Toxic Materials*
- ○ *Oil & Grease*
- ○ *Floatable Materials*
- ○ *Other Construction Waste*

● *Likely to Have Significant Impact*
○ *Probable Low or Unknown Impact*

Implementation Requirements

- ◒ *Capital Costs*
- ○ *O&M Costs*
- ○ *Maintenance*
- ○ *Training*
- ◒ *Suitability for Slopes >5%*

● *High* ○ *Low*

ESC31

Best Management Practices

Additional Information — Temporary Drains and Swales

Slopes that are formed during cut and fill operations should be protected from erosion by runoff. A combination of a temporary drainage swale and an earth dike (see ESC30) at the top of a slope can safely divert runoff to a location where it can safely be brought to the bottom of the slope (see Pipe Slope Drain ESC32). A combination dike and swale is easily constructed by a single pass of a bulldozer or grader and compacted by a second pass of the tracks or wheels over the ridge. Diversion structures should be installed when the site is initially graded, and remain in place until post-construction BMPs are installed and/or the slopes are stabilized.

Diversion practices concentrate the volume of surface runoff, increasing its velocity and erosive force. Thus, the flow out of the drain or swale must be directed onto a stabilized area or into a grade stabilization structure. A swale should be stabilized using vegetation, chemical treatment, rock rip-rap, matting, or other physical means of stabilization, if significant erosion will occur. Any drain or swale which conveys sediment-laden runoff must be diverted into a sediment basin or trap before it is discharged from the site.

Installation/Application Criteria

Diversion drains or swales are only effective if they are properly installed. Swales are more effective than dikes because they tend to be more stable. The combination of a swale with a dike on the downhill side is the most cost-effective diversion.

Standard engineering design criteria for small open channel and closed conveyance systems should be used (see the local drainage design manual). Unless local drainage design criteria state otherwise, drains or swales should be designed as follows:

- No more than 5 acres may drain to a temporary drain or swale
- Place the drain or swale above, not on, a cut and fill slope
- Swale bottom width should be at least 2 ft
- Depth of the swale should be at least 18 inches
- Side slopes should be 2:1 or flatter
- Drain or swale should be layed at a grade of at least 1 percent, but not more than 15 percent
- The swale must not be overtopped by the 10-year, 24-hour storm, irrespective of the design criteria stated above
- Remove all trees, stumps, obstructions, and other objectionable material from the swale when it is built
- Compact any fill material along the path of the swale
- Stabilize all swales immediately. Seed and mulch swales at a slope of less than 5 percent, and use rip-rap or sod for swales with a slope between 5 and 15 percent
- Do not operate construction vehicles across a swale unless a stabilized crossing is provided.
- The cost of swales and other diversion devices is generally included in the earthwork cost, as a separate item under the grading budget of the project construction contract.

REFERENCES

Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Maricopa County, Arizona, September 1992.

"Draft - Sedimentation and Erosion Control, An Inventory of Current Practices", U.S.E.P.A., April, 1990.

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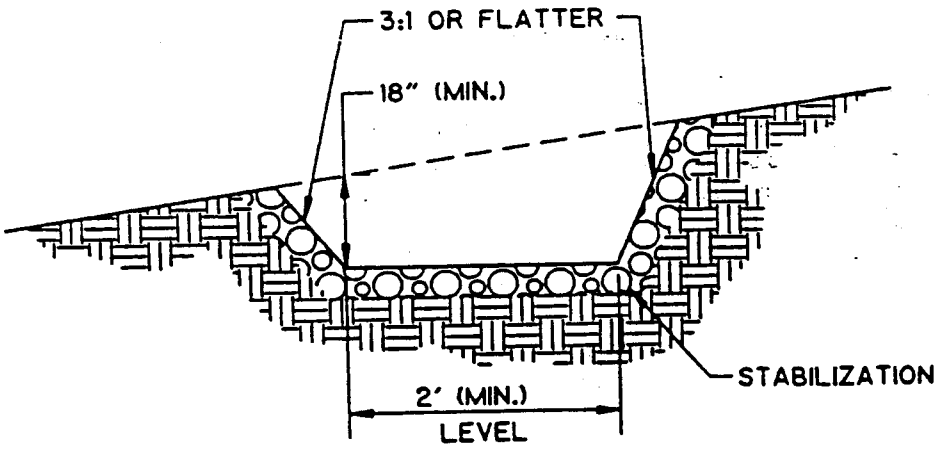
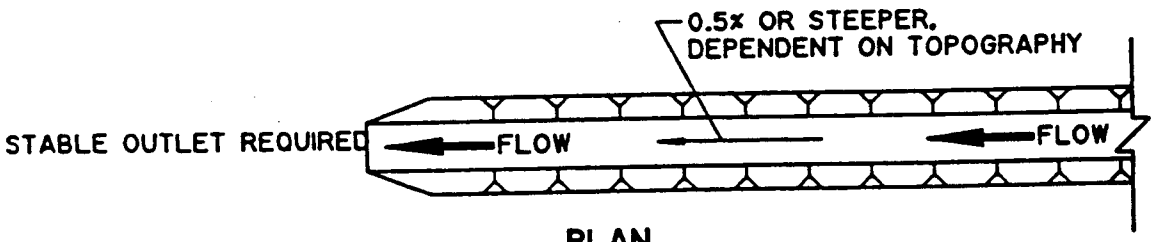
ESC31



CROSS SECTION

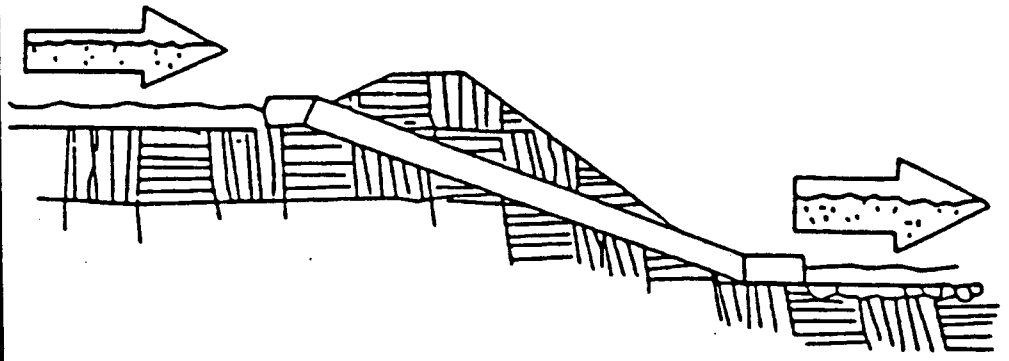


PLAN

TEMPORARY DRAINAGE SWALE

ESC31

BMP: SLOPE DRAIN



Objectives

- *Housekeeping Practices*
- *Contain Waste*
- *Minimize Disturbed Areas*
- *Stabilize Disturbed Areas*
- *Protect Slopes/Channels*
- *Control Site Perimeter*
- *Control Internal Erosion*

GENERAL DESCRIPTION

A temporary pipe or lined channel to drain the top of a slope to a stable discharge point at the bottom of a slope without causing erosion.

SUITABLE APPLICATIONS

- Where concentrated flow of surface runoff must be conveyed down a slope in order to prevent erosion.
- Drainage for top of slope diversion dikes or swales.
- Emergency spillway for a sediment basin.
- Drainage for top of cut/fill slopes where water can accumulate.

The types of slope drain can include:

- Pipe drops.
- Flexible downdrains.
- Sectional downdrains.
- Lined terrace drains.

INSTALLATION/APPLICATION CRITERIA

- Secure inlet and surround with dikes to prevent gully erosion, and anchor pipe to slope.
- Size to convey at least the peak of a 10-year, 24-hour storm (See local flood control agency for requirements).
- Stabilize outlet.

REQUIREMENTS

- Maintenance
  - Structure must be inspected regularly and after storms.
  - Inlet must be free of undercutting and no water should circumvent the entry.
  - Outlet should not produce erosion; velocity dissipators must be maintained.
  - Pipe anchors must be checked to ensure that the pipe remains anchored to the slope.
- Cost
  - CalTrans Cost Schedule gives regional cost ranges.

LIMITATIONS

- Maximum drainage area per slope drain is 5 acres. (For large areas use a paved chute, rock lined channel or additional pipes.)
- Clogged slope drains will force water around the pipe and cause slope erosion.
- Dissipation of high flow velocities at the pipe outlet is required to avoid downstream erosion.
- Failure can result in flooding and severe erosion.

Targeted Pollutants

- ● *Sediment*
- ○ *Nutrients*
- ○ *Toxic Materials*
- ○ *Oil & Grease*
- ○ *Floatable Materials*
- ○ *Other Construction Waste*

● *Likely to Have Significant Impact*
○ *Probable Low or Unknown Impact*

Implementation Requirements

- ◒ *Capital Costs*
- ○ *O&M Costs*
- ◒ *Maintenance*
- ○ *Training*
- ◒ *Suitability for Slopes >5%*

● *High* ○ *Low*

ESC32

Best Management Practices

Additional Information — Slope Drain

The slope drain may be a rigid pipe, such as corrugated metal, a flexible conduit, or a lined terrace drain with the inlet placed on the top of a slope. The drain conveys concentrated runoff down to the bottom of the slope. The BMP typically is used in combination with a diversion control, such as a temporary dike or swale, at the top of the slope, and serves as a temporary BMP to reduce or eliminate slope erosion until permanent BMPs are installed and the slope is stabilized.

The slope drain is applicable for any construction site where concentrated surface runoff can accumulate and must be conveyed down the slope in order to prevent erosion. The slope drain is effective because it prevents the stormwater from flowing directly down the slope by confining all the runoff into an enclosed pipe or channel. Due to the time lag between grading slopes and installation of permanent storm water collection systems and slope stabilization measures, temporary provisions to intercept runoff are sometimes necessary. Particularly in steep terrain, slope drains can protect unstabilized areas from erosion. Typical uses include:

- Emergency spillway for a sediment basin.
- Drainage for top of cut/fill slopes where storm water can accumulate and must be conveyed down the slope.

Installation/Application Criteria

Temporary slope drains are highly effective in eliminating slope erosion. Installation and maintenance requirements are small, especially when flexible pipe is used. General criteria:

- Gully erosion is the major problem with slope drains. Inlet structures must be securely entrenched and compacted to avoid severe gully erosion.
- The drain must be securely anchored to the slope and must be adequately sized to carry the capacity of the design storm and associated forces.
- The outlet must be stabilized with rip-rap, concrete or other type of energy dissipator, or directed into a stable sediment trap or basin.
- A debris rack is recommended at the inlet, and should be encouraged for larger pipes and at the outlet as a safety device to prevent small children from entering the pipe.

Materials:

Material selection and criteria for the pipe slope drain is often established by the local municipality. Soil type, rainfall patterns, construction schedule, and available supply are some of the factors to be considered. The following types of slope drains are commonly used:

- Rigid Pipe: This type of slope drain is also known as a pipe drop. The pipe usually consists of corrugated metal pipe or rigid plastic pipe. The pipe is placed on undisturbed or compacted soil and secured into the slope. One foot minimum cover is required on the pipe, and concrete thrust blocks must be used when required by the municipality or warranted by the calculated thrust forces. Collars should be properly installed and secured with metal strappings or watertight collars.
- Flexible Pipe: The flexible pipe slope drain consists of a flexible conduit of heavy duty material. The conduit material is securely anchored into the slope and connections are watertight. The conduit should be securely fastened to the metal inlet and outlet conduit sections with metal strappings or water tight collars.
- Sectional Downdrains: The sectional downdrain consists of pre-fabricated, sectional conduit of half-round or third-round material. The sectional downdrain performs similar to a flume or chute. The pipe must be placed on undisturbed or compacted soil and secured into the slope.
- Concrete-lined Terrace Drain: This is a concrete channel for draining water from a terrace on a slope to the next level. These drains are after permenant structures which should be designed according to local drainage design criteria.

ESC32

Best Management Practices

Additional Information — Slope Drain

Design:
Unless specified by the local municipality, the capacity for temporary drains should be sufficient to handle the peak runoff from a 10-year, 24-hour rainfall event. The pipe size may be computed using the Rational Method or a method established by the local municipality. Higher flows must be safely stored or routed to prevent any offsite concentration of flow, and any erosion of the slope.

As a guide, temporary pipe slope drains should not be sized smaller than shown in the following table:

MINIMUM PIPE DIAMETER	MAXIMUM DRAINAGE AREA (ACRES)
12"	0.5
18"	1.5
21"	2.5
24"	3.5
30"	5.0

Permanent improvements must be designed and installed if the drainage area is greater than 5 acres.

The following additional design criteria should be considered:

- Construct the pipe slope drain entrance of a standard flared end section with a minimum 6-inch metal toe plate to prevent runoff from undercutting the pipe inlet. The slope of the entrance is usually at least 3 percent.
- Thoroughly compact the soil around and under the pipe and entrance section.
- Securely fasten the slope drain sections together, have gasketed watertight fittings, and securely anchored into the soil.
- Secure the flared inlet section to the slope drain and have watertight connecting bands.
- Use interceptor dikes to direct runoff into a slope drain. The height of the dike should be at least 1 foot higher at all points than the top of the inlet pipe.
- If the pipe slope drain is conveying sediment-laden water, direct all flows into a sediment trap (ESC55) or sediment basin (ESC56).
- Unless the pipe directly enters a sediment trap/basin, stabilize the area below the outlet with a riprap apron.

Limitations
Installation is critical for effective use of the pipe slope drain to minimize potential gully erosion. Maximum drainage area per pipe slope drain is 5 acres. For larger areas use a paved chute, rock lined channel or additional pipes. (See the local municipality for drainage requirements)

- During large storms, pipe slope drains may become clogged or overcharged, forcing water around the pipe and causing extreme slope erosion.
- Structures for dissipation of high flow velocities at the pipe outlet must be constructed to avoid downstream erosion.
- Failure of this type of temporary structure may result in flooding and severe erosion.
- If the sectional downdrain is not sized correctly, the runoff can spill over the drain sides causing gully erosion, and potential failure of the structure.

ESC32

Additional Information — Slope Drain

REFERENCES

Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Maricopa County, Arizona, September 1992.

"Draft - Sedimentation and Erosion Control, An Inventory of Current Practices", U.S.E.P.A., April, 1990.

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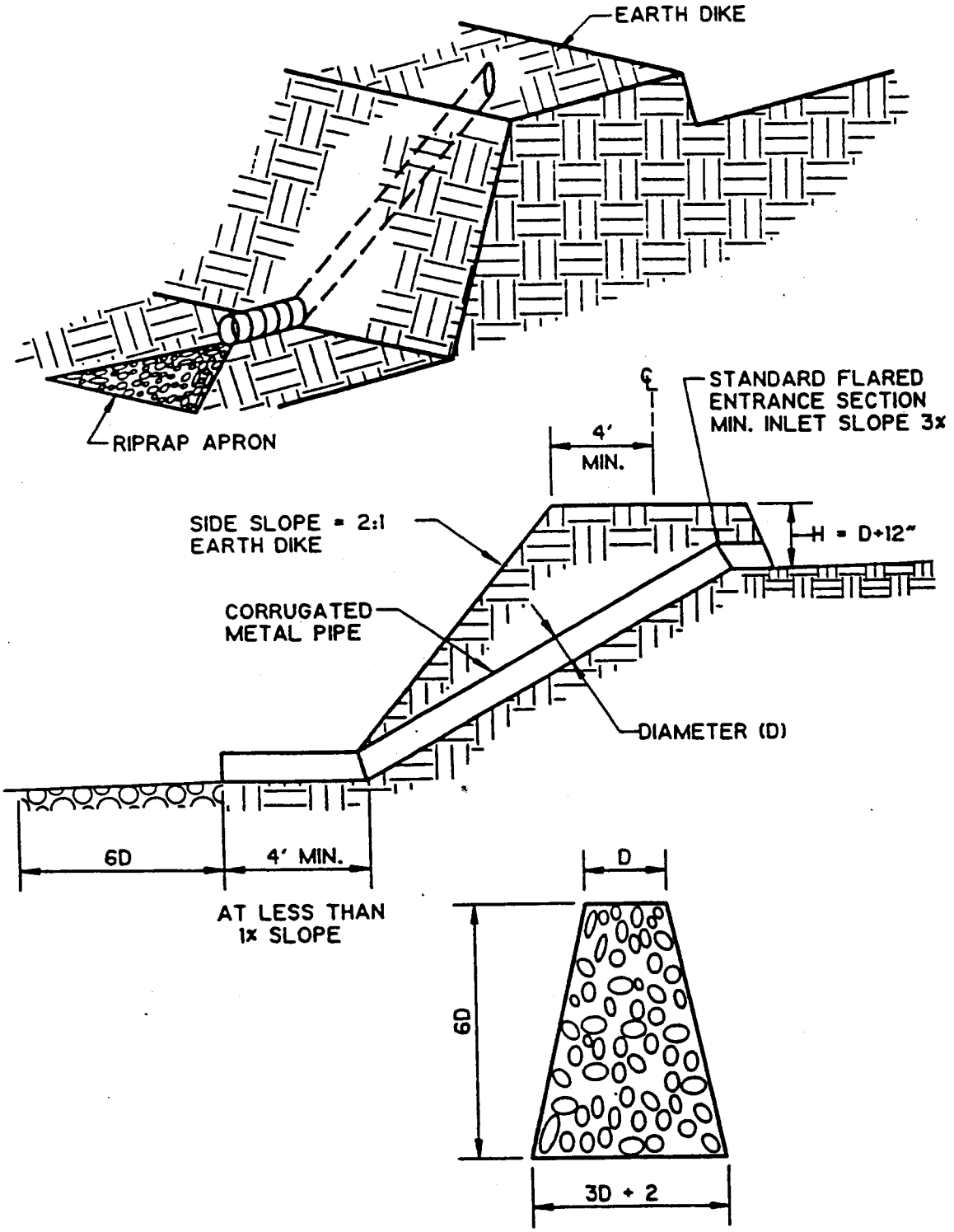
ESC32

Additional Information — Slope Drain

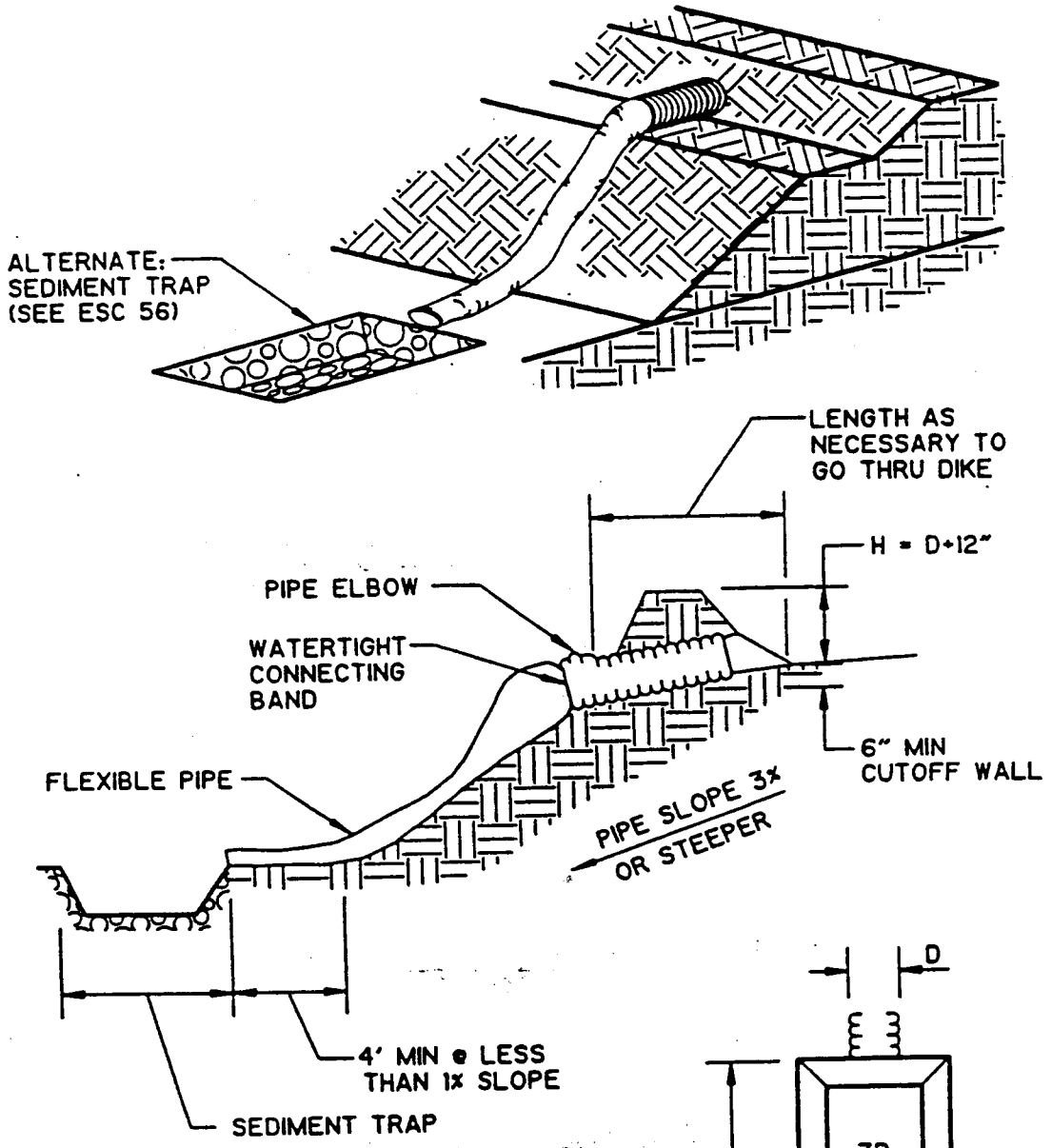


RIPRAP SHOULD CONSIST OF 6" DIAMETER STONE PLACED AS SHOWN AND SHOULD BE A MINIMUM OF 12" IN THICKNESS.

PIPE SLOPE DRAIN (RIGID)

ESC32

Additional Information — Slope Drain



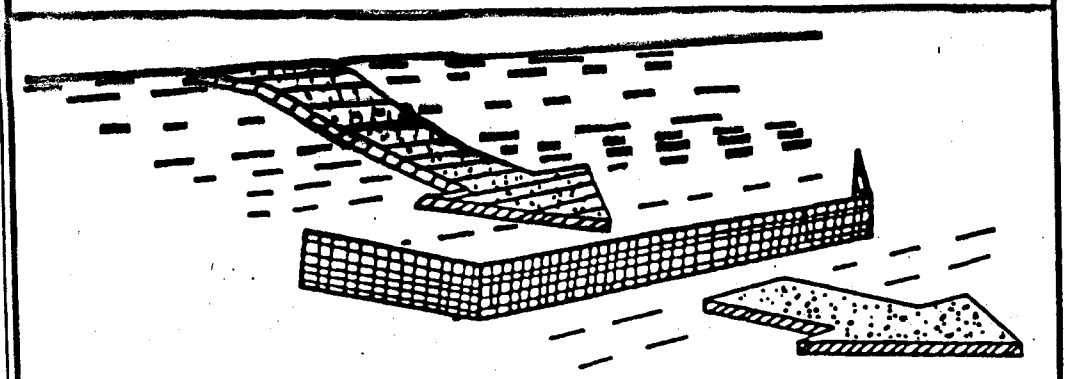
RIPRAP SHOULD CONSIST OF 6" DIA STONE PLACED AS SHOWN. DEPTH OF APRON SHOULD EQUAL THE PIPE DIA AND RIPRAP SHALL BE A MINIMUM OF 12" IN THICKNESS.

ALTERNATIVE SEDIMENT TRAP: RIPRAP PLAN

PIPE SLOPE DRAIN (FLEXIBLE)

ESC32

BMP: SILT FENCE



Objectives

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- (Control Site Perimeter)
- (Control Internal Erosion)

Targeted Pollutants

- ● Sediment
- ○ Nutrients
- ○ Toxic Materials
- ○ Oil & Grease
- ○ Floatable Materials
- ○ Other Construction Waste

● Likely to Have Significant Impact
○ Probable Low or Unknown Impact

Implementation Requirements

- ◒ Capital Costs
- ◒ O&M Costs
- ◒ Maintenance
- ○ Training
- ○ Suitability for Slopes >5%

● High ○ Low

ESC50

Best Management Practices

GENERAL DESCRIPTION

A silt fence is made of a filter fabric which has been entrenched, attached to supporting poles, and sometimes backed by a wire fence for support. The silt fence detains sediment-laden water, promoting sedimentation behind the fence.

SUITABLE APPLICATIONS

- Along the perimeter of the site.
- Below the toe of a cleared slope.
- Along streams and channels.
- Around temporary spoil areas.
- Across swales with catchments less than 1 acre.
- Below other small cleared areas.

INSTALLATION/APPLICATION

- Use principally in areas where sheet flow occurs.
- Install along a level contour, so water does not pond more than 1.5 feet at any point.
- No more than 1 acre, 100 ft., or 0.5 cfs of concentrated flow should drain to any point along the silt fence.
- Turn ends of fence uphill.
- Provide area behind the fence for runoff to pond and sediment to settle (approx. 1200 sq. ft. per acre draining to the silt fence).
- Select filter fabric which retains 85% of the soil, by weight, based on sieve analysis, but is not finer than an equivalent opening size of 70.

REQUIREMENTS

- Maintenance
  - Inspect weekly and after each rainfall.
  - Repair wherever fence is damaged.
  - Remove sediment when it reaches 1/3 the height of the fence.
- Cost (source: EPA, 1992)
  - Average annual cost for installation and maintenance (assumes 6 month useful life): $7 per lineal foot ($850 per drainage acre)

LIMITATIONS

- Do not use where 85% of the soil, by weight, passes through a No. 200 sieve because the filter fabric will clog.
- Do not place fence on a slope, or across any contour line.
- Do not use in streams, channels, or anywhere flow has concentrated.
- Do not use in locations where ponded water may cause flooding.

Additional Information — Silt Fence

A silt fence is a temporary sediment barrier consisting of filter fabric stretched across and attached to supporting posts, entrenched, and, depending upon the strength of the fabric used, supported with wire fence. Silt fences trap sediment in two ways: (1) by intercepting and detaining small amounts of sediment from disturbed areas during construction operations in order to promote sedimentation behind the fence; and (2) by decreasing the velocity of low flows (up to 0.5 cfs) in swales.

Silt fences may be used for perimeter control, placed upstream of the point(s) of discharge of sheet flow from a site. They may also be used as interior controls below disturbed areas where runoff may occur in the form of sheet and rill erosion, and perpendicular to minor swales or ditch lines for up to one acre contributing drainage areas. Silt fences are generally ineffective in locations where the flow is concentrated and are only applicable for sheet or overland flows.

Installation/Application

Planning:

Silt fences are generally most effective when the following placement criteria are followed:

- Limit the upstream drainage area to 1 acre or less when used alone or in combination with sediment basin in a larger site.
- The maximum slope perpendicular to the fence line should be 1:1.
- Limit the maximum sheet or overland flow path length to any point along the fence to 100 feet.
- Limit the concentrated flows reaching the fence to 0.5 cfs.

Silt fences are preferable to straw barriers in many cases. Laboratory work at the Virginia Highway and Transportation Research Council has shown that silt fences can trap a much higher percentage of suspended sediments than can straw bales. While the failure rate of silt fences is lower than that of straw barriers, there are many instances where silt fences have been improperly installed. The following installation methods can improve performance and should be followed:

- Construct the silt fence along a level contour.
- Silt fences should remain in place until the disturbed area is permanently stabilized.
- Provide sufficient room for runoff to pond behind the fence and to allow sediment removal equipment to pass between the silt fence and toes of slopes or other obstructions. About 1200 sq. ft. of ponding area should be provided for every acre draining to the fence.
- Turn the ends of the filter fence uphill to prevent storm water from flowing around the fence.
- Leave an undisturbed or stabilized area immediately downslope from the fence.
- Do not place in live streams or intermittently flowing channels.

Design:

Selection of a filter fabric is based on soil conditions at the construction site (which affect the equivalent opening size (EOS) fabric specification) and characteristics of the support fence (which affect the choice of tensile strength). The designer should specify a filter fabric that retains the soil found on the construction site yet will have openings large enough to permit drainage and prevent clogging. The following criteria is recommended for selection of the equivalent opening size:

1. If 50 percent or less of the soil, by weight, will pass the U.S. standard sieve No. 200, select the EOS to retain 85 percent of the soil. The EOS should not be finer than EOS 70.
2. For all other soil types, the EOS should be no larger than the openings in the U.S. Standard Sieve No. 70 [0.0083 in. (0.21 mm.)] except where direct discharge to a stream, lake, or wetland will occur, then the EOS should be no larger than Standard Sieve No. 100.

ESC50

Best Management Practices

Additional Information — Silt Fence

To reduce the chance of clogging, it is preferable to specify a fabric with openings as large as allowed by the criteria. No fabric should be specified with an EOS smaller than U.S. Standard Sieve No. 100 [0.0059 in. (0.15 mm.)]. If 85 percent or more of a soil, by weight, passes through the openings in a No. 200 sieve [0.0029 in. (0.074 mm.)], filter fabric should not be used. Most of the particles in such a soil would not be retained if the EOS was too large, and they would clog the fabric quickly if the EOS was small enough to capture the soil.

The fence should be supported by a wire mesh if the fabric selected does not have sufficient strength and bursting strength characteristics for the planned application (as recommended by the fabric manufacturer). Filter fabric material should contain ultraviolet ray inhibitors and stabilizers to provide a minimum of six months of expected usable construction life at a temperature range of 0° F. to 120° F.

Installation Guidelines:
Filter fences are to be constructed on a level contour. Sufficient area should exist behind the fence for ponding to occur without flooding or overtopping the fence.

- Posts should be spaced a maximum of 6 feet apart and driven securely into the ground a minimum of 30 inches.
- A trench should be excavated approximately 8 inches wide and 12 inches deep along the line of posts and upslope from the barrier.
- When standard strength filter fabric is used, a wire mesh support fence should be fastened securely to the upslope side of the posts using heavy-duty wire staples at least 1 inch long, tie wires or hog rings. The wire should extend into the trench a minimum of 4 inches.
- The standard strength filter fabric should be stapled or wired to the fence, and 40 inches of the fabric should extend into the trench. When extra-strength filter fabric and closer post spacing are used, the wire mesh support fence may be eliminated and the filter fabric stapled or wired directly to the posts.
- Avoid the use of joints. The filter fabric should be purchased in a continuous roll, then cut to the length of the barrier. When joints are necessary, filter cloth should be spliced together only at a support post, with a minimum 6 inch overlap, and both ends securely fastened to the post.
- The trench should be backfilled with compacted native material.

Requirements
Maintenance:

Inspect monthly during dry periods and immediately after each rainfall. Repair as necessary. Sediment must be removed when it reaches approximately one third the height of the fence, especially if heavy rains are expected.

Filter fences should not be removed until the upslope area has been permanently stabilized.

Limitations
- Filter fences will create a temporary sedimentation pond on the upstream side of the fence and may cause temporary flooding. Fences not constructed on a level contour will be overtopped by concentrated flow resulting in failure of the filter fence.
- Filter fences are not practical where large flows of water are involved, hence the need to restrict their use to drainage areas of one acre or less, and flow rates of less than 0.5 cfs.
- Problems may arise from incorrect selection of pore size and/or improper installation.
- Do not allow water depth to exceed 1.5 ft. at any point.
- Improperly installed fences are subject to failure from undercutting, overlapping, or collapsing.

ESC50

Additional Information — Silt Fence

REFERENCES

Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Maricopa County, Arizona, September1992.

Environmental Action Manual, City of Austin, Texas, 1989.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, Jun 1981.

Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group Working Paper, USEPA, April, 1992.

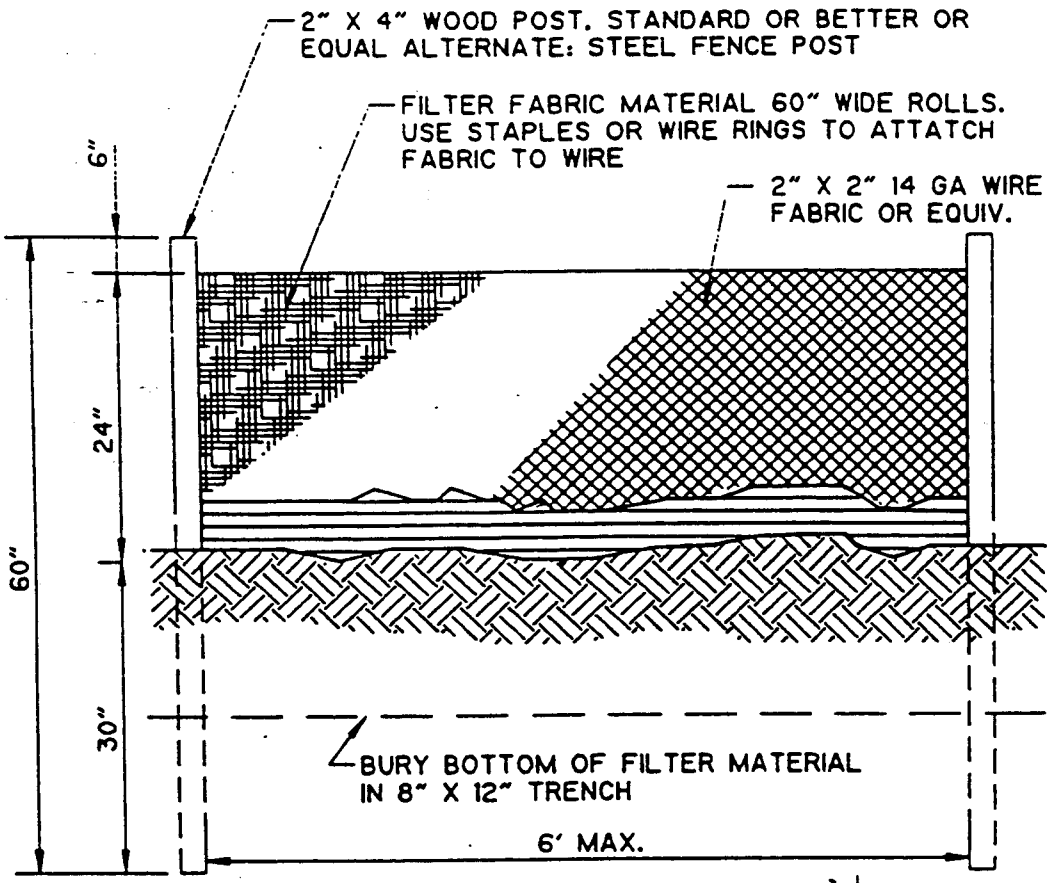
Sedimentation and Erosion Control Practices, An Introductory of Current Practices (Draft), USEPA, 1990.

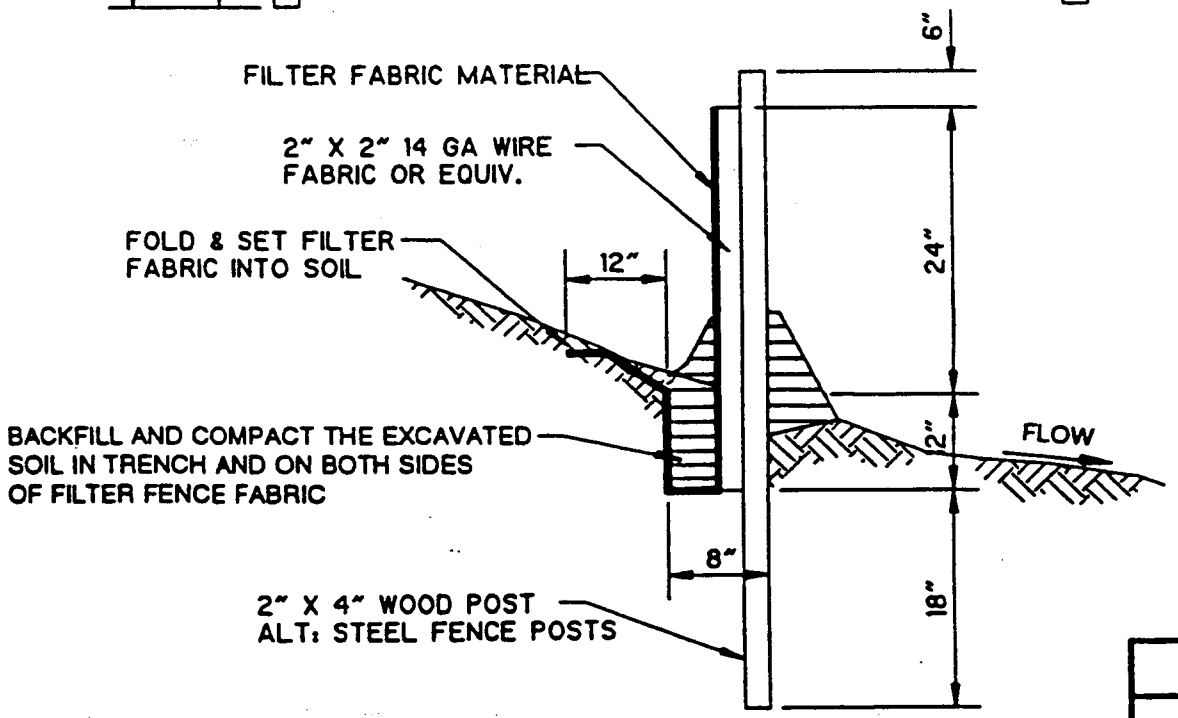
Stormwater Management Manual for The Puget Sound Basin, Washington State Department of Ecology, Public Review Draft, 1991.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency - November 1988.

ESC50

Additional Information — Silt Fence

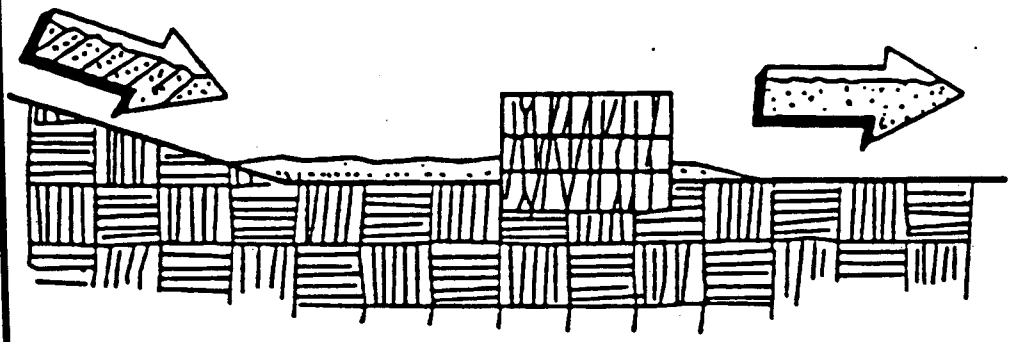




SILT FENCE

ESC50

BMP: STRAW BALE BARRIERS



Objectives

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- (Control Site Perimeter)
- (Control Internal Erosion)

GENERAL DEFINITION

A straw bale barrier consists of straw bales placed end to end along a level contour in a shallow trench and staked to hold them in place. The barrier detains runoff, creating a pond behind the barrier where sedimentation occurs.

SUITABLE APPLICATIONS

- Along the perimeter of the site.
- Along streams and channels.
- Across swales with small catchments.
- Around temporary spoil areas.
- Below other small, cleared areas.

INSTALLATION/APPLICATION CRITERIA

- Use primarily in areas where sheet or rill flow occurs.
- No more than 1/4 acre per 100 feet of barrier should drain to the barrier.
- Install along a level contour.
- Place in a 4-inch deep trench.
- Backfill and compact the excavated soil on the upstream face of the barrier.
- Secure each bale with two stakes.
- Leave enough area (about 1200 sq. ft. per acre) behind the barrier for runoff to pond (no more than 1.5 ft. depth) and sediment to settle.

REQUIREMENTS

- Maintenance
  - Inspect weekly and after each rain.
  - Replace bales which have decomposed or whose bindings have broken.
  - Remove sediment behind the barrier when it reaches a depth of 6 inches.
- Costs (source: EPA, 1992)
  - Average annual cost for installation and maintenance (assumes 3 month useful life): $17 per lineal foot ($6,800 per drainage acre).

LIMITATIONS

- Straw bale barriers are not to be used for extended periods of time because they tend to rot and fall apart.
- Suitable only for sheet flow on slopes of 2% or flatter.
- Not appropriate for large drainage areas, limit to one acre or less.
- Straw bales lose their effectiveness rapidly due to rotting, thus constant maintenance is required.
- Not recommended for concentrated flow, inlet protection, channel flow, and live streams.
- Bale bindings of jute or cotton not recommended.

Targeted Pollutants

- ● Sediment
- ○ Nutrients
- ○ Toxic Materials
- ○ Oil & Grease
- ○ Floatable Materials
- ○ Other Construction Waste

- ● Likely to Have Significant Impact
- ○ Probable Low or Unknown Impact

Implementation Requirements

- ● Capital Costs
- ● O&M Costs
- ● Maintenance
- ○ Training
- ○ Suitability for Slopes >5%

● High ○ Low

ESC51

Best Management Practices

- Straw bale barriers have not been as effective as expected due to improper use. These barriers have been placed in streams and drainageways where runoff volumes and velocities have caused the barriers to wash out. In addition, failure to stake and entrench the straw bale has allowed undercutting and end flow.

ESC51

Additional Information — Straw Bale Barrier

A straw bale barrier consists of a series of secured anchored bales placed to intercept sediment-laden runoff from small drainage areas of disturbed soil. The barrier ponds runoff and allow sediment to settle. Straw bale dikes should not be used for extended periods of time because they tend to rot and fall apart.

The straw bale barrier is used where there are no concentrations of water in a channel or drainageway, and where erosion would occur from sheet flow. These barriers are typically constructed below disturbed areas subject to sheet flow of runoff.

Installation/Application

Straw bale barriers should be used for drainage areas no more than 1/4 acre per 100 feet of barrier length, with no more than 100 ft upstream of any point along the barrier. The barrier should be placed along a level contour no greater than 2:1. When installed and maintained according to the guidelines on this fact sheet, straw bale dikes remove approximately 67% of the sediment transported in construction site runoff. This optimum efficiency can only be achieved through careful maintenance, with special attention to replacing rotted or broken bales. The barrier should be constructed on a level contour to prevent concentration of flow against a small portion of the barrier.

An effective straw bale barrier should be installed in the following manner:

1. Bales should be placed on the contour and in a row with ends tightly abutting the adjacent bales.
2. Leave area for runoff to pond upstream of the barrier by locating barrier away from the toe of slopes. This also provides access for maintenance.
3. Each bale should be embedded in the soil a minimum of (4) inches and placed so the bindings are horizontal. Bindings placed on soil will soon disintegrate and cause the barrier to fail.
4. Bales should be securely anchored in place by either two stakes or re-bars driven through the bale. The first stake in each bale should be driven toward the previously laid bale at an angle to force the bales together. Stakes should be driven flush with the bale.
5. Backfill and compact the excavated soil along the upstream face of the barrier.
6. Remove the barrier when it has served its usefulness so as not to block or impede storm flow or drainage.

REFERENCES

Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Maricopa County, Arizona, September 1992.

"Draft - Sedimentation and Erosion Control, An Inventory of Current Practices", U.S.E.P.A., April, 1990.

"Environmental Criteria Manual", City of Austin, Texas.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, Jun 1981.

Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group Working Paper, USEPA, April, 1992.

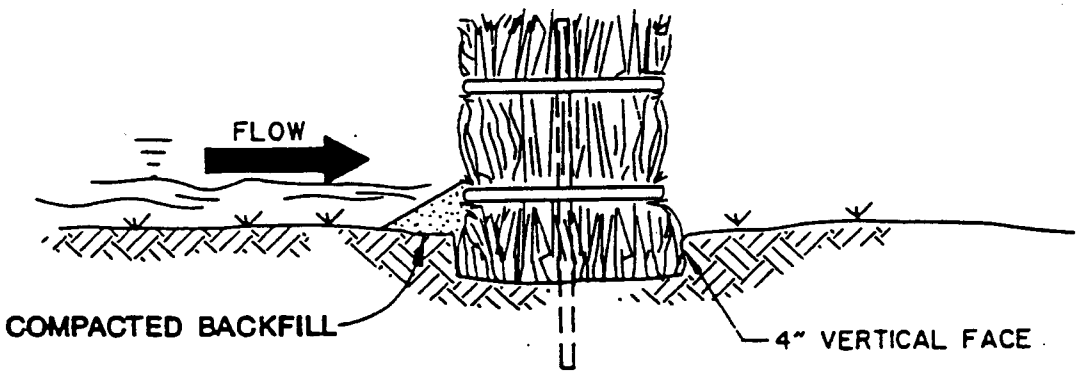
Stormwater Management Water for the Puget Sound Basin, Washington State Department of Ecology, The Technical Manual - February 1992, Publication # 91-75.

Water Quality for Construction Businesses, City of Bellevue, Washington.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency - November 1988.

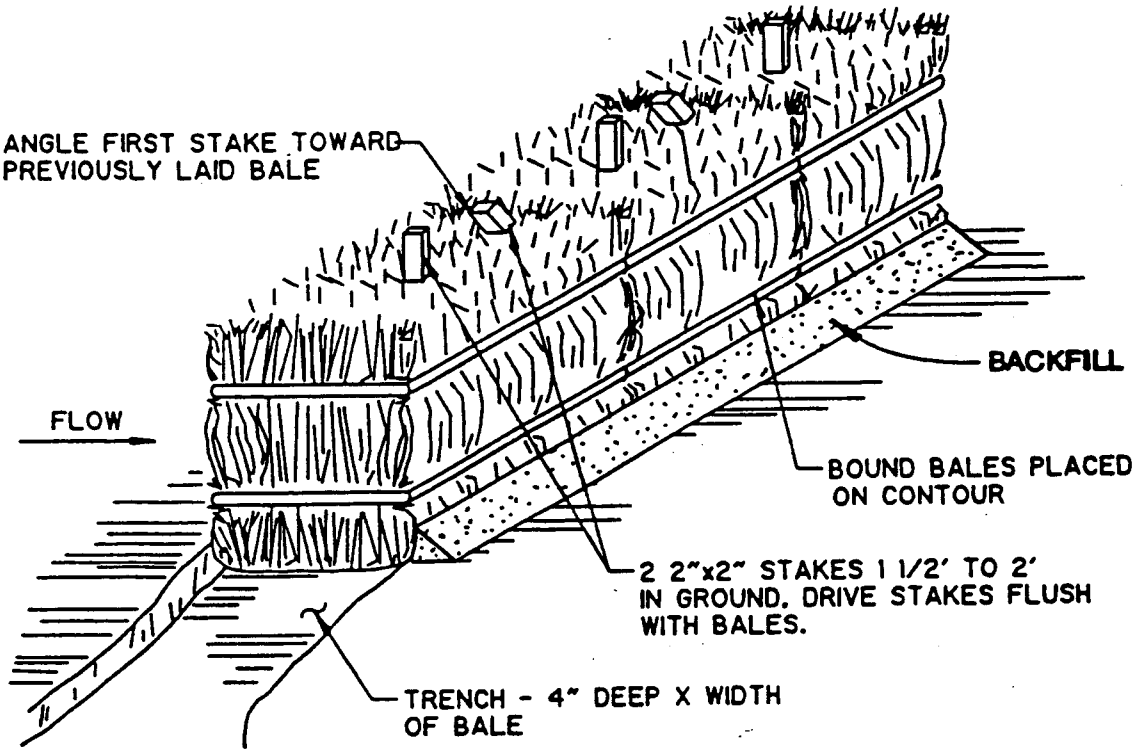
ESC51

Additional Information — Straw Bale Barrier



- PROMOTES ON SITE SEDIMENTATION BY CREATING A TEMPORARY POND.

BEDDING DETAIL



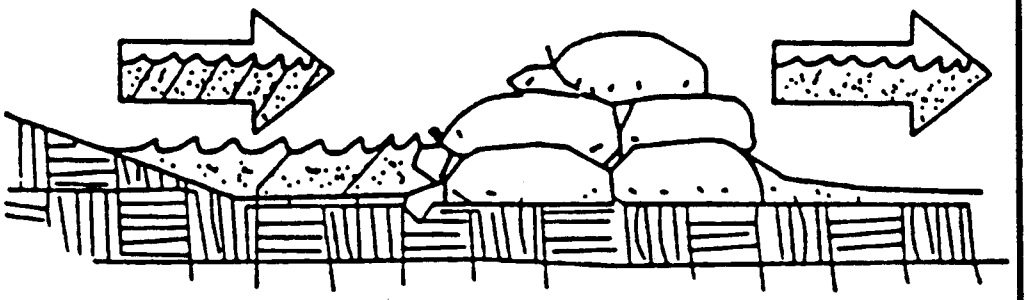
SUBSTITUTION OF STEEL BARS FOR WOODEN STAKES IS NOT RECOMMENDED DUE TO POTENTIAL FOR DAMAGING CONSTRUCTION EQUIPMENT

ANCHORING DETAIL

STRAW BALE BARRIERS

ESC51

BMP: SAND BAG BARRIER



Objectives

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- Control Site Perimeter
- Control Internal Erosion

GENERAL DEFINITION

Stacking sand bags along a level contour creates a barrier which detains sediment-laden water, ponding water upstream of the barrier and promoting sedimentation.

SUITABLE APPLICATIONS

- Along the perimeter of the site.
- Check dams across streams and channels.
- Along streams and channels.
- Barrier for utility trenches in a channel.
- Across swales with small catchments.
- Division dike or berm.
- Below the toe of a cleared slope.
- Create a temporary sediment trap.
- Around temporary spoil areas.
- Below other small cleared areas.

INSTALLATION/APPLICATION CRITERIA

- May be used in drainage areas up to 5 acres.
- Install along a level contour.
- Base of sand bag barrier should be at least 48 inches wide.
- Height of sand bag barrier should be at least 18 inches high.
- 4 inch PVC pipe may be installed between the top layer of sand bags to drain large flood flows.
- Provide area behind barrier for runoff to pond and sediment to settle, size according to sediment trap BMP criteria (ESC55).
- Place <u>below</u> the toe of a slope.
- Use sand bags large enough and sturdy enough to withstand major flooding.

REQUIREMENTS

- Maintenance
  - Inspect after each rain.
  - Reshape or replace damaged sand bags immediately.
  - Remove sediment when it reaches six inches in depth.
- Cost
  - Sand bag barriers are more costly, but typically have a longer useful life than other barriers.

LIMITATIONS

- Sand bags are more expensive than other barriers, but also more durable.
- Burlap should not be used for sand bags.

Targeted Pollutants

- ● Sediment
- ○ Nutrients
- ○ Toxic Materials
- ○ Oil & Grease
- ○ Floatable Materials
- ○ Other Construction Waste

● Likely to Have Significant Impact
○ Probable Low or Unknown Impact

Implementation Requirements

- ● Capital Costs
- ○ O&M Costs
- ○ Maintenance
- ○ Training
- ◒ Suitability for Slopes >5%

● High ○ Low

ESC52

Best Management Practices

Additional Information — Sand Bag Barrier

Suitable Applications

Sand bag berms may be used during construction activities in stream beds and utility construction in channels, temporary channel crossing for construction equipment, etc. Sand bag berms may also be installed parallel to roadway construction. Sand bag berms may also be used to create temporary sediment traps, retention basins and in place of straw bales or silt fences. Examples of applications include:

- Check dams across stream channels.
- Barriers for utility trenches or other construction in a stream channel.
- At temporary channel crossings.
- May be used on a slope where straw bales and silt fences are not appropriate.
- As a diversion dike.
- Embankment for a temporary sediment basin or retention basin.
- Sediment barriers near the toe of slopes.
- At construction perimeter.

Advantages

- Provides a semi-permeable barrier in potentially wet areas.
- More permanent than silt fences or straw bales.
- Allows for easy relocation on site to meet changing needs during construction.

Installation/Application

Sand bag barriers may be used for sediment trapping in locations where silt fences and straw bale barriers are not strong enough. In addition, sand bag barriers are appropriate to use when construction of check dams or sumps in a stream is undesirable. The sand bag berms can provide the same function as a check dam without disturbing the stream or vegetation. The sand bag berm will also allow a small sediment retention area to be created prior to construction of final detention basins. For installation of a sand bag berm, the following criteria should be observed:

- Drainage Area - Up to five (5) acres.
- Height of Berm - 18 inches minimum height, measured from the top of the existing ground at the upslope toe to the top of the barrier.
- Width of Berm - 48 inches minimum width measured at the bottom of the barrier; 18 inches at the top.
- Sand bag Size - Length 24 to 30 inches, width 16 to 18 inches and thickness six (6) to eight (8) inches. Weight 90 to 125 pounds.
- Sand bag Material - Polypropylene, polyethylene or polyamide woven fabric, minimum unit weight four (4) ounces per square yard, mullen burst strength exceeding 300 psi and ultraviolet stability exceeding 70 percent. Use of burlap is discouraged since it rots and deteriorates easily.
- Grade of Sand - Coarse sand, gravel.
- Runoff water should be allowed to flow over the tops of the sand bags or through four (4) inch polyvinyl chloride pipes embedded below the top layer of bags.
- Area behind the sand bag barrier should be established according to sizing criteria for sediment trap BMP (ESC55).

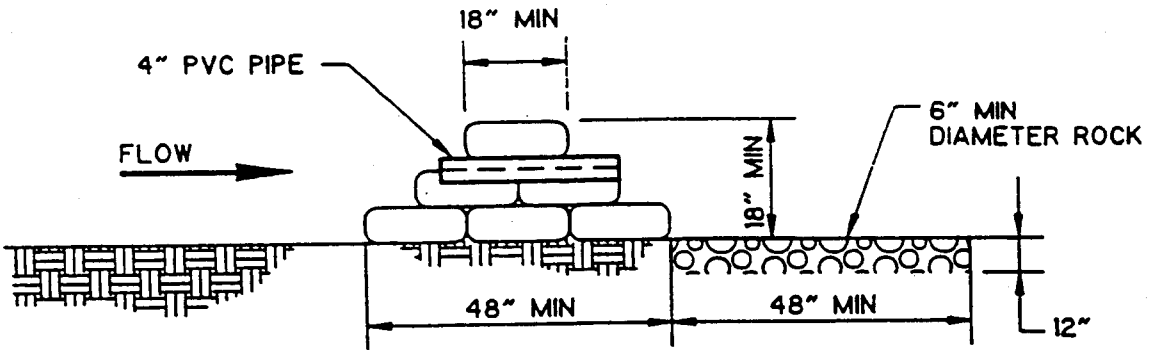
REFERENCES

Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Maricopa County, Arizona, September 1992.

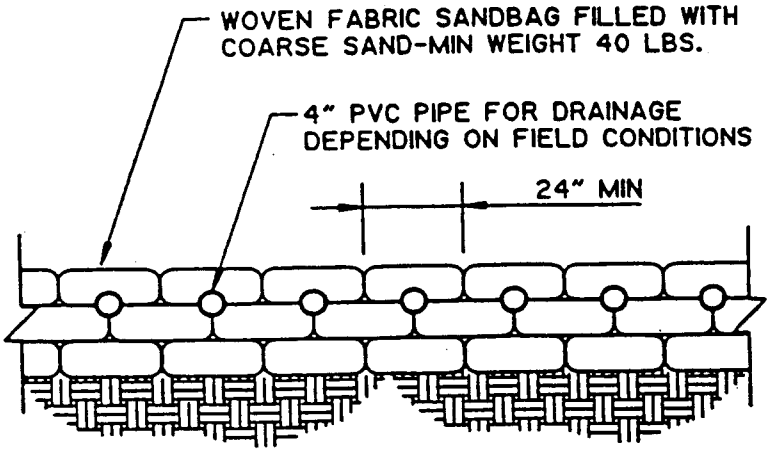
Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency - November 1988.

ESC52

Additional Information — Sand Bag Barrier



CROSS-SECTION

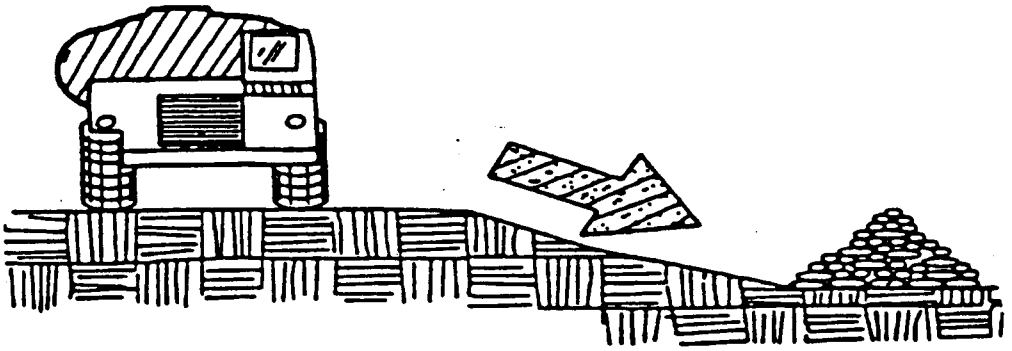


FRONT VIEW

SAND BAG BERM

ESC52

BMP: BRUSH OR ROCK FILTER



Objectives

- *Housekeeping Practices*
- *Contain Waste*
- *Minimize Disturbed Areas*
- *Stabilize Disturbed Areas*
- *Protect Slopes/Channels*
- *Control Site Perimeter*
- *Control Internal Erosion*

GENERAL DEFINITION

A rock filter berm is made of rock 3/4 to 3 inches in diameter and placed along a level contour where sheet flow may be detained and ponded, promoting sedimentation. A brush barrier is composed of brush (usually obtained during the site clearing) wrapped in filter cloth and anchored to the toe of the slope. If properly anchored brush or rock filters may be used for sediment trapping and velocity reduction. See Check Dam BMP (ESC41) for more information.

SUITABLE APPLICATIONS

- As check dams across mildly sloped construction roads.
- Below the toe of slopes.
- Along the site perimeter.
- Along streams and channels.
- Around temporary spoil areas.
- Below other small cleared areas.
- At sediment traps at culvert/pipe outlets.

INSTALLATION/APPLICATION CRITERIA

- Use principally in areas where sheet or rill flow occurs.
- For rock filter, use larger rock and place in a staked, woven wire sheathing if placed where concentrated flows occur.
- Install along a level contour.
- Leave area behind berm where runoff can pond and sediment can settle.
- Drainage area should not exceed 5 acres.

REQUIREMENTS

- Maintenance
  - Inspect monthly and after each rainfall.
  - If berm damaged, reshape and replace lost/dislodged rock.
  - Remove sediments when depth reaches 1/3 of berm height, or 1 ft.
- Cost
  - Brush filter: Low to moderate cost if debris from on-site clearing and grubbing is used.
  - Rock filter: Expensive, since off-site materials, hand construction and demolition/removal are usually required.

Targeted Pollutants

- ● *Sediment*
- ○ *Nutrients*
- ○ *Toxic Materials*
- ○ *Oil & Grease*
- ○ *Floatable Materials*
- ○ *Other Construction Waste*

● *Likely to Have Significant Impact*
○ *Probable Low or Unknown Impact*

Implementation Requirements

- ◒ *Capital Costs*
- ◒ *O&M Costs*
- ○ *Maintenance*
- ○ *Training*
- ◒ *Suitability for Slopes >5%*

● *High* ○ *Low*

ESC53

Best Management Practices

Attachment 2

Reissuance of NPDES General Permits for Stormwater Discharges from Activities in Region 6

Federal Register

Monday
July 6, 1998

Part II

Environmental Protection Agency

Reissuance of NPDES General Permits for Storm Water Discharges From Construction Activities in Region 6; Notice

ENVIRONMENTAL PROTECTION AGENCY

[FRL-6119-7]

Reissuance of NPDES General Permits for Storm Water Discharges from Construction Activities in Region 6

AGENCY: Environmental Protection Agency (EPA).

ACTION: Notice of final NPDES general permits.

SUMMARY: Region 6 is issuing the final National Pollutant Discharge Elimination System (NPDES) general permits for storm water discharges associated with construction activity in Region 6. EPA first issued permits for these activities in September 1992. These permits subsequently expired in September 1997. Today's permits, which replace those expired permits, are similar to the permits issued in 1992. The main changes from those 1992 permits are summarized in the SUPPLEMENTARY INFORMATION section, below.

ADDRESSES: The index to the administrative record and the complete administrative record are available at the Water Docket, MC-4101, U.S. EPA, 401 M Street SW, Washington, DC 20460. Copies of information in the record are available upon request. A reasonable fee may be charged for copying. The index to the administrative record is also available from EPA Region 6, Water Quality Protection Division, Customer Service Branch (6WQ-CA) 1445 Ross Avenue, Suite 1200, Dallas, TX 75202.

DATES: These general permits shall be effective on July 6, 1998.

NOTICE OF INTENT: A NOTICE OF INTENT (NOI) FORM MUST BE SUBMITTED TO OBTAIN COVERAGE FOR STORM WATER DISCHARGES UNDER THESE PERMITS. THE NOI FORM IS GIVEN IN ADDENDUM C OF THESE PERMITS. DEADLINES FOR SUBMITTAL OF NOI'S ARE PROVIDED IN PART II.A OF THE PERMITS.

FOR FURTHER INFORMATION CONTACT: For further information on the NPDES Construction General Permits, call the EPA Region 6 Storm Water Hotline at 1-800-245-6510. Information is also available through the EPA Region 6's storm water web site at "http://www.epa.gov/region6/sw/ and on the PIPES bulletin board web site at "http://pipes.ehsg.saic.com/pipes.htm".

SUPPLEMENTARY INFORMATION:

Contents

I. Introduction
II. Answers to Common Questions
III. Section 401 Certification and Coastal Zone Management Act
IV. Endangered Species Protection
V. Historic Properties Protection
VI. Regulatory Review (Executive Order 12866)
VII. Unfunded Mandates Reform Act
VIII. Paperwork Reduction Act
IX. Regulatory Flexibility Act

I. Introduction

The United States Environmental Protection Agency Region 6 office is reissuing the general permits which authorizes the discharge storm water associated with construction activity. As used in this permit, "storm water associated with construction activity" means construction activity disturbing at least five acres, or construction activity disturbing less than five acres which is part of a larger common plan of development or sale with the potential to disturb cumulatively five or more acres (*See* 40 CFR 122.26(b)(14)(x)).

These permits replace the previous Baseline Construction General Permits which were issued for a five-year term in September 1992. The most significant changes from the 1992 permits are:

► New conditions to protect listed endangered and threatened species and critical habitats;

► Expanded coverage to construction sites under five acres of disturbed land which are not part of a larger common plan of development or sale when an operator has been designated by the Director to obtain coverage.

► A requirement to post at the construction site the confirmation of permit coverage (the permit number or copy of the Notice of Intent (NOI) if a permit number has not yet been assigned) including a brief description of the project;

► Storm water pollution prevention plan performance objectives have been added.

These general permits for storm water discharges associated with construction activity was proposed on June 2, 1997 (62 FR 29786), and are hereby issued for the following areas in Region 6: The States of New Mexico and Texas; Indian Country lands in Louisiana, Oklahoma, Texas and New Mexico (except Navajo Reservation Lands and Ute Mountain Reservation Lands); and oil and gas construction in the State of Oklahoma.

II. Answers to Common Questions

In this section, EPA provides answers to some of the more common questions on the construction storm water permitting program. These answers are fairly broad and may not take into account all scenarios possible at construction sites. More details on these issues are provided at 63 FR 7858 (February 17, 1998) in the "Summary of Responses to Comments on the Proposed Permit" section of the reissuance of NPDES General Permits From Construction Activities for Regions 1, 2, 3, 7, 8, 9 and 10.

How do I Know if I Need a Permit?

You need a storm water permit if you can be considered an "operator" of the construction activity that would result in the "discharge of storm water associated with construction activity." You must become a permittee if you meet either of the following two criteria:

► You have operational control of construction project plans and specifications, including the ability to make modifications to those plans and specifications; or

► You have day-to-day operational control of those activities at a project which are necessary to ensure compliance with a storm water pollution prevention plan (SWPPP) for the site or other permit conditions (e.g., you are authorized to direct workers at a site to carry out activities required by the SWPPP or comply with other permit conditions).

There may be more than one party at a site performing the tasks relating to "operational control" as defined above. Depending on the site and the relationship between the parties (e.g., owner, developer), there can either be a single party acting as site operator and consequently be responsible for obtaining permit coverage, or there can be two or more operators with all needing permit coverage. The following are three general operator scenarios (variations on any of the three are possible as the number of "owners" and contractors increases):

► *Owner as Sole Permittee.* The property owner designs the structures for the site, develops and implements the SWPPP, and serves as general contractor (or has an on-site representative with full authority to direct day-to-day operations). He may be the only party that needs a permit, in which case everyone else on the site may be considered subcontractors and not need permit coverage.

► *Contractor as Sole Permittee.* The property owner hires a construction company to design the project, prepare the SWPPP, and supervise implementation of the plan and compliance with the permit (e.g., a "turnkey" project). Here, the contractor would be the only party needing a permit. It is under this scenario that an individual having a personal residence built for his own use (e.g., not those to be sold for profit or used as rental property) would not be considered an

operator. EPA believes that the general contractor, being a professional in the building industry, should be the entity rather than the individual who is better equipped to meet the requirements of both applying for permit coverage and developing and properly implementing a SWPPP. However, individuals would meet the definition of "operator" and require permit coverage in instances where they perform general contracting duties for construction of their personal residences.

► *Owner and Contractor as Co-Permittees.* The owner retains control over any changes to site plans, SWPPPs, or storm water conveyance or control designs; but the contractor is responsible for overseeing actual earth disturbing activities and daily implementation of SWPPP and other permit conditions. In this case, both parties may need coverage.

However, you are probably not an operator and subsequently do not need permit coverage if:

► You are a subcontractor hired by, and under the supervision of, the owner or a general contractor (i.e., if the contractor directs your activities on-site, you probably are not an operator); or

► your activities on site result in earth disturbance and you are not legally a subcontractor, but a SWPPP specifically identifies someone other than you (or your subcontractor) as the party having operational control to address the impacts your activities may have on storm water quality (i.e., another operator has assumed responsibility for the impacts of your construction activities). This particular provision will apply to most utility service line installations. For further information concerning whether utility service line installations meet the definition of operator and require permit coverage, see the discussion under "Installation of Utility Service Lines" in Section VIII, Summary Response to Public Comments of the Fact Sheet.

In addition, for purposes of this permit and determining who is an operator, "owner" refers to the party that owns the structure being built. Ownership of the land where construction is occurring does not necessarily imply the property owner is an operator (e.g., a landowner whose property is being disturbed by construction of a gas pipeline). Likewise, if the erection of a structure has been contracted for, but possession of the title or lease to the land or structure is not to occur until after construction, the would-be owner may not be considered an operator (e.g., having a house built by a residential homebuilder).

My Project Will Disturb Less Than Five Acres, but It May Be Part of a "Larger Common Plan of Development or Sale." How Can I Tell and What Must I do?

If your smaller project is part of a larger common plan of development or sale that collectively will disturb five or more acres (e.g., you are building on six half-acre residential lots in a 10-acre development or are putting in a parking lot in a large retail center) you need permit coverage. The "plan" in a common plan of development or sale is broadly defined as any announcement or piece of documentation (including a sign, public notice or hearing, sales pitch, advertisement, drawing, permit application, zoning request, computer design, etc.) or physical demarcation (including boundary signs, lot stakes, surveyor markings, etc.) indicating construction activities may occur on a specific plot. You must still meet the definition of operator in order to be required to get permit coverage, regardless of the acreage you personally disturb. As a subcontractor, it is unlikely you would need a permit.

For some situations where less than five acres of the original common plan of development remain undeveloped, a permit may not be needed for the construction projects "filling in" the last parts of the common plan of development. A case in which a permit would not be needed is where several empty lots totaling less than five acres remain after the rest of the project had been completed, providing stabilization had also been completed for the entire project. However, if the total area of all the undeveloped lots in the original common plan of development was more than five acres, a permit would be needed.

When Can You Consider Future Construction on a Property To Be Part of a Separate Plan of Development or Sale?

In many cases, a common plan of development or sale consists of many small construction projects that collectively add up to five (5) or more acres of total disturbed land. For example, an original common plan of development for a residential subdivision might lay out the streets, house lots, and areas for parks, schools and commercial development that the developer plans to build or sell to others for development. All these areas would remain part of the common plan of development or sale until the intended construction occurs. After this initial plan is completed for a particular parcel, any subsequent development or redevelopment of that parcel would be regarded as a new plan of development, and would then be subject to the five-acre cutoff for storm water permitting.

What Must I do to Satisfy The Permit Eligibility Requirements Related to Endangered Species?

In order to be eligible for this permit, you must follow the procedures and examples found in Addendum A for the protection of endangered species. You cannot submit your NOI until you are able to certify your eligibility for the permit. Enough lead time should be built into your project schedule to accomplish these procedures. If another operator has certified eligibility for the project (or at least the portion of the project you will be working on) in his NOI, you will usually be able to rely on his certification of project eligibility and not have to repeat the process. EPA created this "coat tail" eligibility option for protection of endangered species to allow the site developer/owner to obtain up-front "clearance" for a project, thereby avoiding duplication of effort by his contractors and unnecessary delays in construction.

What Does the Permit Require Regarding Historic Preservation?

Today's permit does not currently impose requirements related to historic preservation, though EPA may modify the permit at a later date after further discussions with the Advisory Council on Historic Preservation. Therefore, under today's permit, EPA will conduct consultations as it did under the pre-existing Baseline Construction General Permit on a case-by-case basis as needed. Removal of the proposed permit provisions related to historic preservation in no way relieves applicants and permittees of their obligations to comply with applicable State, Tribal or local laws for the preservation of historic properties. EPA reminds permittees that according to section 110(k) of the National Historic Preservation Act (NHPA), an intentional action to significantly adversely affect historic resources with intent to avoid Federal historic preservation requirements may jeopardize future permit coverage for such a permittee.

How Many Notices of Intent (NOIs) Must I Submit? Where and When Are They Sent?

You only need to submit one NOI to cover all activities on any one common plan of development or sale. The site map you develop for the storm water pollution prevention plan identifies which parts of the overall project are

under your control. For example, if you are a homebuilder in a residential development, you need submit only one NOI to cover all your lots, even if they are on opposite sides of the development.

The NOI must be postmarked two days before you begin work on site. The address for submitting NOIs is found in the instruction portion of the NOI form and in Part II.C. of the CGP. You must also look in Part X of the permit to determine if copies of the NOI form are to be sent to a State or Indian Tribe.

If I Am on an ongoing Construction Project, do I Have to Fill in a New NOI To Be Covered by the Permit?

Yes, if you are on an ongoing construction project, a construction project which started prior to the effective date of this permit, you must complete a revised NOI Form (EPA Form 3510-9) to obtain coverage under this permit. However, applicants who have previously submitted an NOI for permit coverage prior to the effective date of this permit have the option to leave the section regarding Addendum A on endangered species blank unless there is a potential impact on endangered species or their habitat.

How do I Know Which Permit Conditions Apply to Me?

You are responsible for complying with all parts of the permit that are applicable to the construction activities you perform. Part III.E. of the permit defines the roles of various operators at a site. In addition, several States and Indian Tribes require alternative or additional permit conditions, and these can be found in Part X of the permit.

Do I Have Flexibility in Preparing the Storm Water Pollution Prevention Plan (SWPPP) and Selecting Best Management Practices (BMPs) for My Site?

Storm water pollution prevention plan requirements were designed to allow maximum flexibility to develop the needed storm water controls based on the specifics of the site. Some of the factors you might consider include: more stringent local development requirements and/or building codes; precipitation patterns for the area at the time the project will be underway; soil types; slopes; layout of structures for the site; sensitivity of nearby water bodies; safety concerns of the storm water controls (e.g., potential hazards of water in storm water retention ponds to the safety of children; the potential of drawing birds to retention ponds and the hazards they pose to aircraft); and coordination with other site operators.

Must Every Permittee Have His Own Separate SWPPP or Is a Joint Plan Allowed?

The only requirement is that there be at least one SWPPP for a site which incorporates the required elements for all operators, but there can be separate plans if individual permittees so desire. EPA encourages permittees to explore possible cost savings by having a joint SWPPP for several operators. For example, the prime developer could assume the inspection responsibilities for the entire site, while each homebuilder shares in the installation and maintenance of sediment traps serving common areas.

If a Project Will Not Be Completed Before This Permit Expires, How Can I Keep Permit Coverage?

If the permit is reissued or replaced with a new one before the current one expires, you will need to comply with whatever conditions the new permit requires in order to transition coverage from the old permit. This usually includes submitting a new NOI. If the permit expires before a replacement permit can be issued, the permit will be administratively "continued." You are automatically covered under the continued permit, without needing to submit anything to EPA, until the earliest of:

- The permit being reissued or replaced;
- Submittal of a Notice of Termination (NOT);
- Issuance of an individual permit for your activity; or
- The Director issues a formal decision not to reissue the permit, at which time you must seek coverage under an alternative permit.

When Can I Terminate Permit Coverage? Can I Terminate Coverage (i.e., Liability for Permit Compliance) Before the Entire Project Is Finished?

You can submit an NOT for your portion of a site providing: (1) You have achieved final stabilization of the portion of the site for which you are a permittee (including, if applicable, returning agricultural land to its pre-construction agricultural use); (2) another operator/permittee has assumed control according to Part VI.G.2.c. of the permit over all areas of the site that have not been finally stabilized which you were responsible for (for example, a developer can pass permit responsibility for lots in a subdivision to the homebuilder who purchases those lots, providing the homebuilder has filed his own NOI); or (3) for residential construction only, you have completed temporary stabilization and the residence has been transferred to the homeowner.

III. Section 401 Certification and Coastal Zone Management Act

Section 401 of the Clean Water Act states that EPA may not issue an NPDES permit until the State in which the discharge will originate grants or waives certification to ensure compliance with appropriate requirements of the Act and State law. The Region has received section 401 certification from the appropriate States and Indian Tribes for all facilities covered by today's permits. Additional permit requirements were required as a condition of certification by the State of Texas and by the Pueblos of Isleta, Nambe, Picuris, Pojoaque, Sandia, Tesuque and Santa Clara in New Mexico. These additional permit requirements are contained in Part X of the permits.

The Coastal Zone Management Act (CZMA) requires all Federal permitting actions to be reviewed for consistency with each approved State Coastal Zone Management Plan. Texas is the only State covered by these permits that has an approved Coastal Zone Management Plan. EPA Region 6 has determined that the permit is consistent with the Texas Coastal Zone Management Plan. The Texas Coastal Zone Management Plan procedures for Federal consistency with Coastal Management Program goals and policies (31 TAC 506.12) state that if an activity requiring a state agency or subdivision action above thresholds requires an equivalent Federal permit, the Texas Coastal Coordination Council may determine the consistency of the state agency/subdivision action or the Federal permit, but not both. Permittees whose construction projects are located within the boundary of the Texas Coastal Management Program above thresholds will be required, as a part of pre-construction project approval, to have a consistency review by the Texas Council. An additional consistency review by the Texas Coastal Coordination Council of the storm water discharges from these construction projects covered by today's permit is, therefore, not required.

IV. Endangered Species Protection

A. Background

The Construction General Permit (CGP) also contains conditions to ensure the activities regulated by it are protective of species that are listed under the Endangered Species Act (ESA) as endangered or threatened (known as "listed species"), and listed species habitat that is designated under

the ESA as critical ("critical habitat"). In addition, the permit's coverage does not extend to discharges and discharge-related activities likely to jeopardize the continued existence of species proposed but not yet listed as endangered or threatened or result in the adverse modification of habitat proposed to be designated critical habitat.

The ESA places several different requirements on activities covered by the CGP. First, section 9 of the ESA and the ESA implementing regulations generally prohibit any person from "taking" a listed animal species (e.g., harassing or harming it) unless the take is authorized under the ESA. This prohibition applies to all entities and includes EPA, permit applicants, permittees and the public at large. Second, section 7(a)(2) of the ESA requires that Federal agencies consult with the Fish and Wildlife Service (FWS) or the National Marine Fisheries Service (NMFS) ("the Services") to insure that any action authorized, funded or carried out by them (also known as "agency actions") are not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitat. Jeopardizing the continued existence of a listed species means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers or distribution of that species (*See* 40 CFR 402.02).

The ESA section 7 implementing regulations at 50 CFR 402 apply this consultation requirement to any action authorized by a Federal agency that may affect listed species or critical habitat, including permits. This effect, among other things, can be beneficial, detrimental, direct and indirect. The issuance of the CGP by EPA is thus subject to the ESA section 7(a)(2) consultation requirements. Finally, ESA section 7(a)(1) directs Federal agencies to use their authority to further the purposes of the ESA by carrying out programs for the conservation of listed species, and section 7(a)(4) directs Federal agencies to confer with the Services on Agency actions likely to jeopardize the existence of species proposed but not yet finally listed or result in the adverse modification of critical habitat proposed to be designated.

The ESA regulations provide for two types of consultation: formal and informal. Informal consultation is an optional process that includes discussions, correspondence, etc. between the Services and a Federal agency or a designated non-Federal representative (NFR) to determine whether a Federal action is likely to have an adverse effect on listed species or critical habitat. During informal consultation the Services may suggest modifications to the action that a Federal agency, permit applicant or non-Federal representative could implement to avoid likely adverse effects to listed species or critical habitat. If adverse effects are likely and those effects cannot be addressed through informal consultation, then formal consultation generally occurs.

Also of relevance for the CGP are ESA section 10 incidental taking permits. Section 10 of the ESA allows persons, including non-Federal entities to incidentally take listed animal species, where otherwise prohibited, through the issuance of a permit after development of a habitat conservation plan (HCP). These procedures were developed to allow non-Federal entities such as developers to, among other things, alter habitat without incurring takings liability where take is minimized to the extent practicable.

B. Conditions in the June 2, 1997 Proposed Permit To Protect Species and Critical Habitat

The CGP was proposed with a number of conditions to ensure that storm water discharges and best management practices (BMPs) to control storm water runoff were protective of listed species or critical habitat. Specifically, coverage under the proposed CGP would be granted only under the following circumstances:

1. An applicant's storm water discharges or BMPs to control storm water runoff were not likely to adversely affect listed species (identified in Addendum A of the permit) or critical habitat; or

2. The applicant's activity was previously authorized under § 7 or § 10 of the Endangered Species Act (ESA) and that authorization addressed storm water discharges and BMPs to control storm water runoff; or

3. The applicant's activity was considered as part of a larger, more comprehensive assessment of impacts on endangered and threatened species under § 7 or § 10 of the ESA which accounted for storm water discharges and BMPs to control storm water runoff; or

4. Consultation under § 7 of the ESA was conducted for the applicant's activity which resulted in either a no jeopardy opinion or a written concurrence on a finding of no likelihood of adverse effects; or

5. The applicant's activity was considered as part of a larger, more comprehensive site-specific assessment of impacts on endangered and threatened species by the owner or other operator of the site and that permittee certified eligibility under items 1., 2., 3. or 4. above.

The proposal required that applicants assess the impacts of their "storm water discharges" and "BMPs to control storm water runoff" on listed species and critical habitat that are located "in proximity" to the those discharges and BMPs when developing Storm Water Pollution Prevention Plans (SWPPPs) as part of the application process. The proposed CGP also required applicants to include measures in SWPPPs to protect listed species and critical habitat. "In proximity" was defined in Addendum A to include species:

► Located in the path or immediate area through which or over which contaminated point source storm water flows from construction activities to the point of discharge into the receiving water;

► Located in the immediate vicinity of, or nearby, the point of discharge into receiving waters; or

► Located in the area of a site where storm water BMPs are planned or are to be constructed.

EPA also solicited comment on whether the area or scope of impacts to be considered by applicants should be broadened to encompass listed species found on the entire construction site and not just those species found "in proximity" as currently defined in Addendum A.

Failure by permittees to abide by measures in their SWPPPs to protect species and critical habitat would invalidate permit coverage. Attached to the proposed permits were instructions (Addendum A) to assist permit applicants in making this inquiry. The proposal indicated that a county-by-county species list would be included in Addendum A of the final permit to assist applicants in determining if listed species might be "in proximity" to storm water discharges and BMPs. EPA did not provide a draft species list in proposed Addendum A. Instead, EPA referred commenters to a similar species list that was used for an earlier EPA-issued storm water permit, the Multisector Storm Water General Permit, that was issued on September 29, 1995 (*See* 62 FR 29792, note 12, June 2, 1997).

C. Final CGP Conditions To Protect Listed Species

On April 28, 1997, EPA entered into formal consultation with the Fish and Wildlife Service (FWS) and the National Marine Fisheries Service (NMFS) (the "Services") for issuance of the CGP. After discussions with the Services, EPA terminated formal consultation and entered into ESA section 7 informal consultation and conferencing with the Fish and Wildlife Service (FWS) and the National Fisheries Service Services (NMFS) on June 11, 1997. On November 4, and 26, 1997, EPA completed ESA informal consultation when NMFS and FWS provided their respective concurrences with EPA's finding that issuance of the CGP was not likely to adversely affect listed species or critical habitat. However, the negotiations on CGP did not consider ongoing construction projects; i.e., construction projects which started prior to the effective date of these permits.

In January, 1998, Region 6 decided to address ESA certification issues for ongoing construction projects before finalizing the permit. In February, 1998, EPA Region 6 began a supplemental informal consultation with FWS and NMFS on language to clarify requirements for ongoing construction activity. EPA Region 6 completed ESA informal section 7 consultation and conferencing when FWS and NMFS provided their concurrences that issuance of these permits is unlikely to adversely affect listed species or critical habitat on June 9, and 15, respectively. With the completion of these consultations, EPA Region 6 has reduced the administrative burden associated with obtaining permit coverage for ongoing construction projects for the federal agencies and the regulated community.

Based on that consultation and in consideration of comments received on the June 2, 1997, proposal, EPA has placed the following conditions in the permit to protect listed species and critical habitat (*See* Part I.B.3.e). Coverage under the CGP is available for construction projects only if:

a. The storm water discharges and storm water discharge-related activities are not likely to adversely affect listed species or critical habitat (Part I.B.3.e.(2)(a)); or

b. Formal or informal consultation with the Services under section 7 of the Endangered Species Act (ESA) has been concluded which addresses the effects of the applicant's storm water discharges and storm water discharge-related activities on listed species and critical habitat and the consultation results in either a no jeopardy opinion or a written concurrence by the Service(s) on a finding that the applicant's storm water discharges and storm water discharge-related activities are not likely to adversely affect listed species or critical habitat. A section 7 consultation may occur in the context of another Federal on (e.g., an ESA section 7 consultation was performed for issuance of a wetlands dredge and fill permit for the project, or as part of a National Environmental Policy Act [NEPA] review); or

c. The applicant's construction activities are covered by a permit under section 10 of the ESA and that permit addresses the effects of the applicant's storm water discharges and storm water discharge-related activities on listed species and critical habitat (Part I.B.3.e.(2)(c)); or

d. The applicant's storm water discharges and storm water discharge-related activities were already addressed in another operator's certification of eligibility under Part I.B.3.e.(2)(a), (b), or (c) which included the applicant's project area. By certifying eligibility under Part I.B.3.e.(2)(d), the applicant agrees to comply with any measures or controls upon which the other operator's certification under Part I.B.3.e.(2)(a), (b) or (c) was based.

The CGP requires that applicants consider effects to listed species and critical habitat when developing SWPPPs and require that those plans include measures, as appropriate, to protect those resources. Failure by permittees to abide by measures in the SWPPPs to protect species and critical habitat may invalidate permit coverage.

This permit requires all projects commencing construction after the effective date of this permit, to follow the procedures provided in Addendum A of the permit when applying for permit coverage. The Director may also require any existing permittee or applicant to provide documentation of eligibility for this permit using the procedures in Addendum A, where EPA or the Fish and Wildlife Services determine that there is a potential impaction on endangered or threatened species or a critical habitat. Nothing in the permit relieves applicants which are under construction as of the effective date of this permit of their obligations they may have to comply with any requirements of the Endangered Species Act.

Addendum A contains instructions to assist permit applicants in making this inquiry. Those instructions require that applicants ascertain: (1) If their construction activities would occur in critical habitat; (2) whether listed species are in the project area; and (3) whether the applicant's storm water discharges and discharge-related activities are likely to adversely affect listed species or critical habitat. If adverse effects are likely, then applicants would have to meet one of the eligibility requirements of Part I.B.3.e.(2)(b)–(d) (paragraphs b., c., and d. above) to receive permit coverage. "Discharge-related activities" include activities which cause point source storm water pollutant discharges including but not limited to excavation, site development, and other surface disturbing activities, and measures to control, reduce or prevent storm water pollution including the siting, construction and operation of BMPs. The "project area" includes:

1. Area(s) on the construction site where storm water discharges originate and flow towards the point of discharge into the receiving waters (this includes the entire area or areas where excavation, site development, or other ground disturbance activities occur), and the immediate vicinity;

2. Area(s) where storm water discharges flow from the construction site to the point of discharge into receiving waters;

3. Area(s) where storm water from construction activities discharges into the receiving waters and the area(s) in the immediate vicinity of the point of discharge; and

4. Area(s) where storm water BMPs will be constructed and operated, including any area(s) where storm water flows to and from BMPs.

The project area will vary with the size and structure of the construction activity, the nature and quantity of the storm water discharges, the measures (including BMPs) to control storm water runoff, and the type of receiving waters

Addendum A also contains information on where to find information on listed and proposed species organized by State and county to assist applicants in determining if further inquiry is necessary as to whether listed species are present in the project area. Applicants can check the Office of Wastewater Management's website (http://www.epa.gov/owm). CGP applicants can also get updated species information for their county by calling the appropriate FWS or NMFS office. EPA Region 6 applicants can also contact the EPA Region 6 Storm Water Hotline (1–800–245–6510) for updated species information.

The CGP also requires that applicants comply with any conditions imposed under the eligibility requirements of Part I.B.3.e.(2)a., b., c., or d. above to remain eligible for coverage under this

permit. Such conditions must be incorporated in the applicant's SWPPP. The CGP does not authorize any prohibited take (as defined under section 3 of the ESA and 50 CFR 17.3) of endangered or threatened species unless such takes are authorized under sections 7 or 10 of the ESA. The CGP does not authorize any storm water discharges or storm water discharge-related activities that are likely to jeopardize the continued existence of any species that are listed or proposed to be listed as endangered or threatened under the ESA or result in the adverse modification or destruction of habitat that is designated or proposed to be designated as critical under the ESA.

It is EPA's intention to provide permit applicants with the greatest possible flexibility in meeting permit requirements for protecting listed species and critical habitat. Thus, EPA is allowing applicants to use either section 7 or section 10 ESA mechanisms to address situations where adverse effects are likely (*See* Part I.B.3.e.(2)(b) and (c)). Also, to give applicants additional flexibility in meeting the Part I.B.3.e. eligibility requirements and with the timing of informal consultations, the permit automatically designates CGP applicants as non-Federal representatives for the purpose of carrying out informal consultation. However, EPA notes that meeting ESA requirements raises difficult implementation issues on how to best ensure that the permits are protective of listed species and critical habitats without unduly burdening permit applicants, permittees, and State, local, and Federal governmental entities. Thus, EPA intends in the future to review those permit conditions and procedures that relate to the ESA and the protection of historic resources to see how well that goal has been achieved and may revise the permits if necessary to better achieve that goal.

V. Historic Property Protection

A. Background

The National Historic Preservation Act of 1966, as amended, (NHPA) establishes a national historic preservation program for the identification and protection of historic properties and resources. Under the NHPA, identification of historic properties is coordinated by the State Historic Preservation Officers (SHPOs), Tribal Historic Preservation Officers (THPOs) or other Tribal Representatives (in the absence of a THPO). Section 106 of the NHPA requires Federal agencies to take into account the effects of their actions on historic properties that are listed or eligible for listing on the National Register of Historic Places and to seek comments from the Advisory Council on Historic Preservation (ACHP). The permit was proposed with a number of conditions pertaining to the consideration of historic properties. EPA has decided to not include those conditions because the ACHP and the National Conference of State Historic Preservation Officers (NCSHPO) have requested that EPA not include such conditions in the final permit at this time. The ACHP and the NCSHPO have recommended that EPA issue the permit but recommend that EPA continue working with them and Tribes regarding the possible development of a more comprehensive and efficient approach to ensure that effects to historic properties are given appropriate consideration while ensuring undue burdens are not imposed on applicants and regulatory authorities. EPA plans to continue working with the ACHP, NCSHPO and Tribes on this effort and may modify the permit to incorporate procedures regarding the protection of historic resources at a later date.

B. Future CGP Conditions To Protect or Consider Effects to Historic Properties

In response to comments received on the permit proposal and because the Agency is still discussing historic preservation with the Advisory Council on Historic Preservation (ACHP), the final permit reserves permit requirements related to historic preservation. Today's final permit does not include the eligibility restrictions and evaluation requirements from the proposed permit. After future discussions with the ACHP, EPA may modify the permit to reflect those discussions.

VI. Regulatory Review (Executive Order 12866)

Under Executive Order 12866, (58 FR 51735 [October 4, 1993]) the Agency must determine whether the regulatory action is "significant" and therefore subject to OMB review and the requirements of the Executive Order. The Order defines "significant regulatory action" as one that is likely to result in a rule that may have an annual effect on the economy of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local or Tribal governments or communities; create a serious inconsistency or otherwise interfere with an action taken or planned by another agency; materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order. It has been determined that this re-issued general permit is not a "significant regulatory action" under the terms of Executive Order 12866.

VII. Unfunded Mandates Reform Act

Title II of the Unfunded Mandates Reform Act of 1995 (UMRA), Pub. L. 104–4, establishes requirements for Federal agencies to assess the effects of their regulatory actions on State, local, and Tribal governments and the private sector. Under UMRA section 202, EPA generally must prepare a written statement, including a cost-benefit analysis, for proposed and final rules with "Federal mandates" that may result in expenditures to State, local, and Tribal governments, in the aggregate, or to the private sector, of $100 million or more in any one year. Before promulgating an EPA rule for which a written statement is needed, UMRA § 205 generally requires EPA to identify and consider a reasonable number of regulatory alternatives and adopt the least costly, most cost-effective or least burdensome alternative that achieves the objectives of the rule. The provisions of UMRA § 205 do not apply when they are inconsistent with applicable law. Moreover, UMRA § 205 allows EPA to adopt an alternative other than the least costly, most cost-effective or least burdensome alternative if the Administrator publishes an explanation with the final rule why the alternative was not adopted.

Before EPA establishes any regulatory requirements that may significantly or uniquely affect small governments, including Tribal governments, it must have developed under UMRA § 203 a small government agency plan. The plan must provide for notifying potentially affected small governments, enabling officials of affected small governments to have meaningful and timely input in the development of EPA regulatory proposals with significant Federal intergovernmental mandates, and informing, educating and advising small governments on compliance with the regulatory requirements.

A. UMRA Section 202 and the Construction General Permit

UMRA § 202 requires a written statement containing certain assessments, estimates and analyses prior to the promulgation of certain general notices of proposed rulemaking (2 U.S.C. 1532). UMRA § 421(10) defines

"rule" based on the definition of rule in the Regulatory Flexibility Act. Section 601 of the Regulatory Flexibility Act defines "rule" to mean any rule for which an agency publishes a general notice of proposed rulemaking pursuant to § 553 of the Administrative Procedure Act. EPA does not propose to issue NPDES general permits based on APA § 553. Instead, EPA relies on publication of general permits in the Federal Register in order to provide "an opportunity for a hearing" under CWA § 402(a), 33 U.S.C. 1342(a). Nonetheless, EPA has evaluated permitting alternatives for regulation of storm water discharges associated with construction activity. The general permit that EPA proposes to re-issue would be virtually the same NPDES general permit for construction that many construction operators have used over the past five years. Furthermore, general permits provide a more cost and time efficient alternative for the regulated community to obtain NPDES permit coverage than that provided through individually drafted permits.

B. UMRA Section 203 and the Construction General Permit

Agencies are required to prepare small government agency plans under UMRA § 203 prior to establishing any regulatory requirement that might significantly or uniquely affect small governments. "Regulatory requirements" might, for example, include the requirements of these NPDES general permits for discharges associated with construction activity, especially if a municipality sought coverage under one of the general permits. EPA envisions that some municipalities—those with municipal separate storm sewer systems serving a population over 100,000—may elect to seek coverage under these proposed general permits. For many municipalities, however, a permit application is not required until August 7, 2001, for a storm water discharge associated with construction activity where the construction site is owned or operated by a municipality with a population of less than 100,000. (See 40 CFR 122.26(e)(1)(ii) and (g)).

In any event, any such permit requirements would not significantly affect small governments because most State laws already provide for the control of sedimentation and erosion in a similar manner as today's general permit. Permit requirements also would not uniquely affect small governments because compliance with the permit's conditions affects small governments in the same manner as any other entity seeking coverage under the permit. Thus, UMRA § 203 would not apply.

VIII. Paperwork Reduction Act

On June 2, 1997, EPA solicited comments on the proposed revision to the current Information Collection Request (ICR) document for this permit (ICR approved OMB; OMB No. 2040–0086, expiration, August 31, 1998) to accommodate the increased information requirements in the new NOI for the construction general permit (62 FR 29826). A revised NOI form has been approved (EPA Form 3510–9 OMB No. 2040–0188.) This revised form is included in the permit in Addendum C. EPA estimates an increase in the burden associated with filling out the NOI form for the permit due to added requirements under the Endangered Species Act. EPA also anticipates a small increase in the time because of the requirement to submit an NOT upon completion of construction activities.

IX. Regulatory Flexibility Act

Under the Regulatory Flexibility Act (RFA), 5 U.S.C. 601 *et seq.*, a Federal agency must prepare an initial regulatory flexibility analysis "for any proposed rule" for which the agency "is required by section 553 of [the Administrative Procedure Act (APA)], or any other law, to publish general notice of proposed rulemaking." The RFA exempts from this requirement any rule that the issuing agency certifies "will not, if promulgated, have a significant economic impact on a substantial number of small entities."

EPA did not prepare an initial regulatory flexibility analysis (IRFA) for the proposed CGP. (Note that in today's action, EPA is issuing a separate general permit for each jurisdiction where EPA issues permits; i.e., in certain States, Indian Country lands and Federal facilities within certain States. However, for purposes of readability, reference is made to the permits in the singular form such as "permit" or "CGP" rather than in plural form.) In the notice of the proposed permit, EPA explained its view that issuance of an NPDES general permit is not subject to rulemaking requirements, including the requirement for a general notice of proposed rulemaking, under APA section 553 or any other law, and is thus not subject to the RFA requirement to prepare an IRFA. Nevertheless, in keeping with EPA's policy to consider the impact of its actions on small entities even when it is not legally required to do so, the Agency considered the potential impact of the permit on small entities that would be eligible for coverage under the permit. EPA concluded that the permit, if issued as drafted, would not have a significant impact on a substantial number of small entities. EPA based its conclusion on the fact that the draft permit was largely the same as the previous permit issued in 1992 and, to the extent it differed, provided dischargers with more flexibility than that permit allowed.

Some commenters on the proposed CGP disagreed with EPA's conclusions that NPDES general permits are not subject to rulemaking requirements and that the proposed permit would not have a significant impact on small entities. They asserted that the CGP is subject to rulemaking requirements and thus the RFA, and that the Agency should have prepared an IRFA for the permit.

In light of the comments received, EPA further considered whether NPDES general permits are subject to rulemaking requirements. The Agency reviewed its previous NPDES general permitting actions and related statements in the Federal Register or elsewhere. This review suggests that the Agency has generally treated NPDES general permits effectively as rules, though at times it has given contrary indications as to whether these actions are rules or permits. EPA also reviewed again the applicable law, including the CWA, relevant CWA case law and the APA, as well as the Attorney General's Manual on the APA (1947). On the basis of its review, EPA has concluded, as set forth in the proposal, that NPDES general permits are permits under the APA and thus not subject to APA rulemaking requirements or the RFA.

The APA defines two broad, mutually exclusive categories of agency action—"rules" and "orders." Its definition of "rule" encompasses "an agency statement of general or particular applicability and future effect designed to implement, interpret, or prescribe law or policy or describing the organization, procedure, or practice requirements of an agency * * *" APA section 551(4). Its definition of "order" is residual: "a final disposition * * * of an agency in a matter other than rule making but including *licensing*." APA section 551(6) (emphasis added). The APA defines "license" to "include * * * an agency permit * * *" APA section 551(8). The APA thus categorizes a permit as an order, which by the APA's definition is not a rule.

Section 553 of the APA establishes "rule making" requirements. The APA defines *rule making* as "the agency process for formulating, amending, or repealing a rule." APA § 551(5). By its terms, then, § 553 applies only to "rules" and not also to "orders," which

include permits. As the Attorney General's Manual on the APA explains, "the entire Act is based upon a dichotomy between rule making and adjudication [the agency process for formulation of an order]" (p. 14).

The CWA specifies the use of permits for authorizing the discharge of pollutants to waters of the United States. Section 301(a) of the CWA prohibits discharges of pollutants "[except as in compliance with" specified sections of the CWA, including section 402. 33 U.S.C. 1311(a). Section 402 of the CWA authorizes EPA "to issue a permit for the discharge of any pollutant * * *, notwithstanding section [301(a) of the CWA]." 33 U.S.C. 1342(a). Thus, the only circumstances in which a discharge of pollution may be authorized is where the Agency has issued a permit for the discharge. Courts, recognizing that a permit is the necessary condition-precedent to any lawful discharge, specifically suggested the use of area-wide and general permits as a mechanism for addressing the Agency's need to issue a substantial number of permits. See *NRDC* v. *Train*, 396 F.Supp. 1393, 1402 (D.D.C. 1975); *NRDC* v. *Costle*, 568 F.2d 1369, 1381. (D.C. Cir. 1977). Adopting the courts' suggestion, EPA has made increasing use of general permits in its CWA regulatory program, particularly for storm water discharges.

In the Agency's view, the fact that an NPDES general permit may apply to a large number of different dischargers does not convert it from a permit into a rule. As noted above, the courts which have faced the issue of how EPA can permit large numbers of discharges under the CWA have suggested use of a general *permit*, not a rule. Under the APA, the two terms are mutually exclusive. Moreover, an NPDES general permit retains unique characteristics that distinguish a permit from a rule. First, today's NPDES general permit for storm water discharges associated with construction activity is effective only with respect to those dischargers that *choose* to be bound by the permit. Thus, unlike the typical rule, this NPDES general permit does not impose immediately effective obligations of general applicability. A discharger must choose to be covered by this general permit and so notify EPA. A discharger always retains the option of obtaining its own individual permit. Relatedly, the terms of the NPDES general permit are enforceable only against dischargers that choose to make use of the permit. If a source discharges without authorization of a general or an individual permit, the discharger violates § 301 of the Act for discharging without a permit, not for violating the terms of an NPDES general permit.

Because the CWA and its case law make clear that NPDES permits are the congressionally chosen vehicle for authorizing discharges of pollutants to waters of the United States, the APA's rulemaking requirements are inapplicable to issuance of such permits, including today's general permit. Further, while the CWA requires that NPDES permits be issued only after an opportunity for a hearing, it does not require publication of a general notice of proposed rulemaking. Thus, NPDES permitting is not subject to the requirement to publish a general notice of proposed rulemaking under the APA or any other law. Accordingly, it is not subject to the RFA.

At the same time, the Agency recognizes that the question of the applicability of the APA, and thus the RFA, to the issuance of a general permit is a difficult one, given the fact that a large number of dischargers may choose to use the general permit. Indeed, the point of issuing a general permit is to provide a speedier means of permitting large number of sources and save dischargers and EPA time and effort. Since the Agency hopes that many dischargers will make use of a general permit and since the CWA requires EPA to provide an opportunity for "a hearing" prior to issuance of a permit, EPA provides the public with notice of a draft general permit and an opportunity to comment on it. From public comments, EPA learns how to better craft a general permit to make it appropriate for, and acceptable to, the largest number of potential permittees. This same process also provides an opportunity for EPA to consider the potential impact of general permit terms on small entities and how to craft the permit to avoid any undue burden on small entities. This process, however, is voluntary, and does not trigger rulemaking or RFA requirements.

In the case of the CGP being issued today, the Agency has considered and addressed the potential impact of the general permit on small entities in a manner that would meet the requirements of the RFA if it applied. Specifically, EPA has analyzed the potential impact of the general permit on small entities and found that it will not have a significant economic impact on a substantial number of small entities. Like the previous general permit that it replaces (the Baseline Construction General Permit), the permit will make available to many small entities, particularly operators of construction sites, a streamlined process for obtaining authorization to discharge. Of the possible permitting mechanisms available to dischargers subject to the CWA, NPDES general permits are designed to reduce the reporting and monitoring burden associated with NPDES permit authorization, especially for small entities with discharges having comparatively less potential for environmental degradation than discharges typically regulated under individual NPDES permits. Thus, general permits like the permit at issue here provide small entities with a permitting application option that is much less burdensome than NPDES individual permit applications.

Furthermore, the general permit is virtually identical to its predecessor, the Baseline Construction General Permit, under which many construction operators have operated during the past five years. Moreover, the other new provisions of the permit have been designed to minimize burdens on small entities, including eliminating the requirement that construction site operators require that their contractors and subcontractors sign a standard certification statement agreeing to abide by storm water pollution prevention plan provisions developed for a project. In today's general permit, only the operator(s) of a construction site are required to satisfy certification requirements under the permit. EPA believes this modification from the prior permit should reduce any such adverse economic impacts on both operators and contractors/subcontractors who, in many instances, are small entities. In view of the foregoing, the Regional Administrators find that the final general permit, even if it were a rule, will not have a significant economic impact on a substantial number of small entities.

Storm Water General Permit for Construction Activities in Region 6

NPDES Permit No. [See Part I.A.]

Authorization to Discharge Under the National Pollutant Discharge Elimination System

In compliance with the provisions of the Clean Water Act, as amended, (33 U.S.C. 1251 et. seq.), except as provided in Part I.B.3 of this permit, operators of construction activities located in an area specified in Part I.A. and who submit a Notice of Intent in accordance with Part II, are authorized to discharge pollutants to waters of the United States in accordance with the conditions and requirements set forth herein.

This permit shall become effective on [insert the date of publication of the final permit in the Federal Register].

This permit and the authorization to discharge shall expire at midnight, July 7, 2003.

Signed: June 24, 1998.

William B. Hathaway,

Director, Water Quality Protection Division.

NPDES General Permits for Storm Water Discharges from Construction Activities

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Part I. Coverage Under This Permit

A. Permit Area

The permit language is structured as if it were a single permit, with State, Indian Country land, or other area-specific conditions specified in Part X. Permit coverage is actually provided by legally separate and distinctly numbered permits covering each of the following areas:

Region 6

LAR10*##I: Indian Country lands in the State of Louisiana

NMR10*###: The State of New Mexico, except Indian Country lands

NMR10*##I: Indian Country lands in the State of New Mexico, except Navajo Reservation Lands and Ute Mountain Reservation Lands

OKR10*##I: Indian Country lands in the State of Oklahoma

OKR10*##F: Oil and Gas Sites in State of Oklahoma

TXR10*###: The State of Texas, except Indian Country lands

TXR10*##I: Indian Country lands in the State of Texas

B. Eligibility

1. Permittees are authorized to discharge pollutants in storm water runoff associated with construction activities as defined in 40 CFR 122.26(b)(14)(x) and those construction site discharges designated by the Director as needing a storm water permit under 122.26(a)(1)(v) or under 122.26(a)(9) and 122.26(g)(1)(i). Discharges identified under Part I.B.3 are excluded from coverage. Any discharge authorized by a different NPDES permit may be commingled with discharges authorized by this permit.

2. This permit also authorizes storm water discharges from support activities (e.g., concrete or asphalt batch plants, equipment staging yards, material storage areas, excavated material disposal areas, borrow areas) provided:

a. The support activity is directly related to a construction site that is required to have NPDES permit coverage for discharges of storm water associated with construction activity;

b. The support activity is not a commercial operation serving multiple unrelated construction projects by different operators, and does not operate beyond the completion of the construction activity at the last construction project it supports; and

c. Appropriate controls and measures are identified in a storm water pollution prevention plan covering the discharges from the support activity areas.

3. Limitations on Coverage

a. *Post Construction Discharges.* This permit does not authorize storm water discharges that originate from the site *after* construction activities have been completed and the site, including any temporary support activity site, has undergone final stabilization. Industrial post-construction storm water discharges may need to be covered by a separate NPDES permit.

b. *Discharges Mixed with Non-Storm Water.* This permit does not authorize discharges that are mixed with sources of non-storm water, other than those discharges which are identified in Part III.A.2. or 3. (exceptions to prohibition on non-storm water discharges) and are in compliance with Part IV.D.5 (non-storm water discharges).

c. *Discharges Covered by Another Permit.* This permit does not authorize storm water discharges associated with construction activity that have been covered under an individual permit or required to obtain coverage under an alternative general permit in accordance with Part VI.L.

d. *Discharges Threatening Water Quality.* This permit does not authorize storm water discharges from construction sites that the Director (EPA) determines will cause, or have reasonable potential to cause or contribute to, violations of water quality standards. Where such determinations have been made, the Director may notify the operator(s) that an individual permit application is necessary in accordance with Part VI.L. However, the Director may authorize coverage under this permit after appropriate controls and implementation procedures designed to bring the discharges into compliance with water quality standards have been included in the storm water pollution prevention plan;

e. *Storm water discharges and storm water discharge-related activities that are not protective of Federally listed endangered and threatened ("listed") species or designated critical habitat ("critical habitat").*

(1) For the purposes of complying with the Part I.B.3.e. eligibility requirements, "storm water discharge-related activities" include:

(a) Activities which cause, contribute to, or result in point source storm water pollutant discharges, including but not limited to: excavation, site development, grading and other surface disturbance activities; and

(b) Measures to control storm water including the siting, construction and operation of best management practices

(BMPs) to control, reduce or prevent storm water pollution.

(2) Coverage under this permit is available only if the applicant certifies that it meets at least one of the criteria in paragraphs (a)–(d) below. Failure to continue to meet one of these criteria during the term of the permit will render a permittee ineligible for coverage under this permit.

(a) The storm water discharges and storm water discharge-related activities are not likely to adversely affect listed species or critical habitat; or

(b) Formal or informal consultation with the Fish and Wildlife Service and/or the National Marine Fisheries Service (the "Services") under section 7 of the Endangered Species Act (ESA) has been concluded which addresses the effects of the applicant's storm water discharges and storm water discharge-related activities on listed species and critical habitat and the consultation results in either a no jeopardy opinion or a written concurrence by the Service(s) on a finding that the applicant's storm water discharges and storm water discharge-related activities are not likely to adversely affect listed species or critical habitat. A section 7 consultation may occur in the context of another Federal action (e.g., a ESA section 7 consultation was performed for issuance of a wetlands dredge and fill permit for the project, or as part of a National Environmental Policy Act (NEPA) review); or

(c) The applicant's construction activities are authorized under section 10 of the ESA and that authorization addresses the effects of the applicant's storm water discharges and storm water discharge-related activities on listed species and critical habitat; or

(d) The applicant's storm water discharges and storm water discharge-related activities were already addressed in another operator's certification of eligibility under Part I.B.3.e.(2)(a), (b), or (c) which included the applicant's project area. By certifying eligibility under Part I.B.3.e.(2)(d), the applicant agrees to comply with any measures or controls upon which the other operator's certification under Part I.B.3.e.(2)(a), (b) or (c) was based.

(3) For all projects commencing construction after the effective date of this permit, applicants must follow the procedures provided at Addendum A of this permit when applying for permit coverage. The Director may also require any existing permittee or applicant to provide documentation of eligibility for this permit using the procedures in Addendum A, where EPA or the Fish and Wildlife Services determine that there is a potential impaction on endangered or threatened species or a critical habitat. Nothing in this permit relieves applicants which are under construction as of the effective date of this permit of their obligations they may have to comply with any requirements of the Endangered Species Act.

(4) The applicant must comply with any applicable terms, conditions or other requirements developed in the process of meeting eligibility requirements of Part I.B.3.e.(2)(a), (b), (c), or (d) above to remain eligible for coverage under this permit. Such terms and conditions must be incorporated in the applicant's storm water pollution prevention plan.

(5) Applicants who choose to conduct informal consultation to meet the eligibility requirements of Part I.B.3.e.(2)(b) are automatically designated as non-Federal representatives under this permit. See 50 CFR 402.08. Applicants who choose to conduct informal consultation as a non-Federal representatives must notify EPA and the appropriate Service office in writing of that decision.

(6) This permit does not authorize any storm water discharges where the discharges or storm water discharge-related activities cause prohibited "take" (as defined under section 3 of the Endangered Species Act and 50 CFR 17.3) of endangered or threatened species unless such takes are authorized under sections 7 or 10 of the Endangered Species Act.

(7) This permit does not authorize any storm water discharges where the discharges or storm water discharge-related activities are likely to jeopardize the continued existence of any species that are listed or proposed to be listed as endangered or threatened under the ESA or result in the adverse modification or destruction of habitat that is designated or proposed to be designated as critical under the ESA.

f. *Storm water Discharges and Storm Water Discharge-Related Activities with Unconsidered Adverse Effects on Historic Properties.* (Reserved)

C. Obtaining Authorization

1. In order for storm water discharges from construction activities to be authorized under this general permit, an operator must:

a. Meet the Part I.B eligibility requirements;

b. Except as provided in Parts II.A.5 and II.A.6, develop a storm water pollution prevention plan (SWPPP) covering either the entire site or all portions of the site for which they are operators (see definition in Part IX.N) according to the requirements in Part IV. A "joint" SWPPP may be developed and implemented as a cooperative effort where there is more than one operator at a site; and

c. Submit a Notice of Intent (NOI) in accordance with the requirements of Part II, using an NOI form provided in Addendum C of this permit. Only one NOI need be submitted to cover all of the permittee's activities on the common plan of development or sale (e.g., you do not need to submit a separate NOI for each separate lot in a residential subdivision or for two separate buildings being constructed at a manufacturing facility, provided your SWPPP covers each area for which you are an operator). The SWPPP must be implemented upon commencement of construction activities.

2. Any new operator on site, including those who replace an operator who has previously obtained permit coverage, must submit an NOI to obtain permit coverage.

3. Unless notified by the Director to the contrary, operators who submit a correctly completed NOI in accordance with the requirements of this permit are authorized to discharge storm water from construction activities under the terms and conditions of this permit two (2) days after the date that the NOI is postmarked. The Director may deny coverage under this permit and require submittal of an application for an individual NPDES permit based on a review of the NOI or other information (see Part VI.L).

D. Terminating Coverage

1. Permittees wishing to terminate coverage under this permit must submit a Notice of Termination (NOT) in accordance with Part VIII of this permit. Compliance with this permit is required until an NOT is submitted. The permittee's authorization to discharge under this permit terminates at midnight of the day the NOT is signed.

2. All permittees must submit a NOT within thirty (30) days after one or more of the following conditions have been met:

a. Final stabilization (see definition Part IX.I) has been achieved on all portions of the site for which the permittee is responsible (including if applicable, returning agricultural land to its pre-construction agricultural use);

b. Another operator/permittee has assumed control according to Part VI.G.2.c. over all areas of the site that have not been finally stabilized; or

c. For residential construction only, temporary stabilization has been completed and the residence has been transferred to the homeowner.

Enforcement actions may be taken if a permittee submits a NOT without

meeting one or more of these conditions.

Part II. Notice of Intent Requirements

A. Deadlines for Notification

1. Except as provided in Parts II.A.3, II.A.4, II.A.5 or II.A.6 below, parties defined as operators (see definition in Part IX.N) due to their operational control over construction plans and specifications, including the ability to make modifications to those plans and specifications, must submit a Notice of Intent (NOI) in accordance with the requirements of this Part at least two (2) days prior to the commencement of construction activities (i.e., the initial disturbance of soils associated with clearing, grading, excavation activities, or other construction activities).

2. Except as provided in Parts II.A.3, II.A.4, II.A.5 or II.A.6 below, parties defined as operators (see definition in Part IX.N) due to their day-to-day operational control over activities at a project which are necessary to ensure compliance with a storm water pollution prevention plan or other permit conditions (e.g., general contractor, erosion control contractor) must submit a NOI at least two (2) days prior to commencing work on-site.

3. For storm water discharges from construction projects where the operator changes, including instances where an operator is added after a NOI has been submitted under Parts II.A.1 or II.A.2, the new operator must submit a NOI at least two (2) days before assuming operational control over site specifications or commencing work on-site.

4. Operators are not prohibited from submitting late NOIs. When a late NOI is submitted, authorization is only for discharges that occur after permit coverage is granted. The Agency reserves the right to take appropriate enforcement actions for any unpermitted activities that may have occurred between the time construction commenced and authorization of future discharges is granted (typically 2 days after a complete NOI is submitted).

5. Operators of on-going construction projects as of the effective date of this permit which received authorization to discharge for these projects under the 1992 baseline construction general permit must:

a. Submit a NOI according to Part II.B. within 90 days of the effective date of this permit. If the permittee is eligible to submit a Notice of Termination (e.g., construction is finished and final stabilization has been achieved) before the 90th day, a new NOI is not required to be submitted;

b. For the first 90 days from the effective date of this permit, comply with the terms and conditions of the 1992 baseline construction general permit they were previously authorized under; and

c. Update their storm water pollution prevention plan to comply with the requirements of Part IV within 90 days after the effective date of this permit.

6. Operators of on-going construction projects as of the effective date of this permit which did *not* receive authorization to discharge for these projects under the 1992 baseline construction general permit must:

a. Prepare and comply with an interim storm water pollution prevention plan in accordance with the 1992 baseline construction general permit prior to submitting an NOI;

b. Submit a NOI according to Part II.B; and

c. Update their storm water pollution prevention plan to comply with the requirements of Part IV within 90 days after the effective date of this permit.

B. Contents of Notice of Intent (NOI)

1. Use of Revised NOI Form

The revised NOI form [EPA Form 3510–9] shall be signed in accordance with Part VI.G of this permit and shall include the following information:

a. The name, address, and telephone number of the operator filing the NOI for permit coverage;

b. An indication of whether the operator is a Federal, State, Tribal, private, or other public entity;

c. The name (or other identifier), address, county, and latitude/longitude of the construction project or site;

d. An indication of whether the project or site is located on Indian Country lands;

e. Confirmation that a storm water pollution prevention plan (SWPPP) has been developed or will be developed prior to commencing construction activities, and that the SWPPP will be compliant with any applicable local sediment and erosion control plans. Copies of SWPPPs or permits should *not* be included with the NOI submission;

f. Optional information: the location where the SWPPP may be viewed and the name and telephone number of a contact person for scheduling viewing times;

g. The name of the receiving water(s);

h. Estimates of project start and completion dates, and estimates of the number of acres of the site on which soil will be disturbed (if less than 1 acre, enter "1");

i. Based on the instructions in Addendum A, whether any listed or proposed threatened or endangered species, or designated critical habitat, are in proximity to the storm water discharges or storm water discharge-related activities to be covered by this permit;

j. Under which section(s) of Part I.B.3.e. (Endangered Species) the applicant is certifying eligibility; and

Note that as of the effective date of this permit, reporting of information relating to the preservation of historic properties has been reserved and is not required at this time. Such reservation in no way relieves applicants or permittees from any otherwise applicable obligations or liabilities related to historic preservation under State, Tribal or local law. After further discussions between EPA and the Advisory Council on Historic Preservation, the Agency may modify the permit. Any such modification may affect future Notice of Intent reporting requirements.

C. Where To Submit

1. NOIs must be signed in accordance with Part VI.G. and sent to the following address: Storm Water Notice of Intent (4203), US EPA, 401 M Street, SW, Washington, DC 20460.

Part III. Special Conditions, Management Practices, and Other Non-Numeric Limitations

A. Prohibition on Non-Storm Water Discharges

1. Except as provided in Parts I.B.2 or 3 and III.A.2 or 3, all discharges covered by this permit shall be composed entirely of storm water associated with construction activity.

2. Discharges of material other than storm water that are in compliance with an NPDES permit (other than this permit) issued for that discharge may be discharged or mixed with discharges authorized by this permit.

3. The following non-storm water discharges from active construction sites are authorized by this permit provided the non-storm water component of the discharge is in compliance with Part IV.D.5 (non-storm water discharges): discharges from fire fighting activities; fire hydrant flushings; waters used to wash vehicles where detergents are not used; water used to control dust in accordance with Part IV.D.2.c.(2); potable water sources including waterline flushings; routine external building wash down which does not use detergents; pavement washwaters where spills or leaks of toxic or hazardous materials have not occurred (unless all spilled material has been removed) and where detergents are not used; air

conditioning condensate; uncontaminated ground water or spring water; and foundation or footing drains where flows are not contaminated with process materials such as solvents.

B. Releases in Excess of Reportable Quantities

The discharge of hazardous substances or oil in the storm water discharge(s) from a facility shall be prevented or minimized in accordance with the applicable storm water pollution prevention plan for the facility. This permit does not relieve the permittee of the reporting requirements of 40 CFR 110, 40 CFR 117 and 40 CFR 302. Where a release containing a hazardous substance or oil in an amount equal to or in excess of a reportable quantity established under either 40 CFR 110, 40 CFR 117 or 40 CFR 302, occurs during a 24 hour period:

1. The permittee is required to notify the National Response Center (NRC) (800–424–8802; in the Washington, DC, metropolitan area call 202–426–2675) in accordance with the requirements of 40 CFR 110, 40 CFR 117 and 40 CFR 302 as soon as he or she has knowledge of the discharge;

2. The storm water pollution prevention plan required under Part IV of this permit must be modified within 14 calendar days of knowledge of the release to: provide a description of the release, the circumstances leading to the release, and the date of the release. In addition, the plan must be reviewed to identify measures to prevent the reoccurrence of such releases and to respond to such releases, and the plan must be modified where appropriate.

C. Spills

This permit does not authorize the discharge of hazardous substances or oil resulting from an on-site spill.

D. Discharge Compliance With Water Quality Standards

Operators seeking coverage under this permit shall not be causing or have the reasonable potential to cause or contribute to a violation of a water quality standard. Where a discharge is already authorized under this permit and is later determined to cause or have the reasonable potential to cause or contribute to the violation of an applicable water quality standard, the Director will notify the operator of such violation(s). The permittee shall take all necessary actions to ensure future discharges do not cause or contribute to the violation of a water quality standard and document these actions in the storm water pollution prevention plan. If violations remain or re-occur, then coverage under this permit may be terminated by the Director, and an alternative general permit or individual permit may be issued. Compliance with this requirement does not preclude any enforcement activity as provided by the Clean Water Act for the underlying violation.

E. Responsibilities of Operators

Permittees may meet one or both of the operational control components in the definition of "operator" found in Part IX.N. Either Parts III.E.1 or III.E.2 or both will apply depending on the type of operational control exerted by an individual permittee. Part III.E.3 applies to all permittees.

1. Permittees with operational control over construction plans and specifications, including the ability to make modifications to those plans and specifications (e.g., developer or owner), must:

a. Ensure the project specifications that they develop meet the minimum requirements of Part IV (Storm Water Pollution Prevention Plans (SWPPP)) and all other applicable conditions;

b. Ensure that the SWPPP indicates the areas of the project where they have operational control over project specifications (including the ability to make modifications in specifications), and ensure all other permittees implementing portions of the SWPPP impacted by any changes they make to the plan are notified of such modifications in a timely manner; and

c. Ensure that the SWPPP for portions of the project where they are operators indicates the name and NPDES permit number for parties with day-to-day operational control of those activities necessary to ensure compliance with the SWPPP or other permit conditions. If these parties have not been identified at the time the SWPPP is initially developed, the permittee with operational control over project specifications shall be considered to be the responsible party until such time as the authority is transferred to another party (e.g., general contractor) and the plan updated.

2. Permittee(s) with day-to-day operational control of those activities at a project which are necessary to ensure compliance with a SWPPP for the site or other permit conditions (e.g., general contractor) must:

a. Ensure that the SWPPP for portions of the project where they are operators meets the minimum requirements of Part IV (Storm Water Pollution Prevention Plan) and identifies the parties responsible for implementation of control measures identified in the plan;

b. Ensure that the SWPPP indicates areas of the project where they have operational control over day-to-day activities;

c. Ensure that the SWPPP for portions of the project where they are operators indicates the name and NPDES permit number of the party(ies) with operational control over project specifications (including the ability to make modifications in specifications);

3. Permittees with operational control over only a portion of a larger construction project (e.g., one of four homebuilders in a subdivision) are responsible for compliance with all applicable terms and conditions of this permit as it relates to their activities on their portion of the construction site, including protection of endangered species and implementation of BMPs and other controls required by the SWPPP. Permittees shall ensure either directly or through coordination with other permittees, that their activities do not render another party's pollution controls ineffective. Permittees must either implement their portions of a common SWPPP or develop and implement their own SWPPP.

F. Consistency With the Texas Coastal Management Program

This permit does not relieve permittees whose construction project is located within the boundary of the Texas Coastal Management Program of their responsibility to insure consistency with all applicable requirements of this State program. While pre-construction approval of development projects is not within the jurisdiction of the Federal NPDES permit program, State or local pre-construction project approvals and/or permits may be required. The permittee's Storm Water Pollution Prevention Plan must be consistent with any storm water discharge-related requirements established pursuant to, or necessary to be consistent with, the Texas Coastal Management Program. This permit may be reopened, upon petition by the State, to include more stringent discharge requirements applying to areas within the State's designated coastal zone.

The Texas Coastal Management Program boundary covers part or all of the following Texas Counties: Aransas, Brazoria, Calhoun, Cameron, Chambers, Galveston, Harris, Jackson, Jefferson, Kenedy, Kleberg, Matagorda, Nueces, Orange, Refugio, San Patricio, Victoria, and Willacy. To determine if a construction project is located within the Texas Coastal Zone, and if so, the applicable requirements of the Texas Coastal Management Program, please

contact the Texas General Land Office's Coastal Hotline at 1-800-85-BEACH or access their Internet site at "http://red.glo.state.tx.us/res-mgmt/coastal/". Information is also available from the Texas Coastal Coordination Council's Coastal Permitting Assistance Office at 1-888-3-PERMIT or via the Internet at "http://red.glo.state.tx.us/coastalpermits/".

Part IV. Storm Water Pollution Prevention Plans

At least one storm water pollution prevention plan (SWPPP) shall be developed for each construction project or site covered by this permit. For more effective coordination of BMPs and opportunities for cost sharing, a cooperative effort by the different operators at a site to prepare and participate in a comprehensive SWPPP is encouraged. Individual operators at a site may, but are not required, to develop separate SWPPPs that cover only their portion of the project provided reference is made to other operators at the site. In instances where there is more than one SWPPP for a site, coordination must be conducted between the permittees to ensure the storm water discharge controls and other measures are consistent with one another (e.g., provisions to protect listed species and critical habitat).

Storm water pollution prevention plans shall be prepared in accordance with good engineering practices. The SWPPP shall identify potential sources of pollution which may reasonably be expected to affect the quality of storm water discharges from the construction site. The SWPPP shall describe and ensure the implementation of practices which will be used to reduce the pollutants in storm water discharges associated with construction activity at the construction site and assure compliance with the terms and conditions of this permit.

When developing SWPPPs, applicants must follow the procedures in Addendum A of this permit to determine whether listed endangered or threatened species or critical habitat would be affected by the applicant's storm water discharges or storm water discharge-related activities. Any information on whether listed species or critical habitat are found in proximity to the construction site must be included in the SWPPP. Any terms or conditions that are imposed under the eligibility requirements of Part I.B.3.e and Addendum A of this permit to protect listed species or critical habitat from storm water discharges or storm water discharge-related activity must be incorporated into the SWPPP.

Permittees must implement the applicable provisions of the SWPPP required under this part as a condition of this permit.

A. Deadlines for Plan Preparation and Compliance

The storm water pollution prevention plan shall:

1. Be completed prior to the submittal of an NOI to be covered under this permit (except as provided in Parts II.A.5 and II.A.6) updated as appropriate; and

2. Provide for compliance with the terms and schedule of the SWPPP beginning with the initiation of construction activities.

B. Signature, Plan Review and Making Plans Available

1. The SWPPP shall be signed in accordance with Part VI.G, and be retained on-site at the facility which generates the storm water discharge in accordance with Part V (Retention of Records) of this permit.

2. The permittee shall post a notice near the main entrance of the construction site with the following information:

a. The NPDES permit number for the project or a copy of the NOI if a permit number has not yet been assigned;

b. The name and telephone number of a local contact person;

c. A brief description of the project; and

d. The location of the SWPPP if the site is inactive or does not have an on-site location to store the plan.

If posting this information near a main entrance is infeasible due to safety concerns, the notice shall be posted in a local public building. If the construction project is a linear construction project (e.g., pipeline, highway, etc.), the notice must be placed in a publicly accessible location near where construction is actively underway and moved as necessary. This permit does not provide the public with any right to trespass on a construction site for any reason, including inspection of a site; nor does this permit require that permittees allow members of the public access to a construction site.

3. The permittee shall make SWPPPs available upon request to the Director, a State, Tribal or local agency approving sediment and erosion plans, grading plans, or storm water management plans; local government officials; or the operator of a municipal separate storm sewer receiving discharges from the site. The copy of the SWPPP that is required to be kept on-site or locally available must be made available to the Director for review at the time of an on-site inspection. Also, in the interest of public involvement, EPA encourages permittees to make their SWPPPs available to the public for viewing during normal business hours.

4. The Director may notify the permittee at any time that the SWPPP does not meet one or more of the minimum requirements of this Part. Such notification shall identify those provision of this permit which are not being met by the SWPPP as well as those requiring modification in order to meet the minimum requirements of this Part. Within seven (7) calendar days of receipt of such notification from the Director (or as otherwise provided by the Director), the permittee shall make the required changes to the SWPPP and shall submit to the Director a written certification that the requested changes have been made. The Director may take appropriate enforcement action for the period of time the permittee was operating under a plan that did not meet the minimum requirements of this permit.

C. Keeping Plans Current

The permittee must amend the storm water pollution prevention plan whenever:

1. There is a change in design, construction, operation, or maintenance which has a significant effect on the discharge of pollutants to the waters of the United States which has not been addressed in the SWPPP; or

2. Inspections or investigations by site operators, local, State, Tribal or Federal officials indicate the SWPPP is proving ineffective in eliminating or significantly minimizing pollutants from sources identified under Part IV.D.1 of this permit, or is otherwise not achieving the general objectives of controlling pollutants in storm water discharges associated with construction activity.

D. Contents of Plan

The storm water pollution prevention plan (SWPPP) shall include the following items:

1. Site Description

Each SWPPP shall provide a description of potential pollutant sources and other information as indicated below:

a. A description of the nature of the construction activity;

b. A description of the intended sequence of major activities which disturb soils for major portions of the site (e.g., grubbing, excavation, grading, utilities and infrastructure installation);

c. Estimates of the total area of the site and the total area of the site that is

expected to be disturbed by excavation, grading, or other activities including off-site borrow and fill areas;

d. An estimate of the runoff coefficient of the site for both the pre-construction and post-construction conditions and data describing the soil or the quality of any discharge from the site;

e. A general location map (e.g., a portion of a city or county map) and a site map indicating the following: drainage patterns and approximate slopes anticipated after major grading activities; areas of soil disturbance; areas which will not be disturbed; locations of major structural and nonstructural controls identified in the SWPPP; locations where stabilization practices are expected to occur; locations of off-site material, waste, borrow or equipment storage areas; surface waters (including wetlands); and locations where storm water discharges to a surface water;

f. Location and description of any discharge associated with industrial activity other than construction, including storm water discharges from dedicated asphalt plants and dedicated concrete plants, which is covered by this permit;

g. The name of the receiving water(s) and the areal extent and description of wetland or other special aquatic sites (as described under 40 CFR 230.3(q-1)) at or near the site which will be disturbed or which will receive discharges from disturbed areas of the project;

h. A copy of the permit requirements (attaching a copy of this permit is acceptable);

i. Information on whether listed endangered or threatened species, or critical habitat, are found in proximity to the construction activity and whether such species may be affected by the applicant's storm water discharges or storm water discharge-related activities; and

j. Information on whether storm water discharges or storm water discharge-related activities would have an affect on a property that is listed or eligible for listing on the National Register of Historic Places; where effects may occur, any written agreements with the State Historic Preservation Officer, Tribal Historic Preservation Officer, or other Tribal leader to mitigate those effects.

2. Controls

Each SWPPP shall include a description of appropriate control measures (i.e., BMPs) that will be implemented as part of the construction activity to control pollutants in storm water discharges. The SWPPP must clearly describe for each major activity identified in Part IV.D.1.b: (a) appropriate control measures and the general timing (or sequence) during the construction process that the measures will be implemented; and (b) which permittee is responsible for implementation (e.g., perimeter controls for one portion of the site will be installed by Contractor A after the clearing and grubbing necessary for installation of the measure, but before the clearing and grubbing for the remaining portions of the site; and perimeter controls will be actively maintained by Contractor B until final stabilization of those portions of the site up-gradient of the perimeter control; and temporary perimeter controls will be removed by the owner after final stabilization). The description and implementation of control measures shall address the following minimum components:

a. *Erosion and Sediment Controls.*

(1) Short and Long Term Goals and Criteria:

(a) The construction-phase erosion and sediment controls should be designed to retain sediment on site to the extent practicable.

(b) All control measures must be properly selected, installed, and maintained in accordance with the manufacturers specifications and good engineering practices. If periodic inspections or other information indicates a control has been used inappropriately, or incorrectly, the permittee must replace or modify the control for site situations.

(c) If sediment escapes the construction site, off-site accumulations of sediment must be removed at a frequency sufficient to minimize offsite impacts (e.g., fugitive sediment in street could be washed into storm sewers by the next rain and/or pose a safety hazard to users of public streets).

(d) Sediment must be removed from sediment traps or sedimentation ponds when design capacity has been reduced by 50%.

(e) Litter, construction debris, and construction chemicals exposed to storm water shall be prevented from becoming a pollutant source for storm water discharges (e.g., screening outfalls, picked up daily).

(f) Offsite material storage areas (also including overburden and stockpiles of dirt, borrow areas, etc.) used solely by the permitted project are considered a part of the project and shall be addressed in the SWPPP.

(2) *Stabilization Practices:* The SWPPP must include a description of interim and permanent stabilization practices for the site, including a schedule of when the practices will be implemented. Site plans should ensure that existing vegetation is preserved where attainable and that disturbed portions of the site are stabilized. Stabilization practices may include but are not limited to: establishment of temporary vegetation, establishment of permanent vegetation, mulching, geotextiles, sod stabilization, vegetative buffer strips, protection of trees, preservation of mature vegetation, and other appropriate measures. Use of impervious surfaces for stabilization should be avoided.

The following records shall be maintained and attached to the SWPPP: the dates when major grading activities occur; the dates when construction activities temporarily or permanently cease on a portion of the site; and the dates when stabilization measures are initiated.

Except as provided in Parts IV.D.2.a.(2)(a), (b), and (c) below, stabilization measures shall be initiated as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased, but in no case more than 14 days after the construction activity in that portion of the site has temporarily or permanently ceased.

(a) Where the initiation of stabilization measures by the 14th day after construction activity temporary or permanently cease is precluded by snow cover or frozen ground conditions, stabilization measures shall be initiated as soon as practicable.

(b) Where construction activity on a portion of the site is temporarily ceased, and earth disturbing activities will be resumed within 21 days, temporary stabilization measures do not have to be initiated on that portion of site.

(c) In arid areas (areas with an average annual rainfall of 0 to 10 inches), semi-arid areas (areas with an average annual rainfall of 10 to 20 inches), and areas experiencing droughts where the initiation of stabilization measures by the 14th day after construction activity has temporarily or permanently ceased is precluded by seasonal arid conditions, stabilization measures shall be initiated as soon as practicable.

(3) *Structural Practices:* The SWPPP must include a description of structural practices to divert flows from exposed soils, store flows or otherwise limit runoff and the discharge of pollutants from exposed areas of the site to the degree attainable. Structural practices may include but are not limited to: silt fences, earth dikes, drainage swales, sediment traps, check dams, subsurface drains, pipe slope drains, level spreaders, storm drain inlet protection,

rock outlet protection, reinforced soil retaining systems, gabions, and temporary or permanent sediment basins. Placement of structural practices in floodplains should be avoided to the degree attainable. The installation of these devices may be subject to section 404 of the CWA.

(a) For common drainage locations that serve an area with ten (10) or more acres disturbed at one time, a temporary (or permanent) sediment basin that provides storage for a calculated volume of runoff from a 2 year, 24 hour storm from each disturbed acre drained, or equivalent control measures, shall be provided where attainable until final stabilization of the site. Where no such calculation has been performed, a temporary (or permanent) sediment basin providing 3,600 cubic feet of storage per acre drained, or equivalent control measures, shall be provided where attainable until final stabilization of the site. When computing the number of acres draining into a common location it is not necessary to include flows from offsite areas and flows from onsite areas that are either undisturbed or have undergone final stabilization where such flows are diverted around both the disturbed area and the sediment basin.

In determining whether installing a sediment basin is attainable, the permittee may consider factors such as site soils, slope, available area on site, etc. In any event, the permittee must consider public safety, especially as it relates to children, as a design factor for the sediment basin and alternative sediment controls shall be used where site limitations would preclude a safe design. For drainage locations which serve ten (10) or more disturbed acres at one time and where a temporary sediment basin or equivalent controls is not attainable, smaller sediment basins and/or sediment traps should be used. Where neither the sediment basin nor equivalent controls are attainable due to site limitations, silt fences, vegetative buffer strips, or equivalent sediment controls are required for all down slope boundaries of the construction area and for those side slope boundaries deemed appropriate as dictated by individual site conditions. EPA encourages the use of a combination of sediment and erosion control measures in order to achieve maximum pollutant removal.

(b) For drainage locations serving less than 10 acres, smaller sediment basins and/or sediment traps should be used. At a minimum, silt fences, vegetative buffer strips, or equivalent sediment controls are required for all down slope boundaries (and for those side slope boundaries deemed appropriate as dictated by individual site conditions) of the construction area unless a sediment basin providing storage for a calculated volume of runoff from a 2 year, 24 hour storm or 3,600 cubic feet of storage per acre drained is provided. EPA encourages the use of a combination of sediment and erosion control measures in order to achieve maximum pollutant removal.

b. *Storm Water Management.* A description of measures that will be installed during the construction process to control pollutants in storm water discharges that will occur after construction operations have been completed must be included in the SWPPP. Structural measures should be placed on upland soils to the degree attainable. The installation of these devices may also require a separate permit under section 404 of the CWA. Permittees are only responsible for the installation and maintenance of storm water management measures prior to final stabilization of the site, and are not responsible for maintenance after storm water discharges associated with construction activity have been eliminated from the site. However, post-construction storm water BMPs that discharge pollutants from point sources once construction is completed may, in themselves, need authorization under a separate NPDES permit.

(1) Such practices may include but are not limited to: storm water detention structures (including wet ponds); storm water retention structures; flow attenuation by use of open vegetated swales and natural depressions; infiltration of runoff onsite; and sequential systems (which combine several practices). The SWPPP shall include an explanation of the technical basis used to select the practices to control pollution where flows exceed predevelopment levels.

(2) Velocity dissipation devices shall be placed at discharge locations and along the length of any outfall channel to provide a non-erosive flow velocity from the structure to a water course so that the natural physical and biological characteristics and functions are maintained and protected (e.g., no significant changes in the hydrological regime of the receiving water).

c. *Other Controls.*

(1) No solid materials, including building materials, shall be discharged to waters of the United States, except as authorized by a permit issued under section 404 of the CWA.

(2) Off-site vehicle tracking of sediments and the generation of dust shall be minimized.

(3) The SWPPP shall be consistent with applicable State, Tribal and/or local waste disposal, sanitary sewer or septic system regulations to the extent these are located within the permitted area.

(4) The SWPPP shall include a description of construction and waste materials expected to be stored on-site with updates as appropriate. The SWPPP shall also include a description of controls to reduce pollutants from these materials including storage practices to minimize exposure of the materials to storm water, and spill prevention and response.

(5) The SWPPP shall include a description of pollutant sources from areas other than construction (including storm water discharges from dedicated asphalt plants and dedicated concrete plants), and a description of controls and measures that will be implemented at those sites to minimize pollutant discharges.

(6) The SWPPP shall include a description of measures necessary to protect listed endangered or threatened species, or critical habitat, including any terms or conditions that are imposed under the eligibility requirements of Part I.B.3.e(4) of this permit. Failure to describe and implement such measures will result in storm water discharges from construction activities that are ineligible for coverage under this permit.

d. *Approved State, Tribal or Local Plans.*

(1) Permittees which discharge storm water associated with construction activities must ensure their storm water pollution prevention plan is consistent with requirements specified in applicable sediment and erosion site plans or site permits, or storm water management site plans or site permits approved by State, Tribal or local officials.

(2) Storm water pollution prevention plans must be updated as necessary to remain consistent with any changes applicable to protecting surface water resources in sediment and erosion site plans or site permits, or storm water management site plans or site permits approved by State, Tribal or local officials for which the permittee receives written notice.

3. Maintenance

All erosion and sediment control measures and other protective measures identified in the SWPPP must be maintained in effective operating condition. If site inspections required by Part IV.D.4. identify BMPs that are not operating effectively, maintenance shall be performed before the next anticipated storm event, or as necessary to maintain the continued effectiveness of storm

water controls. If maintenance prior to the next anticipated storm event is impracticable, maintenance must be scheduled and accomplished as soon as practicable.

4. Inspections

Qualified personnel (provided by the permittee or cooperatively by multiple permittees) shall inspect disturbed areas of the construction site that have not been finally stabilized, areas used for storage of materials that are exposed to precipitation, structural control measures, and locations where vehicles enter or exit the site, at least once every fourteen (14) calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater.

Where sites have been finally or temporarily stabilized, runoff is unlikely due to winter conditions (e.g., site is covered with snow, ice, or frozen ground exists), or during seasonal arid periods in arid areas (areas with an average annual rainfall of 0 to 10 inches) and semi-arid areas (areas with an average annual rainfall of 10 to 20 inches) such inspections shall be conducted at least once every month.

Permittees are eligible for a waiver of monthly inspection requirements until one month before thawing conditions are expected to result in a discharge if all of the following requirements are met: (1) the project is located in an area where frozen conditions are anticipated to continue for extended periods of time (i.e., more than one month); (2) land disturbance activities have been suspended; and (3) the beginning and ending dates of the waiver period are documented in the SWPPP.

a. Disturbed areas and areas used for storage of materials that are exposed to precipitation shall be inspected for evidence of, or the potential for, pollutants entering the drainage system. Sediment and erosion control measures identified in the SWPPP shall be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters. Where discharge locations are inaccessible, nearby downstream locations shall be inspected to the extent that such inspections are practicable. Locations where vehicles enter or exit the site shall be inspected for evidence of offsite sediment tracking.

b. Based on the results of the inspection, the SWPPP shall be modified as necessary (e.g., show additional controls on map required by Part IV.D.1; revise description of controls required by Part IV.D.2) to include additional or modified BMPs designed to correct problems identified. Revisions to the SWPPP shall be completed within 7 calendar days following the inspection. If existing BMPs need to be modified or if additional BMPs are necessary, implementation shall be completed before the next anticipated storm event. If implementation before the next anticipated storm event is impracticable, they shall be implemented as soon as practicable.

c. A report summarizing the scope of the inspection, name(s) and qualifications of personnel making the inspection, the date(s) of the inspection, and major observations relating to the implementation of the SWPPP shall be made and retained as part of the SWPPP for at least three years from the date that the site is finally stabilized. Major observations should include: the location(s) of discharges of sediment or other pollutants from the site; location(s) of BMPs that need to be maintained; location(s) of BMPs that failed to operate as designed or proved inadequate for a particular location; and location(s) where additional BMPs are needed that did not exist at the time of inspection. Actions taken in accordance with Part IV.D.4.b of this permit shall be made and retained as part of the storm water pollution prevention plan for at least three years from the date that the site is finally stabilized. Such reports shall identify any incidents of non-compliance. Where a report does not identify any incidents of non-compliance, the report shall contain a certification that the facility is in compliance with the storm water pollution prevention plan and this permit. The report shall be signed in accordance with Part VI.G of this permit.

5. Non-Storm Water Discharges

Except for flows from fire fighting activities, sources of non-storm water listed in Part III.A.2 or 3 of this permit that are combined with storm water discharges associated with construction activity must be identified in the SWPPP. The SWPPP shall identify and ensure the implementation of appropriate pollution prevention measures for the non-storm water component(s) of the discharge.

Part V. Retention of Records

A. Documents

The permittee shall retain copies of storm water pollution prevention plans and all reports required by this permit, and records of all data used to complete the Notice of Intent to be covered by this permit, for a period of at least three years from the date that the site is finally stabilized. This period may be extended by request of the Director at any time.

B. Accessibility

The permittee shall retain a copy of the storm water pollution prevention plan required by this permit (including a copy of the permit language) at the construction site (or other local location accessible to the Director, a State, Tribal or local agency approving sediment and erosion plans, grading plans, or storm water management plans; local government officials; or the operator of a municipal separate storm sewer receiving discharges from the site) from the date of project initiation to the date of final stabilization. Permittees with day-to-day operational control over SWPPP implementation shall have a copy of the SWPPP available at a central location on-site for the use of all operators and those identified as having responsibilities under the SWPPP whenever they are on the construction site.

C. Addresses

Except for the submittal of NOIs and NOTs (see Parts II.C and VIII.B, respectively), all written correspondence concerning discharges in any State, Indian Country land or from any Federal facility covered under this permit and directed to the EPA, including the submittal of individual permit applications, shall be sent to the address listed below: United States EPA, Region 6, Storm Water Staff, Enforcement and Compliance Assurance Division (GEN-WC), EPA SW Construction GP, P.O. Box 50625, Dallas, TX 75205.

Part VI. Standard Permit Conditions

A. Duty To Comply

1. The Permittee Must Comply With All Conditions of This Permit

Any permit noncompliance constitutes a violation of CWA and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application.

2. Penalties for Violations of Permit Conditions

The Director will adjust the civil and administrative penalties listed below in accordance with the Civil Monetary Penalty Inflation Adjustment Rule (Federal Register: December 31, 1996, Volume 61, Number 252, pages 69359–69366, as corrected, March 20, 1997, Volume 62, Number 54, pages 13514–

13517) as mandated by the Debt Collection Improvement Act of 1996 for inflation on a periodic basis. This rule allows EPA's penalties to keep pace with inflation. The Agency is required to review its penalties at least once every four years thereafter and to adjust them as necessary for inflation according to a specified formula. The civil and administrative penalties listed below were adjusted for inflation starting in 1996.

a. *Criminal.*

(1) Negligent Violations. The CWA provides that any person who negligently violates permit conditions implementing sections 301, 302, 306, 307, 308, 318, or 405 of the Act is subject to a fine of not less than $2,500 nor more than $25,000 per day of violation, or by imprisonment for not more than 1 year, or both.

(2) Knowing Violations. The CWA provides that any person who knowingly violates permit conditions implementing sections 301, 302, 306, 307, 308, 318, or 405 of the Act is subject to a fine of not less than $5,000 nor more than $50,000 per day of violation, or by imprisonment for not more than 3 years, or both.

(3) Knowing Endangerment. The CWA provides that any person who knowingly violates permit conditions implementing sections 301, 302, 306, 307, 308, 318, or 405 of the Act and who knows at that time that he is placing another person in imminent danger of death or serious bodily injury is subject to a fine of not more than $250,000, or by imprisonment for not more than 15 years, or both.

(4) False Statement. The CWA provides that any person who knowingly makes any false material statement, representation, or certification in any application, record, report, plan, or other document filed or required to be maintained under the Act or who knowingly falsifies, tampers with, or renders inaccurate, any monitoring device or method required to be maintained under the Act, shall upon conviction, be punished by a fine of not more than $10,000 or by imprisonment for not more than two years, or by both. If a conviction is for a violation committed after a first conviction of such person under this paragraph, punishment shall be by a fine of not more than $20,000 per day of violation, or by imprisonment of not more than four years, or by both. (See section 309.c.4 of the Clean Water Act).

b. *Civil Penalties.* The CWA provides that any person who violates a permit condition implementing sections 301, 302, 306, 307, 308, 318, or 405 of the Act is subject to a civil penalty not to exceed $27,500 per day for each violation.

c. *Administrative Penalties.* The CWA provides that any person who violates a permit condition implementing sections 301, 302, 306, 307, 308, 318, or 405 of the Act is subject to an administrative penalty, as follows:

(1) *Class I Penalty.* Not to exceed $11,000 per violation nor shall the maximum amount exceed $27,500.

(2) *Class II Penalty.* Not to exceed $11,000 per day for each day during which the violation continues, nor shall the maximum amount exceed $137,500.

B. Continuation of the Expired General Permit

If this permit is not reissued or replaced prior to the expiration date, it will be administratively continued in accordance with the Administrative Procedures Act and remain in force and effect. Any permittee who was granted permit coverage prior to the expiration date will automatically remain covered by the continued permit until the *earlier* of:

1. Reissuance or replacement of this permit, at which time the permittee must comply with the Notice of Intent conditions of the new permit to maintain authorization to discharge; or

2. The permittee's submittal of a Notice of Termination; or

3. Issuance of an individual permit for the permittee's discharges; or

4. A formal permit decision by the Director not to reissue this general permit, at which time the permittee must seek coverage under an alternative general permit or an individual permit.

C. Need To Halt or Reduce Activity Not a Defense

It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

D. Duty To Mitigate

The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

E. Duty To Provide Information

The permittee shall furnish to the Director or an authorized representative of the Director any information which is requested to determine compliance with this permit or other information.

F. Other Information

When the permittee becomes aware that he or she failed to submit any relevant facts or submitted incorrect information in the Notice of Intent or in any other report to the Director, he or she shall promptly submit such facts or information.

G. Signatory Requirements

All Notices of Intent, Notices of Termination, storm water pollution prevention plans, reports, certifications or information either submitted to the Director or the operator of a large or medium municipal separate storm sewer system, or that this permit requires be maintained by the permittee, shall be signed as follows:

1. All Notices of Intent and Notices of Termination shall be signed as follows:

a. For a corporation: by a responsible corporate officer. For the purpose of this section, a responsible corporate officer means: a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation; or the manager of one or more manufacturing, production or operating facilities employing more than 250 persons or having gross annual sales or expenditures exceeding $25,000,000 (in second-quarter 1980 dollars) if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;

b. For a partnership or sole proprietorship: by a general partner or the proprietor, respectively; or

c. For a municipality, State, Federal, or other public agency: by either a principal executive officer or ranking elected official. For purposes of this section, a principal executive officer of a Federal agency includes (1) the chief executive officer of the agency, or (2) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrators of EPA).

2. All reports required by this permit and other information requested by the Director or authorized representative of the Director shall be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:

a. The authorization is made in writing by a person described above and submitted to the Director.

b. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of manager, operator, superintendent, or position of equivalent responsibility or an

individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position).

c. *Changes to Authorization.* If an authorization under Part II.B is no longer accurate because a different operator has responsibility for the overall operation of the construction site, a new Notice of Intent satisfying the requirements of Part II.B must be submitted to the Director prior to or together with any reports, information, or applications to be signed by an authorized representative. The change in authorization must be submitted within the time frame specified in Part II.A.3, and sent to the address specified in Part II.C.

d. *Certification.* Any person signing documents under Part VI.G shall make the following certification:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

H. Penalties for Falsification of Reports

Section 309(c)(4) of the Clean Water Act provides that any person who knowingly makes any false material statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including reports of compliance or noncompliance shall, upon conviction, be punished by a fine of not more than $10,000, or by imprisonment for not more than two years, or by both.

I. Oil and Hazardous Substance Liability

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under section 311 of the CWA or section 106 of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA).

J. Property Rights

The issuance of this permit does not convey any property rights of any sort, nor any exclusive privileges, nor does it authorize any injury to private property nor any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations.

K. Severability

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit shall not be affected thereby.

L. Requiring an Individual Permit or an Alternative General Permit

1. The Director may require any person authorized by this permit to apply for and/or obtain either an individual NPDES permit or an alternative NPDES general permit. Any interested person may petition the Director to take action under this paragraph. Where the Director requires a permittee authorized to discharge under this permit to apply for an individual NPDES permit, the Director shall notify the permittee in writing that a permit application is required. This notification shall include a brief statement of the reasons for this decision, an application form, a statement setting a deadline for the permittee to file the application, and a statement that on the effective date of issuance or denial of the individual NPDES permit or the alternative general permit as it applies to the individual permittee, coverage under this general permit shall automatically terminate. Applications shall be submitted to the appropriate Regional Office indicated in Part V.C of this permit. The Director may grant additional time to submit the application upon request of the applicant. If a permittee fails to submit in a timely manner an individual NPDES permit application as required by the Director under this paragraph, then the applicability of this permit to the individual NPDES permittee is automatically terminated at the end of the day specified by the Director for application submittal.

2. Any permittee authorized by this permit may request to be excluded from the coverage of this permit by applying for an individual permit. In such cases, the permittee shall submit an individual application in accordance with the requirements of 40 CFR 122.26(c)(1)(ii), with reasons supporting the request, to the Director at the address for the appropriate Regional Office indicated in Part V.C of this permit. The request may be granted by issuance of any individual permit or an alternative general permit if the reasons cited by the permittee are adequate to support the request.

3. When an individual NPDES permit is issued to a permittee otherwise subject to this permit, or the permittee is authorized to discharge under an alternative NPDES general permit, the applicability of this permit to the individual NPDES permittee is automatically terminated on the effective date of the individual permit or the date of authorization of coverage under the alternative general permit, whichever the case may be. When an individual NPDES permit is denied to an owner or operator otherwise subject to this permit, or the owner or operator is denied for coverage under an alternative NPDES general permit, the applicability of this permit to the individual NPDES permittee is automatically terminated on the date of such denial, unless otherwise specified by the Director.

M. State/Tribal Environmental Laws

1. Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable State/Tribal law or regulation under authority preserved by section 510 of the Act.

2. No condition of this permit shall release the permittee from any responsibility or requirements under other environmental statutes or regulations.

N. Proper Operation and Maintenance

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit and with the requirements of storm water pollution prevention plans. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. Proper operation and maintenance requires the operation of backup or auxiliary facilities or similar systems, installed by a permittee only when necessary to achieve compliance with the conditions of this permit.

O. Inspection and Entry

The permittee shall allow the Director or an authorized representative of EPA, the State/Tribe, or, in the case of a construction site which discharges

through a municipal separate storm sewer, an authorized representative of the municipal owner/operator or the separate storm sewer receiving the discharge, upon the presentation of credentials and other documents as may be required by law, to:

1. Enter upon the permittee's premises where a regulated facility or activity is located or conducted or where records must be kept under the conditions of this permit;

2. Have access to and copy at reasonable times, any records that must be kept under the conditions of this permit; and

3. Inspect at reasonable times any facilities or equipment (including monitoring and control equipment).

P. Permit Actions

This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any permit condition.

Part VII. Reopener Clause

A. If there is evidence indicating that the storm water discharges authorized by this permit cause, have the reasonable potential to cause or contribute to, a violation of a water quality standard, the permittee may be required to obtain an individual permit or an alternative general permit in accordance with Part I.C of this permit, or the permit may be modified to include different limitations and/or requirements.

B. Permit modification or revocation will be conducted according to 40 CFR 122.62, 122.63, 122.64 and 124.5.

C. EPA may propose a modification to this permit after further discussions between the Agency and the Advisory Council on Historic Preservation for the protection of historic properties.

Part VIII. Termination of Coverage

A. Notice of Termination

Permittees must submit a completed Notice of Termination (NOT) that is signed in accordance with Part VI.G of this permit when one or more of the conditions contained in Part I.D.2. (Terminating Coverage) have been met at a construction project. The NOT form found in Addendum D will be used unless it has been replaced by a revised version by the Director. The Notice of Termination shall include the following information:

1. The NPDES permit number for the storm water discharge identified by the Notice of Termination;

2. An indication of whether the storm water discharges associated with construction activity have been eliminated (i.e., regulated discharges of storm water are being terminated) or the permittee is no longer an operator at the site;

3. The name, address and telephone number of the permittee submitting the Notice of Termination;

4. The name of the project and street address (or a description of location if no street address is available) of the construction site for which the notification is submitted;

5. The latitude and longitude of the construction site; and

6. The following certification, signed in accordance with Part VI.G (signatory requirements) of this permit. For construction projects with more than one permittee and/or operator, the permittee need only make this certification for those portions of the construction site where the permittee was authorized under this permit and not for areas where the permittee was not an operator:

"I certify under penalty of law that all storm water discharges associated with industrial activity from the identified facility that authorized by a general permit have been eliminated or that I am no longer the operator of the facility or construction site. I understand that by submitting this notice of termination, I am no longer authorized to discharge storm water associated with industrial activity under this general permit, and that discharging pollutants in storm water associated with industrial activity to waters of the United States is unlawful under the Clean Water Act where the discharge is not authorized by a NPDES permit. I also understand that the submittal of this Notice of Termination does not release an operator from liability for any violations of this permit or the Clean Water Act."

For the purposes of this certification, elimination of storm water discharges associated with construction activity means that all disturbed soils at the portion of the construction site where the operator had control have been finally stabilized (as defined in Part IX.I) and temporary erosion and sediment control measures have been removed or will be removed at an appropriate time to ensure final stabilization is maintained, or that all storm water discharges associated with construction activities from the identified site that are authorized by a NPDES general permit have otherwise been eliminated from the portion of the construction site where the operator had control.

B. Addresses

1. All Notices of Termination, signed in accordance with Part VI.G of this permit, are to be submitted using the form provided by the Director (or a photocopy thereof), to the address specified on the NOT form.

Part IX. Definitions

A. *Best Management Practices* ("BMPs") means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the discharge of pollutants to waters of the United States. BMPs also include treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

B. *Control Measure* as used in this permit, refers to any Best Management Practice or other method used to prevent or reduce the discharge of pollutants to waters of the United States.

C. *Commencement of Construction* the initial disturbance of soils associated with clearing, grading, or excavating activities or other construction activities.

D. *CWA* means the Clean Water Act or the Federal Water Pollution Control Act, 33 U.S.C. § 1251 *et seq.*

E. *Director* means the Regional Administrator of the Environmental Protection Agency or an authorized representative.

F. *Discharge* when used without qualification means the "discharge of a pollutant."

G. *Discharge of Storm Water Associated With Construction Activity* as used in this permit, refers to a discharge of pollutants in storm water runoff from areas where soil disturbing activities (e.g., clearing, grading, or excavation), construction materials or equipment storage or maintenance (e.g., fill piles, borrow areas, concrete truck washout, fueling), or other industrial storm water directly related to the construction process (e.g., concrete or asphalt batch plants) are located.

H. *Facility or Activity* means any NPDES "point source" or any other facility or activity (including land or appurtenances thereto) that is subject to regulation under the NPDES program.

I. *Final Stabilization* means that either:

1. All soil disturbing activities at the site have been completed and a uniform (e.g., evenly distributed, without large bare areas) perennial vegetative cover with a density of 70% of the native background vegetative cover for the area

has been established on all unpaved areas and areas not covered by permanent structures, or equivalent permanent stabilization measures (such as the use of riprap, gabions, or geotextiles) have been employed. In some parts of the country, background native vegetation will cover less than 100% of the ground (e.g., arid areas, beaches). Establishing at least 70% of the natural cover of native vegetation meets the vegetative cover criteria for final stabilization (e.g., if the native vegetation covers 50% of the ground, 70% of 50% would require 35% total cover for final stabilization; on a beach with no natural vegetation, no stabilization is required); or

2. For individual lots in residential construction by either: (a) the homebuilder completing final stabilization as specified above, or (b) the homebuilder establishing temporary stabilization including perimeter controls for an individual lot prior to occupation of the home by the homeowner and informing the homeowner of the need for, and benefits of, final stabilization. (Homeowners typically have an incentive to put in landscaping functionally equivalent to final stabilization as quick as possible to keep mud out of their homes and off their sidewalks and driveways.); or

3. For construction projects on land used for agricultural purposes (e.g., pipelines across crop or range land), final stabilization may be accomplished by returning the disturbed land to its preconstruction agricultural use. Areas disturbed that were not previously used for agricultural activities, such as buffer strips immediately adjacent to "waters of the United States," and areas which are not being returned to their preconstruction agricultural use must meet the final stabilization criteria in (1) or (2) above.

J. *Flow-Weighted Composite Sample* means a composite sample consisting of a mixture of aliquots collected at a constant time interval, where the volume of each aliquot is proportional to the flow rate of the discharge.

K. *Large and Medium Municipal Separate Storm Sewer System* means all municipal separate storm sewers that are either:

1. Located in an incorporated place (city) with a population of 100,000 or more as determined by the latest Decennial Census by the Bureau of Census (these cities are listed in Appendices F and G of 40 CFR 122); or

2. Located in the counties with unincorporated urbanized populations of 100,000 or more, except municipal separate storm sewers that are located in the incorporated places, townships or towns within such counties (these counties are listed in Appendices H and I of 40 CFR 122); or

3. Owned or operated by a municipality other than those described in paragraph (i) or (ii) and that are designated by the Director as part of the large or medium municipal separate storm sewer system.

L. *NOI* means Notice of Intent to be covered by this permit (see Part II of this permit).

M. *NOT* means Notice of Termination (see Part VIII of this permit).

N. *Operator* for the purpose of this permit and in the context of storm water associated with construction activity, means any party associated with a construction project that meets either of the following two criteria:

1. The party has operational control over construction plans and specifications, including the ability to make modifications to those plans and specifications; or

2. The party has day-to-day operational control of those activities at a project which are necessary to ensure compliance with a storm water pollution prevention plan for the site or other permit conditions (e.g., they are authorized to direct workers at a site to carry out activities required by the SWPPP or comply with other permit conditions).

This definition is provided to inform permittees of EPA's interpretation of how the regulatory definitions of "owner or operator" and "facility or activity" are applied to discharges of storm water associated with construction activity.

O. *Owner or operator* means the owner or operator of any "facility or activity" subject to regulation under the NPDES program.

P. *Point Source* means any discernible, confined, and discrete conveyance, including but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, landfill leachate collection system, vessel or other floating craft from which pollutants are or may be discharged. This term does not include return flows from irrigated agriculture or agricultural storm water runoff.

Q. *Pollutant* is defined at 40 CFR 122.2. A partial listing from this definition includes: dredged spoil, solid waste, sewage, garbage, sewage sludge, chemical wastes, biological materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt, and industrial or municipal waste.

R. *Runoff coefficient* means the fraction of total rainfall that will appear at the conveyance as runoff.

S. *Storm Water* means storm water runoff, snow melt runoff, and surface runoff and drainage.

T. *Storm Water Associated With Industrial Activity* is defined at 40 CFR 122.26(b)(14) and incorporated here by reference. Most relevant to this permit is 40 CFR 122.26(b)(14)(x), which relates to construction activity including clearing, grading and excavation activities that result in the disturbance of five (5) or more acres of total land area, or are part of a larger common plan of development or sale.

U. *Waters of the United States* means

1. All waters which are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;

2. All interstate waters, including interstate "wetlands";

3. All other waters such as interstate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation, or destruction of which would affect or could affect interstate or foreign commerce including any such waters:

a. Which are or could be used by interstate or foreign travelers for recreational or other purposes;

b. From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or

c. Which are used or could be used for industrial purposes by industries in interstate commerce;

4. All impoundments of waters otherwise defined as waters of the United States under this definition;

5. Tributaries of waters identified in paragraphs (a) through (d) of this definition;

6. The territorial sea; and

7. Wetlands adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs 1. through 6. of this definition.

Waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of the CWA (other than cooling ponds for steam electric generation stations per 40 CFR 423 which also meet the criteria of this definition) are not waters of the United States. Waters of the United States do not include prior converted cropland. Notwithstanding the determination of an area's status as prior converted cropland by any other federal agency, for the purposes of the Clean Water Act, the final authority regarding Clean

Water Act jurisdiction remains with EPA.

Part X. Permit Conditions Applicable to Specific States and Indian Country Lands

The provisions of this Part provide additions to the applicable conditions of Parts I through IX of this permit to reflect specific additional conditions required as part of the State or Tribal CWA Section 401 certification process. The additional revisions and requirements listed below are set forth in connection with, and only apply to, the following States and Indian Country lands.

1. LAR10##I: Indian Country Lands in the State of Louisiana*

No additional requirements.

2. NMR10###: The State of New Mexico, Except Indian Country Lands*

No additional requirements.

3. NMR10##I: Indian Country Lands in the State of New Mexico, Except Navajo Reservation Lands (see Region 9) and Ute Mountain Reservation Lands (see Region 8)*

a. *Pueblo of Isleta.* Copies of Notices of Intent (NOI), Notices of Termination (NOT), and Storm Water Pollution Prevention Plans (SWPPPs) must be submitted to the Pueblo of Isleta's Environment Department, Water Quality Program.

(1) Part II.C.2 of the permit is added as follows:

Special NOI Requirements for the Pueblo of Isleta. NOIs shall also be submitted to the Pueblo of Isleta's Environment Department, Water Quality Program, concurrently with their submission to EPA at the following address: Isleta Environment Department, Water Quality Program, Pueblo of Isleta, PO Box 1270, Isleta, New Mexico 87022.

(2) Part VIII.B.2 is added to the permit as follows:

Special NOI Requirements for the Pueblo of Isleta. NOTs are to be sent to the Pueblo of Isleta's Environment Department, Water Quality Program, concurrently with their submission to EPA. NOTs are to be sent to the address given in Part II.C.2.

(3) Part IV.A.3 is added to the permit as follows:

Special Storm Water Pollution Prevention Plan Requirements for the Pueblo of Isleta. Storm water pollution prevention plans must be submitted to the Pueblo of Isleta Environment Department, Water Quality Program, ten working days prior to commencing the project on Pueblo of Isleta tribal lands. SWPPPs are to be sent to the address given in Part II.C.2.

b. *Pueblo of Nambe.* Copies of Notices of Intent (NOI), Notices of Termination (NOT), and Storm Water Pollution Prevention Plans (SWPPPs) must be submitted to the Pueblo of Nambe Department of Environment and Natural Resources.

(1) Part II.C.2 is added to the permit as follows:

Special NOI Requirements for the Pueblo of Nambe. NOIs shall also be submitted to the Pueblo of Nambe Department of Environment and Natural Resources at the same time they are submitted to EPA at the following address: Pueblo of Nambe, Department of Environment and Natural Resources, Route 1 Box 11788, Santa Fe, New Mexico 87501, Phone (505) 455-2036, Fax (505) 455-2038.

(2) Part VIII.B.2 is added to the permit as follows:

Special NOT Requirements for the Pueblo of Nambe. NOTs shall also be submitted to the Pueblo of Nambe Department of Environment and Natural Resources at the same time they are submitted to EPA. NOTs are to be sent to the address given in Part II.C.2.

(3) Part IV.A.3 is added to the permit as follows:

Special Storm Water Pollution Prevention Plan Requirements for the Pueblo of Nambe. Storm water pollution prevention plans must be submitted to the Pueblo of Nambe Department of Environment and Natural Resources before the project on Pueblo of Nambe tribal lands begins. SWPPPs are to be sent to the address given in Part II.C.2.

c. *Pueblo of Picuris.* Copies of Notices of Intent (NOI), Notices of Termination (NOT), and Storm Water Pollution Prevention Plans (SWPPPs) must be submitted to the Pueblo of Picuris Environment Department.

(1) Part II.C.2 is added to the permit as follows:

Special NOI Requirements for the Pueblo of Picuris. NOIs shall also be submitted to the Pueblo of Picuris Environment Department at the same time they are submitted to EPA at the following address: Pueblo of Picuris, Environment Department, P.O. Box 127, Penasco, New Mexico 87553, Phone (505) 587-2519, Fax (505) 587-1071.

(2) Part VIII.B.2 is added to the permit as follows:

Special NOT Requirements for the Pueblo of Picuris. NOTs shall also be submitted to the Pueblo of Picuris Environment Department at the same time they are submitted to EPA. NOTs are to be sent to the address given in Part II.C.2.

(3) Part IV.A.3 is added to the permit as follows:

Special Storm Water Pollution Prevention Plan Requirements for the Pueblo of Picuris. Storm water pollution prevention plans must be submitted to the Picuris Environment Department before the project on Pueblo of Picuris tribal lands begins. SWPPPs are to be sent to the address given in Part II.C.2.

d. *Pueblo of Pojoaque.* Copies of Notices of Intent (NOI), Notices of Termination (NOT), and Storm Water Pollution Prevention Plans (SWPPPs) must be submitted to the Pueblo of Pojoaque Environment Department Director.

(1) Part II.C.2 is added to the permit as follows:

Special NOI Requirements for the Pueblo of Pojoaque. NOIs shall also be submitted to the Pueblo of Pojoaque Environment Department Director at the same time they are submitted to EPA at the following address: Pueblo of Pojoaque, Environment Department, Route 11, P.O. Box 208, Santa Fe, New Mexico 87501, Phone (505) 455-3383, Fax (505) 455-3633.

(2) Part VIII.B.2 of the permit is added as follows:

Special NOT Requirements for the Pueblo of Pojoaque. NOTs shall also be submitted to the Pueblo of Pojoaque Environment Department Director at the same time they are submitted to EPA. NOTs are to be sent to the address given in Part II.C.2.

(3) Part IV.A.3 is added to the permit as follows:

Special Storm Water Pollution Prevention Plan Requirements for the Pueblo of Pojoaque. Storm water pollution prevention plans must be submitted to the Pueblo of Pojoaque Environment Department Director before the project on Pueblo of Pojoaque tribal lands begins. SWPPPs are to be sent to the address given in Part II.C.2.

e. *Pueblo of San Juan.* No additional requirements.

f. *Pueblo of Sandia.* Copies of Notices of Intent (NOI), Notices of Termination (NOT), and Storm Water Pollution Prevention Plans (SWPPPs) must be submitted to the Pueblo of Sandia Environment Department.

(1) Part II.C.2 of the permit is added as follows:

Special NOI Requirements for the Pueblo of Sandia. NOIs shall also be submitted to the Pueblo of Sandia Environment Department at the same time they are submitted to EPA at the following address: Pueblo of Sandia, Environment Department, Box 6008, Bernalillo, New Mexico 87004, Phone (505) 867-4533; Fax (505) 867-9235.

(2) Part VIII.B.2 is added to the permit as follows:

Special NOT Requirements for the Pueblo of Sandia. NOTs shall also be submitted to the Pueblo of Sandia Environment Department at the same time they are submitted to EPA. NOTs are to be sent to the address given in Part II.C.2.

(3) Part IV.A.3 is added to the permit as follows:

Special Storm Water Pollution Prevention Plan Requirements for the Pueblo of Sandia. Storm water pollution prevention plans must be submitted to the Pueblo of Sandia Environment Department before commencement of the project on Pueblo of Sandia tribal lands. SWPPPs are to be sent to the address given in Part II.C.2.

g. Pueblo of Tesuque. Copies of Notices of Intent (NOI), Notices of Termination (NOT), Storm Water Pollution Prevention Plans (SWPPPs), inspection reports, all certifications and "other information" must be submitted, by hand delivery or certified mail, to the Pueblo of Tesuque.

(1) Part II.C.2 of the permit is added as follows:

Special NOI Requirements for the Pueblo of Tesuque. NOIs shall also be submitted to the Pueblo of Tesuque at least five (5) days prior to any ground disturbing activity at the following address: Pueblo of Tesuque, Environment Department, Route 5, Box 3260–T, Santa Fe, New Mexico 87501, Phone (505) 983–2667; Fax (505) 982–2331.

(2) Part VIII.B.2 is added to the permit as follows:

Special NOT Requirements for the Pueblo of Tesuque. NOTs shall also be submitted to the Pueblo of Tesuque at the same time they are submitted to EPA. NOTs are to be sent to the address given in Part II.C.2.

(3) Part IV.A.3 is added to the permit as follows:

Special Storm Water Pollution Prevention Plan Requirements for the Pueblo of Tesuque. Storm water pollution prevention plans must be submitted to the Pueblo of Tesuque at least five (5) days prior to any ground disturbing activity on Pueblo of Tesuque tribal lands. SWPPPs are to be sent to the address given in Part II.C.2.

(4) Part V.D is added to the permit as follows:

Special Reporting Requirements for the Pueblo of Tesuque. Copies of all certifications required by Section IV.D, and copies of "other information" required by Section VI.F shall be provided to the Pueblo of Tesuque, by hand delivery or certified mail. Also, copies of all inspection reports required under Section IV.D.4.c. shall be submitted within five (5) days of completion of the inspection. All information sent to the Pueblo of Tesuque is to be sent to the address given in Part II.C.2.

h. Santa Clara Pueblo. Copies of Notices of Intent (NOI) and Notices of Termination (NOT) must be submitted to the Santa Clara Pueblo Governors Office with a copy to the Office of Environmental Affairs.

(1) Part I.C.4. is added to the permit as follows:

Special Authorization Requirements for the Santa Clara Pueblo. Prior to submitting a Notice of Intent, the operator must obtain permission from the Santa Clara Governors Office to do the construction. If the project is approved by the tribal administration, the operator may proceed with submitting a Notice of Intent (NOI).

(2) Part II.C.2 is added to the permit as follows:

Special NOI Requirements for the Santa Clara Pueblo. NOIs shall also be submitted to the Santa Clara Pueblo Governors Office with a copy to the Office of Environmental Affairs at least two (2) weeks prior to the start of construction at the following address: Santa Clara Governors Office, PO Box 580, Espanola, New Mexico 87532, Phone (505) 753–7326; Fax (505) 753–8988.

(3) Part VIII.B.2 is added to the permit as follows:

Special NOT Requirements for the Santa Clara Pueblo. NOTs shall also be submitted to the Santa Clara Pueblo Governors Office with a copy to the Office of Environmental Affairs at least two (2) weeks prior to the start of construction. NOTs are to be sent to the address given in Part II.C.2.

i. All Other Indian Country lands in New Mexico. No additional requirements.

4. OKR10##I: Indian Country Lands in the State of Oklahoma*

No additional requirements.

5. OKR10##F: Oil and Gas Sites in the State of Oklahoma*

No additional requirements.

6. TXR10###: The State of Texas, Except Indian Country Lands*

a. Part III of the permit is modified as follows: Change the title of Part III. (*Special Conditions, Management Practices, and other Non-Numeric Limitations*) to: *Part III. Special Conditions, Management Practices, and other Limitations.*

b. Part III.G is added to the permit as follows:

Special Numeric Limitations for Discharges from Ready-Mixed Concrete Plants in the State of Texas, except Indian Country lands. All discharges of storm water from ready-mixed concrete plants covered by this permit must comply with the following limitations:

pH—Between 6.0 and 9.0 standard units

Oil and Grease—15 mg/l as a daily maximum

Total Suspended Solids—65 mg/l as a daily maximum

These limitations must be taken into account when designing the storm water control measures to be used for areas draining any ready-mixed concrete plants operated by the permittee.

7. TXR10##I: Indian Country Lands in the State of Texas*

No additional requirements.

Addendum A—Endangered Species

I. Instructions for Applicants

A. Background

To meet its obligations under the Clean Water Act and the Endangered Species Act (ESA) and to promote those Acts' goals, the Environmental Protection Agency (EPA) is seeking to ensure the activities regulated by the Construction General Permit (CGP) are protective of endangered and threatened species and critical habitat. To ensure that those goals are met, applicants for CGP coverage are required under Part I.B.3.e. to assess the impacts of their storm water discharges and storm water discharge-related activities on Federally listed endangered and threatened species ("listed species") and designated critical habitat ("critical habitat") by following Steps One through Six listed below. EPA strongly recommends that applicants follow these steps at the earliest possible stage to ensure that measures to protect listed species and critical habitat are incorporated early in the planning process. At minimum, the procedures should be followed when developing the storm water pollution prevention plan.

Permittees and applicants also have an independent ESA obligation to ensure that their activities do not result in any prohibited "takes" of listed species.[1] Many of the measures required in the CGP and in these instructions to protect species may also assist permittees in ensuring that their construction activities do not result in a prohibited take of species in violation of § 9 of the ESA. Applicants who plan construction activities in areas that harbor endangered and threatened species are advised to ensure that

[1] Section 9 of the ESA prohibits any person from "taking" a listed species (e.g., harassing or harming it) unless: (1) the taking is authorized through a "incidental take statement" as part of undergoing ESA § 7 formal consultation; (2) where an incidental take permit is obtained under ESA § 10 (which requires the development of a habitat conservation plan); or (3) where otherwise authorized or exempted under the ESA. This prohibition applies to all entities including private individuals, businesses, and governments.

they are protected from potential takings liability under ESA § 9 by obtaining either an ESA § 10 permit or by requesting formal consultation under ESA § 7 (as described in more detail in Step Seven below). Applicants who seek protection from takings liability should be aware that it is possible that some specific construction activities may be too unrelated to storm water discharges to be afforded incidental take coverage through an ESA § 7 consultation that is performed to meet the eligibility requirements for CGP coverage. In such instances, applicants should apply for an ESA § 10 permit. Where applicants are not sure whether to pursue a § 10 permit or a § 7 consultation for takings protection, they should confer with the appropriate Fish and Wildlife Service (FWS) or National Marine Fisheries Service (NMFS) office.

This permit provides for the possibility of multiple permittees at a construction site. Applicants should be aware that in many cases they can meet the permit eligibility requirements by relying on another operator's certification of eligibility under Part I.B.3.e.(2)(a), (b), or (c). This is allowed under Part I.B.3.e.(2)(d) of the permit. However, the other operator's certification must apply to the applicant's project area and must address the effects from the applicant's storm water discharges and storm water discharge-related activities on listed species and critical habitat. By certifying eligibility under Part I.B.3.e.(2)(d), the applicant agrees to comply with any measures or controls upon which the other operator's certification under Part I.B.3.e.(2)(a), (b) or (c) was based. This situation will typically occur where a developer or primary contractor, such as one for construction of a subdivision or industrial park, conducts a comprehensive assessment of effects on listed species and critical habitat for the entire construction project, certifies eligibility under Part I.B.3.e.(2)(a), (b) or (c), and that certification is relied upon by other operators (i.e., contractors) at the site. However, applicants that consider relying on another operator's certification should carefully review that certification along with any supporting information. If an applicant does not believe that the operator's certification provides adequate coverage for the applicant's storm water discharges and storm water discharge-related activities or for the applicant's particular project area, the applicant should provide its own independent certification under Part I.B.3.e.(2)(a), (b), or (c).

B. Procedures

To receive coverage under the Construction General Permit, applicants must assess the potential effects of their storm water discharges and storm water discharge-related activities on listed species and their critical habitat. To make this assessment, applicants must follow the steps outlined below prior to completing and submitting Notice of Intent (NOI) form. Applicants who are able to certify eligibility under Parts I.B.3.e.(2)(b), (c) or (d) because of a previously issued ESA § 10 permit, a previously completed ESA § 7 consultation, or because the applicant's activities were already addressed in another operator's certification of eligibility may proceed directly to Step Six.

Note.—The revised NOI form which was included in the CGP (see 62 FR 29822–29823, June 2, 1997) requires that applicants provide detailed certification information on listed species. That form is still under development and is not expected to be finalized before this permit is issued. Until the revised NOI form is finalized, applicants must use the existing NOI form which does not contain the specific certification provisions relating to listed species and critical habitats at construction projects. However, use of the existing NOI form does not relieve applicants of their obligation to follow the procedures listed below to determine if their construction storm water discharges or storm water discharge-related activities meet permit eligibility requirements for the protection of listed species and critical habitat. By following these instructions, applicants will have sufficient information on listed species and critical habitat in order to complete either the existing or revised NOI form and sign the certification statement.

Step One: Determine if the Construction Site Is Found Within Designated Critical Habitat for Listed Species

Some, but not all, listed species have designated critical habitat. Exact locations of such habitat is provided in the Service regulations at 50 CFR Parts 17 and 226. To determine if their construction site occurs within designated critical habitat, applicants should either:

- Contact the nearest Fish and Wildlife Service (FWS) and National Marine Fisheries Service (NMFS) Office. A list of FWS and NMFS offices is found in Section II of this Addendum; or
- Contact the State or Tribal Natural Heritage Centers. These centers compile and disseminate information on Federally listed and other protected species. They frequently have the most current information on listed species and critical habitat. A list of these centers is provided in Section III of this Addendum; or
- Review those regulations (which can be found in many larger libraries).

If the construction site is not located in designated critical habitat, then the applicant does not need to consider impacts to critical habitat when following Steps Two through Six below. If the site is located within critical habitat, then the applicant must look at impacts to critical habitat when following Steps Two through Six. Note that many but not all measures imposed to protect listed species under these steps will also protect critical habitat. Thus, meeting the eligibility requirements of this permit may require measures to protect critical habitat that are separate from those to protect listed species.

Step Two: Determine if Listed Species Are Located in the County(ies) Where the Construction Activity Will Occur

Section IV of the Addendum contains a county-by-county list of listed endangered and threatened species ("listed species"), and proposed endangered and threatened species ("proposed species"). Since the list was current as of September 1, 1997, applicants must also check with other sources for updated species and county information. These sources include: Sections II and III of this Addendum; EPA's Office of Wastewater Management's web page at "http://www.epa.gov/owm" where updates of the county-by-county list will be posted on a periodic basis; Federal Register Notices; State wildlife protection offices; a biologist or similar professional in the environmental field; or any other method which can be reasonably expected to provide this information. Applicants with construction projects located in EPA Region 2 and Region 6 can call the Storm Water General Permits Hotline at (800) 245-6510 for further assistance, while applicants with projects located in EPA Regions 1, 3, 7, 8, 9 and 10 may contact the appropriate EPA Regional Office.

Where a facility is located in more than one county, the lists for all counties should be reviewed. Where a facility discharges into a water body which serves as a border between counties or which crosses a county line which is in the immediate vicinity of the point of discharge, applicants should also review the species list for the county which lies immediately downstream or is across the water body from the point of discharge.

After a review of the available information from the sources mentioned above, if no listed species are located in a facility's county or if a facility's county is not listed, and the construction site is not located in critical habitat as described under Step One, an applicant is eligible for CGP coverage without further inquiry into the presence of, or effect to, listed species. The applicant must check the appropriate certification item on the revised NOI form (Part I.B.3.e.(2)(a)).

Once the applicant has determined which listed species are located in his or her facility's county, the applicant must follow Step Three.

Step Three: Determine if any Federally Listed Endangered and Threatened Species May Be Present in the Project Area

The project area consists of:

- The areas on the construction site where storm water discharges originate and flow toward the point of discharge into the receiving waters (including areas where excavation, site development, or other ground disturbance activities occur) and the immediate vicinity.

Example(s)

1. Where bald eagles nest in a tree that is on or bordering a construction site and could be disturbed by the construction activity.
2. Where grading causes storm water to flow into a small wetland or other habitat that is on the site which contains listed species.

- The areas where storm water discharges flow from the construction site to the point of discharge into receiving waters.

Example(s)

1. Where storm water flows into a ditch, swale, or gully which leads to receiving waters and where listed species (such as amphibians) are found in the ditch, swale, or gully.

- The areas where storm water from construction activities discharge into receiving waters and the areas in the immediate vicinity of the point of discharge.

Example(s)

1. Where storm water from construction activities discharges into a stream segment that is known to harbor listed aquatic species.

• The areas where storm water BMPs will be constructed and operated, including any areas where storm water flows to and from BMPs.

Example(s)

1. Where a storm water retention pond would be built.

The project area will vary with the size and structure of the construction activity, the nature and quantity of the storm water discharges, the storm water discharge-related activities and the type of receiving water. Given the number of construction activities potentially covered by the CGP, no specific method to determine whether listed species may be located in the project area is required for coverage under the CGP. Instead, applicants should use the method which allows them to determine, to the best of their knowledge, whether listed species are located in their project area. These methods may include:

• Conducting visual inspections: This method may be particularly suitable for construction sites that are smaller in size or located in non-natural settings such as highly urbanized areas or industrial parks where there is little or no natural habitat, or for construction activities that discharge directly into municipal storm water collection systems.

• Contacting the nearest State or Tribal wildlife agency, the Fish and Wildlife Service (FWS), or the National Marine Fisheries Service (NMFS). Many endangered and threatened species are found in well-defined areas or habitats. Such information is frequently known to State, Tribal, or Federal wildlife agencies. A list of FWS and NMFS offices is provided in Section II of this Addendum below.

• Contacting local/regional conservation groups or the State or Tribal Natural Heritage Centers (see Section III of this Addendum). State and local conservation groups may have location specific listed species information. The Natural Heritage Centers inventory species and their locations and maintain lists of sightings and habitats.

• Submitting a data request to a Natural Heritage Center. Many of these centers will provide site specific information on the presence of listed species in a project area. Some of these centers will charge a fee for researching data requests.

• Conducting a formal biological survey. Larger construction sites with extensive storm water discharges may choose to conduct biological surveys as the most effective way to assess whether species are located in the project area and whether there are likely adverse effects. Biological surveys are frequently performed by environmental consulting firms. A biological survey can be used to follow Steps Four through Six of these instructions.

• Conducting an environmental assessment under the National Environmental Policy Act (NEPA). Some construction activities may require environmental assessments under NEPA. Such assessments may indicate if listed species are in the project area. Coverage under the CGP does not trigger such an assessment because the permit does not regulate any dischargers subject to New Source Performance Standards under Section 306 of the Clean Water Act, and is thus statutorily exempted from NEPA. *See* CWA § 511(c). However, some construction activities might require review under NEPA because of Federal funding or other Federal involvement in the project.

If no species are found in the project area, an applicant is eligible for CGP coverage. Applicants must provide the necessary certification on the revised NOI form. If listed species are found in the project area, applicants must indicate the location and nature of this presence in the storm water pollution prevention plan and follow Step Four.

Step Four: Determine if Listed Species or Critical Habitat Are Likely To Be Adversely Affected by the Construction Activity's Storm Water Discharges or Storm Water Discharge-Related Activities

To receive CGP coverage, applicants must assess whether their storm water discharges or storm water discharge-related activities are likely to adversely affect listed species or critical habitat. "Storm water discharge-related activities" include:

• Activities which cause, contribute to, or result in point source storm water pollutant discharges, including but not limited to excavation, site development, grading, and other surface disturbance activities; and

• Measures to control storm water discharges including the siting, construction, operation of best management practices (BMPs) to control, reduce or prevent storm water pollution.

Potential adverse effects from storm water discharges and storm water discharge-related activities include:

• *Hydrological.* Storm water discharges may cause siltation, sedimentation or induce other changes in receiving waters such as temperature, salinity or pH. These effects will vary with the amount of storm water discharged and the volume and condition of the receiving water. Where a storm water discharge constitutes a minute portion of the total volume of the receiving water, adverse hydrological effects are less likely. Construction activity itself may also alter drainage patterns on a site where construction occurs which can impact listed species or critical habitat.

• *Habitat.* Excavation, site development, grading, and other surface disturbance activities from construction activities, including the installation or placement of storm water BMPs, may adversely affect listed species or their habitat. Storm water may drain or inundate listed species habitat.

• *Toxicity.* In some cases, pollutants in storm water may have toxic effects on listed species.

The scope of effects to consider will vary with each site. If the applicant is having difficulty in determining whether his or her project is likely to adversely Affect a listed species or critical habitat, then the appropriate office of the FWS, NMFS or Natural Heritage Center listed in Sections II and III of this Addendum should be contacted for assistance. If adverse effects are not likely, then the applicant should make the appropriate certification on the revised NOI form and apply for coverage under the permit. If adverse effects are likely, applicants must follow Step Five.

Step Five: Determine If Measures Can Be Implemented To Avoid Any Adverse Effects

If an applicant makes a preliminary determination that adverse effects are likely, it can still receive coverage under Part I.B.3.e.(2)(a) of the CGP if appropriate measures are undertaken to avoid or eliminate the likelihood of adverse effects prior to applying for permit coverage. These measures may involve relatively simple changes to construction activities such as re-routing a storm water discharge to bypass an area where species are located, relocating BMPs, or by changing the "footprint" of the construction activity. Applicants may wish to contact the FWS and/or NMFS to see what appropriate measures might be suitable to avoid or eliminate the likelihood of adverse impacts to listed species and/or critical habitat. (See 50 CFR 402.13(b).) This can entail the initiation of informal consultation with the FWS and/or NMFS which is described in more detail in Step Six.

If applicants adopt measures to avoid or eliminate adverse effects, they must continue to abide by those measures during the course of permit coverage. These measures must be described in the storm water pollution prevention plan and may be enforceable as permit conditions. If appropriate measures to avoid the likelihood of adverse effects are not available to the applicant, the applicant must follow Step Six.

Step Six: Determine if the Eligibility Requirements of Part I.B.3.e.(2)(b)–(d) Can Be Met

Where adverse effects are likely, the applicant must contact the EPA and FWS/NMFS. Applicants may still be eligible for CGP coverage if any likely adverse effects can be addressed through meeting the criteria of Part I.B.3.e.(2)(b)–(d) of the permit. These criteria are as follows:

1. An ESA Section 7 Consultation Is Performed for the Applicant's Activity (See Part I.B.3.e.(2)(b)

Formal or informal ESA § 7 consultation is performed with the FWS and/or NMFS which addresses the effects of the applicant's storm water discharges and storm water discharge-related activities on listed species and critical habitat. The formal consultation must result in either a "no jeopardy opinion" or a "jeopardy opinion" that identifies reasonable and prudent alternatives to avoid jeopardy which are to be implemented by the applicant. The informal consultation must result in a written concurrence by the Service(s) on a finding that the applicant's storm water discharge(s) and storm water discharge-related activities are not likely to adversely affect listed species or critical habitat (for informal consultation, see 50 CFR 402.13).

Most consultations are accomplished through informal consultation. By the terms of this permit, EPA has automatically designated applicants as non-Federal representatives for the purpose of conducting informal consultations. *See* Part I.B.3.e.(5) and 50 CFR 402.08 and 402.13. When conducting informal ESA § 7 consultation as a non-Federal representative, applicants must follow the procedures found in 50 CFR 402 of the ESA regulations.

Applicants must also notify EPA and the Services of their intention and agreement to conduct consultation as a non-Federal representative. Consultation may occur in the context of another Federal action at the construction site (e.g., where ESA § 7 consultation was performed for issuance of a wetlands dredge and fill permit for the project or where a NEPA review is performed for the project which incorporates a section 7 consultation). Any terms and conditions developed through consultations to protect listed species and critical habitat must be incorporated into the SWPPP. As noted above, applicants may, if they wish, initiate consultation with the Services at Step Five.

Whether ESA § 7 consultation must be performed with either the FWS, NMFS or both Services depends on the listed species which may be affected by the applicant's activity. In general, NMFS has jurisdiction over marine, estuarine, and anadromous species. Applicants should also be aware that while formal § 7 consultation provides protection from incidental takings liability, informal consultation does not.

2. An Incidental Taking Permit Under Section 10 of the ESA Is Issued for the Applicants Activity (See Part I.B.3.e.(2)(c))

The applicant's construction activities are authorized through the issuance of a permit under § 10 of the ESA and that authorization addresses the effects of the applicant's storm water discharge(s) and storm water discharge-related activities on listed species and critical habitat. Applicants must follow FWS and/or NMFS procedures when applying for an ESA Section 10 permit (see 50 CFR § 17.22(b)(1) (FWS) and § 222.22 (NMFS)). Application instructions for Section 10 permits for NMFS species can be obtained by (1) accessing the "Office of Protected Resources" sector of the NMFS Home Page at "http://www.nmfs.gov" or by contacting the National Marine Fisheries Service, Office of Protected Resources, Endangered Species Division, F/PR3, 1315 East-West Highway, Silver Spring, Maryland 20910; telephone (301) 713-1401, fax (301) 713-0376.

3. The Applicant Is Covered Under the Eligibility Certification of Another Operator for the Project Area (See Part I.B.3.e.(2)(d))

The applicant's storm water discharges and storm water discharge-related activities were already addressed in another operator's certification of eligibility under Part I.B.3.e.(2)(b), or (c) which also included the applicant's project area. By certifying eligibility under Part I.B.3.e.(2)(d), the applicant agrees to comply with any measures or controls upon which the other operator's certification under Part I.B.3.e.(2)(a), (b) or (c) was based. Certification under Part I.B.3.e.(2)(d) is discussed in more detail in Section I.A. of this addendum.

The applicant must comply with any terms and conditions imposed under the eligibility requirements of paragraphs I.B.3.e(2)(a), (b), (c), (d) to ensure that its storm water discharges and storm water discharge-related activities are protective of listed species and/or critical habitat. Such terms and conditions must be incorporated in the project's SWPPP. If the eligibility requirements of Part I.B.3.e.(2)(a)-(d) cannot be met, then the applicant may not receive coverage under the CGP. Applicants should then consider applying to EPA for an individual permit.

II. List of Fish and Wildlife Service and National Marine Fisheries Service Offices

A. U.S. Fish and Wildlife Service Offices

National Website for Endangered Species Information

Endangered Species Home page: http://www.fws.gov/r9endspp/endspp.html

Regional, State, Field and Project Offices

USFWS Region Two

Regional Office

Division Chief, Endangered Species, U.S. Fish and Wildlife Service, ARD Ecological Services, P.O. Box 1306, Albuquerque, NM 87103

State, Field, and Project Offices (Region Two)

Field Supervisor, U.S. Fish and Wildlife Service, Corpus Christi Field Office, 6300 Ocean Dr., Campus Box 338, Corpus Christi, TX 78412

Field Supervisor, U.S. Fish and Wildlife Service, Arlington Field Office, 711 Stadium Dr., East, Suite 252, Arlington, TX 76011

Field Supervisor, U.S. Fish and Wildlife Service, Clear Lake Field Office, 17629 El Camino Real, Suite 211, Houston, TX 77058

Field Supervisor, U.S. Fish and Wildlife Service, Oklahoma Field Office, 222 S. Houston, Suite a, Tulsa, OK 74127

Field Supervisor, U.S. Fish and Wildlife Service, New Mexico Field Office, 2105 Osuna, NE, Albuquerque, NM 87113

Field Supervisor, U.S. Fish and Wildlife Service, Austin Ecological Serv. Field Office, 10711 Burnet Road, Suite 200, Austin, TX 78758

Field Supervisor, U.S. Fish and Wildlife Service, Arizona State Office, 2321 W. Royal Palm Road, Suite 103, Phoenix, AZ 85021-4951

USFWS Region Four

Regional Office

Division Chief, Endangered Species, U.S. Fish and Wildlife Service, ARD—Ecological Services, 1875 Century Blvd., Suite 200, Atlanta, GA 30345

State, Field, and Project Offices (Region Four)

Field Supervisor, U.S. Fish and Wildlife Service, Panama City Field Office, 1612 June Avenue, Panama City, FL 32405-3721

Field Supervisor, U.S. Fish and Wildlife Service, South Florida Ecosystem Field Office, 1360 U.S. Hwy 1, #5; P.O. Box 2676, Vero Beach, FL 32961-2676

Field Supervisor, U.S. Fish and Wildlife Service, Caribbean Field Office, P.O. Box 491, Boqueron, PR 00622

Field Supervisor, U.S. Fish and Wildlife Service, Puerto Rican Parrot Field Office, P.O. Box 1600, Rio Grande, PR 00745

Field Supervisor, U.S. Fish and Wildlife Service, Brunswick Field Office, 4270 Norwich Street, Brunswick, GA 31520-2523

Field Supervisor, U.S. Fish and Wildlife Service, Jacksonville Field Office, 6620 Southpoint Drive S., Suite 310, Jacksonville, FL 32216-0912

Field Supervisor, U.S. Fish and Wildlife Service, Charleston Field Office, 217 Ft. Johnson Road, P.O. Box 12559, Charleston, SC 29422-2559

Field Supervisor, U.S. Fish and Wildlife Service, Clemson F.O., Dept. of Forest Resources, 261 Lehotsky Hall, Box 341003, Clemson, SC 29634-1003

Field Supervisor, U.S. Fish and Wildlife Service, Raleigh Field Office, P.O. Box 33726, Raleigh, NC 27636-3726

Field Supervisor, U.S. Fish and Wildlife Service, Cookeville Field Office, 446 Neal Street, Cookeville, TN 38501

Field Supervisor, U.S. Fish and Wildlife Service, Asheville Field Office, 160 Zillicoa Street, Asheville, NC 28801

Field Supervisor, U.S. Fish and Wildlife Service, Daphne Field Office, P.O. Drawer 1190, Daphne, AL 36526

Field Supervisor, U.S. Fish and Wildlife Service, Vicksburg Field Office, 2524 S. Frontage Road, Suite B, Vicksburg, MS 39180-5269

Field Supervisor, U.S. Fish and Wildlife Svc., Lafayette Field Office, Brandywine II, Suite 102, 825 Kaliste Saloom Road, Lafayette, LA 70508

Field Supervisor, U.S. Fish and Wildlife Service, Jackson Field Office, 6578 Dogwood View Pkwy Suite A, Jackson, MS 39213

B. National Marine Fisheries Service Offices

The National Marine Fisheries Service is developing a database to provide county and territorial water (up to three miles offshore) information on the presence of endangered and threatened species and critical habitat. The database is projected to be available to the public sometime in December 1997. The database should be found at the "Office of Protected Resources" site on the NMFS Homepage at "http://www.nmfs.gov".

Regional and Field Office

Southeast Region

Protective Species Management Branch, National Marine Fisheries Service, Southeast Region, 9721 Executive Center Drive, St. Petersburg, Florida 33702-2432

III. Natural Heritage Centers

The Natural Heritage Network comprises 85 biodiversity data centers throughout the Western Hemisphere. These centers collect, organize, and share data relating to endangered and threatened species and habitat. The network was developed to inform land-use decisions for developers,

corporations, conservationists, and government agencies and is also consulted for research and educational purposes. The centers maintain a Natural Heritage Network Control Server Website (http://www.heritage.tnc.org) which provides website and other access to a large number of specific biodiversity centers. Some of these centers are listed below:

Oklahoma Natural Heritage Inventory

Oklahoma Biological Survey, 111 East Chesapeake Street, University of Oklahoma, Norman, OK 73019–0575, 405/325–1985 Fax: 405/325–7702, Web site: http://obssun02.uoknor.edu/biosurvey/onhi/home.html

Louisiana Natural Heritage Program

Department of Wildlife & Fisheries, P.O. Box 98000, Baton Rouge, LA 70898–9000, 504/765–2821 Fax: 504/765–2607

Navajo Natural Heritage Program

P.O. Box 1480, Window Rock, Navajo Nation, AZ 86515, (520) 871–7603, (520) 871–7069 (FAX)

Texas Biological and Conservation Data System

3000 South IH–35, Suite 100, Austin, TX 78704, 512/912–7011 Fax: 512/912–7058

IV. County List of Endangered and Threatened Species

Please see February 17, 1998, Federal Register Vol. 63 no. 31 for county by county listing or contact EPA Region 6 Storm Water Hotline (1–800–245–6510). EPA's Office of Wastewater Management's web page at "http://www.epa.gov/owm" will post periodic updates of the county-by-county list. You may also check the list of endangered and threatened species published by the Fish and Wildlife Service on the Endangered Species Home Page (http://www.fws.gov/~r9endspp/enddspp.htm) which is also attached to the FWS Home Page in the "Nationwide Activities Category". List of species under NMFS jurisdiction can be found on the NMFS Homepage (http:www.nmfs.gov) under the "Protected Resources Program." Lists and maps of critical habitat can be found in the Code of Federal Regulations (CFRs) at 50 CFR parts 17 and 226.

Addendum B—Historic Properties (Reserved)

Instructions related to historic preservation have not been included in the permit at this time. EPA may modify the permit to include such provisions at a later date. This does not relieve applicants or permittees of their responsibility to comply with applicable State, Tribal or local laws for the protection of historic properties.

Addendum C—Revised Notice of Intent Form

The Notice of Intent form (EPA3510–9) replaces the Notice of Intent form (EPA 3510–6 (8–98)). The revised form is contained in this Addendum. According to the provisions in Part II.B.1 of this permit, applicants are reminded they must certify that they meet all eligibility requirements of Part I.B. of this permit and are informing the Director of their intent to be covered by, and comply with, those terms and conditions. These conditions include certifications that the applicant's storm water discharges and storm water-related discharge activities will not adversely affect listed endangered or threatened species, or their critical habitat. EPA may modify this permit to include provisions relating to historic preservation.

BILLING CODE 6560–50–P

Attachment 3

Notice of Intent for Stormwater Discharges Associated with Construction Activity

Note: Attachment 3 will be distributed upon receipt.

Attachment 4

Construction Schedule Documentation

Construction Schedule Documentation

Site Activity	Planned Start	Planned Finish	Actual Start	Actual Finish
Mobilization	*	*		
Erosion Control Measure Implementation (Silt fences and earthen berms)	*	*		
Soil Placement	*	*		
Final Grading	*	*		
Demobilization	*	*		
Construction Activities Complete	*	*		

* See Subcontractor Schedule.

APPENDIX F

Regulatory Compliance Plan

REGULATORY COMPLIANCE PLAN
FOR
CLOSURE CONSTRUCTION
AT SEWAGE LAGOONS

Prepared for:

27 CE/CEV
Cannon Air Force Base, NM
and
HQ ACC/CEV
Langley Air Force Base, VA

Prepared by:

Foster Wheeler Environmental Corporation
6605 Uptown Boulevard, Suite 220
Albuquerque, New Mexico 87110

Under Contract No. DACW45-94-D-0003

Delivery Order No. 35, Work Authorization Directive 1

U.S. Army Corps of Engineers
Omaha District
Omaha, Nebraska

February 2003

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ACRONYMS AND ABBREVIATIONS

AFB	Air Force Base
CAU	Corrective Action Unit
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
DOM	Delivery Order Manager
DOT	Department of Transportation
EHS	Environmental Health and Safety
EPA	U.S. Environmental Protection Agency
ESQ	Environmental, Safety, and Quality
Foster Wheeler Environmental	Foster Wheeler Environmental Corporation
IRP	Installation Restoration Program
LDR	Land Disposal Restriction
mg/kg	milligrams per kilogram
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
NOI	Notice of Intent
NPDES	National Pollution Discharge Elimination System
PCS	petroleum-contaminated soil
PPE	personal protective equipment
RCP	Regulatory Compliance Plan
RCRA	Resource Conservation and Recovery Act
SHSO	Site Health and Safety Officer
SPCCP	Spill Prevention Control and Countermeasures Plan
SW	solid waste
SWMU	Solid Waste Management Unit
SWMU 101	Sewage Lagoon
SWPPP	Stormwater Pollution Prevention Plan
TAL	Target Analyte List
TBD	to be determined
TCLP	Toxicity Characteristic Leaching Procedure
TPH	total petroleum hydrocarbons
TSDF	Treatment, Storage, and Disposal Facility

ACRONYMS AND ABBREVIATIONS (Continued)

USACE	U.S. Army Corps of Engineers
USAF	U.S. Air Force
UTS	Universal Treatment Standards

1. INTRODUCTION

This Regulatory Compliance Plan (RCP) has been specifically developed to identify the necessary regulatory requirements applicable to response actions planned for implementing Cannon Air Force Base's (AFB) closure of the Solid Waste Management Unit (SWMU) 101, Sewage Lagoons. The RCP details closure requirements, waste management practices, and training requirements to be applied and followed during field work at the sewage lagoons. This project is considered to be a "clean construction" project (i.e., it is expected that no hazardous or special wastes will be generated during the Closure activities). The RCP provides information on how wastes such as non-hazardous personal protective equipment (PPE) and decontamination water associated with project activities will be stored and disposed. The RCP also addresses the requirements for hazardous and special wastes, including petroleum-contaminated soil (PCS) in the event they are generated. In addition, a secondary goal of the RCP is to ensure that waste minimization practices are followed, to the extent practical, to reduce the volume of waste that will be generated, stored, and removed from the site for disposal.

2. REGULATORY FRAMEWORK

Cannon AFB is conducting an Installation Restoration Program (IRP) at the Base, which was initially managed under the United States Air Force (USAF) IRP. The IRP was subsequently integrated with the U.S. Environmental Protection Agency (EPA) Resource Conservation and Recovery Act (RCRA) corrective action program. This site has been included under the Base's IRP and is designated SWMU 101. IRP activities are implemented in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and response procedures consistent with the National Contingency Plan. Under CERCLA, Executive Order 12580, and the Defense Restoration Program (10 United States Code Section 2701, *et seq.*), the Department of Defense has delegated USAF "lead agency" in responding to hazardous substance and other pollutant and contaminant releases. Because this project is under the IRP, there is certain flexibility regarding permitting and waste management. Specifically, no federal, state, or local permits are required for on-site response actions conducted pursuant to CERCLA. The term "on-site" means the real extent of contamination and all suitable areas in very close proximity to the contamination necessary for implementation of the response action.

2.1 Permit Requirements

2.1.1 National Pollution Discharge Elimination System Stormwater Construction Permit

Title 40 of the Code of Federal Regulations (CFR) 122.26 requires a National Pollution Discharge Elimination System (NPDES) permit for construction activity, including clearing, grading, and excavation activities, except for operations that result in the disturbance of less than 5 acres of total land area and are not part of a larger common plan of development or sale. The actual construction area for this project is greater than 5 acres; consequently, an NPDES construction permit or a Notice of Intent (NOI) to discharge is required. The Stormwater Pollution Prevention Plan (SWPPP) has been prepared and is provided as Appendix E to the Closure Work Plan. The SWPPP addresses surface water discharges and runon and runoff control resulting from project construction activities.

2.1.2 Bulk Storage User Permit

Section 7-16A-8 of the New Mexico Special Fuels Supplier Tax Act requires a Special Bulk Storage User Permit in order to avoid excise tax. Fuel must be used for non-highway purposes only.

2.2 Regulated Site Activities

The following actions are addressed in the Closure Work Plan and are applicable to the planned project activities. The anticipated regulated activities are as follows:

- Fuel Storage Tanks—An aboveground diesel fuel storage tank will be located at the site. Appendix D addresses the site-specific Spill Prevention Control and Countermeasures Plan (SPCCP) as required by 40 CFR Part 112.

- General—Proper management of decontamination water (if generated) and contaminated soil or debris (if encountered during project work), including chemical analysis for characterization, handling, and disposal purposes, is required.

- Transportation and Disposal of Wastes—Cannon AFB will dispose and transport any hazardous wastes or special wastes (if generated) resulting from project work. Assistance will be provided for these activities, including proposing waste characterizations, labeling and marking containers, preparing manifests for Cannon AFB personnel signature, and performing transporter and treatment/disposal facility compliance evaluations.

2.3 Regulatory Requirements

Project activities are expected to generate only nonhazardous solid waste (trash, grubbing and cleaning waste, and excess construction materials, such as reinforcement steel from concrete processing). While not expected, there is the potential for encountering hazardous waste and possibly New Mexico-regulated special waste in the form of PCS resulting from equipment leaks. As such, the following federal and state regulations are potentially applicable and must be complied with during implementation of planned project activities:

- 33 CFR Parts 320–330, U.S. Army Corps of Engineers (USACE) Permits
- 40 CFR Part 122.26, EPA Stormwater Permit Regulations
- 40 CFR Parts 190–256, EPA Regulations for Solid Waste
- 40 CFR Parts 260–299, EPA Regulations for Identification and Management of Hazardous Waste
- 49 CFR Parts 100–178, Department of Transportation (DOT) Rules for Hazardous Materials Transport
- 20 New Mexico Administrative Code (NMAC) Chapter 9, Solid Waste Management Regulations
- 20 NMAC Chapter 4, Hazardous Waste Management Regulations
- 20 NMAC Chapters 2, Air Quality Control Regulations
- 20 NMAC, Water Quality Regulations
- Applicable Cannon AFB Permits and Policies and Procedures

A more detailed discussion of the remedial activities to be implemented during the project is presented in Sections 3, 4, and 5 of the Closure Work Plan.

Standards or methods used to determine management practices for the various waste streams to be generated during the closure process will consist of the use of generator knowledge and/or toxicity characteristic leaching procedure (TCLP) and/or total petroleum hydrocarbons (TPH) analysis of contaminated soil, PCS, decontamination water, and PPE. In the event that any wastewater (e.g., decontamination water) is generated during project activities, Cannon AFB will notify NMED with an NOI to discharge the wastewater, provided the water meets the New Mexico Environment Department

(NMED) groundwater discharge standards. If the water does not meet NMED discharge standards, alternative means for treatment and/or disposal of the wastewater will be developed.

As described within the SWPPP (Appendix E), Best Management Practices will be followed to control runon/runoff during construction activities. Best Management Practices shall consist of the use of temporary silt fences, berms, small diversion trenches, and/or drainage ditches along the perimeter of the construction area.

2.4 Waste Minimization

To minimize the volume of waste, the following general guidelines will be followed:

- Materials will not be contaminated unnecessarily.
- Work will be planned ahead, based on the work procedure to be used.
- Only the material (i.e., chemicals) needed to perform the work activity will be taken to the site.
- Additional material can be brought to the work location if deemed necessary.
- Materials can be stored in large containers, but the smallest reasonable container will be used to transport the material to the location where it is needed.
- Cleaning and extra sampling supplies will be maintained outside any potentially contaminated area to keep them clean and to minimize additional waste generation.
- Prefabricated materials, barriers, support equipment, etc., located outside will be maintained or constructed outside potentially contaminated areas.
- Mixing of detergents or decontamination solutions will be performed outside potentially contaminated areas.
- Cover material, trench residuals, trench soils, and decontamination water will be segregated.
- Drop cloths or other absorbent material will be used to contain small spills or leaks.
- A bellows effect will be avoided when double-bagging contaminated materials.
- Containers will be used to minimize the spread of contamination.

- Contaminated materials will not be placed with clean materials.
- Wooden pallets inside the exclusion zone will be covered with plastic.
- Material and equipment will be decontaminated and revised when practical.
- Volume-reduction techniques will be used when practicable.
- Waste containers will be solidly packed to minimize the number of containers.
- The size of container will match the need (i.e., a drum or garbage can will not be used when a small polyethylene bag will be used).
- Less hazardous substances will be used whenever possible (i.e., only the volume of standard solutions needed for testing will be brought; minimal amounts of decontamination water and solvent rinses will be used).

3. PROJECT WASTE DESCRIPTIONS

This section presents information and a corresponding description for each type of "potential" waste stream that is anticipated to be generated during sewage lagoon closure activities.

Potential waste streams associated with the sewage lagoon project activities can be categorized as follows:

- Nonhazardous solid waste, such as trash and inert construction debris
- Potential contaminated soil, rock, sorbent material, and debris (petroleum from equipment leaks)
- Used oil (including engine oil, hydraulic fluid, greases, antifreeze/coolant, etc.) and oil filters from vehicle and equipment maintenance operations
- Decontamination water generated during sampling operations.

Table F-1 summarizes applicable waste management, transportation, and disposal requirements for each of the waste streams indicated above.

Table F-1. Waste Management Summary Requirements

Waste Types	Characterization Requirements	Applicable Regulations	Allowable Containment	Storage Requirements	Transportation Requirements	Disposal Requirements
Petroleum-Contaminated Soils (PCS)	Need to determine whether excavated soil is a hazardous or Special Waste. Representative sample to be taken from stockpiled or containerized soil. Use material safety data sheets to characterize contaminants based on knowledge of petroleum, oil, and lubricants used in site equipment. If analysis necessary, perform Toxicity Characteristic Leaching Procedure (TCLP) analysis and/or total petroleum hydrocarbon (TPH) analysis using the U.S. Environmental Protection Agency (EPA) Method 9071A/418.1	20 New Mexico Administrative Code (NMAC) 4.1 "Identification & Listing of Hazardous Waste" and "Standards Applicable to Generators of Hazardous Waste" 40 Code of Federal Regulations 268.48—Land Disposal Restriction (LDR) and Universal Treatment Standards (UTS) 40 CFR Part 262—Generator Standards 20 NMAC 9.1 Special Waste Requirements	Special Waste: PCS to be temporarily stockpiled (or containerized) within a bermed, lined containment structure. A cover shall be used to prevent runon of precipitation. Hazardous Waste: Department of Transportation (DOT)-approved 55-gallon metal drums (1A2) or roll-offs that must be kept sealed when not being loaded or unloaded.	Special Waste: Maximum onsite storage for PCS Special Waste is 45 days. Use sign or label as indicated in Section 4.4 of this Regulatory Compliance Plan (RCP). Store at temporary storage area designated by Cannon AFB personnel. Hazardous Waste: 90-day storage limit if determined to be a hazardous waste and must be labeled with a completed hazardous waste label. Waste to be stored at a predesignated 90-day storage area prior to moving to Defense Reutilization and Marketing Office. NOTE: Storage clock starts from the date that waste is generated.	Special Waste: PCS shipped offsite must be accompanied by a New Mexico Envrionment Department (NMED) Special Waste manifest. Containers must be labeled indicating contents and the potential health, safety, and environmental hazards associated with the waste. Hazardous Waste: Hazardous waste manifest and DOT placarding. Must use an EPA-permitted and Foster Wheeler Environmental-approved transporter. Must also have LDR certifications as necessary. NOTE: Individuals involved in overseeing or shipping hazardous materials must meet HM-181 & HM-126F training requirements.	Special Waste: PCS Special Waste can be disposed only in an approved offsite solid waste facility authorized for special wastes. PCS Special Waste containing free liquid cannot be sent to a landfill and must pass the paint filter test before it can be landfilled. Hazardous Waste: Must be disposed at an approved offsite Resource Conservation and Recovery Act (RCRA) Treatment, Storage, and Disposal Facility (TSDF). Nonhazardous, non-PCS soil will be used for backfill or construction material. NOTE: Foster Wheeler Environmental's Environmental, Safety, and Quality (ESQ) must approve TSDF and transporter prior to shipment of waste.

Table F-1. Waste Management Summary Requirements (Continued)

Waste Types	Characterization Requirements	Applicable Regulations	Allowable Containment	Storage Requirements	Transportation Requirements	Disposal Requirements
Used Oil (Motor Oil, Hydraulic Fluid, and Greases) and Oil Filters. The best management practice for each of these areas are described in the following sections.	Spent oil filters and oil will be handled as a non-RCRA hazardous waste. "Drained" oil filters to be managed as a nonhazardous solid waste. Recycling of used oil and oil filters is recommended.	40 CFR Part 279—Standards for Generators of Used Oil	DOT-approved 55-gallon (bunghole-type) metal drums (1A1) or DOT-approved portable tanks (DOT 51,52,53,56,57 and 60) that must be sealed when not being loaded/filled or unloaded.	Nonhazardous Waste: Containers must be labeled "Used Oil" and containers must be stored within secondary containment structures within the staging area.	Used oil and empty oil filters generated from vehicle and equipment maintenance activities will be collected by the equipment maintenance subcontractor, who in turn will be responsible for transporting the used oil and oil filters under a "Bill of Lading" to an appropriate offsite recycling facility.	An approved recycling facility will be utilized for used oil and empty oil filters generated from vehicle and equipment maintenance activities. "Drained" oil filters can also be disposed of as a solid waste.
Solid Waste (Trash)	Trash will be managed as a solid waste (SW). Unused materials will either be returned to manufacturer or will be used on other projects.	20 NMAC 9.1 "Solid Waste Management Regulations"	Place in specified dumpsters or containers	No specific requirements. Store at area designated by Cannon personnel.	Not Applicable	Trash to be disposed at the base's solid waste landfill or other approved facility. Unused materials to be either returned to supplier or used for other projects.

Table F-1. Waste Management Summary Requirements (Concluded)

Waste Types	Characterization Requirements	Applicable Regulations	Allowable Containment	Storage Requirements	Transportation Requirements	Disposal Requirements
Disposable Personal Protective Equipment (PPE)	Decontaminated PPE will be handled as a SW and no analysis is required. If not decontaminated, then need to determine whether the PPE is a hazardous waste or not using generator knowledge or by running a total analysis[1] or a TCLP.	20 NMAC 9.1 "Solid Waste Management Regulations" 20 NMAC 4.1 "Identification & Listing of Hazardous Waste" and "Standards Applicable to Generators of Hazardous Waste" 40 CFR 268.48—LDR and UTS 40 CFR Part 262—Generator Standards.	Hazardous Waste: DOT-approved 55-gallon Metal drums (1A2) that must be kept closed when not being loaded or unloaded. Nonhazardous Waste: Double-bagged in plastic bags.	Hazardous Waste: 90-day storage limit if determined to be a hazardous waste. Must be labeled with a completed hazardous waste label. Waste to be stored at a predesignated 90-day storage area. NOTE: Storage clock starts from the date that waste is first generated.	Hazardous Waste: Hazardous waste manifest and DOT placarding. Must use an EPA permitted and Foster Wheeler Environmental-approved transporter. Must also have LDR certifications as necessary. NOTE: Individuals involved in overseeing or shipping hazardous materials must meet HM-181 & HM-126F training requirements.	Hazardous Waste: Must be disposed at an approved off-site RCRA TSDF. Nonhazardous solid waste to be disposed at the base's solid waste landfill or other approved facility. NOTE: Foster Wheeler Environmental ESQ must approve TSDF and transporter prior to shipment of waste.

[1] If a total analysis is chosen and the results indicate that a constituent is more than 20 times the appropriate Toxicity Characteristic level, then a TCLP will have to be run.

DOT	Department of Transportation
EPA	U.S. Environmental Protection Agency
ESQ	Environmental, Safety, and Quality
LDR	Land Disposal Restriction
NMAC	New Mexico Administrative Code
PCS	petroleum-contaminated soil
PPE	personal protective equipment
RCRA	Resource Conservation and Recovery Act
SW	solid waste
TCLP	Toxicity Characteristic Leaching Procedure
TPH	total recoverable petroleum hydrocarbon
TSDF	treatment, storage, and disposal facility
UTS	Universal Treatment Standards

4. WASTE MANAGEMENT ACTIVITIES

This section provides a discussion as to how potential wastes generated during project activities will be characterized, managed while onsite, and disposed of, if necessary.

4.1 Waste Characterization/Classification

To determine proper waste management requirements for waste generated during project activities, waste characterization may be necessary. Unless a waste determination can be made based on generator knowledge and site data, all waste streams will be sampled and characterized in accordance with 40 CFR 262.11 regulations. If samples for classifying waste are deemed necessary to meet characterization requirements, representative samples will be taken and analyzed in accordance with federal and New Mexico Hazardous Waste Management Regulations and Solid Waste Management Regulations. Waste streams, including but not limited to debris and soil, decontamination water, and PPE, will be sampled and/or characterized using generator knowledge, TCLP testing, or TPH analysis, depending on the nature of the material and expected contaminant. Generator knowledge is expected to be the primary means of characterizing wastes generated during this project. The basis for characterization will be in the form of material data safety sheets for materials brought onsite, prior site assessment data and observations made and analyses conducted during site activities.

Waste will first be characterized to determine whether it is a hazardous or special waste; waste is determined to be characteristically hazardous on the basis of its chemical constituents or physical properties. Listed wastes are specifically identified in 40 CFR Part 261, Subpart D. New Mexico Special Waste, which includes PCS, is identified as soil contaminated with a TPH concentration greater than 100 milligrams per kilogram (mg/kg).

Characteristic hazardous waste includes those wastes that exhibit toxicity in excess of the values indicated in 40 CFR Part 261, Subpart C. As previously discussed, any waste generated will first be characterized (if possible) based on generator knowledge. If generator knowledge is not sufficient to make an adequate determination, an exceedance of a toxicity characteristic will be determined through the waste's constituent concentration comparisons with listed TCLP regulatory levels.

PCS will be characterized using results from analysis for the toxicity parameters of volatile organic compounds, semivolatile organic compounds, pesticides, herbicides, and target analyte list (TAL) metals. The analysis will be performed in accordance with EPA SW-846, Test Methods for Evaluating Solid Waste, Third Edition and Updates (EPA, 1986). The analytical results will be compared to 20 times the

toxicity characteristic values for TCLP analytes. The 20-times value accounts for the sample dilution factor associated with the TCLP analysis. If an analyte concentration exceeds 20 times the TCLP regulatory level, then a TCLP analysis will be performed for that analyte to enable a direct comparison of the specific constituent concentration to the TCLP regulatory levels.

The 20-times value above is related to the dilution factor used in the TCLP test. Consequently, TCLP analyses may not have to be performed if the total value is less than 20 times the indicated regulatory level for a particular constituent. Hydrocarbon contamination will be determined through testing for using EPA Method 9071A/418.1 or other approved method.

Documentation of all proposed waste classifications (supported by generator knowledge or through chemical analyses) will be provided to Cannon AFB for final waste stream characterization approval.

4.2 Hazardous Waste Management

RCRA Subtitle C and the New Mexico Hazardous Waste Management Regulations (20 NMAC 4.1) govern hazardous waste management from the point of generation, through storage and treatment (if necessary), to its ultimate disposal. The NMED Hazardous Waste Bureau oversees management of the hazardous waste program in New Mexico.

Hazardous waste must comply with the following requirements:

- Waste generated during sewage lagoon activities must be characterized chemically or using generator knowledge to determine if it is a hazardous waste (as discussed in Section 4.1).
- Hazardous waste must be managed in accordance with 40 CFR Part 262—Standards Applicable to Generators of Hazardous Waste.
- Hazardous waste transported offsite must be manifested in accordance with 40 CFR Part 262, Subpart B—Manifests, and accompanied by Land Disposal Restriction (LDR) certification notices as per 40 CFR 268—Waste Analysis and Record-keeping.
- Small quantities of hazardous waste must be stored in accordance with 40 CFR Part 265, Subpart I—Use and Management of Containers.
- All containers of hazardous waste to be stored or disposed will be clearly marked with a completed hazardous waste label indicating the starting date of accumulation, EPA identification number, EPA waste code, and DOT labels and markings.

- Hazardous waste may be stored onsite for a maximum of 90 days. As this is a "clean construction" project, the generation of significant quantities of hazardous waste is unlikely. However, a determination of whether a waste, once generated, is hazardous by using generator knowledge, chemical analyses, or other information will be made within 15 days.

- Hazardous waste must be disposed only at a hazardous waste disposal facility approved by Cannon AFB and Foster Wheeler Environmental Corporation (Foster Wheeler Environmental) and permitted for the disposal of the particular type of hazardous waste generated. Hazardous waste disposal activities will be contracted, coordinated, and arranged for by Cannon AFB personnel. Under no circumstances will Foster Wheeler Environmental personnel sign hazardous waste manifests.

4.3 New Mexico Special Waste Management

New Mexico Special Waste Regulations are found in 20 NMAC 9.1; management of special wastes is under the control of the NMED Solid Waste Bureau.

With regard to this project, defined New Mexico Special Wastes (i.e., solid wastes that have unique handling, transportation, or disposal requirements to assure protection of the environment and the public's health and safety) potentially include PCS. For Cannon AFB, New Mexico has defined PCS as special waste if the TPH concentration is greater than 100 mg/kg.

Special wastes must comply with the following requirements:

- Special wastes must either be treated prior to disposal and/or isolated in their disposal to ensure a minimum of exposure to the public.

- All special wastes must be disposed only at solid waste facilities permitted for disposal of special wastes.

- All special wastes must be manifested in accordance with Section 712 of the New Mexico Special Waste Regulations.

- Storage of special wastes will occur only at an approved special waste storage area in a bermed area containing an impermeable membrane liner. Special wastes will not be stored longer than 45 days, unless approved in advance by NMED.

- All containers of special wastes to be stored or disposed will be clearly labeled, indicating the contents and potential health, safety, and environmental hazards associated with the waste.

- The physical and chemical characteristics of all special wastes will be documented prior to storage, transportation, or disposal by the following means:

  — Records of the results of analysis performed in accordance with Section 704 of the New Mexico Special Waste Regulations, as applicable

  — Detailed descriptions of the generator's knowledge of specific wastes

  — Transporters of any type of regulated special waste must be registered with the NMED Solid Waste Bureau

4.4 Waste Containerization, Storage, and Disposal

Container selection will be performed by DOT-trained personnel and is based on the type and quantity of waste to be generated. Containers may include either DOT-specification drums or roll-offs for regulated hazardous material. DOT-specification containers are not required for material that does not meet a DOT hazard class, such as PCS, which may be transported in a covered dump truck.

Prior to commencement of field activities, the Foster Wheeler Environmental Construction Superintendent will, in conjunction with Cannon AFB personnel, select areas for the temporary staging and storage of soil, debris, hazardous waste, special waste, trash, decontamination fluids, and PPE. Areas to be used for staging or storage of hazardous waste and/or special waste will be properly designated, demarcated, and prepared. In accordance with 40 CFR Part 262 and New Mexico Special Waste Regulations, and as further described in the SWPPP, the designated areas will include spill containment and control equipment, fire suppression equipment, and secondary containment, as applicable.

Waste material must be classified according to EPA and DOT criteria prior to affixing labels. Upon classification, the project's Regulatory Compliance Specialist will direct the application of appropriate hazardous/nonhazardous waste and DOT labels, complete with proper information specific to each waste stream. Each container will be marked and labeled as required by EPA and DOT, if applicable.

DOT functions, as required by 49 CFR Part 172, Subpart H, will be conducted by DOT-trained personnel.

Containers or roll-offs confirmed to contain PCS shall be labeled using the following format:

"Petroleum-Contaminated Soil"
Origin: Excavation Material-Petroleum Hydrocarbons
Contaminated Soils—Gasoline, Diesel, Hydraulic Fluid (whichever applies)

At the time of generation and until sample analysis or other information is proves that the material is a hazardous waste or a special waste, the container will be labeled, using indelible ink, with the following information:

- Origin and location
- Contents and quantity of material in the container
- Potential health, safety, and environmental hazards
- Accumulation start date (the date the first drop of material was put in the container)
- Date container sampled
- Analytical parameters

Once analytical data have been received, containers determined to contain hazardous waste will immediately be labeled with a completed commercial EPA "HAZARDOUS WASTE" label, which will include the original accumulation start date and other requested information. Figure F-1 presents a typical hazardous waste label. DOT information for hazardous materials, including proper shipping descriptions and hazard class labels, will be added prior to shipping.

Once wastes are determined to be hazardous, a description of the waste generated (including origin, volume, accumulation date, number of containers, and ultimate disposition; e.g., offsite treatment, storage, and disposal facility [TSDF], etc.) will be entered into an electronic waste-tracking system. The tracking system will be routinely updated upon the generation of new wastes and following transport of wastes offsite.

All hazardous waste stored in drums will also be stored on wooden pallets in a predesignated container storage area equipped with appropriate fire control and spill containment and control equipment. The container storage area and all containers of hazardous waste will be inspected and logged weekly on an inspection log (Figure F-2) while the field work is in progress. Inspection will encompass evaluation for proper labeling, secure closure, the condition of each container, number of containers, and condition of

Figure F-1. Hazardous Waste Label

HAZARDOUS WASTE

FEDERAL LAW PROHIBITS IMPROPER DISPOSAL.

IF FOUND, CONTACT THE NEAREST POLICE, OR PUBLIC SAFETY AUTHORITY, OR THE U.S. ENVIRONMENTAL PROTECTION AGENCY.

GENERATOR INFORMATION:

NAME _____

ADDRESS _____ PHONE _____

CITY _____ STATE _____ ZIP _____

EPA ID NO./MANIFEST DOCUMENT NO. _____ / _____

ACCUMULATION START DATE _____ EPA WASTE NO. _____

_____

_____

_____

D.O.T. PROPER SHIPPING NAME AND UN OR NA NO. WITH PREFIX

HANDLE WITH CARE!

STYLE WM6

Printed by Labelmaster, An American Labelmark Co., Chicago, IL 60646 (800) 621-5808

the storage area. All containers will be checked to ensure labels and markings are in good condition. Any signs of deterioration, leaking, or dents will be noted, and containers will be immediately over packed, if necessary. Inspection results will be provided to USACE and Cannon AFB. Containers of RCRA hazardous waste will be transferred to the TSDF after waste characterization, as indicated below:

- For the duration of this project, hazardous wastes (including soil, debris, decontamination liquids, and PPE) generated through construction activities at sewage lagoons will be sent to an offsite TSDF that has been approved by the base, USACE, and Foster Wheeler Environmental.

- Soil determined to be a hazardous or special waste will be transported offsite by an EPA-permitted hazardous waste transporter or special waste hauler to an approved hazardous waste or special waste treatment/disposal facility.

- Noncontaminated soil will be stockpiled and managed to prevent washout and wind dispersion and used as backfill and construction material as appropriate.

- Nonhazardous debris and soil will be sent offsite to an approved, permitted solid waste landfill.

- Decontamination water, if determined to be nonhazardous and meeting NMED groundwater discharge requirements, will be discharged to the ground following submittal of an NOI and subsequent NMED approval. Any discharges will be coordinated with Cannon AFB Environmental personnel.

- Decontamination pad materials (i.e., liners and solids/liquids residues) will be characterized based on decontamination water characterization. If determined to be nonhazardous, the materials will be managed as nonhazardous solid waste. If determined to be a hazardous waste, the materials will be disposed of at an approved hazardous waste treatment/disposal facility.

- PPE will be "grossly" decontaminated. The decontaminated PPE will be double-bagged (plastic) and managed as nonhazardous solid waste.

- Used oil and empty oil filters generated from vehicle and equipment maintenance activities will be collected by the equipment maintenance subcontractor, who will be responsible for transporting the used oil and oil filters, under a "Bill of Lading," to an approved offsite recycling facility.

Figure F-2. Weekly Container/Drum Inspection Log—Hazardous Waste

Project Name _____ Project Number _____

Contact _____ Month _____

Phone _____ Year _____

Date	Time	Inspector	No. drums "full" in storage	No. drums satellite accum.	Drums marked and labeled?	Lids/bungs closed and labeled?	Signs of leakage	Overall condition?	Deficient items corrected	Comments

NOTES:

1. Federal regulations required that large quantity generators maintain a 50-feet buffer zone from property lines for ignitable (D001) and reactive (D003) waste (40 CFR 265.176). Small quantity generators are not subject to this requirement.
2. Adequate aisle space must be maintained in drum storage areas for unobstructed movement of personnel and fire/spill/decon equipment during an emergency (40 CFR 265.35)

Foster Wheeler Environmental must approve any transporter used for disposal of waste using Environmental Health and Safety (EHS) Program procedures EHS 1-4, Subcontractor Selection and Management and Environmental Health and Safety Guidelines 3-8, Waste Disposal Process. Cannon AFB will be responsible for the final selection of any transporter or TSDF used for waste management.

5. REPORTING SPILLS AND RELEASES

Materials to be used during site activities for the closure at sewage lagoons have been evaluated. The following materials were identified as potentially requiring a spill notification:

- Diesel fuel
- Unleaded gasoline
- Hydraulic fluid
- Used oil

Precautions, including daily inspection by site personnel of equipment, structure(s), and containers, shall be taken to prevent oil and hazardous material spills. Personnel using hazardous material will inspect the container before and after use. In the event of a spill/release, Gene Smith (Cannon AFB Spill Coordinator), and USACE will be immediately notified. New Mexico spill reporting requirements applicable to this project require the reporting of any petroleum discharge whose quantity may, with reasonable probability, injure or be detrimental to human health, animal or plant life, or property, or unreasonably interfere with the public welfare or the use of property.

Such discharge must be reported as soon as possible after learning of such a discharge, but in no event more than 24 hours after the discharge has occurred.

5.1 Emergency Response

Emergency response procedures are specified in the Cannon AFB's Base-Wide Health and Safety Plan (USAF, 2000). Project-specific emergency response procedures are presented within the project-specific SPCCP (Appendix D).

5.2 Client Notification

The following chain of communications should be used in case of a spill:

- The Site Health and Safety Officer (SHSO), James Morning, has been designated as the Foster Wheeler Environmental Spill and Release Reporting Site Representative. He has received training in Foster Wheeler Environmental's EHS Program procedure 1-7, Incident Reporting and Investigation. In the event of a spill or release, the SHSO shall immediately notify the Delivery Order Manager (DOM) and the project Regulatory Compliance Specialist. The DOM shall then immediately notify the Cannon AFB Onsite Representative, Mr. Pete Zamie at (505) 784-1092; and the Cannon AFB Emergency Spill Coordinator, Mr. Gene Smith at (505) 784-1096.

- Site personnel must contact the Foster Wheeler Environmental DOM. If the DOM cannot be located, the Regulatory Compliance Specialist must be contacted.

The following table presents a summary of contacts regarding spill reporting and notification.

Table F-2. Spill Reporting and Notification

Contact	Title	Affiliation	Telephone Number
James Morning	Onsite Spill Reporting Coordinator/SHSO	Foster Wheeler Environmental	(505) 430-2307 - mobile
Carol Bieniulis	Delivery Order Manager	Foster Wheeler Environmental	(505) 878-8924 (505) 301-4715
Craig O'Rourke	Regulatory Compliance Specialist	Foster Wheeler Environmental	(949) 756-7511 (949) 306-2517 - mobile
Jayne Fitzgerald	ESQ Regional Manager	Foster Wheeler Environmental	(949) 756-7534 (805) 501-0474 - mobile
Pete Zamie	Onsite Representative	Cannon AFB	(505) 784-1092
Gene Smith	Spill Coordinator	Cannon AFB	(505) 784-1096
Cannon AFB Fire Prevention and Protection Branch		Cannon AFB	(505) 784-4490 (505) 784-2578
Cannon AFB Safety and Environmental Office		Cannon AFB	(505) 784-4472 (505) 784-1146
Subcontractor representative	TBD	TBD	TBD

AFB Air Force Base
ESQ Environmental Safety and Quality
DBD To Be Determined

6. TRAINING/CERTIFICATION REQUIREMENTS

This section presents the DOT training and certification requirements for personnel involved in the sewage lagoons project. In addition, all employees will be trained in Foster Wheeler Environmental's Corporate EHS Program policies and procedures to ensure that they are familiar with the program. These policies and procedures meet Department of Justice requirements for a sound environmental management program. The Occupational Safety and Health Administration training and certification requirements are contained in Cannon's Base-Wide Health and Safety Plan, Section 5—Training (USAF, 2000).

All personnel who perform or oversee DOT-related activities must be DOT trained. DOT training records will be maintained in project files onsite. A copy of the DOT training records should also be sent to the Regulatory Compliance Specialist for the regulatory compliance files.

7. INSPECTION PROCEDURES

The following section describes inspection procedures to be followed by field personnel in the event that a regulatory agency or third-party conduct an onsite inspection.

7.1 Inspections by Regulatory Agencies

Foster Wheeler Environmental shall respond to inspections by regulatory agencies in accordance with Foster Wheeler Environmental's EHS Program procedure EHS 1-10, External Inspections. The Task Manager has been designated as the Foster Wheeler Environmental onsite representative for inspections by regulatory agencies and has received training on this procedure. In the event that Cannon AFB is notified of an impending regulatory inspection, the responsible individual will be notified as soon as possible by the base personnel. During any inspection, base and USACE representatives should both be present. These procedures require that the DOM be contacted, who, in turn, must notify the Foster Wheeler Environmental ESQ Regional Compliance Manager. The DOM or his designee will notify Pete Zamie at (505) 784-1092 if contacted by a regulatory agency for site inspection.

7.2 Inspections by Third Parties

Any outside party requesting access to inspect the site must be referred to Pete Zamie at (505) 784-1092. Foster Wheeler Environmental personnel must not grant access or answer questions from unauthorized personnel.

If members of the media pose questions or attempt to access the site, Foster Wheeler Environmental personnel should direct those individuals to the base's Public Affairs Office and then notify Foster Wheeler Environmental's ESQ Regional Compliance Manager.

8. DOCUMENTATION AND RECORDS RETENTION

This section presents project requirements relating to documentation and records and their retention.

8.1 Documentation

Documentation requirements apply to all waste managed during project activities. Field records will be kept of all waste generation activities. All pages of the field data record log shall be signed and dated by the supervising field leader who is entering the data. In addition, the following information will be recorded in the log:

- Description of generating activities
- Location of waste generation (including depth, if applicable)
- Type of waste
- Date and time of generation
- Date and time of disposal of each type of waste
- Disposal location of each type of waste
- Disposal method
- Description of any waste sampling, including:
  - Type of test
  - Laboratory where sample is to be sent
  - Sampling method
  - Name of sampler
- Name of person recording information
- Name of field manager at time of generation and at time of disposal
- Test results
- Inspection logs
- Waste documentation, including:

— Waste profile sheets

— LDR certification

— Hazardous waste manifest

— Trip tickets or bills of lading

— Copies of any state or local permits or approvals

8.1.1 Transportation

Transportation documentation will comply with DOT regulations (49 CFR Parts 100–177) and will be prepared by personnel trained according to the requirements of HM-181 and HM-126F. In addition, copies of Foster Wheeler Environmental's EHS Program procedures EHS 1-4, Subcontractor Selection and Management and EFG 3-8, Waste Disposal Process, approvals for selected transporters; and TSDFs will be maintained in project files.

Containers will be marked, labeled, and/or placarded prior to off-site transport. TSDF waste profile sheets, LDR notifications, waste manifests, and shipping documents will be prepared for Cannon AFB officials to review and sign. Under no circumstance will Foster Wheeler Environmental personnel sign hazardous waste profiles, manifests, or LDR certifications.

All special waste haulers, i.e., transporters, used for Cannon AFB projects will be registered with NMED and approved in accordance with Foster Wheeler Environmental procedures for TSDF and Transporter Approvals.

8.1.2 Hazardous and Special Waste Manifests and Land Disposal Restriction Certification

All hazardous waste transported from the site will be accompanied by a Hazardous Waste Manifest. New Mexico does not provide a standard state manifest, so the receiving state manifest must be used unless that state does not have a state manifest. In that case, a Uniform Hazardous Waste Manifest may be used.

Cannon AFB and USACE personnel will be responsible for reviewing all waste documentation, including waste profiles, manifests, and LDR notifications (manifest packages). Prior to signing the manifest, the designated Cannon AFB official will ensure that pretransport requirements of packaging, labeling, marking, and placarding are met according to 40 CFR 262.30–262.33 and 49 Parts CFR 100–178.

For special waste, a manifest containing the following information will accompany each load originating from or to be disposed in New Mexico, as specified in 20 NMAC, Chapter 9, Subpart VII:

- Name, address, and telephone number of the generator
- Name, address, and telephone number of any and all transporters in the order each will be transporting the waste
- Name, site address, telephone number, and identification number of the solid waste facility to which the waste is to be delivered
- Type and proper name of waste being shipped
- Total weight or volume of waste prior to shipment from generator
- Total weight or volume of waste received at solid waste facility
- Type and number of containers in shipment
- Any special handling instructions
- Date and location the waste was delivered
- Date of receipt from the generator and total weight or volume of the special wastes, to be provided by the transporter
- If more than one transporter is used, each transporter will provide the date of receipt and total weight or volume of said waste received from the previous transporter, to be provided by the current transporter.

Cannon AFB will receive one copy of the manifest; the remaining copies will be given to the transporter. The manifest will be returned to the Cannon AFB signatory official for the base's record-keeping requirements.

Copies of all manifests for waste generated at the site will be kept in a compliance file within Foster Wheeler Environmental's project files. The Task Manager will also provide Cannon AFB with the generator's copy of the manifest for Cannon AFB to submit to the state.

An LDR form will accompany the shipment of hazardous waste to the TSDF. The TSDF must be notified prior to the waste being sent. The following items must accompany the notification and are included in one of the following facility-specific forms:

- EPA and New Mexico Hazardous Waste Generator identification number (provided by Cannon AFB)
- Manifest number, including state disposal application number
- Waste analysis data
- If the waste is also restricted, corresponding concentration-based or technology-based treatment standards or prohibition

RCRA record-keeping requirements per 40 CFR 262.20–262.44 including retention of signed copies of manifests from the designated facility that received the waste must be adhered to. The Construction Superintendent will provide Cannon AFB with copies of the manifest. Additionally, biennial and exception reporting information must be submitted, as necessary, according to 40 CFR 262.41 and 262.42, respectively, to Cannon AFB. Additional reporting may be required according to 40 CFR 262.43.

The Task Manager is responsible for maintaining compliance files in the project files. The compliance file must contain a completed project questionnaire, this RCP, and any updates to this plan or the questionnaire. Filing of project documents shall conform to Foster Wheeler Environmental Compliance Procedure EHS 1-9 Record-keeping.

9. UPDATING THE REGULATORY COMPLIANCE PLAN

The RCP will be updated as changes in site activities or changes in applicable regulations occur.

10. REFERENCES

EPA
1986. *Test Methods for Evaluating Solid Waste*, Third Edition and Updates.

USAF
2000. *Final Base-Wide Health and Safety Plan for Cannon Air Force Base.* Cannon AFB, New Mexico.

APPENDIX G

Resumes

CAROL L. BIENIULIS

Senior Geologist/Project Manager

EXPERIENCE SUMMARY

More than 13 years of professional technical and management experience including over 8 years as a project manager and over 13 years as a geologist and geochemist involved in hazardous, toxic, and radioactive waste (HTRW) investigations supporting site remediation. Currently, delivery order manager for site investigation and remediation projects at Cannon Air Force Base and task manager for multiple projects at Holloman Air Force Base (AFB), Kirtland AFB, and Cannon AFB under the Total Environmental Restoration Contract for the U.S. Army Corps of Engineers, Omaha District (TERC 4). Serves as the lead scientist for the TERC 4 program providing technical oversight over several science-related projects. Also currently serving as the Albuquerque Operations Lead supporting office operations, staff supervision, and local business development.

Other relevant experience includes technical involvement in environmental assessments, site investigations, and risk assessments for the USFWS, Department of Defense (DoD), the Department of Energy (DOE), the U.S. Bureau of Reclamation, and commercial and private clients. Technical project responsibilities have included technical leadership on the Dugway Proving Ground Closure Plans, Texas Natural Resource Conservation Commission (TNRCC) State Superfund Program, and the Jet Propulsion Laboratory (JPL) remedial investigations providing statistical and fate and transport support for site characterization, and human health and ecological risk assessments. As a project manager she served as the deputy program manager on a nationwide contract with the U.S. Fish and Wildlife Service (USFWS).

Specific experience includes project management, work plan development, data quality objectives development, selection of applicable relevant and appropriate requirements (ARARs), site and background geochemical characterizations, contaminant fate and transport modeling, sample collection, laboratory analytical techniques, data management, statistical evaluations, and report preparation. She has a working knowledge of applicable federal, state, and locals laws as required for her work on projects in New Mexico, Colorado, Utah, California, and Wyoming. As a cross-trained environmental safety specialist she has written and implemented project health and safety plans and is currently the Albuquerque office environmental safety and quality (ESQ) coordinator.

Comprehensive knowledge of various technical software applications including geochemical models, fate and transport models, database management and evaluation software, statistical software, borehole logging and cross-section packages, and several Microsoft applications. Work in statistics has involved writing and testing programs used on databases exceeding 300,000 records for supporting risk assessment work.

TRAINING

40-Hour OSHA Hazardous Waste Health and Safety Training - 1989
8-Hour OSHA Hazardous Waste Health and Safety Refresher - Current
Department of Transportation Hazmat Training 49 CFR 172 - Current
Waste Management Training – Current
Supervising in the Matrix, Foster Wheeler Environmental - 2002
New Mexico Risk-Based Decision Making Short Course, Holloman AFB and Dr. Atul Salhotra - 2002
Project Management Level 300 Training, Foster Wheeler Environmental - 2001
Construction Superintendent Training, Foster Wheeler Environmental - 2001
Sales Training, Foster Wheeler Environmental - 2000
Oral Communications Training Foster Wheeler Environmental - 2000

CAROL L. BIENIULIS

Senior Geologist/Project Manager

Negotiations Skill Training, Foster Wheeler Environmental - 2000
Project Management Level 100 Training, Foster Wheeler Environmental – 1995
Health and Safety Environmental Safety Specialist Cross-Training - 1996
Ecological Risk Assessment and Military Related Compounds:
Current Research and Future Needs, Workshop, Sponsored by USACE Waterways Experiment Station and U.S. Army Center for Health Promotion and Prevention Medicine - 1996
Personal Communications Workshop, Foster Wheeler Environmental - 1995
Project Management Training, Foster Wheeler Environmental - 1995 and 1997
Groundwater Statistics and Regulations, sponsored by the International Groundwater Modeling Center, Colorado School of Mines - 1995
Introduction to Health Risk Assessment and Exposure Assessment Modeling, Short Course, sponsored by the National Groundwater Association - 1994
SESOIL Modeling Workshop, Short Course, sponsored by the National Groundwater Association - 1994
Principles of Subsurface Contaminant Fate and Transport Modeling, Short Course, sponsored by the National Groundwater Association - 1992
Applications of Aqueous Geochemistry to Groundwater Investigations, Short Course, sponsored by Colorado Groundwater Society and the National Water Well Association - 1991
Radiation Worker Health and Safety Course, EG&G Rocky Flats Plant - 1991
Unclassified Nuclear Information (UCNI) Training Course - 1990
Ocean Drilling Project: Well Logging School, Short Course, sponsored by the Lamont Doherty Institute for Oceanographic Research - 1988

EDUCATION

BA / Geology / Western State College of Colorado / 1988

REPRESENTATIVE PROJECT EXPERIENCE

Foster Wheeler Environmental Corporation; 01/89-Present

Cannon AFB Delivery Order Manager and Holloman AFB and Kirtland AFB Task Manager, TERC 4; January 1999 - Present – Responsible for management of all projects at Cannon AFB which consist of site investigations, corrective measures studies, and remediation construction. Tasks managed for Holloman AFB include the long-term groundwater monitoring program, an environmental baseline assessment, RIs at Installation Restoration Program (IRP) sites SS-61 and DP-63, and a Preliminary Assessment (PA) and Site Inspection (SI) at IRP site DP-63. Additional Holloman tasks include management and technical oversight on a biosolids use feasibility study and oversight of a student intern researching petroleum-contaminated soil remediation through composting. Served as field operations lead for earlier work at site SS-61 and conducted field sampling in support of the SS-61 RI and performed soil sampling and characterization during construction of facilities for the German Air Force. Work at Cannon AFB includes task management supporting the Corrective Measures Study (CMS) of the SWMU 101 sewage lagoons. Additional responsibilities on the Cannon AFB CMS include field oversight and work plan and report preparation. Also serving as task manager and technical lead for the RCRA Facility Investigation (RFI) of seven sites at Melrose Air Force Range. Recent work at Cannon AFB includes and additional CMS and remediation of Fire-Training Area 4, the remediation of Landfill 25 which contains construction and demolition debris and asbestos-containing material, and remediation of the Base sewage lagoons through excavation and construction of a soil cover system. Tasks at Kirtland AFB include managing investigations of nine landfills and a fuel spill site supplementing previous investigations in

supporting of site closures. Providing management and technical oversight on site closures, CMSs, deep well installations, and an update of the Basewide RCRA Corrective Action Plan.

Program Manager and Task Manager; U.S. Fish and Wildlife Service and National Park Service Nationwide Contracts; Deputy February 1998 - Present – Supported the program manager in scoping and budgeting of task order contracts. Conducts closeout procedures on task order contracts consistent with government regulations. Provides assistance on monthly invoices to client. Managed two tasks under the USFWS program for site investigations at wildlife refuges in Rhode Island and the Central Pacific.

Task Order Manager, Technical Lead, and Report Author; Site Inspections (SI) at Baker Island National Wildlife Refuge (NWR); Central Pacific Ocean and Sachuest Point NWR, RI; January 1998 - August 1998 – Managed two task orders under the nationwide hazardous waste contract with USFWS. Provided logistical support for the work planned at Baker Island NWR, a remote island wildlife refuge located 1600 miles southwest of Hawaii. Served as health and safety officer, geophysical surveyor, and field sampler for the at Baker Island NWR SI. She prepared the work plans and final SI reports for both refuges for submittal to the U.S. Environmental Protection Agency (EPA). Additionally, she prepared a supplemental site investigation report for the Sachuest Point NWR as required by the state agency.

Remedial Investigations for Operable Units 1, 2, and 3 Fate and Transport Lead, Risk Assessment Support, and Report Author; Jet Propulsion Laboratory, Pasadena, CA; June 1998 - Present – Assessed contaminant fate and transport for on-site and off-site groundwater and on-site soil contamination through the evaluation of geological and chemical data. Modeled contaminated groundwater to support the RI and risk assessment for Operable Units (OU) 1 and 3. Supported the human health risk assessment in the areas of data management and statistical analyses required by appropriate state and federal regulations. Contributed as a report author and reviewer for the two RI reports required for this site.

Long-Term Groundwater Monitoring Plan Geochemist, Groundwater Modeling Support, and Report Author; Rocky Mountain Arsenal, Commerce City, CO; July 1998 - Present – Supported the preparation of parameter data required for input into the sitewide numerical groundwater flow model (MODFLOW) of the unconfined flow system at RMA. Contributed as an author for the long-term groundwater monitoring plan required for this site.

Remedial Investigation Fate and Transport Lead, Lead Geochemist, and Report Author/Coordinator; Clinton-Sherman Industrial Airpark, Burns Flat, OK; June 1997 - June 1998 – Assessed contaminant fate and transport for soils, groundwater, surface water, and sediment contamination through the evaluation of geological and chemical data. Modeled contaminated groundwater to support the RI and risk assessment. Supported human health and ecological risk assessments in the areas of data management and statistical analyses required by appropriate state and federal regulations. Contributed as a author and primary coordinator of the RI report required for this site as delegated by the project manager.

Phase II Assessment - Field Geologist, Health and Safety Officer, and Work Plan and Report Author; Continental Airlines Facility at the former Stapleton International Airport; Denver, CO; October 1996 - June 1997 – Prepared work plan for the Phase II assessment of 11 former underground storage tank (UST) sites. Supervised drilling, conducted soil sampling, and logged boreholes, collected groundwater samples using geoprobe technology, and installed eight monitoring wells at the airline's former facility.

Managed and evaluated chemical analytical data and prepared report for submittal to the client and state regulators.

Remedial Investigations and Risk Assessments Program Fate and Transport Lead, Lead Geochemist, and Report Author; Multiple State Superfund Sites, TX; June 1996 - Present – Assessed contaminant fate and transport for four state superfund sites through the evaluation of geological and chemical data and by modeling saturated and unsaturated systems affected by contaminant releases at the sites. Served as a reviewer of modeling tasks completed by project personnel. Supported human health and ecological risk assessments in the areas of data management and statistical analyses required by appropriate state and federal regulations.

Technical Lead, Geochemist, Lead Statistician, and Report Author; TERC 4, Melrose Air Force Range (AFR), Phase I RFI and Preliminary Assessment/Site Inspection, Clovis, NM and Kirtland Air Force Base (AFB) Site Investigations, Albuquerque, NM; February 1996 - Present – Performed the statistical analysis of site and background geochemistry data for the Melrose AFR RFI. Provided support to project management in site characterization, data evaluation, and technical review in support of the risk screening. Interacted with the client, U.S. Army Corps of Engineers (USACE), to address comments on the report draft that will be submitted to State and Federal agencies. Work for USACE at Kirtland AFB included developing and sitewide background geochemistry evaluation plan for planned site investigations. Recent project work for Kirtland AFB includes developing data quality objectives and a statistically-based sampling approach for the ecological risk assessments at inactive landfills at the facility.

Geochemist, Lead Statistician, Database Manager, and Sample Coordinator; Dugway Proving Ground, Site Investigation and Facility Closure Plan, Dugway, UT; 1993 - Present – Involved throughout the three field mobilizations and risk assessments for the U.S. Army Environmental Center (USAEC) and the USACE on the Dugway Proving Ground Closure Plans. Initially, was involved in preparing work plans and field operating procedures for the two field programs and managing analytical data for work performed at 37 solid waste management units in 1992, 1993, and 1995. Currently the lead geochemist and statistician for the project and provides support to the human health risk assessments and ecological risk assessment for the program. Recently, was tasked to statistically develop sitewide soil background concentrations which will be used in all programs at Dugway for all site assessments, feasibility studies, and remedial action.

Lead Statistician, Data Manager, and Technical Support; U.S. Army Environmental Center; Phase I and II RCRA Facility Investigations, Deseret Chemical Depot (formerly Tooele Army Depot-South Area), Tooele, UT; 1990 - Present – Work on this project was similar in nature to work for the Dugway Proving Ground Closure Plans. During work on two tasks for this project, statistically developed sitewide soil background concentrations in support of risk assessments aimed at facility/base closure. Additional work included work plan preparation, site assessment, data management and risk assessment support leading to the CMS of the facility.

Remedial Investigation Report Manager/Technical Lead; Kennecott Utah Copper Refiner, Remedial Investigation, Magna, UT; September 1993 - January 1995 – Duties included preparing the project work plan, costing the data evaluation and report preparations tasks, managing analytical data, and interfacing with the client in preparing a site assessment as a proactive measure prior to the site being placed on the National Priority List (NPL) for Superfund.

Geochemist and Lead Statistician; F.E. Warren Air Force Base; Baseline Risk Assessments, Cheyenne, WY; September 1990 - April 1995 – Provided support to the human health preliminary baseline risk assessments for eight sites at F.E. Warren AFB in 1990 and 1991. In this capacity, assisted in modeling the fate and transport of chemicals of concern in groundwater. In 1991 and 1992, was the lead statistician in the effort to develop sitewide soil background concentrations for 10 sites in support of the final risk assessment. Additional work for this project consisted of lead technical support in reviewing documents for the client in the area of advanced statistical studies in soil background geochemistry prepared by other contractors.

Task Manager and Field Geologist; Rocky Flats Plant; RCRA Facility Investigation, Golden, CO; June 1990 - January 1993 – Responsibilities included project management and overseeing the report production and the data evaluation task. Data evaluation included site characterization, contamination source characterization, nature and extent analysis, and fate and transport analysis of data of a three-phase site investigation. Provided technical oversight on all phases of data acquisition, data quality evaluation, database management, scheduling, and interfacing with the client and report staff. During the field program, was a rig geologist completing, logging, and sampling more than 30 boreholes. Additional field sampling experience at the site includes sampling of surficial soils for a sitewide characterization program.

Technical Lead; Rocky Flats Plant; Annual RCRA Groundwater Monitoring Report, Golden, CO; 1990 - 1991 – Responsible for three regulated units at the Rocky Flats Plant. Performed and supervised data evaluation, technical writing, and peer review for three regulated units, and management of the report products. Additional tasks involved technical oversight on a pilot study for implementation of a quarterly monitoring report. In this capacity, also served as data evaluator, author, and report manager for the task deliverable.

Geochemist; Rocky Mountain Arsenal (RMA), ARARs Development, Commerce City, CO; September 1989 - April 1990 – Completed research for ARARs selection for this accelerated feasibility study. In addition, has performed biota sampling and groundwater sampling and monitoring as part of the Comprehensive Monitoring Program.

Staff Geochemist; Bunker Hill Superfund Site, Kellogg, ID; 1990 – Supported a lead speciation study requiring geochemical modeling and analysis of data collected for a mining site with multiple primary responsible parties (PRPs) on the National Priorities List (NPL). Work on the project included use of geochemical modeling results to derive Stiff diagrams and lead speciation diagrams to determine different sources of lead contamination.

Geologist; Rocky Mountain Arsenal; Remedial Investigation, Commerce City, CO; January 1989 - December 1990 – Conducted a contaminant nature and extent and fate and transport assessment for three study area reports as part of the remedial investigation at RMA. Additional work in the RI at RMA included the Remedial Investigation Summary Report and graphics coordination. Work on the RMA database included interfacing with the Data Management Group to solve data gaps and finalizing the RMA soils database to make RI data consistent with the RMA sitewide risk assessment data.

CAROL L. BIENIULIS

Senior Geologist/Project Manager

PREVIOUS EXPERIENCE

Esther R. Magathan and Associates
Denver, CO; November 1998 – January 1989
Geologic Technician – Constructed geologic cross-sections and contour maps pertinent to an oil company project regional study of Pennsylvanian/Permian rocks of the northern Denver basin. Interpreted well logs for use in maps and cross-sections and proofed text pertaining to project reports.

U.S. Geological Survey
Arvada, CO; May 1987 – October 1987; May 1988 – October 1988
Physical Science Technician – Worked for the Water Resources Division at the National Water Quality Laboratory. Analyzed water samples for pH and specific conductivity, prepared chemical reagents, and prepared samples for Kjedahl nitrogen and phosphorus analyses. Responsible for maintaining QA/QC on pH and specific conductivity analyses performed. Additionally, gained a working knowledge of the Statpak statistical software package, which determines variance in laboratory analyses, and taught other employees how to use it. Involved in two U.S. EPA QA/QC audits and laboratory certifications.

Western State College
Geology and Chemistry Departments
Gunnison, CO; February 1984 – May 1988
Laboratory Assistant – Assisted in geology laboratory sessions and general chemistry, organic chemistry, and inorganic chemistry lectures and laboratories. Aided faculty geologic research by preparing petrographic slides and performing wet chemical analyses of rock samples for isotope and trace element composition. Conducted independent research to determine the trace element geochemistry of the Korolevu pluton in south Fiji. Work on the project included submitting a cost proposal for research funds, preparing and chemically analyzing geologic samples, analyzing geochemical and petrographic data, and presenting the paper to the Western State College Foundation.

PUBLICATIONS

Bieniulis, Carol L. "Remediation through Materials Reuse–A Success Story at Cannon AFB." Proceedings from 6th Annual Joint Services Pollution Prevention & Hazardous Waste Management Conference and Exhibition. San Antonio, Texas, 2001.

Bieniulis, Carol L. "Comprehensive Assessment of Background Soil Geochemistry" Proceedings from Workshop on Ecological Risk Assessment and Military Related Compounds: Current Research and Future Needs. Denver, Colorado, 1996.

LOCATION

Company: Foster Wheeler Environmental Corporation; 1/9/89 - Present
Years w/Other Firms: 2
Present Location: Albuquerque, NM
Daytime Phone: 505-878-8924

LANGUAGE (R=Read, S=Speak, W=Write)

Russian - R, W

CAROL L. BIENIULIS

Senior Geologist/Project Manager

SKILL SET

GEOSCIENCES

Borings and Wells - Geotechnical Borings
Borings and Wells - Monitoring Well Installation
Borings and Wells - Soil Classification/Logging
Contaminant Fate and Transport
Dense Non Aqueous Phase Liquids (DNAPL)
Geochemistry - Isotope
Geochemistry - Metal / Trace Metal
Geochemistry - Organic
Geochemistry - Water Quality
Geostatistics
Hydrogeology - Water Quality
Hydrology - Water Quality
Light Non Aqueous Phase Liquids (LNAPL)
Modeling - Contaminant Transport
Modeling - Groundwater Flow
Non Aqueous Phase Liquids (NAPL)
Radioactive Waste / Mixed Waste
RCRA / CERCLA
Sampling - EPA / CLP Paperwork
Sampling - Groundwater
Sampling - Sediment
Sampling - Soil
Sampling - Water Level Measurements

DISCIPLINE(S) (Y = Primary Indicator; N = Secondary Indicator)

011 Geologists	N
012 Hydrologists	N
136 Chemical Experts	Y

RISK ASSESSMENT SPECIALISTS **N**

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ROBERT G. EDERER

Principal Civil Engineer

EXPERIENCE SUMMARY

Twenty years of professional environmental experience, with sixteen years as a civil/ environmental engineer involved in conceptual design; design calculations; construction drawings and specifications; construction cost estimates; and cost proposals for civil engineering projects related to landfills, surface and groundwater treatment systems, and soil remediation systems. Extensive experience in the design of groundwater extraction well networks, groundwater treatment systems, solid waste landfills, surface water hydrology, and hydraulic structures. Experience as a field biologist performing plant and animal surveys.

Presently, serving as Principal Civil Engineer in the Albuquerque, NM office providing task management and technical oversight of landfill and impoundment site closures under the TERC contract.

EDUCATION

M.S. (Master of Science), Civil Engineering, California State University, Sacramento, CA, 1987
B.S. (Bachelor of Science), Environmental and Systematic Biology, California Polytechnic State University, San Luis Obispo, 1980

REGISTRATIONS/CERTIFICATIONS

Registered Professional Civil Engineer
CA, #C49011, Date of Issue: June 1992, Date of Expiration: September 2004

Registered Professional Engineer
NM, #12467, Date of Issue: August 1994, Date of Expiration: December 2003

Registered Professional Engineer
AZ, #30605, Date of Issue: August 1996, Date of Expiration: September 2004

Certified Cost Engineer (American Association of Cost Engineers)
N/A, #1783, Date of Issue: November 1999, Date of Expiration: September 2002

TRAINING

Project Management Training (PM-200), Foster Wheeler Environmental Corp, 2002
Vadose Zone Hydrology, University of New Mexico, 2001
Site Superintendents Training, Foster Wheeler Environmental Corp, 2001
Risk Management, ECS Risk Control, Inc., 2000
Construction Claims in New Mexico, Lorman Education Services, 2000
Professional Liability IQ, DPIC, 1997
Groundwater Treatment Technology, Groundwater Technology, Inc., 1994
Hydrologic Modeling and Drainage Criteria using Albuquerque Metropolitan Arroyo and Flood Control Authority's (AMAFCA) AHYMO Model, AMAFCA/University of New Mexico, 1992
Urban Stormwater Management and Detention Pond Design, Haestead, Inc., 1992
(RCRA) Comprehensive Environmental Response, Compensation, and Liability Act
(CERCLA) Sites, Association of Groundwater Scientists and Engineers, 1991

Onsite Corrective Action Solutions for Resource Conservation and Recovery Act, Association of Groundwater Scientists and Engineers, 1990
Hazardous Waste Site Operations Management and Supervisor Training, McLaren Environmental Engineering, 1990
40-Hour Hazardous Waste Site Training Course, OSHA 29 CFR 1910.120(e)(3), Metcalf & Eddy, Inc., 1986

REPRESENTATIVE PROJECT EXPERIENCE

Lead Project Engineer; USACE, Omaha Total Environmental Restoration Contract (TERC), Closure Design-Build Support of Landfills 1, 2, & 8, Kirtland AFB, NM; May 2001 - Present – Prepared design calculations, drawings and specifications for closure of three former landfills at this Air Force Base. Responsible for field designs of grading and drainage systems. Addressed issues related to alternative cover system design (evapotranspiration cover) including unsaturated soil flow hydraulics, soil properties, and testing. Redesigned drainage systems by evaluating runoff and runon watershed hydrology (using HEC-HMS), sizing channel dimensions and erosion protection.

Task Manager; USACE, Omaha Total Environmental Restoration Contract (TERC), Reclaimed Wastewater Irrigation Feasibility Study, Holloman AFB, NM; August 2001 - Present – Evaluated irrigation practices, estimated consumptive use, and prepared conceptual design for application of reclaimed wastewater to the Base golf course.

Project Engineer; Bechtel BWXT, Underground Storage Tank Removal, Idaho National Engineering and Environmental Laboratory, Idaho Falls, ID; April 1998 - May 2001 – Prepared design calculations, drawings and specifications for the removal of four 10,000-gallon tanks contaminated with radioactive sludge. Calculated preliminary shoring and lifting requirements.

Technical Reviewer; U.S. Army Corp of Engineers (USACE), Trickling Filter Capacity Reduction Evaluation, White Sands Missile Range, NM; April 1998 - May 2001 – Provided technical review and PE approval of an evaluation to determine feasibility of reducing the current wastewater treatment system with two trickling filters to one operating unit. The analysis, conducted according to WEF MOP 8, indicated that the facility could operate below discharge limits. This analysis allowed the plant to be reclassified as a "minor facility" thereby reducing its NPDES reporting requirements.

Technical Consultant; Stone and Webster Environmental Corporation (under USACE, Omaha Total Environmental Restoration Contract [TERC]), Closure Design Support of Landfills 6 and 7, Ft. Sheridan, IL; April 1998 - May 2001 – Provided technical direction and review of landfill closure project as part of the Ft Sheridan Base Realignment and Closure process. Provided cost estimates to support evaluation of RCRA landfill cover design options. Reviewed constructability of design including review of plans and specifications. Modified design of gas collection system.

Project Manager; Arizona Department of Environmental Quality and U.S Bureau of Reclamation, Vulture Mill Mine Tailings Remediation, Wickenburg, AZ; April 1998 - May 2001 – Project manager and technical director for remediation of a former gold milling operation. Oversaw preparation of design plans and specifications to excavate contaminated soils and consolidate in a landfill structure. Prepared design report detailing engineer's cost estimate, hydraulic and hydrologic analysis, earthwork design, and revegetation. Performed hydraulic analysis for affects from 100-year floodplain using HEC-RAS. Designed erosion protection for landfill side slopes.

Project/Technical Manager; U.S. Forest Service, Mt. Hamilton Mine Tailings Reclamation, Ely, NV; April 1998 - May 2001 – Provided project management and technical direction for the detoxification of 3.5 million tons of cyanide-contaminated mill tailings from a former gold mining operation. Designed chlorine treatment processes, including the chemical mix and delivery system. Performed water balance analysis of the land application system (spray irrigation). Supervised preparation of final site grading. Provided technical oversight and review of process operations. Managed onsite resources, negotiated contract modifications, and tracked the budget and schedule.

Lead Design Engineer; DOE Uranium Mill Tailings Remedial Action (UMTRA) Project, Groundwater Remediation System, Tuba City, AZ; April 1998 - May 2001 – Provided design and construction support of a 200-gallon-per-minute (gpm) groundwater remediation system at a former uranium mill site contaminated with uranium, nitrates, sulfates, and metals. Prepared designs, plans, and specifications for the extraction and recharge well field piping network, water storage systems, foundations, and control building. Designed and simulated the pumping and conveyance system operations using a computer hydraulic network model. Provided field and office engineering support during construction.

Lead Design Engineer; DOE Monticello Remedial Action Project, Creek Restoration Hydraulic Analysis, Monticello, UT; April 1998 - May 2001 – Conducted stream hydraulic analysis using the U.S. Army Corps of Engineer's HEC-RAS model. Modeled flow through reconstructed channel and new culverts under various storm events.

Lead Design Engineer; DOE Monticello Vicinity Properties Project, Wetland Restoration Hydrology and Hydraulic Analysis, Monticello, UT – Conducted watershed analysis of the U.S. Soil Conservation Service TR55 Urban Watershed model and stream hydraulic analysis using the U.S. Army Corps of Engineer's HEC-RAS model. Designed new channels and wetland reaches. Modeled flow through reconstructed channel. Specified erosion control blankets and rock armoring. Prepared design plans and specifications.

Lead Design Engineer; DOE Monticello Vicinity Properties Project, Road Embankment Stability Design, Monticello, UT; April 1998 - May 2001 – Designed a reinforced earth wall to stabilize a roadway embankment. Calculated geotextile strength, length, and spacing. Specified geotextile fabric and block facing. Prepared design plans and specifications.

Project Engineer; Gamelsky-Benton Architects, Wastewater Facilities Design, Sandoval County Landfill, NM; April 1998 - May 2001 – Prepared design of wastewater disposal facilities for a large public works office. Designed septic tank, leachfield, and sewer piping for domestic waste disposal. Designed evaporation pond for truck wash-water.

Project Engineer; Sandia National Laboratories, Resource Conservation and Recovery Act (RCRA) Tank Inspection, Albuquerque, NM; April 1998 - May 2001 – Inspected tank system, reported, and certified results for the RCRA Subpart J certification of several tank systems related to the chemical waste landfill operation.

Project Engineer; Sandia National Laboratories, Classified Waste Landfill Study, Albuquerque, NM; April 1998 - May 2001 – Conducted feasibility study to determine the most appropriate approach to closing this 5-acre landfill site. Prepared detailed cost analysis and evaluation of alternatives.

ROBERT G. EDERER

Principal Civil Engineer

Project Manager; Village of Roy, Forty-Year Water Plan, Roy, NM; April 1997 - April 1998 – Conducted a water supply study to determine current and future water requirements. Evaluated existing infrastructure and conducted hydraulic network analysis of the entire system with the WaterCad computer model. Conducted pump-drawdown test and computed hydraulic parameters. Evaluated wastewater collection and aerated lagoon treatment systems by forecasting future population and determining ability of the current infrastructure to meet future demands.

Traffic Engineer; Playa Estates Subdivision, Traffic Analysis, Rio Communities, NM; April 1997 - April 1998 – Prepared a traffic impact analysis for a 540-acre subdivision near Albuquerque, NM. Counted traffic and predicted future traffic flow patterns, prepared highway capacity analysis, and prepared final report including road improvements.

Project Manager; Playa Estates Subdivision, Planning and Design for Tierra del Sur, Rio Communities, NM; April 1997 - April 1998 – Project manager in charge of planning for a 60-acre subdivision. Completed public utility design including permitting, capacity analysis, and design of wastewater collection system. Coordinated permitting and planning with privately owned treatment works. Prepared planning documents for review by Valencia County, NM. Also performed traffic capacity analysis.

Project Manager; Village of Capitan, Water Storage Tank, Capitan, NM; April 1997 - April 1998 – Supervised the design/bidding and oversaw construction for a 2-million-gallon storage tank project. Prepared plans and specifications and conducted periodic inspection of the contractor's work.

Project Manager; Alamo Navajo Tribe, Water Treatment System, Alamo, NM; April 1997 - April 1998 – Managed final design and construction of a 40-gpm water-filtration system. The greensand filtration system was designed to remove iron and manganese, and then provide chlorination to oxide sulfide.

Project Manager; Village of La Jara, Water Filtration System, La Jara, NM; April 1997 - April 1998 – Managed final design and construction inspection of a slow sand filtration system to treat this central New Mexico's stream water supply. Reviewed design calculations and drawings, attended payment inspections with funding agencies, and provided periodic inspection of the work.

Project Manager; McIntosh Volunteer Fire Department, Water Supply System, McIntosh, NM; April 1997 - April 1998 – Oversaw design and bidding of a 100-gpm domestic water supply system, including a high-pressure, high-volume pumping system to fill fire trucks.

Consulting Engineer; Village of Tijeras Subdivision Consulting, Tijeras, NM; April 1997 - April 1998 – Provided consulting services for review of a 30-lot rural subdivision. Attended public meetings and reviewed technical documents regarding the water supply, wastewater treatment, traffic analysis, grading and drainage, and overall site development.

Project Manager; Academy Corporation, Stormwater Pollution Prevention Plan, Albuquerque, NM; September 1995 - April 1997 – Prepared a stormwater pollution prevention plan (SWPP) for a precious metal recovery facility. Designed grading and drainage improvements as part of implementation of the SWPP.

Project Manager; Chama-West Subdivision, Water Distribution System Design, Chama, NM; September 1995 - April 1997 – Designed a water distribution and storage system for a 7,500-acre rural

subdivision. Applied for and received approval from the New Mexico Environment Department (NMED) for the system.

Project Engineer and Estimator; Air National Guard, Groundwater Treatment Plant Construction, Tucson, AZ; September 1995 - April 1997 – Prepared the winning bid for this effort. Responsible for review submittal, cost and schedule tracking, and engineering support.

Technical Reviewer and Project Manager; Laguna Construction Co., Paguate Dam Project, Design and Construction Oversight, Laguna Pueblo, NM; September 1995 - April 1997 – Reviewed drawings and specifications for a 270-acre feet reservoir dam design to identify bidding and construction problems. Modified inlet headworks structure reinforcing details, revised construction detail layout, and amended technical specifications. Provided periodic construction inspections, resolved design issues, and prepared final completion report.

Technical Manager; Town of Miami, Municipal Landfill Closure, Town of Miami, AZ; September 1995 - April 1997 – Analyzed stormwater drainage using Arizona Department of Transportation's hydrology manual. Designed final site grading for drainage control, which included a diversion channel. Assisted in the final design of the landfill cover system and reviewed final construction drawings.

Technical Manager; Sandoval County, Landfill Design, Closure, and Permitting, Bernallio, NM; September 1995 - April 1997 – As Senior Engineer, coordinated design drawings for closure of an existing municipal solid waste cell and the construction of a new cell in accordance with New Mexico solid waste regulations. Analyzed the stability of the composite liner system and prepared the drainage report for permitting and design. Conducted hydrologic analysis of existing and future landfill development using the City of Albuquerque's AHYMO computer model. Designed drainage structures, including retention ponds, channels, and culverts. Supervised the design and preparation of construction drawings for the landfill's waste transfer station; design included preparation of a grading plan and an 8-ft-high retaining wall.

Project Manager; Southern Sanitation Systems, Landfill Operations and Closure Plan, Yuma, AZ; September 1995 - April 1997 – Managed landfill permitting and design for project involving the permitting of solid waste management units on Tribal lands under the State and Tribal Implementation Rule (STIR). Prepared a landfill closure plan and final cover design on the Cocopah Native American Reservation. Oversaw budget and schedule management and provided technical direction for stormwater hydrologic analysis and landfill cell design modifications. Addressed EPA comments on the STIR documentation and provided technical assistance to the Tribe's legal counsel.

Technical Manager; White Mountain Apache Tribe, Landfill Design, White Mountain, AZ; September 1995 - April 1997 – Served as Lead Design Engineer responsible for preparation of plans and specifications for the construction of a Tribal solid waste management facility and RCRA Subtitle D closure design. Designed leachate collection and evaporation pond and prepared engineer's construction cost estimate.

Ute Tribe, Solid Waste Management Engineering Study, Toyiabe, AZ – Prepared conceptual designs for several solid waste management alternatives, including construction and RCRA Subtitle D closure of a Tribal landfill and regional landfill, transfer stations, and Tribal collection and offsite disposal. Estimated capital and annual operating costs and evaluated alternatives based on economic and noneconomic factors.

ROBERT G. EDERER

Principal Civil Engineer

Project Manager; Southern Sanitation Systems, Septic Waste Treatment and Disposal System Design, Yuma, AZ; September 1995 - April 1997 – Designed a 10-gallons-per-day septic waste disposal pond and evaporation lagoon system. The system involved four primary settling/sludge drying beds and two decant evaporation ponds.

Cost Engineer; U.S. Department of Energy, Cost Proposal Review, Uranium Mill Tailings Remedial Action Project (UMTRA), Albuquerque, NM; September 1995 - April 1997 – Reviewed construction cost proposals prepared for UMTRA project sites. Prepared comparative estimates, evaluated unit costs, and reported the results.

Project Engineer; Cobisa Corporation, Evaporative Lagoon Design, Lordsburg, NM; August 1992 - September 1995 – Served as Lead Designer for an evaporative lagoon system to handle cooling tower effluent from this New Mexico power plant. Prepared preliminary design and cost estimates to compare enhanced sprinkler evaporation to passive evaporation.

Task Leader; Cyprus-Amax Minerals Company, Wetland Design, Pecos, NM; August 1992 - September 1995 – Served as Lead Design Engineer and Task Manager for the 35 % design of a developed wetland at the Cyprus-Amax El Molino mine site. Prepared a predesign report that addressed revegetation, construction details, and construction costs.

Project Manager; Cannon Air Force Base (AFB), Architecture-Engineer Open-End Contract, Clovis, NM; August 1992 - September 1995 – Responsible for delivery order management, client relations, and technical direction. Completed preliminary site assessment for an asbestos landfill, design and regulatory analysis for sewage lagoon influent and effluent monitoring stations, and design of piping modification to reroute an oil/water separator from a storm sewer to the Cannon AFB sanitary sewer system. The sewage lagoon monitoring station and oil/water separator rerouting designs were completed in accordance with EPA National Pollutant Discharge Elimination System (NPDES) storm drainage regulations.

Task Manager; Kirtland AFB, Landfill Feasibility Studies (FS), Albuquerque, NM; August 1992 - September 1995 – Provided management support for an engineering economic analysis to determine the feasibility of two future waste disposal alternatives for a Kirtland AFB landfill, either partial closure and continued operation or full closure and off-base disposal. Presented results to acting Base commander in an executive briefing.

Project Manager; New Mexico Environment Department (NMED), Carbon Adsorption Water Treatment System, Edgewood, NM; August 1992 - September 1995 – Managed and served as lead designer for construction of a carbon water treatment system for a New Mexico elementary school water supply. The system was required to treat groundwater containing low concentrations of methyl-tert-butyl-ether.

Project Engineer; Hopi Tribe, Water Supply Operations and Management Plan, Keams Canyon, AZ; August 1992 - September 1995 – Prepared a public water supply operations and management plan for the Tribe. Evaluated the existing water system infrastructure and made recommendations for a consolidated village water utility.

Project Engineer; NMED, Hobbs City Wells Remediation, Hobbs, NM; August 1992 - September 1995 – Oversaw design of a 400-gpm groundwater extraction and treatment system for a petroleum hydrocarbon contamination site.

Project Manager; Tucson Water/U.S. Air Force/Tucson Airport Authority, Remedial Investigation (RI)/FS, Tucson, AZ; August 1992 - September 1995 – Managed a vadose zone Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) RI/FS at the Tucson International Airport. Ensured budget and schedule management; facilitated client relations; and provided technical direction for fieldwork, document preparation, and potential remedial action alternatives.

Project Manager; NMED, Whitfield Tank Lines, Soil Remediation, Albuquerque, NM; August 1992 - September 1995 – In situ soil vapor extraction and bioventing remediation project. Responsible for remediation operations work plan development, air permitting, alternative cost analysis, and budget and schedule management.

Project Engineer; Curtesy Oil Company, Curtesy Oil Soil and Groundwater Remediation, Modesto, CA; March 1989 - August 1992 – Designed, permitted, and supervised construction of a 50-gpm air-stripping system and a 150 cubic-feet-per-minute (cfm) soil vapor extraction system for this central California oil company. The air-stripping system was designed to operate concurrently with the soil vapor extraction system. The combined emissions were to be treated with a 700-cfm catalytic oxidizer.

Project Engineer; OCLI Corporation, OCLI Groundwater Remediation, Santa Rosa, CA; March 1989 - August 1992 – Designed and air permitted a 350-gpm air-stripping system to remediate groundwater contaminated with various solvents for this Sonoma County, CA, optical coating manufacturing firm. The treatment system design involved an aboveground pipeline to convey groundwater from several wells and a 3,000-cfm vapor-phase carbon system for emission control.

Design Engineer; IBM Corporation, IBM Groundwater Remediation Facilities, San Jose, CA; March 1989 - August 1992 – Served as engineering team member for the design and construction of a 1,000-gpm air-stripping system and a 30-gpm steam-stripping system for this manufacturing facility of IBM. Responsible for groundwater extraction and conveyance system design and equipment specifications.

IBM Corporation, IBM Effluent Reuse Study, San Jose, CA – Conducted a predesign study to determine the feasibility of using treated groundwater from a 1,000-gpm air-stripping system for irrigation needs at this IBM manufacturing facility. Preparation of the report included evaluation of the facility's current irrigation demands as well as the current system design. Provided preliminary recommendations for a final treated groundwater reuse system, including provisions for groundwater recharge.

Project Engineer; Conoco Oil Company, Kayo-Carmichael Underground Storage Tank (UST) Remediation, Sacramento, CA; March 1989 - August 1992 – Managed construction of a 10-gpm groundwater extraction and air-stripping system designed to treat groundwater contaminated with petroleum hydrocarbon compounds at a Conoco Oil leaking UST in Sacramento.

Project Engineer; ARCO, UST Remediation, Sacramento, CA; March 1989 - August 1992 – Designed and constructed a six-well soil vapor extraction system to remove petroleum hydrocarbon compounds from soil contaminated by leaking USTs. Designed and conducted a pilot study to determine the levels of petroleum hydrocarbons and benzene emissions to evaluate the necessity for emission control.

Project Engineer; Curtesy Oil Company, Curtesy-Hughson UST Remediation, Modesto, CA; March 1989 - August 1992 – Designed and constructed a 150-cfm soil vapor extraction system at a Merced, CA gas station using a network of six existing soil vapor extraction wells. Conducted pilot testing to

determine volatile organic chemical concentrations, area of influence, and final system design parameters. Selected catalytic oxidizer to be used for emission control during system operation.

Project Engineer; Courtalds-Grafil, Air Risk Assessment, Sacramento, CA; March 1989 - August 1992 – Prepared a California Air Pollution Control Officers' Association risk assessment to support an air permit application for the expansion of the graphite fiber manufacturing process at this plant. Classified and evaluated chemical emissions from point sources, and conducted a health-based screening of the chemicals using air dispersion computer modeling.

Project Manager/Engineer; California Department of Health Services, California Superfund Remediation Projects, Palo Alto, CA; June 1986 - March 1989 – Managed and supported several site investigation and remediation projects including a site hazard assessment study of wood treating operations in central and northern California, soil removal action at a lead contaminated ceramics manufacturing facility in Sacramento, investigation and clean-up of a former chrome plating operation in Modesto, investigation and cleanup of a mercury spill site at former illicit drug operation in Grass Valley, and a preliminary investigation of potential hazardous waste sites in Rosemond.

Project Engineer; MWD of Southern California, Water Treatment Plant Filtration Studies, Palo Alto, CA; June 1986 - March 1989 – Conducted field and laboratory tests and data interpretations for filter backwash operations and sludge handling at five water treatment plants operated by Metropolitan Water District of Southern California. Determined the cause of plant-upset conditions due to filter backwash recycling. Work included pilot tube settling performance tests.

Project Engineer; City of Napa, Water Quality Report, Jameson Canyon Water Treatment Plant, Napa CA; June 1986 - March 1989 – Prepared water quality report on the Sacramento Delta water supply for the water treatment plant. Prepared an analysis of water quality data in order to predict future treatment modifications to plant operations and design.

Project Engineer; City of Alameda, Water Treatment Plant Study, Alameda, CA; June 1986 - March 1989 – Evaluated unit processes from operational data. Determined the system mass balance and projected expansions to meet future demands.

DISCIPLINE CODES

Civil Engineers: 004, Primary
Sanitary Engineers: 019, Secondary
Environmental Engineers: 195, Secondary

SKILL SET

AIR SCIENCES

Air Quality Permitting
BACT Analysis
Dispersion Modeling
Emission Inventories
Risk Assessment

BIOLOGICAL SCIENCES

Biological Field Studies
Botanical Inventories
Field Biology
Wildlife and Habitat Inventory

ROBERT G. EDERER

Principal Civil Engineer

GEOSCIENCE

Borings and Wells - Monitoring Well Installation
Borings and Wells Recovery Well / Production Well Installation
Hydraulics/ Design - Extraction Well Design
Hydrogeology - Groundwater Hydraulics
Hydrogeology - Pump Test Analysis
Hydrogeology - Pump Test Performance
Hydrogeology - Water Quality
Hydrogeology - Water Supply
Hydrogeology - Wellhead Protection
Hydrology - Runoff / Flooding
Hydrology - Stream Hydraulics
Hydrology - Water Quality
In Situ Remediation - Soil Vapor Extraction
Light Non Aqueous Phase Liquids (LNAPL)
Modeling - Surface Water / Runoff
Modeling -Air Flow
RCRA / CERCLA
Sampling - Groundwater
Sampling - Soil
Sampling - Water Level Measurements
Underground Storage Tanks / Refineries

HEALTH RISK

Probabilistic Risk Analysis
Risk Based Cleanup Goal Development
Sampling & Analysis Planning
State Programs
Voluntary Actions
Wetland Ecology

REGULATORY AFFAIRS

Air Operating Permits
Air Permitting
Air Toxics
CERCLA
CERCLA Remedial Investigation
Clean Air Act
Clean Water Act
Emission Inventorying
Environmental Assessment
Environmental Assessments for Property Transactions (Phase I & II)
Environmental Site Assessments
Hazardous & Solid Waste Mgmt
NPDES
NPDES Stormwater permitting & Facility Compliance Inspections
Petroleum Contaminated Sites
Phase I ASTM
Phase II
Radioactive Waste
RCRA
RCRA Closure
RCRA Corrective Action
Remediation
Safe Drinking Water Act
SDWA
Solid Waste
Stormwater
Stormwater Permitting
Superfund
Treatability studies
UST Closure
UST Remedial Monitoring
UST Removal & Closure
UST Corrective Action

SOCIAL SCIENCE

Economic Feasibility

TECHNICAL EXPERTISE

Areas of technical expertise include: water distribution and treatment; wastewater treatment; site grading and drainage; surface water hydrology and hydraulic analysis and design; landfill permitting, design, and closure; soil vapor extraction system design; groundwater extraction well network and pipeline design; groundwater treatment system design and construction; feasibility studies; and cost estimating and economic analysis.

LANGUAGE SKILLS

English *Knowledge Level:* Primary

ROBERT G. EDERER

Principal Civil Engineer

PROFESSIONAL REFERENCES

Richard Olm, P.E., Remedial Projects Manager, Arizona Department of Environmental Quality, 602-207-4223
James F. Kaminski, P.E., Project Manager, Stone & Webster Engineers and Constructors, 303-741-7525
Mary Beth Marks, Geologist, USDA-Forest Service, 775-778-0223

RELATED COMPANY INFORMATION

Office Location: Albuquerque
FWENC Hire Date: 5/14/01
Years with Other Firms: 15
Daytime Telephone: 505-878-8925
E-mail Address: rederer@fwenc.com

ROGER N. MARGOTTO, CIH, CSP, CHMM

Principal Health and Safety Scientist

EXPERIENCE SUMMARY

Mr. Margotto has over fifteen years of leadership experience as a manager of health, safety and technical programs. He has also served in progressive leadership positions as an Air Force officer. He has experience in all phases of organizing, managing, and decision-making; training and supervising personnel; conducting quality assurance assessments; preparing budgets; writing, public speaking and teaching. Mr. Margotto also possesses an extensive working knowledge of EPA, OSHA, and DOT regulations, with an emphasis on regulations relating to hazardous waste management and hazardous materials transportation.

EDUCATION

BA / Chemistry / College of St. Thomas / 1969

REGISTRATIONS/CERTIFICATIONS

Certified Industrial Hygienist, Comprehensive Practice
#5571, Date of Issue: July 15, 1992

Certified Safety Professional, Management Aspects
#11894, Date of Issue: August 1, 1993

Certified Hazardous Waste Materials Manager, Master Level
#2005, Date of Issue: September 1, 1989

TRAINING

8-Hour OSHA Hazardous Waste Health and Safety Refresher Training, 2001
American Industrial Hygiene Conferences, 2000
Respiratory Program Management, 2000
Handling Naturally Occurring Radioactive Material, 2000
OSHA 500: Trainer Course in Occupational Safety and Health for the Construction Industry, 2000
Data Quality Objectives, 1999
Ergonomic Assessment, 1999
Advanced Risk Assessment, 1998
Building Air Quality, 1998
Loss Control Management, 1998
Radiation Safety, 1997
Occupational Ergonomics, 1994
Confined Spaces, 1986, 1993
Welding Safety, 1993
Process Safety Management, 1993
Air Monitoring Training, 1993
Blood Borne Pathogens, 1992
Site Safety Supervisor Training, 1991
NIOSH 551 Industrial Hygiene and Engineering, 1988

ROGER N. MARGOTTO, CIH, CSP, CHMM

Principal Health and Safety Scientist

NIOSH 550 Industrial Hygiene Measurements, 1987
First Aid and CPR Site Safety Officer, 1986
40-Hour OSHA Hazardous Waste Training
Understanding Worker's Compensation

FOSTER WHEELER ENVIRONMENTAL CORPORATION EXPERIENCE

Principal Health & Safety Scientist; San Diego, CA; 1998 – Present – Responsible for managing environmental health and safety for remediation services contracts with the U.S. Navy and the United States Army Corps of Engineers. Serves as a Certified Industrial Hygienist for the Southwest Division Remedial Activities Contract, Naval Facilities Engineering Command and for contracts with the United States Fish and Wildlife Service, the National Park Service, and the Air Force Center for Environmental Excellence. Writes site-specific health and safety plans. Also responsible for reviewing activities, plans and data for a variety of field projects including two Superfund sites, the former Long Beach Naval Station, the San Diego Naval Station, the Miramar Marine Corps Air Station, the Kirtland Air Force Base, and the Holloman Air Force Base in New Mexico. Provides special support to projects at the Rocky Flats Environmental Technology Site (DOE) in the Denver area. Previously evaluated and prepared health and safety plans for a rapid response remediation project of almost 800,000 gallons of stored waste oil and hazardous waste. Presented testimony to the California Energy Commission in preparation of power plant siting plans. Developed and managed an air-monitoring program for a demolition project at Naval Weapons Station Seal Beach. Inspected projects in the field to insure compliance with plans, procedures and regulations. Trained personnel in various areas of environmental compliance, safety, and health.

PREVIOUS EXPERIENCE

OHM Remediation Services Corporation; Certified Industrial Hygienist; San Diego, CA; 1994 – 1998 – Managed health and safety for major remediation services contract with the U.S. Navy. Wrote site-specific health and safety plans, and integrated health and safety into daily operations at over 12 Navy and marine facilities for more than 100 delivery orders totaling more than $200 million. Assessed the effectiveness of chemical protective clothing, procedures, and hazard appraisals. Evaluated data and air monitoring from job sites to ensure employee protection and compliance with safe work procedures. Provided training for over 300 employees. Audited field projects to insure compliance with plans, procedures and regulations.

Chemical Waste Management, Inc; Health and Safety Manager; Kettleman City, CA; 1991 – 1994 – Managed health and safety at a major hazardous waste TSDF. Implemented and directed a health and safety program for over 200 employees. Assessed operations involving landfilling, stabilization of hazardous waste, storage of over 1,000 drums, management of PCBs, and other special projects. Taught OSHA HAZWOPER required 40-hour course, 8-hour supervisor course, and annual refresher courses. Trained personnel in operational procedures such as confined space entry. Managed the facility emergency response team.

Archon Services, Inc.; Partner/Technical Health and Safety Manager; Memphis, TN; 1989 – 1990 – Wrote health and safety plans and implemented them in field operations. Performed work in the field monitoring for exposure levels and to insure that work was performed safely. Participated in a high hazard project with inhibited red fuming nitric acid (IRFNA) and unsymmetrical dimethylhydrazine (UDMH) for the U.S. Navy. Evaluated sites for environmental contamination and performed site

assessments. Managed PCB remediation projects for Arkansas Power and Light. Managed the company health and safety program and provided training and consulting services. Wrote health and safety plans and QA/QC and environmental management plans for an ACOE project in Indiana.

Chemical Waste Management, Inc.; Health & Safety Technical Coordinator, San Antonio, TX, Memphis, TN, and Atlanta, GA; 1986 – 1989 – Developed and managed a health and safety program for 120 employees. Organized and developed an 86-hour training program. Trained over 300 people in hazardous waste operations. Wrote a health and safety plan for a major project at Pinebluff Army Arsenal and provided site supervision for the construction of two landfills involving contaminated soils, chemical warfare agents and decommissioning bi-products. Participated in projects involving PCBs, pentachlorophenol, IRFNA, anhydrous hydrazine, UDMH, white phosphorous and other chemicals at the Redstone Army Arsenal and Marshall Space Flight Center. Provided health and safety training and oversight to two Superfund projects. Managed the removal of hazardous waste for a DRMO project at Kelly AFB, Texas.

U.S. Air Force; Biomedical Scientist (Officer 04); United States and Europe; 1971 – 1985 – Managed Air Force clinical laboratories. Developed and performed laboratory tests to treat military members and eligible dependents. Served as laboratory manager, clinical pathology manager, radiation safety officer, and base drug testing program monitor. Managed a staff of laboratory technologists, technicians and officers. Served on the hospital radiation safety committee and infection control committees. Developed original analytical procedures for the urine analysis of abusive drugs and managed the USAFE Drug Abuse Detection Laboratory.

DISCIPLINE CODES

Health Experts: 113, Primary

LANGUAGE SKILLS

English Knowledge Level: Primary

RELATED COMPANY INFORMATION

Office Location: San Diego
FWENC Hire Date: 2/17/98
Years with Other Firms: 27
Daytime Telephone: 619-234-8696
E-mail Address: rmargotto@fwenc.com

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JAMES A. MORNING, OHST

Associate Health and Safety Scientist

EXPERIENCE SUMMARY

Health and safety scientist with 13 years experience in the environmental industry. Mr. Morning is currently the Site Manager at Holloman Air Force Base (AFB), New Mexico under the Total Environmental Restoration Contract (TERC) for the U.S. Army Corps of Engineers, Omaha District (Southwest TERC [SW TERC]). He also supports other projects under the SW TERC contract at other air force bases in the areas of construction management, quality control (QC), and health and safety oversight. Additional experience also includes preparing cost proposals, construction estimates, and site closure documentation.

Mr. Morning has also successfully performed as a health and safety officer on projects throughout the United States. In addition, he has successfully provided technical support as a field operations lead for large-scale remediation projects, remedial investigations, underground storage tank (UST) removals, environmental sampling programs, remediation system installation and maintenance, and reporting and construction oversight.

REGISTRATIONS/CERTIFICATIONS

Occupational Health and Safety, US

TRAINING

40-Hour OSHA Hazardous Waste Health and Safety Training - 1989
8-Hour OSHA Hazardous Waste Health and Safety Supervisor Training - 1992
8-Hour OSHA Hazardous Waste Health and Safety Refresher Course - Current
DOT/HM 126F - June 1996
24-Hour EPA Accredited Asbestos Inspector Course, Exp. 08/24/1992
40-Hour Health and Safety Officer Course - 1992
CPR and First Aid Training - Current
USACE Contractor Quality Control Certification - 1999
Project Management Training, Foster Wheeler Environmental - 1999
Internal Negotiating Training, Foster Wheeler Environmental - 1999
Occupational Health and Safety Technician Certification (OHST) - 1996

EDUCATION

AAS, Real Estate, Northlake College, 1987

REPRESENTATIVE PROJECT EXPERIENCE

U.S. Army Corps Of Engineers; Omaha District, SW TERC Contract, Holloman AFB, NM; Site Manager; 01/99-Present - Supervises day-to-day operations of a subcontractor who operates and maintains the Long Term Operation (LTO) of several environmental remediation systems. Supervises subcontractors, craft personnel in various support projects for the U.S. Air Force (USAF) environmental compliance group in sampling, managing non-hazardous and hazardous waste, overseeing contaminated soil removal projects, and supporting other client service and quality needs. Mr. Morning also supports projects at Cannon AFB and Kirtland AFB as needed in similar project roles as he is involved at Holloman AFB. He is responsible for site project management, health and safety, QC, construction management, and client relations. Involved in all proposals, estimating and planning phases of continuing projects and new delivery orders.

U.S. Army Corps Of Engineers; Omaha District, SW TERC Contract, Holloman AFB, NM; Main Base Landfill Closure Project, Environmental Safety Specialist; 05/98-12/98 - Provided Environmental Safety Specialist support and acted as assistant superintendent. Project included a concrete crushing operation, soil cap installation, and re vegetation of approximately 110 acres. Also assisted in QC operations.

U.S. Army Corps of Engineers; Omaha District, SW TERC Contract, Holloman AFB, NM; 300 Pound Open Burn Unit Remediation, Environmental Safety Specialist/Construction Manager; 01/98-06/98 - Provided Environmental Safety Specialist support and was on site construction manager for the excavation, screening and disposal of UXO and POL contaminated soils at this site. Site consisted of four (4) open burn trenches used for destroying old munitions by burning with POL products. A Radiation ID Tag was found during trench 4 excavation, and Mr. Morning kept down time to a minimum by getting specialized training for the workers and kept project on schedule.

U.S. Army Corps of Engineers; Omaha District, SW TERC Contract, Holloman AFB, NM; Sewage Lagoons Closure Project, Environmental Safety Specialist; 08/97-12/97 - Provided Environmental Safety support during the closure of 8 sewage lagoons. Project included de watering, sludge stabilization, backfill and re-vegetation and Long Term Monitoring.

Union Pacific Railroad; Huron South Dakota, DME Roundhouse Remediation Project, Site Health and Safety Officer; 03/97-07/97 - Provided health and safety support and acted as superintendent in the absence of assigned superintendent. Project was de-watering, sludge removal and stabilization, backfill, re vegetation and closure of 4 lagoons used previously for disposal of waste POL products.

U.S. Army Corps of Engineers; Tulsa District, Clinton-Sherman Industrial Airpark Remedial Investigation Phase III, Burns Flat, OK; Lead Health and Safety Officer; 09/96-12/96 - Coordinated Health and Safety procedures between as many as six individual field crews performing separate simultaneous tasks. Supervised four health and safety officers during implementation of the field work. Supervised the groundwater sampling crew and assisted in obtaining approximately 130 groundwater samples

Colgate-Palmolive; Underground Storage Tank and Pond Removal, Texarkana, TX; Project Site Supervisor; 08/96-09/96 - Removal of six 20,000-gallon USTs and the closure of a stormwater detention pond. Provided Health and Safety support for the client and the subcontractor. A previous contractor ruptured one of the UST's during a previous removal effort resulting in an explosion. The project was successfully completed by Foster Wheeler without incident.

U.S. Army Corps of Engineers; Aberdeen Proving Grounds, Adamsite Vault and Building Demolition, 07/96-08/96 - Provided health and safety support at the Adamsite Storage Vault Demolition project that involved the removal of radioactive soils and then the demolition of concrete vaults and steel overhead structure utilizing heavy equipment equipped with shearing and grappling devices.

U.S. Army Corps of Engineers; Aberdeen Proving Ground, 26th St. Dump Site, 09/95-08/96 - Provided health and safety support at the 26th Street Disposal Site that involved excavation of over 2,000 cubic yards of soil and removal of materials potentially contaminated with radioactive, chemical agent, UXO

and other mixed waste hazardous waste. Activities were conducted in Level "B" and Level "C" PPE. Real-time monitoring utilizing radiation, chemical surety, and FID/PID/CGI/PDM.

NAS-JAX Plating Shop Demolition/Remediation, Jacksonville, FL; Site Health and Safety Officer; 01/95-08/95 - A $5.8 million cost plus D.O./United States Navy - Acids Metals Bases Contract. Peak manpower reached a level of 30 field personnel supported by eight non-manual staff. Performed at the same time as subcontractor procurement specialist. Remediation efforts involved project design, site mobilization, material tracking/decontamination, drum handling, wastewater treatment, air monitoring, and asbestos abatement. Demolition and removal via roll-offs of various material including pipe, grating, platforms, tanks, ductwork, concrete, CMU walls, utility rerouting including network electric high pressure steam system, and electrical termination/rerouting. Performed craft supervisor duties in the final phase.

U.S. Army Corps of Engineers; Bridgeport Rental and Oil Services (BROS) Superfund Site, Bridgeport, NJ; 09/94-12/94 - Provided health and safety support on remediation project at this Superfund site. BROS was a CERCLA site involving lagoon dewatering, drum extraction and characterization, excavation, material handling (i.e., segregation, screening, and shredding) and incineration of approximately 100,000 cubic yards of material contaminated with metals, PCBs, and organic compounds; and characterization for off-site disposal of contaminated debris.

Eastern Missouri Dioxin Project, Times Beach, MO; 05/94-09/94 - Provided safety support for remedial activities. Site was contaminated with dioxin through the application of waste oil that was applied for the suppression of dust. Remedial activities included thermally treating the dioxin-contaminated materials for the Times Beach and 26 other sites, and providing monitoring, sampling, and administrative/project management services to Agribusiness Technologies, Inc. to facilitate completion of these remedial activities.

Texas Natural Resource Conversation Commission (TNRCC); TX; 1992-1994 - Provided technical and health and safety support to the state of Texas for their leaking underground storage tank (UST) program. Provided construction oversight of a tank removal project consisting of eight USTs and approximately 800 cubic yards of contaminated soil. Experience also includes free product recovery, soil and groundwater sampling and soil gas investigations.

Department of Environmental Regulation Contract, Stuart, FL; 1992-1994 - Provided technical support to Foster Wheeler's Stuart, FL operations on its Florida Department of Environmental Regulations Contract. Activities included site assessments, sampling programs, remediation construction oversight, and serving as the on-site Health and Safety Officer.

Amoco Oil Company; Texas City Refinery, TX; Field Operations Lead/Health and Safety Officer; 1992-1994 - Responsible for several sampling events over two years with no accidents. Involved sampling over 300 monitoring wells.

Texas Water Commission (TWC); North Cavalcade Street Superfund Site, TX; 12/93-04/94 - Provided construction oversight and technical support to ensure that the remedial action was completed in accordance with the requirements of the contract drawings and specifications. CERCLA project involved

the installation of a groundwater extraction system with a carbon adsorption water treatment facility, as well as excavation/stockpiling of contaminated soil for future biological treatment.

U.S. Army Environmental Center (USAEC); Dugway Proving Ground and Tooele Army Depot, UT; 07/93-10/93 - Provided over 50 days of accident-free health and safety field support in remedial investigation tasks. Work involved surface and subsurface sampling, monitoring well installation, and general health and safety duties. Level "B" operations with heavy equipment at Tooele Army Depot activities were completed with no accidents.

Coltex Superfund Site, TX; 06/93-06/93 - Provided field operations and health and safety services during the pre-bid construction site assessment phase for the removal of liquids and solids for off-site disposal/treatment. Work included demolition of above ground tanks for disposal and/or recycling.

Enserch Exploration; Non-Hazardous Waste Removal, Pasgalula, MS; 06/93-06/93 - Observed and evaluated the methods and approach of the removal operation, health and safety practices, storage and transportation of an estimated 750 tons of non-hazardous waste material (sludge) from the ballast tanks of semi-submersible offshore oil rig.

U.S. Army Corps of Engineers; Pantex Ordnance Plant, TX; 01/94-05/94 - Provided accident-free health and safety field support and technical support in the installation of a dedicated sampling pump system for six 300-foot monitor wells.

PREVIOUS EXPERIENCE

Maxim Engineers, Inc.
1989-1992
Environmental Technician Supervisor– Responsibilities included collection of field data and regarding remediation projects such as a groundwater, soil, sampling, hazardous waste profiling procedures. Reviews and bid, examine UST proposals to include remediation proposals involving equipment installation. Provide technical UST assistance to environmental staff, interface with government agencies and clients regarding various aspects of projects. Field UST supervisor which involved UST removals including project management activities, performed modified EPS 418.1 field analysis of soil utilizing Fox-boro Miran 1 instrument, maintain maintenance on several field instruments, i.e., OVA, OVM, and HNU. Set up and operate Hermit 2000 field data logger for aquifer pump test. Responsible for installation, operation and maintenance of two air stripping tower's three product recovery systems, one mobile bioreactor groundwater treatment system, two bioremediation soil projects, three-bench study bioprojects. Also responsible for the automation of a batch process Bio Reactors groundwater treatment system and reduced daily manhours for 4 hours to 30 minutes. Performed construction materials testing such as field density tests, proctors, concrete inspections and various soils laboratory activities.

TSI Engineering
10/87-09/89
Supervising Operator– Constructed commercial petroleum service facilities, repaired and installed existing systems to include interfacing remediation systems. Responsible for numerous UST removals.

U.S. Army Reserve Corps of Engineers
1976-1993

Heavy Equipment Supervisor for Company C, 980th Engineer Battalion– Duty included supervision of 22 people in unit. Responsibilities included unit's heavy equipment construction missions. Received several Corps' awards for completed projects and individual awards for the supervision of projects, as well as safety awards.

DISCIPLINE CODES

109 Construction Experts, N
113 Health Experts, Y

OTHER DATA

Office Location: HOLLOMAN AFB, NM
FWENC Hire Date: 09/01/1992
Years w/Other Firms: 4
Daytime Phone: (505) 479-2668, (505) 430-230 (cell)

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EXPERIENCE SUMMARY

Twenty-one years experience in analytical and environmental chemistry, environmental consulting and laboratory management, waste characterization and disposal, quality assurance, and analytical data validation. Experience includes eight years of analytical laboratory supervisory experience and seven years of environmental project management experience. Served as a task manager, project chemist, quality assurance manager, and environmental laboratory coordinator for remedial investigations, feasibility studies, site investigations, long-term groundwater monitoring, compliance sampling, and waste drum characterization programs. Extensive knowledge and experience with project management, United States Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP), U.S. Army Corps of Engineers (USACE) Chemistry Scope of Services, Air Force Center for Environmental Excellence (AFCEE) Quality Assurance Program, and United States Army Environmental Center (USAEC) analytical methodologies.

EDUCATION

B.S. (Bachelor of Science), Food Chemistry, Purdue University, , 1977

TRAINING

40-Hour OSHA Hazardous Waste Training, 29 CFR 1910.120 H&S - 1990
8-Hour OSHA Hazardous Waste Refresher Training - Current
Project Management 100 Training - 1997
Project Management 200 Training - 2000
Certified Quality Auditor Training - 1998
Waste Management/Department of Transportation Training - 1998
American Chemical Society - Environmental Laboratory Data Quality Assurance -1998

REPRESENTATIVE PROJECT EXPERIENCE

Denver Federal Center, Colorado; Federal Highways Administration (FHWA), General Services Administration (GSA); Lead Chemist, 1999-present; Provide lead chemistry, chemical QA, and laboratory and data management support for the Denver Federal Center (DFC) Site-Wide Groundwater Monitoring and DFC Background Characterization Programs. As lead chemist for this contract, responsible for development of project data quality objectives, data collection plans, data validation, and electronic data management using the DFC Database Management System. Responsible for implementation of the Quality Assurance Project Plan for the DFC Site-Wide RCRA Facility Investigation for project-specific work, and laboratory subcontractor management of $300K analytical work.

U.S. Army Corps of Engineers, Omaha District; TERC 4; 1994-Present; Task Manager, Project Chemist - Provide task management and lead chemistry support for this $150 million HTRW contract in support of Holloman, Kirtland, and Cannon Air Force Bases in New Mexico. Perform task manager role for hazardous waste, stormwater, drinking water, biomonitoring, detonation unit, on-site systems, and site investigation sampling, analysis, and reporting activities in support of a $380K per year compliance monitoring task at Holloman AFB. In addition, perform as task manager for a $1.4M per year long-term groundwater monitoring (LTM) program at Kirtland AFB. Responsible for well installation and maintenance; and semiannual and quarterly sampling, analysis, and reporting activities for 40 monitoring

wells included under the LTM. As lead chemist for all task orders associated with this contract, responsibilities include: management and auditing of laboratory subcontractors; development of project data quality objectives, data collection quality assurance plans, and field sampling plans; and oversight and management of data validation and ERPIMS database deliverables, evaluation and assessment of analytical data.

U.S. Air Force Center for Environmental Excellence; 3P Contract; 2000-Present; Quality Assurance Manager, Lead Chemist - Provide quality assurance (QA) and lead chemistry support for this $480M world-wide Air Force Base contract which includes environmental restoration, regulatory compliance, pollution prevention, conservation, planning, design and construction management. Currently providing QA and chemistry management for a $500K remedial investigation at spill site 34N at McChord AFB, Seattle, Washington, and for 5 task orders totaling $3.5M at Anderson AFB, Guam. Responsibilities include implementation of overall project QA procedures, development of QA plans and project data quality objectives, management and auditing of laboratory subcontractors, management of data validation and ERPIMS data deliverables, and overall evaluation, assessment, and usability of analytical data.

U.S. Fish and Wildlife Service - Amchitka Island, Great Swamp National Wildlife Refuge, Sachuest Point NWR, Trustom Pond NWR, Patuxent Chemical Leachfield, Kenai Alaska Pentachlorphenol Site, D'Arbonne and Ouachita NWR; 1993-Present; Project Chemist - Responsible for development of project data quality objectives and FSP for nonhazardous and hazardous preliminary site assessment, site inspection, remedial investigation and design, and feasibility study, performs technical evaluation, management and oversight of subcontractor labs; and management of database development, validation of analytical data, and data assessment and interpretation. Designed presentation and provided instruction on development of data quality objectives, analytical lab selection, analytical methods, and data validation for 2 day CERCLA training program in support of USFWS refuge management and Service Pollution Control Office.

Oak Ridge National Laboratories; Low-Level Mixed Waste Drum Characterization; Oak Ridge, TN; 1991-1993; Project Task Manager/Technical Chemistry Lead - Managed chemical and process knowledge characterization of 1,000 low-level radioactive waste containers. Implemented the process knowledge approach as an alternative to analytical testing, resulting in a cost savings to the client. Responsible for development of the field sampling plan and the QA plan; coordinated project tasks and personnel; quality assurance of all drum characterization process knowledge, analytical data, and deliverables; and chemistry oversight and technical review of all waste materials in accordance with RCRA regulations to determine ultimate disposal options. Involved with revising the current waste management tracking system, and establishing and implementing a waste generator training program at Oak Ridge National Laboratories.

U.S. Army Rocky Mountain Arsenal, Colorado; Continuous Air Quality Monitoring and Meteorological Program; Fluoroacetic Acid Volume Refinement Soil Sampling Program; In-situ Biotreatability Program; Supplemental Field Study; Commerce City, CO; 1990-Present; Project Chemist - Responsible for chemistry and analytical support for field sampling activities; laboratory coordination, oversight, and auditing; and analytical data evaluation for report preparation. Responsible for analytical support for Chemical Data Assessment Program including 20,000 particulate and gaseous air samples for modified EPA analyses, and 10,000 water and soil samples for routine and non-routine chemical analyses. Also responsible for technical evaluation, coordination, and oversight of analytical subcontractors, auditing of subcontractor labs; and coordination and management of IRDMIS deliverables.

U.S. Army Environmental Center; Tooele Army Depot-South and Dugway Proving Ground, UT; 1991-Present; Project Chemist - Performed laboratory coordination for field data collection activities on this $25 million RFI, where responsibilities included technical evaluation and laboratory procurement; laboratory oversight, performance auditing, and quality assurance of analytical methods for $5 million of subcontracted analytical work. Responsible for management of data validation, project database management, and data assessment for report preparation. Coordinated and evaluated the analytical data for use in waste management program. Provided client with substantial cost savings as a result of our timely and efficient waste management procedures.

U.S. Bureau of Reclamation; Krejci Dump Site, Ohio; Bingham Creek, Utah; Warren Air Force Base, Wyoming; 1991-1994; Project Chemist - Provided support in developing work plans, field sampling and analysis plans, and quality assurance project plans. Provided a cost savingsto the client by performing on-site compatibility testing of samples from more than 800 waste drums and off-site confirmation analysis for the cradle-to-grave remediation at the Krejci Dump site. Responsible for laboratory coordination, data review and verification, reporting, documentation, and project database management. In addition, performed as the project manager for the Bureau of Reclamation Wright Patterson data validation task. Responsible for project coordination, budgets, labor, schedules, and quality control. Designed and implemented an on-site laboratory that resulted in a significantly reduced analytical program and a $50,000 savings.

Rocky Flats Plant, Colorado; 1992; Project Chemist - Supported the data analysis, data verification, and report preparation for the 1990 Surface Water and Sediment Geochemical Characterization Report at the Rocky Flats Plant in Colorado, a nuclear weapons production facility. This report documents the analytical results of samples collected during 1990 to monitor releases. Primarily involved with the investigation of questionable items for organic, inorganic, and radiochemical data. Upon completing this review, worked with EG&G Rocky Flats staff to document the needed changes to the database and to verify data validation for the final report.

PREVIOUS EXPERIENCE

In addition to the ten years of experience in the environmental consulting industry, has 13 years of experience in organic and inorganic chemical analysis. This experience includes eight years of environmental analytical experience with USEPA, CLP, and USAEC methodologies, and six years of environmental laboratory management experience. As laboratory manager, responsible for budgeting and scheduling of workand manpower; hiring, training, and supervising personnel; data quality review and report generation; and client interaction and project management.

Hunter Environmental Services/Environmental Science and Engineering, Denver, CO, Gas Chromatography Manager, 1989-1990 - Responsible for managing all facets of the Gas Chromatography Group. These responsibilities included scheduling of all gas chromatography work, budgeting manpower hours, maintaining laboratory equipment, requisitioning supplies, and reviewing the quality of all data generated by the group. Also involved with performing special analytical tasks.

PACE (Hager Laboratories), Denver, CO, Environmental Laboratory Supervisor, 1988-1989 - Responsible for establishing and running the environmental organic extraction and gas chromatography laboratories using USEPA protocol. Responsibilities included hiring, training, and supervising personnel for both sections; setting up and maintaining instrumentation; writing standard operating procedures and methodologies; scheduling of work; reviewing all data generated; preparing written reports for analysis; and interacting with clients.

PAMELA J. MOSS
Senior Chemist

Truesdail Laboratories, Tustin, CA, Assistant Manager, 1985-1988 - Trained and supervised personnel for the gas chromatography laboratory. Responsible for the operation and daily analysis of environmental gas chromatography work as well as equipment maintenance and problem solving. Laboratory project manager for two drinking water contracts for the Department of Health Sciences that involved coordinating sampling, scheduling, analysis, data reporting, and client interaction.

SGS Control Services, New Orleans, LA, Chief Chemist/Mineral Division Laboratory Supervisor, 1981-1985 - Performed gas chromatography and mass spectrometry analysis of pesticides, fumigants, transformer oils, petroleum, and petroleum products using USEPA methodology. Performed and supervised the analysis of coal and petroleum coke. This involved coordinating the sample preparation group with the laboratory, maintaining and calibrating laboratory equipment, performing quality control, developing and improving analytical methods, and reporting results to clients.

Barringer Resources, Arvada, CO, Laboratory Supervisor, 1978-1981 - Involved with all phases of inorganic analysis of soil and water, from sample preparation through analysis to customer contact. Responsible for training and supervising employees.

PROFESSIONAL AFFILIATIONS

American Chemical Society - Division of Environmental Chemistry
American Society of Quality Control

DISCIPLINE CODES

Administrative: 001, Secondary
Chemical Engineers: 003, Secondary
Chemical Experts: 136, Primary

SKILL SET

CHEMICAL SCIENCE

Atomic Absorption
Chemical Data Acquisition Plan
Drum Compatibility Testing
Deputy Project Manager
Drum Sampling
Field/Mobile Laboratory Oversight
Field QA Audits
Feasibility Study
Field Sampling and Analysis Plan
Gas Chromatography
Gas Chromatography/Mass Spectrometry
Geotechnical Sampling
Volatile Headspace Analysis
Inorganics
Infrared
Laboratory QA Audits
Organics
Proposal Lead
Quality Assurance Officer
Quality Assurance Plan
Risk Assessment
Resource Conservation Recovery Act
Remedial Action
Remedial Investigation
Remedial Investigation/Feasibility Study
Site Characterization
Task Leader
Wet Chemistry
Work Plan

RELATED COMPANY INFORMATION

Office Location: Denver
FWENC Hire Date: 5/29/90
Years with Other Firms: 13
Daytime Telephone: 303-980-3519
E-mail Address: pmoss@fwenc.com

KATHY K. OMERNIK

Senior Health and Safety Scientist

EXPERIENCE SUMMARY

Ms. Omernik has over 25 years experience in commercial, nuclear and environmental Quality Control and Quality Assurance. Positions held include ESQ Audit Program Manager, QA Oversight Lead, Quality Engineer, Senior Quality Assurance Coordinator, Configuration Records Coordinator, and Quality Control Inspector. Experienced in QA/QC requirements for construction, remediation, records management for Federal environmental projects. Experience in the development, management, and assessment of quality programs, plans, and records. Manufacturing quality control inspection experience. Quality program experience includes work under programs for NQA-1, DOE 10CFR 830.120, ANSI-ASQC E-4, ISO 9000 series, MIL Standards, and environmental standard ISO 14001.

Ms Omernik has served as an Examiner for the Department of Energy's Performance Excellence Award; the Department's equivalent to the Malcomb Baldrige National Quality Award.

EDUCATION

BA / Operations Management / Western Illinois University, Macomb, IL / 1995
AAS / Quality Assurance Technology / Mesa Community College, San Diego, CA / 1987

REGISTRATIONS/CERTIFICATIONS

Certified Quality Auditor, American Society for Quality (ASQ)
#3882, Date of Issue: June 1992, Date of Expiration: June 2004

Certified Quality Engineer, ASQ
#16833, Date of Issue: December 1987, Date of Expiration: June 2004

Former RAB Quality Systems Auditor
#Q04239, Date of Issue: June 1995, Date of Expiration: June 1998

Current DOE "L" level Security Clearance
Date of Issue: May 1999, Date of Expiration: N/A

TRAINING

DOE Performance Excellence Award Examiner Training, Department of Energy, August 2001
8-Hour OSHA Hazwoper Refresher, Foster Wheeler Environmental Corporation, November 2001
Waste Management (40 CFR 265.16), Foster Wheeler Environmental Corporation, October 2000
8-Hour OSHA Hazwoper Supervisor, Foster Wheeler Environmental Corporation, December 1999
Loss Control Self-Study, Foster Wheeler Environmental Corporation, November 1999
DOT Employee Training, Foster Wheeler Environmental Corporation, February 1999
30-Hour OSHA Construction Safety & Health, January 1999
40-Hour OSHA Hazwoper, Kaiser-Hill Rocky Flats, December 1998
Radiological Worker II, Kaiser-Hill Rocky Flats, December 1998

How To Deal With Employee Attitude Problems, American Management Association, May 1995
Lead Auditor Training, Applied Quality Systems, #1573, September 1994

FOSTER WHEELER ENVIRONMENTAL CORPORATION EXPERIENCE

Manager, ESQ Audit Program; Denver, Colorado; March 2001 - Present – Functions as Corporate ESQ Audit Program Manager. Coordinates and implements a cross-functional ESQ Audit Program consisting of performing ESQ audits, supervising ESQ auditors, reviewing audit reports and ensuring distribution to responsible management, development/maintenance of an action item (corrective action) tracking system, implementing and maintaining ESQ Auditor training and qualification records, and maintaining ESQ Audit records. Develop metrics based on audit results and identify opportunities for improvement. Contributes to the maintenance and development of corporate and project ESQ auditing procedures and guidelines. Serves as point of contact for ESQ audit support to FWENC.

Quality Assurance; Idaho Spent Fuel Project; Richland WA; August 2000 - February 2001 – Assist in the development of project specific procedures compliant with Nuclear Quality Assurance (NQA) and Nuclear Regulatory Commission (NRC) requirements.

QA Oversight Lead; Rocky Mountain Arsenal; Commerce City, CO; August 1999 - August 2000 – Functioned as Oversight Lead of Internal QA Surveillance and Audit Program at Rocky Mountain Arsenal. Coordinated and implemented a QA Assessment Program. The Program consisted of performing QA audits and surveillances, supervising QA auditors and surveillances, reviewing audit and surveillance reports and ensuring appropriate distribution, tracking corrective actions, and record retention. Implemented and maintained QA Auditor and Surveillance training and qualification records. Developed metrics based on assessment results and identified opportunities for improvement. Developed and maintained project specific assessment procedures and guidelines.

Quality Assurance; Rocky Flats Environmental Technology Site; Golden, CO; November 1998 - August 1999 – Develop, maintain, and ensure implementation of Quality Assurance Project Plans. Perform quality control inspection of construction activities. Construction sequence planning. Designated Safety & Health representative on construction projects. Perform internal audits and surveillances ensuring compliance with DOE orders and regulations.

PREVIOUS EXPERIENCE

Quality Engineer, ALTA Group Golden Operations; Arvada, CO; June 1997 - November 1998 – Developed and verified implementation of an ISO 9002 Quality Program. Troubleshoot customer reported quality problems. Train employees in applicable aspects of the Quality Program. Develop and maintain standard production operating procedures.

Senior Quality Assurance Consultant; RUST Geotech Inc.; Grand Junction, CO; January 1992 - August 1995 – Overview of support organizations' activities as quality coordinator for compliance with DOE Orders, Code of Federal Regulations, and other industry standards. Perform internal audits and surveillances ensuring compliance with DOE orders and regulations. Develop and maintain Quality Assurance Program and Project Plans. Coordination of Company Performance Indicator Program.

KATHY K. OMERNIK

Senior Health and Safety Scientist

Quality Engineer, Sundstrand Power Systems; San Diego, CA; August 1986 - April 1991 – Receiving inspection/in-process Inspection Supervisor and training. Implement and monitor SPC on select product performance characteristics. Inspection planning and review of assembly instructions. Customer approved member of the Material Review Board for the disposition of nonconforming material. Customer interface on all quality issues and source inspections. Performed internal audits to established procedures and coordinated the response to customer audit reports.

Quality Engineer; Teledyne Ryan Aeronautical; San Diego, CA; October 1983 - August 1986 – Data collection, analysis, and preparation of SPC charts. Established requirements for a Rejection Report database for tracking, corrective action, and SPC uses. Customer approved member of the Material Review Board for the disposition of nonconforming material. Organized, operated, and maintained QA Configuration Record Center for the fuselage of the Apache Helicopter. Inspection Supervisor.

Casting Layout Inspector; Mercury Marine; Stillwater, OK; August 1977 - October 1983 – Receiving Inspection. In-process and final inspection of electronic trolling motors, engine assembly, and marinization. CMM operator, first article inspections of castings and subsequent machining.

PROFESSIONAL AFFILIATIONS

American Society for Quality Boulder Chapter, 1985

DISCIPLINE CODES

Production Experts: 118, Primary

SKILL SET

BIOLOGICAL SCIENCES
Statistical Analysis

CHEMICAL SCIENCES
Field QA Audit
Quality Assurance
RCRA Compliance Audit
RCRA Facility Investigation/RCRA Facility Audit

GEOSCIENCE
Radioactive Waste /Mixed Waste

RCRA/CERCLA
REGULATORY AFFAIRS
DOE Orders
Environmental Compliance Audits
Inspections/Audits
ISO 14000
ISO 9000

OTHER
Certified Quality Engineer
Certified Quality Auditor

TECHNICAL EXPERTISE

Worked with the Grand Junction Chamber of Commerce during 1994 and 1995 to offer educational seminars in the field of Quality Assurance to the business community.

LANGUAGE SKILLS

English Knowledge Level: Primary

PROFESSIONAL REFERENCES

Rich Gioscia, Director, ESQ Department, Foster Wheeler Environmental Corporation, 303-980-3505
Keith Rademacher, QC Manager, Foster Wheeler Environmental Corporation, 509-373-3244
Paul White, QA Manager, Foster Wheeler Environmental Corporation/RMA, 303-289-0658

RELATED COMPANY INFORMATION

Office Location: Denver
FWENC Hire Date: 11/30/98
Years with Other Firms: 22
Daytime Telephone: 303-289-0965
E-mail Address: komernik@fwenc.com

CRAIG O'ROURKE

Principal Health and Safety Scientist

EXPERIENCE SUMMARY

Mr. O'Rourke has twelve years of diversified technical and practical experience working in the environmental industry. He is currently the Foster Wheeler Environmental Manager for the Southwest Region. He is responsible for providing regulatory compliance support and training for projects in Arizona, Nevada, Colorado, New Mexico, and California. He serves as the regulatory compliance manager for all Foster Wheeler projects conducted under the Remedial Action Contract with the U.S. Navy, Southwest Division Naval Facilities Engineering Command, for Foster Wheeler's Southwest Total Environmental Restoration Contract with the U.S. Army Corp. of Engineers, and for Foster Wheeler's nationwide Air Force Center of Environmental Excellence Contract for remediation of Air Force base facilities.

Mr. O'Rourke's experience includes performing compliance audits and providing regulatory interpretation and support as part of a nationwide team of environmental auditors. He has conducted audits and compliance inspections of RCRA hazardous waste TSD and generator facilities, and he has prepared, reviewed and approved hazardous waste TSDF permit applications and closure plans on behalf of the California Environmental Protection Agency Department of Toxic Substances Control. His background also includes the coordination, planning, and management of over 150 environmental site assessments, facility audits, and site investigations in support of regulatory requirements, property transactions, and due diligence evaluations.

Mr. O'Rourke has performed and managed numerous individual and multi-site environmental site assessments for a variety of industries and property uses, including Department of Defense facilities. In addition, he has managed the administrative and technical review, approval and implementation of all phases of the CERCLA remediation and RCRA corrective action cleanup programs. Mr. O'Rourke's experience includes working with corporate attorneys in developing, customizing, and negotiating consent agreements to meet a broad spectrum of business and regulatory situations.

Mr. O'Rourke has also directed community relations and RCRA Corrective Action Public Participation Program for a number of multi-million dollar site investigation and clean-up projects. Mr. O'Rourke's experience includes interfacing with the community through community interviews, public hearings, and workshops.

PROFESSIONAL AFFILIATIONS

National Groundwater Association
Institute of Hazardous Materials Management
Hazardous Waste Association of California

REGISTRATIONS/CERTIFICATIONS

Certified Hazardous Materials Manager (CHMM), 5394
California Registered Environmental Assessor (REA), 6860

TRAINING

OSHA Hazardous Waste Health and Safety Training
First Aid and CPR training
Annual Waste Management Training
DOT Training

EDUCATION

MS / Environmental Sciences / California State University, Fullerton / 1997
BA / Geography / University of California, Los Angeles / 1985

REPRESENTATIVE PROJECT EXPERIENCE

Operating Industries Inc. (OII); PRP-funded CERCLA remediation, Monterey Park, CA; Senior Regulatory Compliance Manager – Conducted environmental compliance inspections, developed standard operating procedures for waste management activities, reviewed regulatory compliance records, plans, and supporting documentation for completeness and accuracy, and provided regulatory support on a day-to-day basis to the Program Manager for the 200-acre Superfund site.

Naval Facilities Engineering Command; Southwest Division, Remedial Action Contract (RAC) – Responsible for ensuring the proper preparation and review of regulatory compliance plans and waste management plans, and for conducting oversight of their implementation, for over 50 remediation projects initiated under the RAC at operating and closing Department of Defense facilities located throughout California.

U.S. Army Corp. of Engineers; Southwest Division, Total Environmental Restoration Contract (TERC) - Regulatory Compliance Officer – Responsible for ensuring regulatory compliance for all projects initiated under the TERC at Holloman, Kirtland, and Cannon Air Force Bases.

Air Force Center of Environmental Excellence (AFCEE) 3P-AE - Regulatory Compliance Manager Currently involved in providing direction to project managers and staff in coordination of all issues pertaining to environmental regulatory compliance and waste management for environmental restoration projects at air force bases across the country.

General Electric Plant, Anaheim, CA – Provided oversight and assisted facility personnel in the preparation of a RCRA Part B Permit Application for the hazardous waste storage operations at the facility. Provided facility inspections and oversight of Operations Plan implementation and training to ensure compliance with the RCRA Permit.

Lockheed Martin; International Light Metals, Torrance, CA; Regulatory Project Manager – Responsible for the technical review and implementation oversight of a "fast track" RCRA corrective action project at a 67-acre heavy manufacturing facility. The activities progressed from the RFA stage and the investigation of over 200 solid waste management units and areas of concern to the implementation of interim measures within 10 months.

CRAIG O'ROURKE

Principal Health and Safety Scientist

Confidential Client – Project Manager for the due diligence assessment and compliance audit of five facilities in California, including two co-generation plants, for an international conglomerate. Project progressed from Phase I and Phase II environmental site assessments and compliance inspections through report preparation within six weeks.

Naval Air Station, North Island, San Diego, CA; Regulatory Project Manager – Responsible for the implementation of the DOD's Installation Restoration Program at Naval Air Station, North Island. Reviewed and approved site investigation workplans and reports in compliance with RCRA and CERCLA regulations. Coordinated with EPA in the evaluation of new and innovative site investigation techniques and waste treatment technologies.

Long Beach Naval Complex, Long Beach, CA; Project Manager – For the DOD's Base Realignment & Closure activities at Long Beach Naval Station and Naval Shipyard. Evaluated historical records, reviewed and approved preliminary site investigation reports, and coordinated the regulatory oversight on the development of a joint RFI and RI/FS Workplan for sites on the two bases. The project involved coordination with over twenty federal, state, and local agencies.

PREVIOUS EXPERIENCE

ARCADIS Geraghty & Miller
Senior Regulatory Compliance Specialist/Project Manager

California Environmental Protection Agency Department of Toxic Substances Control
Regulatory Compliance Specialist - Responsible for reviewing and approving hazardous waste facility closure plans and permit applications, conducting regulatory compliance inspections, and overseeing all phases of RCRA Corrective Action at commercial hazardous waste facilities and Department of Defense installations.

SKILL SET

CHEMICAL SCIENCES

RCRA Compliance Audit

REGULATORY AFFAIRS

ARARs
ASTs
Base Realignment and Closure Requirements
CAMUs/TUs
CERCLA
CERCLA Remedial Investigation
CERCLA/RCRA Reform
CERFA
Clean Water Act
CMS
Compliance Audits
Debris
DERP/DERA Program

REGULATORY AFFAIRS (Continued)

DOT/Transporter regs.
Due Diligence
Environmental Assessment
Environmental Assessments for Property Transactions (Phase I & II)
Environmental Audits
Environmental Compliance Audits
Environmental Impact Statement
Environmental Site Assessments
Environmental Training
Federal Facility Compliance Act
Generator & TSDF waste analysis plans
Hazardous & Solid Waste Mgmt
Hazardous Waste Management

IDW
Inspections/Audits
Installation Restoration Program
Investigation-Derived Waste Mgmt
ISO 14000
NEPA
NPDES Stormwater permitting & Facility Compliance Inspections
Phase I ASTM
Phase II
Pollution Prevention
Pre-Acquisition Audits
RCRA
RCRA Closure
RCRA Corrective Action
RCRA Facility Investigation
RCRA Generator Requirements
RCRA Hazardous Waste Mgmt
RCRA LDRs
RCRA Part B Permits
RCRA Permitting
RCRA Training
RCRA TSDF regs.
RCRA Waste Characterization
RCRA/CERCLA Interface
Reading/Tracking regs.
Regulatory Trainer
Regulatory/Enforcement Actions
Release Reporting-CERCLA/RCRA
Remediation
RFAs
RFIs
Safe Drinking Water Act
SARA Title III
SDWA
Stormwater
Stormwater Permitting
SPCC Plans
Superfund/RCRA interface
Superfund
Transporter regs.
TSCA/PCB disposal
Used Oil
UST Closure
UST Removal & Closure
Waste Characterization
Waste Minimization
Waste Transportation & Disposal

OTHER DATA

Office Location: Santa Ana
FWENC Hire Date: 09/12/1998
Years w/Other Firms: 8
Daytime Phone: 949-756-7511

SINA SEYEDIAN PE

Project Manager – Remediation

EXPERIENCE SUMMARY

More than 14 years experience in various positions in waste management, engineering, construction, and construction management in both the private/commercial and public/government sectors. Nine years of increasing responsibility in program/project management on Title I, II, III, and IV at HTRW sites including planning, removal, and disposal of hazardous waste; construction in radiological controlled areas; evaluation of various technologies including energy research, environmental restoration, and decontamination and decommissioning; as well as construction of buildings, facilities, and infrastructure. Experience includes management and execution of delivery order-/task order-based CPFF, CPAF, T&M, and FFP contracts with special attention to technical work quality, client relations, and cost and schedule.

PROFESSIONAL AFFILIATIONS

National Society of Professional Engineers, Professional Engineers of Colorado, Member

REGISTRATIONS/CERTIFICATIONS

Professional Engineer, Civil - CO, 7/7/89, No. 26415

EDUCATION

BS / Civil/Structural Engineering / University of Wyoming / 1983

TRAINING

OSHA 29 CFR Part 1910 Hazardous Waste Site Operations - 1995
DOT/HM-126F Hazmat Training 49 CFR 172, Subpart H - 1995
Hazardous Waste Operations - 1994
OSHA Construction - 1992
Industrial Safety - 1992
RCRA - 1992
Cost/Schedule Control Systems - 1992
DOE Q Clearance (Active)

Company: Foster Wheeler Environmental Corporation; 11/2/92 - Present
Present Location: Denver, CO
Daytime Phone: 303-980-3573

REPRESENTATIVE PROJECT EXPERIENCE

Program Manager; U.S. Army Corps of Engineers, Omaha District, TERC 4; 08/96-Present – Oversees and ensures timely and cost-effective execution of (to date) 15 delivery orders totaling approximately $30 million providing cradle-to-grave remedial services at HTRW sites at Cannon, Kirtland, and Holloman AFBs for this ten-year, $150 million, CPFF contract. At Holloman AFB (70% of total work), providing full Engineering/Procurement/Construction services. Customer on record that

implementation of the accelerated cleanup program by Foster Wheeler's TERC Team has saved 50% of remediation budget (over $5 million to date) and reduced the remediation schedule by two years. Accelerated schedules are facilitated through partnering, expedited procurements, use of base wide plans, and simultaneous execution of projects at several construction sites to minimize/avoid delays due to base mission requirements.

Project Manager; U.S. Army Kwajalein Atoll, Hazardous Waste Management; Kwajalein, Marshall Islands; 9/93-Present – Manages this on-going, fixed-unit price, task order-based hazardous waste management contract in the Marshall Islands. To date, more than 3.5 million pounds of hazardous waste, includes RCRA and CERCLA, non-hazardous, asbestos, and TSCA waste, have been disposed without a single regulatory or health and safety incident or accident. The waste stream managed under this contract include PCBs, asbestos, waste paint, corrosives, POLs, and miscellaneous waste such as solvents, batteries, pesticides, ignitables, reactives, toxics. Provides assistance on sampling, characterization, and packaging and has direct responsibility for environmental compliance on solid waste and hazardous/non-hazardous waste management planning, transportation, removal, and disposal of waste material. Led the effort to identify, audit, and approve an alternate environmentally sound treatment method for PCB-contaminated oil, thereby reducing disposal costs and passing on the savings to the client.

Program Manager; URS Consultants/Air Force Center for Environmental Excellence (AFCEE), Air Force Environmental Programs, Nationwide; 12/95-Present – Team member on an AFCEE contract providing preliminary assessment/site investigation, remedial investigation/feasibility study, RCRA facility assessment/facility investigation, current operating facility assessment, and remedial design (Title I and II) for Air Force Environmental Programs. Current ongoing delivery orders include data collection and analyses including sampling, testing, analysis, and reporting from groundwater treatment plants at McChord AFB in Washington State.

Project Manager; Defense Re-utilization and Marketing Service; Barstow, CA; 6/93-9/94 – Managed this task order-based fixed unit price contract providing hazardous and non-hazardous waste management services to five military bases surrounding Barstow, California. The scope of work for this contract included confirmation of Generator's waste classification, packaging, removal, and disposal of RCRA, CERCLA, and TSCA waste. Direct responsibility for waste management planning, packaging, removal, and disposal. A total of 206 delivery orders issued by the client were completed on schedule without a single regulatory or health and safety incident or accident.

Project Manager; U.S. Department of Energy, Independent Cost Estimate/Evaluations (ICE); Various U.S. Department of Energy Sites; 11/92 - 6/93 – The scope of work for this task order-based contract encompassed program and cost evaluations on Specialty Major System Acquisitions and Remedial Action Programs as developed by appropriate DOE programs or field offices. Projects evaluated included energy research, environmental restoration, facilities and infrastructures, D&D, and hazardous waste management. Provided technical leadership on assessment and remediation phases of environmental restoration programs, facilities design and engineering, conceptual design reports (CDR), estimated cost, cost/schedule controls systems, project organization and management, indirect costs, contingency, escalation, performance measurement system, and risk analysis.

Project Manager; ICE Environmental Program, AL2; Various U.S. Department of Energy Sites; 1/93-9/93 – This project included evaluation of the Five Year Plan for the environmental restoration program at Kansas City Plant, Missouri; Mound Plant, Ohio; Pantex Plant, Texas; and Pinellas Plant, Florida. The ER programs included identification and evaluation of all areas of potential environmental concerns, and

remediation of those areas that warrant it. Estimated cost of the Five Year Plan for these sites was $645 million.

Project Engineer; ICE Waste Receiving and Processing (WRAP), Module 1 Hanford, WA; 11/93-1/94 – This $91.2 million project was to provide the facilities to perform characterization and segregation necessary to prepare and certify contact handled transuranic (TRU) drum waste for disposal or further processing.

Project Engineer; ICE Solid Waste Operations Complex (SWOC), Phase I; Hanford, WA; 11/92-1/93 – This task order included the evaluation of the overall scope, and technical and programmatic approach of this $295 million program. The SWOC Phase I consisted of three sub-projects to provide a complement of facilities to significantly reduce stored contact handled drummed and boxed waste in the 200 West area of the Hanford site.

PREVIOUS EXPERIENCE

JA Jones Construction Services Company; Golden, CO

Chief Engineer/Project Manager; Rocky Flats Environmental Technology Site; 5/90-11/92 – Managed the Engineering, Project Controls, Cost Estimating, and Document Control groups for this CPFF contractor at the DOE Rocky Flats Environmental Technology site. Performed value engineering and constructability reviews, managed estimates and proposals preparation, conducted negotiations, and was responsible for contractual administration including tracking and reporting costs and schedules in accordance with DOE Order 4700 requirements. Designed, developed, and implemented an earned value performance measurement system in accordance with DOE orders on all construction projects at Rocky Flats. Other responsibilities included review of work packages with respect to technical and operational aspects of the planned work including issues relating to security, safety, quality assurance (QA), subcontracts, and procurement.

Chief Engineer; Rocky Flats Environmental Technology Site, Solar Pond Cleanup; Golden, CO; 5/92-11/92 – Performed value engineering, constructability reviews and overall coordination for the construction of the treatment facility for the solar ponds including start-up and testing. Managed the activities relating to value engineering, review of the shop drawings, estimating and contract negotiations, performance measurement system, as well as resolution of technical problems from field personnel and preparation of planning documents and special work procedures in support of the technical problems.

Chief Engineer; Rocky Flats Environmental Technology Site, Valve Vaults Upgrade; Golden, CO; 5/92-11/92 – Directed and coordinated Title III work relating to this project, which consisted of the construction of leak detection, secondary containment, sumps, flow alarms, and other systems in 20 valve vaults. Total construction costs were approximately $8 million.

Project Engineer; Rocky Flats Environmental Technology Site, Duct Remediation; Golden, CO; 1/92-5/92 – Responsible for preparatory work and development of work packages and material procurement relating to removal of deposited plutonium in ventilation ductwork in Building 707. The work packages addressed issues relating to work sequence, decontamination and demolition, safety, QA/QC, and security.

Chief Engineer; Rocky Flats Environmental Technology Site, I&E Security Upgrades; Golden, CO; 12/91-5/92 – This $25 million construction project included upgrades to the security systems including motion detection, surveillance cameras, vestibules, alarms in protected areas. Coordinated value engineering, estimating, proposal, and negotiating efforts on this fast track project including development of WBS, estimating criteria, support requirements, cost tracking and reporting systems, and overall Performance Measurement parameters in accordance with DOE Order 4700.

Project Manager; Rocky Flats Environmental Technology Site, Various Maintenance Task Orders; Golden, CO; 5/90-12/91 – Managed various facility upgrade projects including facility support and general services at various facilities in RFETS.

Project Engineer/Manager; William J. O'Hare; Denver, CO; 11/83-5/90 – Reviewed contract documents, including surveys; drainage studies; soils reports; civil, landscape, architectural, structural, mechanical, and electrical drawings and specifications. On-site representative to monitor the progress and quality of construction, conformance with the contract documents, and evaluation of the contractor's application for payment on multidiscipline/multi-company projects. Performed cost analysis on contractor's estimates necessary to complete project. Performed diligence studies on existing buildings and facilities for evaluation of civil, architectural, structural, mechanical, and electrical systems, and provided recommendations and design criteria on observed conditions requiring remedial work.

DANIEL M. SULLIVAN, CPM, CMM

Manager, Regional Procurement

EXPERIENCE SUMMARY

Twenty- five years of direct and supervisory experience in prime contract administration, subcontracts, and engineered equipment and project consumables purchasing in both federal and commercial arenas. Sixteen years of project and regional office prime contract administration and procurement systems development experience in support of major project and corporate goals. Seven years experience in materials management functions including the development and implementation of warehousing material receipt, storage and disbursement procedures, and facilities operation. Progressively increasing responsibility in positions reporting to senior management in contract administration, subcontracts administration, procurement, and administration.

As Senior Contracts Manager for Foster Wheeler Environmental, responsibilities include management of contract administration issues for the S.W. Total Environmental Remediation Contract (TERC) with US Corps of Engineers (COE), and administration of A/E and Environmental and Construction contracts with the Air Force Center for Environmental Excellence (AFCEE). Since both projects involve multi-year contracts performed through discrete task orders, duties include contract pricing for task order work scopes, which are fixed for price, time and materials, identifying, negotiating and incorporating both bilateral and unilateral prime contract changes, and submitting required reports on prime contracts. Also assigned to the Fernald Silos 1 and 2 Department of Energy (DOE) project to assist in identification, development and submittal of Requests for Equitable Adjustment (REA) in connection with the prosecution of work performed and to assist in subcontracts review in preparation for audit purposes.

EDUCATION

B.A. (Bachelor of Arts), Political Science, University of North Carolina, Charlotte, NC, 1974
Certificate, Materials Management, University of Phoenix, Denver, CO, 1991

REGISTRATIONS/CERTIFICATIONS

Certified Purchasing Manager (CPM)
Date of Issue: 1981, Date of Expiration: 1997

TRAINING

OSHA HAZWOPER, 8 hour, 1995, 2001, 2002
Contracts Termination, Federal Publications, 1987
Numerous NAPM and NCMA sponsored Procurement and Contracts Courses, 1981 - 1997
Government Contracting, Federal Publications, 1978
Blueprint Reading, Columbia Basin College, 1977
Best Value Procurement, Federal Publications, 1995
Program and Contract Changes, NCMA, 1993
Numerous NAPM and NCMA sponsored Procurement and Contracts Courses, 1981 - 1997

FOSTER WHEELER ENVIRONMENTAL CORPORATION EXPERIENCE

Senior Contracts Manager, 2000 - Present
Foster Wheeler Environmental Corporation, Various Projects, Denver, CO
Responsibilities as Regional Contracts manager include managing contract administration and compliance iscsues on major DOE and DOD construction and environmental remediation programs, directing and implementing project change management and change control issues for the following projects: Fernalds Silos 1 and 2 fixed price construction project; fixed price construction projects for the Department of Energy; TERC (Total Environmental Remediation Contract) with the Corps of Engineers, Omaha District; and AFCEE 3P-AE Services contracts for Environmental Remediation and Architect-Engineer services, respectively. Serves as the lead contract administrator for Foster Wheeler Environmental's Natural Resources group, specifically the ID/IQ United States Forest Service work. Also responsible for preparing notices of cost over- and under-runs, identifying and developing Change Order requests as needed, negotiating Contracts to ensure customer satisfaction while managing cost and profit objectives, resolving contract disputes, and processing unilateral changes from Contracting Officers.

PREVIOUS EXPERIENCE

Regional Purchasing Manager, November 1998 - October 1999
J. A. Jones Construction Company, Multiple Projects, Charlotte, NC
Supervised, coordinated, and implemented all aspects of subcontracting and procurement for energy, petroleum and pharmaceutical construction markets. Directly responsible for the material takeoff and purchase of all tools and consumables, electrical, mechanical and civil material needs for multiple industrial/process projects with values of $50-150 million. Managed bids, negotiated awarded and administered larger, more complex purchases including motor control centers, bulk commodities (lumber, pipe, fittings), and engineered equipment such as steam and gas turbines, condensers and fans. Involved in bidding, negotiating and administering construction subcontracts for civil, mechanical and electrical work in same markets. Identified and negotiated contract change orders. Managed tax and bonding issues, monitored and supervised progress payments, and assisted in contract and subcontract risk issue identification and resolution. Negotiated subcontractor terms and conditions including pay when paid, liabilities, and liquidated damages provisions.

Senior Contracts Administrator/Supervisor, June 1996 - November 1999
Stone and Webster Engineering Corporation, Multiple Projects, Denver, CO
Lead Administrator and Supervisor for Contracts and Subcontracts for major environmental and construction contracts with the U.S. Army Corps of Engineers (COE) and Department of Energy (DOE) totaling $600M. Responsible for the preparation, negotiation, and administration elements of government prime and company major subcontracts. Performed as a team member in proposal development efforts. Identified and negotiated both Prime Contract and subcontract changes and claims. Identified, monitored and implemented contract compliance issues. Supervised buyers and subcontract administrators in multiple customer/multiple environments.

Contracts Manager, August 1987 - June 1996
J. A. Jones Construction Services Company (JAJCSC), Rocky Flats Construction Services Contract, Golden, CO
Responsible for all project support functions over the life of the Contract. Initially managed and directed all purchasing/subcontracts, warehousing, property management for $175 Million construction services

contract at DOE's Rocky Flats Environmental Technology Site. In 1991, assumed and directed MIS and accounts receivable and accounts payable groups. In 1994, was additionally assigned to provide contract administration duties under existing contract. Responsibilities included identification and pricing of changes in operations to Prime contract, negotiations for time extensions, and negotiations to prime contract terms and conditions. As contract evolved from cost plus fixed fee to time and materials/fixed price task orders with fixed overheads, become involved in negotiations as a team member to issue a Memorandum of Understanding which outlined limited liabilities for the Waste Generator responsible for site construction contracting. Also negotiated overhead and G&A rates, and implemented hardware maintenance and software support agreements for the MIS group.

Additional non-DOE project duties and responsibilities included assuming team leadership for JAJCSC in identification of business opportunities, developing and submitting multiple proposals for DOD and DOE construction and environmental remediation projects, and coordinating all estimating, staffing, budgeting and mobilization tasks. As Contracts Manager for two (2) DOD Environmental Remediation contracts with a value of $235M, developed and implemented subcontract flowdown terms and conditions for both projects, set up a regional office to administer these contracts, implemented and coordinated change management systems for both contracts, and developed charge rates for office equipment to support contract cost objectives.

Purchasing Manager, February 1981 - August 1987
J. A. Jones Construction Services Company, DOE Hanford Site Prime Construction Contractor, Richland, WA
Chief Purchasing Agent and Purchasing Manager for DOE Prime Contract for construction with annual volume of $90-100M. Planned, organized, directed purchasing and expediting staff of 18. Directly bid, negotiated and awarded larger, more complex equipment and services purchase orders. Designed and developed an automated expediting system which reduced operating costs and improved project productivity. Instituted cost avoidance program saving 6.7% on $21M project.

PROFESSIONAL AFFILIATIONS

National Contracts Management Association, 1981 - 1997
National Association of Purchasing Management, Columbia Basin Chapter President, Programs Chairman, Board of Directors, 1981 - 1997
Tri-Cities Minority Purchasing Council, Board Member, 1985 - 1987

DISCIPLINE CODES

Procurement Specialists: 172, Primary

SKILL SET

REGULATORY AFFAIRS
DOE Orders
Due Diligence

OTHER
Prime and Subcontract Terms and Conditions
FAR and DFAR expertise
Proposal Development

DANIEL M. SULLIVAN, CPM, CMM

Manager, Regional Procurement

TECHNICAL EXPERTISE

Mr. Sullivan's extensive experience as a Senior Contracts Manager has allowed him to become proficient in negotiations. In addition, he has an extensive background in change orders and claims management for prime contracts as well as subcontracts. He has served as the Small Business liaison for several projects and is experienced in project mobilization and demobilization efforts in compressed time frames. He also has experience in proposal development for major projects and has served as both a company lead in the preparation and completion of CPSRs and a project manager for several small construction and remediation projects.

LANGUAGE SKILLS

English *Knowledge Level:* Primary

PROFESSIONAL REFERENCES

Tom Cloud, Construction Manager, MACTEC, 303-881-8988
Gary Helms, Transportation Manager, J.A. Jones Construction Company, 704-553-3502
Steve Stecker, Contracting Officer, Fluor Federal Services, 509-373-7715

RELATED COMPANY INFORMATION

Office Location: Denver
FWENC Hire Date: 12/1/00
Years with Other Firms: 24
Daytime Telephone: 303-980-3574
E-mail Address: dmsullivan@fwenc.com