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onofill Facility
al Environmental Impact Report

te Clearinghouse No. 89032206

ERC
Environmental
and Energy
Services Co.

FINAL ENVIRONMENTAL IMPACT REPORT
for General Plan Amendment, Zone Change and Conditional Use Permit

State Clearinghouse No. 89032206

Prepared *for:*

Lead Agency:
County of Imperial Planning Department
Court House
El Centro, California 92243
(6 19) 339-4236
Contact: Jurg Heuberger, County of Imperial
S. Harry Orfanos, Public Works

Applicant:
Desert Valley Company
480 West Sinclair Road
Calipatria, California 92233
(6 19) 348-2267

Prepared by:
ERC Environmental and Energy Services Co.
5510 Morehouse Drive
San Diego, California 9212 1
(6 19) 458-9044

May 1990

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SECTION 1
INTRODUCTION AND SUMMARY

Desert Valley Company is proposing to develop a Class II storage/disposal Monofill Facility for non-hazardous geothermal solids on 160 acres of privately-owned land located approximately 12 miles (19.3km) west of the City of Westmorland in Imperial County, California (Figure 1). The site would be developed in two phases with the first phase having a total useful life expectancy of 10 years. Refer to Appendix I (Revised Draft EIR) for a complete project description.

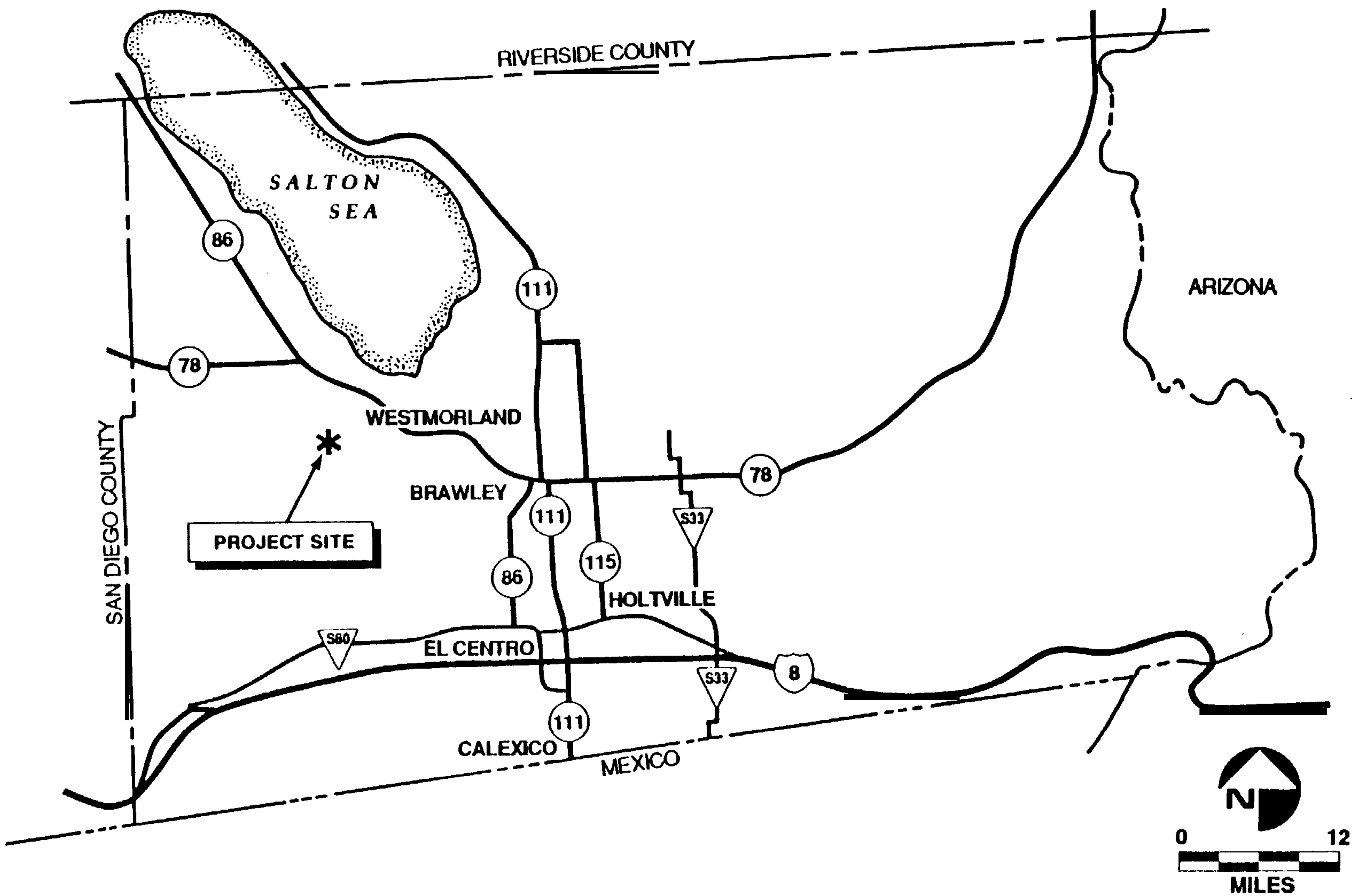
Pursuant to the County of Imperial's Rules and Regulations to Implement the California Environmental Quality Act (CEQA) of 1970, amended February 9, 1988, a Draft Environmental Impact Report (EIR) was prepared for the proposed action and circulated for public review in July 1989.

During this period, subsequent analysis of the geothermal filter cake slated for shipment to the proposed Monofill identified certain Naturally Occurring Radioactive Materials (NORM). In light of this new information and the possibility that the presence of NORM in the filter cake may significantly affect the environment, the project applicant resubmitted a new application for the Monofill project.

The Imperial County Environmental Evaluation Committee (EEC) met on February 2, 1990, to discuss the new issues of NORM found in the geothermal filter cake to be stored/disposed of in the proposed Monofill. The original project description remained the same with the additional review and discussion concentrating on the presence of NORM found in the geothermal solids to be stored/disposed of in the Class II Monofill.

Upon completing review of the initial study and resubmitted documents from the project applicant, certain changes were made by the EEC in areas of: 1) Risk of Upset; 2) Human Health; and 3) Mandatory Findings of Significance.

As a result of the resubmitted project application, new information regarding the presence of NORM in the geothermal material, and EEC's findings, the Desert Valley Company's Monofill Facility Draft EIR originally published in July 1989 was revised. The review period for the revised Draft EIR began on March 29, 1990 and was completed on May 14, 1990.



ERC
Environmental
and Energy
Services Co.

Project Location as Depicted on Imperial County Regional Map

FIGURE 1

Pursuant to CEQA Guidelines, this final environmental impact report is submitted The Final EIR was prepared by ERC Environmental and Energy Services Company (ERCE) for the Imperial County Department of Planning. The Final EIR is presented in five parts: Section 1, Introduction; Section 2, Public Review; Section 3, Revisions to the revised Draft EIR resulting from the public review; Appendix I, the revised Draft EIR; and Appendix II, Analysis of Filter Cake Materials of the Leather's Facility.

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SECTION 2
PUBLIC REVIEW

The Monofill Facility revised Draft EIR was available for a 45-day public review period following the Notice of Completion. Copies were distributed to local libraries for easy public access. Private and governmental agencies or organizations known to have a direct interest in or review and approval authority over all or portions of the project were mailed copies of the Revised Draft EIR by the Imperial County Planning Department or the State Clearinghouse.

Comments addressing the accuracy of the Revised Draft EIR were received during the public input period. The letters and responses follow.

STATE OF CALIFORNIA—OFFICE OF THE GOVERNOR GEORGE DEUKMEJIAN, Governor

OFFICE OF PLANNING AND RESEARCH
1400 TENTH STREET
SACRAMENTO, CA 95814

May 14, 1990

Richard Cabanilla
Imperial County Plng Dept.
939 Main Street
El Centro, CA 92243

Subject: Class II Facility Monofill Desert Valley Company, SCH# 89032206

Dear Mr. Cabanilla:

The State Clearinghouse has submitted the above named draft Environmental Impact Report (EIR) to selected state agencies tot review. The review period is now closed and the comments from the responding agency(ies) is(are) enclosed. On the enclosed Notice of Completion form you will note that the Clearinghouse has checked the agencies that have commented. Please review thr Notice of Completion to ensure that your comment package is complete. If the comment package is not in order, please notify the State Clearinghouse immediately. Remember to refer to the project's eight-digit State Clearinghouse number so that we may respond promptly,

Please note that Section 21104 of the California Public Resources Code required that:

> "a responsible agency or other public agency shall only make substantive comments regarding those activities involved in a project which are within an area of expertise of the agency or which are required to be carried out or approved by the agency."

Commenting agencies are also required by this section to ruppott their comments with specific documentation. These comments are forwarded for your use in preparing your Final EIR. Should you need more information or clarification, we recommend that you contact the commenting agency(ies).

This letter acknowledges that you have complied with tho State Clearinghouse review requirements for draft environmental documents, pursuant to the California Environmental Quality Act. Please contact Barbara Ceran at (916) 445-0613 if you hrve any question8 regarding the environmental review process.

Sincerely,

David C. Nunenkamp
Deputy Director, Permit Assistance

Enclosures

Mail to: State Clearinghouse, 1400 Tenth Street, Sacramento, CA 95814 916/445-0613

SCH # 89032206

Project Title: Class II Facility "Monofill" Desert Valley Company

Lead Agency: Imperial County Planning Dept.   Contact Person: Richard Cabanilla

Street Address: 939 Main Street   Phone: (619) 339-4236

City: El Centro   Zip: 92243   County: Imperial

Project Location

County: Imperial   City/Nearest Community: Westmorland

Cross Streets: Total Acres: 160

Assessor's Parcel No. 019-100-16-01   Section: Por. Sec 33   Twp. 12   Range: 11   Base: SBB&M

Within 2 Miles: State Hwy #: 86   Waterways:

Airports: Railways: Schools:

Document Type

CEQA: ☐ NOP ☐ Early Cons ☐ Neg Dec ☒ Draft EIR (Revised) ☐ Supplement/Subsequent ☐ EIR (Prior SCH No.) ☐ Other

NEPA: ☐ NOI ☐ EA ☐ Draft EIS ☐ FONSI

Other: ☐ Joint Document ☐ Final Document ☐ Other

Local Action Type

☐ General Plan Update ☒ General Plan Amendment ☐ General Plan Element ☐ Community Plan ☐ Specific Plan ☐ Master Plan ☐ Planned Unit Development ☐ Site Plan ☒ Rezone ☐ Prezone ☒ Use Permit ☐ Land Division (Subdivision, Parcel Map, Tract Map, etc.) ☐ Annexation ☐ Redevelopment ☐ Coastal Permit ☐ Other

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Development Type

☐ Residential: Units Acres

☐ Office: Sq.ft. Acres Employees

☐ Commercial: Sq.ft. Acres Employees

☒ Industrial: Sq.ft. N/A Acres 160 Employees

☐ Educational

☐ Recreational

☐ Water Facilities: Type MGD

☐ Transportation: Type

☐ Mining: Mineral

☐ Power: Type Watts

☐ Waste Treatment: Type

☐ Hazardous Waste: Type

☐ Other

Project Issues Discussed in Document

☒ Aesthetic/Visual ☐ Agricultural Land ☒ Air Quality ☒ Archeological/Historical ☐ Coastal Zone ☐ Drainage/Absorption ☐ Economic/Jobs ☐ Fiscal ☒ Flood Plain/Flooding ☐ Forest Land/Fire Hazard ☒ Geologic/Seismic ☐ Minerals ☒ Noise ☐ Population/Housing Balance ☒ Public Services/Facilities ☐ Recreation/Parks ☐ Schools/Universities ☐ Septic Systems ☐ Sewer Capacity ☒ Soil Erosion/Compaction/Grading ☒ Solid Waste ☐ Toxic/Hazardous ☒ Traffic/Circulation ☐ Vegetation ☒ Water Quality ☐ Water Supply/Groundwater ☐ Wetland/Riparian ☒ Wildlife ☐ Growth Inducing ☒ Landuse ☒ Cumulative Effects ☐ Other

Present Land Use/Zoning/General Plan Use

"S" Open Space

Project Description

DVC re-submitted applications for the "monofill", Class II, project for a Conditional Use Permit, Zone Change, General Plan Amendment for storage/disposal of geothermal solids. The revised project includes the analysis of "Naturally Occurring Radioactive Material" (NORM) in the geothermal solids. (See attached for details).

CLEARINGHOUSE CONTACT: 916/445-0613
GARRETT ASHLEY

STATE REVIEW BEGAN: 3-29-90

DEPT REV TO AGENCY: 5-7

AGENCY REV TO SCH: 5-11

SCH COMPLIANCE: 5-14

PLEASE RETURN NOC WITH ALL COMMENTS

AQMD/APCD: 10 (Resources: 3/31)

CNT	ENT	CNT	ENT
	● Resources		[redacted] Svc.
	[redacted]		[redacted]
	● Conservation		● ARB
	● Fish & Game	✓	● CA Waste Mgmt Bd
	[redacted]		[redacted]
	● Parks & Rec/OHP		● Reg. WQCB # 7
	[redacted]		[redacted]
	● DWR		[redacted]
	[redacted]		
	● Caltrans # 11		
	[redacted]		
✓	● Health		[redacted]

STATE OF CALIFORNIA

GEORGE DEUKMEJIAN, Governor

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
COLORADO RIVER BASIN • REGION 7
73-271 HIGHWAY 111, SUITE 21
PALM DESERT, CALIFORNIA 92260
Phone: (619) 3467491

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IMPERIAL COUNTY
BUILDING DIVISION

May 1, 1990

Jurg Htuberger
Planning Director
Imperial County Planning Department
939 Main Street
El Centro, CA 92243-2856

RE: Revised Draft EIR SCH #89032206, Desert Valley Company's Proposed Monofill Project, Imperial County California

The staff of the Regional Board has reviewed the Revised Draft Environmental Impact Report (DEIR/SCH #89032206). The Regional Board staff has no comments on the subject report.

W Paul Sweeney

W. PAUL SWEENEY
Sanitary Engineering Associate

File Ref: Working File, Desert Valley Company Monofill

PS/ci

California Regional Water Quality Control Board, Colorado River Basin (RWQCB)

Response:

1. Comment noted.

STATE OF CALIFORNIA—HEALTH AND WELFARE AGENCY

GEORGE DEUKMEJIAN, Governor

DEPARTMENT OF HEALTH SERVICES
ENVIRONMENTAL MANAGEMENT BRANCH
8455 JACKSON ROAD, SUITE 120
SACRAMENTO, CA ● ww
(916) 739-4083

May 11, 1990

Mr. Richard Cabanilla
Imperial County Planning Department
939 Main Street
El Centro, CA 92243

Dear Mr. Cabanilla:

I have been asked by Jeannie Blakeslee of the Waste Management Board, to review and comment on the proposal by Desert Valley Company to build a Class II "Monofill" for receipt of geothermal solids from their nearby geothermal power plants. Since NORM material is not regulated by State or federal law, this is an advisory opinion only.

The project described is analgous to requests we get from our licensees to dispose of waste regarded as below regulatory concern (BRC). In other words, possible radiation health effects are so insignificant as to make regulation unnecessary. It seems appropriate to evaluate the current proposal to dispose of NORM material by the same standards.

An attempt to do such an evaluation gives rise to the following problems and questions:

02 1. It is not clear that all of the measured data used in calculations was taken at all sites.

03 2. Personnel exposures seem to be much higher than those allowed around BRC waete. This is a consequence of radium concentrations 20 to 30 times greater than those associated with BRC waste.

04 3. It is not clear what effect rising levels of radon will have at the burial site.

05 4. The internal dose calculations are based on a resuspension factor derived from a study of an uranium mill tailings site. It is not obvious that an uranium mill tailings site is equivalent to this NORM waste site.

0 5. Should internal and external dosimetry be performed on workers to confirm calculated doses?

– 0 6. The Radiologic Health Branch should take confirmatory samples of filtercake, air particulates, radon, etc.

These and other pertinent issues are too complex to be resolved in the short time alloted. Perhaps these matters can be resolved to everyones satisfaction in the future, but at the present time the Radiologic Health Branch cannot confirm the health effects of this facility.

If you have any further questions regarding this matter, do not hesitate to contact me at (916) 739-4055.

Sincerely,

Richard W. McKinley

Richard W. McKinley
Associate Health Physicist
Radiologic Health Branch

RMW:kmf

California State Department of Health Services

Response:

2. It is unclear what is meant by all sites. Site specific data for all four geothermal facilities were reviewed for the Final EIR and conservative parameters which reflected the site-specific data were used. For conservatism, the upper limit of the data were generally used for the calculations. For example, Table II on page C-13 of the Revised Draft Environmental Impact Report lists measured radium concentrations ranging from 10pCi/g to 254pCi/g, depending on the particular power plant and clarifier. All of the radiological calculations used a Ra-226 concentration of 250pCi/g, even though the annual average Ra-226 concentration sent to the Monofill would be considerably less.

3. The personnel exposures calculated in the Revised Draft EIR are intended to be bounding; that is, to represent the maximum that the workers could possibly receive. Actual doses to the facility personnel will be much lower. This conservatism has been confirmed through a series of measurements of worker exposures with thermoluminescent dosimenters. Also see response number 5.

4. Radon releases from the Monofill and radon concentrations at the Monofill during operations are estimated to be at their maximum values in calculating their impacts. For example, radon surface fluxes after Monofill closure are calculated assuming the cover is at its ambientlong-term moisture value, not its wetter moisture value at placement. Furthermore, the uranium and thorium decay-chain parents to radon-222 have lower activities in the filtercake than Ra-226; hence, radon-222 generation rates should not increase with time.

5. The internal dose calculations are based on dust resuspension factors determined for the Monofill as contained in Tables 3-9, 3-10 and 3-l 1 of the Revised Draft EIR. The data in these tables were generated using standard EPA methods. The l-hour maximum calculated dust concentration of 512 $\mu g/m^3$, given in Table 3-l 1 is shown to compare favorably with the 425 $\mu g/m^3$ maximum dust concentration for earth-moving activities on the Grand Junction uranium mill tailings site. No uranium mill tailings data were used to obtain the dust concentrations given in Table 3-l 1. The only uranium mill tailings information used in the internal dosimetry calculations was a factor to conservatively account for the possibility that the resuspended dust may contain slightly higher concentrations of the radioactive nuclides than the average concentrations in the disposed materials. For example, the concentration of Ra-226 in the

airborne dust is taken to be a factor of 2.4 higher than the 250pCi/g used for all the disposal material. Since the data needed to determine this factor were not available for the disposal materials, a generic NRC value for uranium mill tailings was used for conservatism. Further uranium mill tailings contain similar or higher activity levels of radionuclides in the same decay chains as are found in the filter cake and contain significant fractions of grain sizes similar to the filter cake; and therefor were considered appropriate for comparison.

6. External dosimetry measurements have been made on workers to confirm the calculated doses. The external dosimetry measurements also serve as an effective surrogate for checking the internal dosimetry calculations. The measurements have just been recently started. For the first month thirty-nine workers were badged. The worker type or location included:

   a. filter press operators
   b. truck drivers
   c. machinists
   d. equipment operators
   e. brine processor
   f. turbine utility
   g. centrifuge

   No workers received detectable external doses during this month. The reported limit of detection is 10 mrem. This comparison illustrates the conservative nature of the calculations of workers doses.

7. Comment noted. Personnel from the Radiological Health Branch are welcome to take confirmatory samples.

State of California Environmental Affairs Agency

Memorandum

To : Lynn Coughlin
State Clearinghouse
1400 10th Street
Sacramento, CA 95814

Jurg Heuberger
Imperial County Planning Department
939 Main Street
El Centro, CA 92243

Date: MAY 11 1990

From :
John D. Smith, Manager
Local Planning Division
CALIFORNIA INTEGRATED WASTE MANAGEMENT BOARD

Subject: SCH# 89032206 Draft Environmental Impact Report (DEIR) for a Class II Facility, Monofill Project - Desert Valley Company, Imperial County

California Integrated Waste Management Board (CIWMB) staff have reviewed the DEIR for a Class II Facility, Monofill Project. Desert Valley Company, a subsidiary of Magma Power Company is proposing to develop a Class II storage and disposal monofill facility for "nonhazardous" geothermal solids, which include geothermal filter cake and mud sump materials. The geothermal filter cake contains naturally occurring radioactive materials (NORMS).

The propoaed site is 160 acres of privately owned land. As a responsible agency, CIWMB Board staff offer the following comments:

Page 1-1 Project Description

8 The California Administrative Code is now California Code of Regulations (CCR).

9 An amendment to the Imperial County Solid Waste Management Plan (CoSWMP) is no longer necessary. CoSWMPs were deemed nonexistent upon the passing of Assembly Bill 939. The proposed facility should be identified in the Facility Siting Element of the Countywide Integrated Waste Management Plan.

10 Although it is implied, it is not apparent, that the material to be monofilled is a designated warts. The document should clearly • tats if this material is a designated waste.

Page 1-6 Mitigation Monitoring Plan

11 Board staff request that the mitigation monitoring rnd implementation schedule required be AB 3180 be included as part of the FEIR. Minimally, it should include the features listed an page 1-6.

Page 1-7 Permitting Process

12 Title 14, CCR, section 18255 (a) (2) states that new solid waste landfills not operating prior to the effective date of thr regulations shall submit their preliminary closure and post closure maintenance plans at the time of application for a solid waste facility permit, pursuant to Title 14, CCR, Chapter 5, Subarticle 3.1, Section 18200 et seq. The document should include an initial cost estimate, • rtablishment of a trust fund or other financial mechanism, and assurance that the selected mechanism will ensure adequate resources for closure and peat-closure maintenance. For • bditianal informatien, William Orr of the Board's Standards and Regulations Division should be contacted.

13 Board staff ask that a proposed permitted daily capacity (in tons) be include8 in the FEIR. A Conditional Use Permit application received by this Board on August 21, 1989, indicates that the facility would accept 250 to 4000 tons of the waste per day. If 4000 tons per day is the anticipated daily capacity, the environmental document should address this amount. Additionally, both the solid waste facility permit concurred upon by CIWMB and the Conditional Use Permit should be consistent in reflecting permitted daily tonnages. Page 2-8 indicates that the facility would initially receive 72 cubic yards of filter cake per day, and initially receive 35,000 to 55,000 cubic yards of mud rump materials. Board staff ask that the FEIR clarify if this material is being stockpiled offsite, or if receipt of this quantity would be on a per day basis, per year, or total.

For additional information concerning requirements for obtaining a solid waoto facility permit, the local enforcement agency with Imperial county Department of Environmental Health or Don Dier of the Board's Permit Section should be contacted.

Page 1-10 Hydrologic Study

14 The hydrologic study was not complete prior to preparation of the DEIR. Siting requirements are contingent on the outcome of such a study (i.e., anticipated highest groundwater level, location of perched aquifers, quality of groundwater) The region may not be a characteristically high groundwater

region, however, there is an apparent lack of information. An ● vironmentd determination cannot be realistically be made until further data is obtained.

15 If soil sealant is an emulsion of polymer, is the sealant to be used as daily cover or as dust control mitigation?

Page 1-13 Public Health and Safety

16 The document states that the project design is in compliance, and that no ● igniflcant hazards to public health will result from thr proposed operation. The hydrologic study had not been not completed at the time Of DEIR preparation (page 1-10), and data has not been incorporated into the project design. It is further stated that this may represent a significant impact if insufficient data were present to allow proper project design and. implementation. The hydrologic report should be complete prior to any determination that implementation of the project would result in no significant hazard to public health and safety. It also should have been included as part of tho DEIR, and made available for agency review and comment.

Page 1-16 Plans and Procedures

17 Staff request that descriptions of the written plans and procedures for facility operation be included in the FEIR. These include the Emergency Response Plan, Material Storage Handling Plan, site operation Plan, Employee Plan, Soil/Groundwater Monitoring PLan, Ambient air Monitoring Plan and Temporary Radiological Monitoring Program.

Page 2-t Design Criteria

18 Several criteria required by Title 23, Subchapter 15 for a Class II landfill are omitted from this list:

- designed to withstand the maximum credible earthquake.
- must have capacity for precipitation and drainage control for 1,000 year and 24 hour storms.
- must be designed for containment of the specific wastes to be discharged.
- lateral barriers to migration of waste or leachate are required.
- all containment structures must withstand hydraulic pressure gradients without failure due to compression, settlement or uplift.

Additionally, the phrase indicating that impervious formations, such us natural soil or the equivalent Of artificially constructed barriers should have a permeability of 1 x 10 exp -6cm/sec is incorrect. This is required.

Page 2-B Monitoring of Wastes

19 The document is not specific regarding how often the waste received are routinely going to be tested, or for what constituents which are referred to, but not described on page 2-8. The FEIR should contain a detailed description of monitoring and screening methods of incoming waste to ensure that the material is nonhazardous.

20 A description of the groundwater monitoring plan and monitoring for isotopes and leachate should be inaludsd in the EIR, including frequencies and methods of data reporting.

Page 2-10 Allowable Release Limits of Radioactive Materials

21 Specifically, what are the allowable release limits of radioactive materials in parts 302 and 355 of Title 40 CFR? What ● nvironmrntal determinations or conclusions can be reached as a result of the analyses included on Table 2-1?

Page 2-13 Figure 2-4

22 The Typical Disposal Area Cross Section includes a 5 foot clay liner, What testing methods are employed to assure that there are no secondary fractures, so that the integrity of the liner system would not be breached?

Page 2-15 Tracking System

23 The material tracking and shipping system used for hauling and disposal should be included a8 part of the Mitigation Monitoring Plan indicated on Page 1-6.

Page 2-16 Closure Procedure

24 14 CCR 18255 (a) (2) requires that new solid waste landfills not operating prior to the effective data of the regulations shall submit their preliminary closure and postclosure maintenance plans at the time of application for a solid waste facility permit. Closure plans are subject to compliance with the California Environmental Quality Act (CEQA). For additional Information, contact CIWMB's Standards and Regulations Division.

Page 3-l Supporting Data

25 The complete text of preliminary geotechnical, and any ether investigations should been included as an appendix in the DEIR. Board staff request that all pertinent data, including all information listed in Section 3.1, page 3-1 of the DEIR be circulated through tha State Clearinghouse for agency

review and comment.

Page 3-4 Holocene Faults

26 According to the text, Figure 3-2 indicates tho existence of known Holocene faults, This detail should be indicated in the legend for this *figure*. Additionally, a figure should be incorporated into any subsequent environmental documents, including the FEIR, which clearly shows the location of known Holocene faults in relation to the project facilities.

Page 3-5, 3-14, 3-18 Groundwater Elevation

27 Page 3-5. Although the DEIR indicates • range of depth to groundwater, there is no information regarding the expected highest groundwater elevation. The FEIR should contain this data.

Page 3-14. Highest groundwater elevation is not indicated as part of the design parameters • HOW will the minimum five feet between groundwater and waste be maintained if the highest groundwater elevation is unknown?

Page 3-18 *a* Again, *the* document is unclear regarding the anticipated elevation of groundwater. Although preliminary geotechnical investigation of the site indicates groundwater depths range from 48 to 63 feet, the issue is not resolved. *Design* af the facility is be dependent upon complete and thorough analyses of data, not preliminary reports.

Page 3-6 Figure 3-3

28 Figure 3-3, Generalized Structure *of* Imperial county, would be more appropriately titled, Active or Potentially Active Fault Traces.

Page 3-14, 3-15 Facility Design in Relation to Holocene Faults

29 The DEIR indicates that there is a known Holocene fault adjacent to the disposal facility. A detailed map of the entire facility design, clearing indicating the location *of* the fault should be included in the FEIR. Although the EIR states that proposed siting of these facilities has been set back 200 feet from the *trace* of subject fault, Board staff request that verification of this be provided in the FEIR.

Page 3-16, 3-17, 3-27 Soil Characteristics

30 Although discussed in several places in the DEIR, (including the "Preliminary Drainage Calculations" in Appendix F), the DEIR does not distinguish between the analysis and handling of 100-year inundation criteria and 1,000-year 24-hour drainage and capacity criteria.

(31) Expansion and reactivity soil characteristics are important siting criteria. The DEIR states that preliminary geotechnical investigations did not identify expansive behavior as a potential problem in facility design or implementation. The document further states that this issue should, however, be investigated and the result incorporated into final project design. The issue of expansive soils should have been resolved prior to preparation of the DEIR, and the results and data should have been incorporated into the DEIR. Additionally, the DEIR states that if reactive soils are present onsite they may pose significant adverse effects to certain proposed facilities. Soil properties and characteristics, possible impacts, and mitigations should already be incorporated into the DEIR.

Page 3-18 Permeability

(32) By what method was the soil permeability tested? The document does not describe the type of permeability tests used to determine in-place permeability. The tests must be in-situ field tests in order to take into account the soils' secondary permeability characteristics.

Page 3-31 Flood Hazards

(33) The document states, "Provided these design measures are properly implemented, no significant impacts to proposed project facilities are anticipated from flooding hazards." What assurances can be given that design measures are properly implemented?

Page 3-34 Title 23 Requirements

(3 The DEIR states that "preliminary project design...will satisfy __most__ Title 23 requirements..." Final design requirements must address ALL Title 23 requirements.

Appendix C

There are five isotopic analyses in Appendix C: two for Del Ranch,
(3 one for Vulcan, and two for the Elmore facilities, but no information regarding the Leathers facility, Staff ask that the waste generated at the Leathers facility be analyzed also, and the information be included in any forthcoming environmental documents and in the FEIR.

Board staff reviewed analyses for four samples in Appendix C: four samples underwent CAM analyses; two samples were analyzed for volatile organics, two for bioassays, and two for corrosivity, ignitability, reactivity, fluoride (incidentally, fluoride is misspelled in the laboratory analysis report; Med-Tax may wish to correct their forms). It appears that laboratory analysis is incomplete. There are four sites which will be using this proposed disposal facility. Board staff request an explanation regarding sampling criteria and analysis, and provide complete analyses of wastes from each of the four facilities, which are origins of the waste material.

06 Attached for your information are Department of Health Services Radiological Health Branch staff's comments regarding the radiological section of the DEIR. Board staff auk that these comments be fully responded to in the FEIR.

Thank you for the opportunity to review this DEIR. If you have any questions concerning these comments, contact Jeannie H. Blakeslee of the Board's Local Planning Division at (916) 327-0454.

cc: Richard McKinley, Department of Health Service
Radiological Health Branch
Paul Sweeney, RWQCB, Colorado River Basin Region
Linda Kestoll, U.S.D.I. Bureau of Land Management, El Central Office
Herb Iwahiro, CIWMB
Alan Oldall, CIWMB
William Ort, CIWMB
Don Dier, Jr., CIWMB
Gregg Jaoob, CIWMB

California Integrated Waste Management Board (CIWMB)

Response:

8. Comment noted.

9. Comment noted: See Errata numbers 2-7.

10. The Revised Draft EIR states that the proposed geothermal filter cake and mud sump material to be disposed/stored is considered to be nonhazardous and must meet California Code of Regulations (CCR) requirements for certain designated wastes.

11. Comment noted: The Environmental Compliance Program (ECP) will be prepared and adopted by the County of Imperial for the Desert Valley Company's Monofill project to comply with AB 3180 and will at a minimum include findings listed in Table l-l of the Revised Draft EIR. Inclusion of the ECP in the FEIR is not required by AB 3180.

    Moreover, The ECP has not been included as part of the FEIR because it is a dynamic program that may undergo changes as additional conditions of approval are placed on the project after certification of the FEIR and throughout the project approval process. Also, additional changes may be made to this program as specific information with regard to the monitoring efforts are provided.

12. Preliminary closure and post-closure maintenance plans were submitted in July 1989, as part of the application for Report of Waste Discharge submitted to the RWQCB. These plans were also submitted to the Imperial County, Division of Environmental Health Services as part of the application for the Solid Waste Facilities permit. This application was revised and resubmitted in March 1990 as the Report Disposal Site Information.

    The CIWMB has received a copy of the latter submittal. These documents are incorporated by reference in the Final EIR.

13. Refer to Appendix A (Notice of Preparation and Public Review of the Draft EIR July 1989) of the Revised Draft EIR, page A-3 1, response number 32.

The 35,000 to 55,000 cubic yards of mud sump materials can be considered a total. This material was generated in developing the geothermal wells for the three new facilities. This material is presently contained in permitted clay line sumps. In the future minor amounts of mud sump materials will be generated in maintaining the well field

14. Comment noted: Refer to Appendix A of the Revised Draft EIR, page A-20, response number 6.

    In addition, background ground water samples for the first quarter have been formally submitted to the Imperial County Division of Environmental Health Services and to the RWQCB. A one year ground water quality monitoring program is close to completion and findings will be submitted to the above agencies.

15. As discussed in the Revised Draft EIR, the soil sealant polymer will be applied on a daily basis as a cover and dust control measure.

16. Comment noted: Refer to Appendix A of the Revised Draft EIR, page A-20, response number 6.

    Inclusion of a final hydrologic report in the FEIR or DEIR is not required by CEQA. The applicant will be required to review the results of the hydrologic report with the RWQCB during the final design phase to confirm that the results of the initial survey are consistent.

    Further detailed information is provided in the applicant's application for Facility Permit/Waste Discharge permit on file with the RWQCB, and the Solid Waste Facility permit on file with the Imperial County Division of Environmental Health Services.

    In addition, the ECP will insure that the project applicant shall implement all applicable Title 23 conditions outlined in the Revised Draft EIR, Section 3.2 and submit results to the RWQCB and the Imperial County Division of Environmental Health Services prior to their approval to any grading/construction activities.

17. Comment noted: The Revised Draft EIR states that prior to the proposed facility operation, the following plans must be approved: a Ground Water Monitoring Plan as required by the RWQCB and Imperial County Division of Environmental Health Services; an Ambient Air Monitoring Plan as required by the Imperial County APCD and Imperial County Division of

Environmental Health Services; a Radiological Monitoring Plan as required by the Imperial County Division of Environmental Health Services; and facility operation plans as required. by the Imperial County Planning Department. The Revised Draft EIR gives general requirements for each of these plans. The ECP will insure that these written plans are developed and completed prior to operation of the proposed facility. These plans will be on file with the Imperial County Planning Department, the Imperial County APCD, the RWQCB and the Imperial County Division of Environmental Health Services. Inclusion of these operational documents in the FEIR and DEIR is not required by CEQA.

18. Comment noted: See Errata numbers 8-9. These criteria are evaluated in the Revised Draft EIR under Geology and Hydrology/Water Quality. In addition, detailed information is provided in the Report of Waste Discharge on file with the RWQCB and also provided in the Report Disposal Site Information on file with the Imperial County Division of Environmental Health Services and the CIWMB. In addition, the project as described in the Revised Draft EIR and the Report of Waste Discharge meets or exceeds all applicable chapter 15 criteria.

19. Refer to Appendix A of the Revised Draft EIR, page A-20, comment number 7 and on page A-31, response number 33.

20. Refer to Appendix A of the Revised Draft EIR, page A-32, response number 35.

21. The allowable release limits (reportable quantities) for the radionuclide emissions as given in 40CFR302 are listed in Table A. Calculated releases are also shown in Table A. The calculated releases utilize data in Tables 2-1 and 3-10 of the Revised Draft EIR. The sum of the fractions for these nuclides is 0.10, significantly less than unity. 40CFR355 is not applicable to this facility.

22. During the excavation of the Monofill, once final grade has been achieved and the 5-foot natural clay liner is exposed, the entire liner will be inspected by a California Certified Geologist for secondary fractures that may impact the integrity of the liner system. This inspection will occur when undisturbed liner samples are obtained for permeability analysis as described on Page 13 of the Design Report for the Monofill, Volume 2 of the Report of Waste Discharge. This report is on file with the RWQCB and the Imperial County Division of Environmental Health Services.

TABLE A

Reportable Quantitiesa and Calculated Particulate Releases for Radionuclidesb

Radionuclide	Reportable Quantify (Ci/day)	Calculated Release (Ci/day)
U-238 CHAIN	0.1	
Ra-226	0.1	.0003
Rn-222		.005
Pb-214	100’	.0002
Bi-214	100	.0002
Pb-2 10	0.01	.0002
PO-210	0.01	.0002
Th-232 CHAIN		
Ra-228	0.1	.0002
Ac-228	10	.0002
Th-228	10.01	.00005
Ra-224	10	.00004
Pb-212		.00004

a. from “Reportable Quantity Adjustment-Radionuclides; Final Rules-40CFR302" Federal Register, 54.22524, May 24, 1989.

b. Releases calculated from Tables 2- 1 and 3- 10 of the Revised Draft EIR.

23. Comment noted. This item will be incorporated in the ECP.

24. Comment noted. See response number 12.

25. Comment noted. The Report of Site Selection and Geological Exploration (1988) is incorporated by reference in the Revised Draft EIR and is on file with the Imperial County Planning Department. The Report of Geological Investigation is also included in the project Report for Waste Discharge which is on file with the Imperial County Division of Environmental Health Services and the RWQCB. Inclusion of these publicly available documents as appendices is not required by CEQA. Copies are available upon request.

26. Comment noted. This information is contained in the document described in response 25. Also refer to Appendix A of the Revised Draft EIR, page A-21, response number 18.

27. See response number 16. As stated in the Revised Draft EIR, the observed minimum depth to groundwater is between 53 and 63 feet. Thus, the highest expected groundwater elevation would be 53 feet. This is approximately 15 feet below the maximum depth of the proposed Monofill. For more detailed information, refer to Volume 2 of the Report of Waste Discharge which is on file with the RWQCB and Imperial County Division of Environmental Health Services.

28. Comment noted.

29. Comment noted. See response 26.

30. As stated in the Revised Draft EIR on page 3-35, the project design incorporates a number of features which meet or exceed all applicable Title 23 CCR (subchapter 15) requirements regarding flood hazards. These include location of the project site outside the 100-year floodplain, and construction of a protective berm around the proposed Monofill designed to accommodate the probable maximum precipitation (PMP) which is greater than 1000-year storm flow.

31. Comment noted. Detailed field analysis was performed including several test pits, auger borings, and backhoe trenches to delineate soil characteristics. Detailed information is provided in the Report of Waste Discharge, Geological Investigation, on file with the

RWQCB and Imperial County Division of Environmental Health Services. The Revised Draft EIR states that additional geotechnical evaluation of the project site should be conducted as part of grading and construction activities and that further evaluation of soil characteristics should be conducted at that time.

The ECP will insure that a final detailed specific geotechnical analysis will be performed which includes all mitigation measures specified in Section 3.1.7 of the Revised Draft EIR prior to operation of the proposed facility.

32. Laboratory permeability tests were performed on both recompacted clay samples from the borrow area and on undisturbed samples of the natural clay liner obtained from soil borings. Tests were performed using both a standard permeant of CaS04 aqueous solution and leachate generated by the filter cake. For detailed information refer to the Report of Waste Discharge on file with the RWQCB and Imperial County Division of Environmental Health Services.

33. The ECP will insure that the applicant will implement Title 23 conditions listed in Section 3.2 of the Revised Draft EIR and submit the results to the RWQCB for their approval prior to any grading/construction activities. The hydrologic data required under Title 23 shall be provided by a qualified hydrological consultant acceptable to the RWQCB and Imperial County Division of Environmental Health Services. Specific monitoring efforts will be incorporated into the permit conditions pursuant to the requirements in Title 23 and subject to RWQCB and Imperial County Division of Environmental Health Services approval.

34. The Revised Draft EIR states in Section 3.2.3 that final project design shall incorporate all Title 23 of the CCR (subchapter 15) requirements for a Class II disposal facility. See response 33.

35. Comment noted. Appendix II of the final EIR provides analysis of filter cake materials of the Leather's facility, The information is complete and sufficient to make an assessment of the material to be received at the proposed project, refer to the evaluation of submitted Monofill Project Wastes analysis data page D- 1 of the Revised Draft EIR.

36. Comments from the Department of Health Services Radiological Health Branch have been responded to, see responses 2-7. Also, please note that State Clearinghouse submitted the Desert Valley Company, Monofill Facility Draft EIR (Revised), Sch#89032206 to the California Department of Health Services for review and comment during the public review period.

.E OF CALIFORNIA—THE RESOURCES AGENCY GEORGE DEUKMEJIAN, Governor

DEPARTMENT OF FISH AND GAME
330 Golden Shore, Suite 50
Long Beach, CA 90802
(213) 590-5113

May 7, 1990

RECEIVED

MAY 14 1990

IMPERIAL COUNTY
BUILDING DIVISION

We have reviewed the Draft EIR for the Desert Valley Company Class II Monofill facility describing the potential environmental impacts of developing a 26 acre geothermal waste disposal site located approximately 12 miles west of the town of Westmoreland. The disposal/storage site would accept nonhazardous geothermal materials consisting of drilling muds, cuttings, and silica filter cake solids. The facility would be constructed to meet county and state requirements for a Class II waste disposal site. We have the following comments.

37 The project would impact 26 acres of habitat for the flat-tailed horned lizard, a candidate for Catagory 1 listing by the U.S. Fish and Wildlife Service. The Department agrees with the proposed mitigation measures as described in the Draft EIR. However, we recommend that the project sponsor provide compensation for lost flat-tailed horned lizard habitat prior to grading or construction of the facility. Compensation should be provided as outlined in the "Flat-tailed Homed Lizard Management Strategy" that was prepared by the Bureau of Land Management. To achieve this goal, we request that the project sponsor jointly coordinate with the Bureau of Land Management, U.S. Fish and Wildlife Service, and the Department to discuss and adopt measures to compensate for the loss of flat-tailed horned lizard habitat.

38 'The project will result in the diversion of several intermittent desert washes. Divers ion, obstruction of the natural flow or changes in the bed, channel, or bank of any river, stream, or lake will require notification to the Department of Fish and Game as called for in the Fish and Game Code. This notification (with fee) and the subsequent agreement must be completed prior to initiating any such changes. Notification should be made after the project is approved by the lead agency.

Thank you for the opportunity to review and comment on this project. If you have any questions, please contact Jack L. Spruill of our Environmental Services staff at (213) 590-5137.

Sincerely,

Melanie Mayer for FW

Fred Worthley
Regional Manager
Region 5

California Department of Fish and Game

Response:

37. Comment noted. The Revised Draft EIR section **3.5.5** (mitigation measures) states that the loss of flat-tailed homed lizard habitat will be compensated commensurate with appropriate state and federal requirements.

    The ECP will insure that the project applicant jointly coordinate with the Bureau of Land Management, U.S. Fish and Wildlife Service, and the California Department of Fish and Game to meet state and federal requirements for compensation of loss of flat-tailed homed lizard habitat.

38. Comment noted. The ECP will insure that the project applicant will notify the California Department of Fish and Game of any diversion of intermittent desert channels. The ECP will insure that notification (with fee) and subsequent agreement will be completed prior to initiating grade.

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
El Centro Resource Area
333 South Waterman
El Centro, California 92243

IN REPLY REFER TO:

CA-24333
2800
(CA-067.21)

May 16, 1990

Richard Cabanilla
County of Imperial
Planning Department
939 Main Street
El Centro, California 92243

Pear Mr. Cabanilla:

Thank you far the opportunity to comment on the revised Draft Environmental Impact Report for Desert Valley Company's Monofill Facility.

39 It is unclear whether the access road straddles the section line or is entirely on the west side. If it does straddle the section line, why does it do so? It is our policy to minimize unnecessary surface disturbance of the public lands whenever possible.

40 No data was found in the document to support the statement that paving a road will minimize the amount of time the Flat-tailed horned lizard (FTHL) will spend on a roadway. It may work the opposite and increase lizard mortality as they use the pavement to warm themselves. This proved to be the case for FTHLs on a paved road in the Imperial Sand Dunes during fringe-toed lizard surveys in June 1989.

41 We also recommend that full compensation for loss of FTHL habitat as outlined in the Mana[redacted] Strategy for the FTHL on BLM Administered Lands within the CDCA (Appendix D), be included as a mitigation measure. A copy at this document is enclosed.

42 FTHLs are limited in range to Imperial County, Eastern San Diego County, and southern Riverside County in California, as well as southwestern Arizona and northern Mexico. Nowhere within their range are FTHLs abundant, even in their molt preferred habitats. Therefore, any loss of habitat is significant.

43 On Paw 3-76, the first sentence should read, The BLM's San Sebastian Marsh/San Felipe Creek area, an Area of *Critical Environmental Concern (ACEC),* . . .

If you require any further information or clarification of the Comments, please don't hesitate to give us a call at 352-5842.

Sincerely,

Lynda Kastoll

for J. Ben Koski
Area Manager

Enclosure

United States Department of Interior Bureau of Land Management

Response:

39. Refer to Appendix A of the Revised Draft EIR, page A-26, response number 19.

40. The proposal to pave the project access road was derived from a similar recommendation generated by BLM staff biologists for the GEO East Mesa Geothermal Development project (WESTEC Services, Inc. 1988). See also response number 39.

41. See response number 37.

42. Refer to Appendix A of the Revised Draft EIR, page A-26, response number 30.

43. Comment noted. See Errata number 10.

SECTION 3
REVISIONS TO THE DRAFT EIR

INTRODUCTION

As a result of comments received on the Revised Draft EIR, a number of modifications to the Revised Draft EIR text were considered necessary. These changes are provided in the form of an errata sheet for the Revised Draft EIR (SCH 89032206).

1. Section 3.11.5 (Public Health and Safety/Mitigation Measures), page 3-106, second bullet, last sentence should read as follows:

   Workers may not receive more than occupational dose limit set by Title 17-30265 for whole body exposure of 1.25 rem per calendar quarter.

2. Section 1 (Executive Summary), page l-l, paragraph 3 should be replaced with the following:

   In order to proceed with the proposed Monofill Facility development, the project applicant has applied to the County of Imperial for a General Plan Amendment, Zone Change, and Conditional Use Permit (CUP). Because approval of the CUP, General Plan and Zone Change will represent a discretionary action by the County of Imperial Planning Commission and Board of Supervisors, and because the proposed project may significantly affect the environment, the California Environmental Quality Act (CEQA) requires the preparation of this environmental impact report (EIR).

3. Section 1 (Executive Summary) page l-12, Table l-l, Land Use Mitigation Measures, first mitigation measure should read as follows:

   Impact to Imperial County's land use plans and policy can be mitigated by approval of a General Plan Amendment, a Rezone for the site, and a CUP.

4. Section 3.7.1 (Existing Land Use) page 3-76, the following paragraph should be added to the end of this section:

Currently, there are two Class III sites in Imperial County which may accept non-hazardous geothermal materials given approval by the RWQCB. There is only one disposal site in Imperial County capable of handling designated/special wastes and/or hazardous wastes.

5. Section 3.7.2 (Relevant Land Use Programs and Zoning), page 3-78, the last paragraph should be deleted.

6. Section 3.7.3 (Land Use Impacts), page 3-80, second paragraph should read as follows:

   In order to construct and operate the proposed Monofill Facility, the applicant has applied to the County of Imperial for a General Plan Amendment and rezone for the site and a CUP. Before the proposed project can begin operations, the California Waste Management Board (CWMB) and the CWMB's local enforcement agency, the Imperial County Department of Health Services, must issue a Solid Waste Permit. Approval of these measures would make the project consistent with the planning policies of the County of Imperial. The potential impacts to land use plans associated with each of the proposed actions are discussed below.

7. Section 3.7.4 (Land Use Mitigation Measures), page 3-81, first paragraph should read as follows:

   No land use compatibility impacts with surrounding uses have been identified within the analysis. No impacts to Imperial County land use plans and policy would occur provided the appropriate amendments, rezone, and permit approvals are obtained form the county and the proposed facility is identified in the Facility Siting Element of the Imperial County-wide Integrated Waste Management Plan. No adverse impacts to BLM land use policy and resource management guidelines are anticipated, provided the BLM approves the proposed access road alignment. Therefore, no mitigation measures are necessary.

8. Section 2.4.1 (Definitions and Criteria), page 2-7, second paragraph, first sentence should read as follows:

Impervious formations, such as natural soil or the equivalent of artificially-constructed barriers, must have a permeability of 1 x 10^{-6} cm/sec and have adequate physical properties to prevent vertical movement of fluid, including waste and leachate, from waste management units to waters of the state as long as wastes in such units pose a threat to water quality.

9. Section 2.4.1 (Definitions and Criteria), page 2-7, third paragraph, the following criteria should be added:

    7. Class II units shall be designed to withstand the maximum credible earthquake.

    8. Class II units must have capacity for precipitation and drainage control for 1,000 year and 24 hour storms.

    9. Class II units must be designed for containment of the specific wastes to be discharged.

    10. Lateral barriers to migration of waste or leachate are required for Class II units.

    11. All containment structures must withstand hydraulic pressure gradients without failure due to compression, settlement or uplift.

10. Section 3.7 (Land Use), page 3-76, the first sentence should read as follows:

The BLM's San Sebastian Marsh/San Felipe Creek area, an Area of Critical Environmental Concern (ACEC), is located 3 miles northwest of the site.

11. Section 8 (references), the following references should be added:

Desert Valley Company, 1989. “Report of Waste Discharge for Monofill”, July.

Desert Valley Company, 1989. “Solid Waste Facility Permit Application for Monofill”, July.

Des&t Valley Company, 1990. "Report Disposal Site Information for Monofill", March.

APPENDIX I
DESERT VALLEY COMPANY'S MONOFILL FACILITY
DRAFT ENVIRONMENTAL IMPACT REPORT (REVISED)

DRAFT ENVIRONMENTAL IMPACT REPORT (Revised)
for General Plan Amendment, Solid Waste Management Plan Amendment, Zone Change and Conditional Use Permit

State Clearinghouse No. 89032206

Prepared *for:*

Lead *Agency:*
County of Imperial Planning Department
Court House
El Centro, California 92243
(6 19) 339-4236
Contact: Jurg Heuberger, County of Imperial
S. Harry Orfanos, Public Works

Applicant:
Desert Valley Company
480 West Sinclair Road
Calipatria, California 92233
(6 19) 340-2267

Prepared by:
ERC Environmental and Energy Services Co.
5510 Morehouse Drive
San Diego, California 92 12 1
(6 19) 458-9044

March 1990

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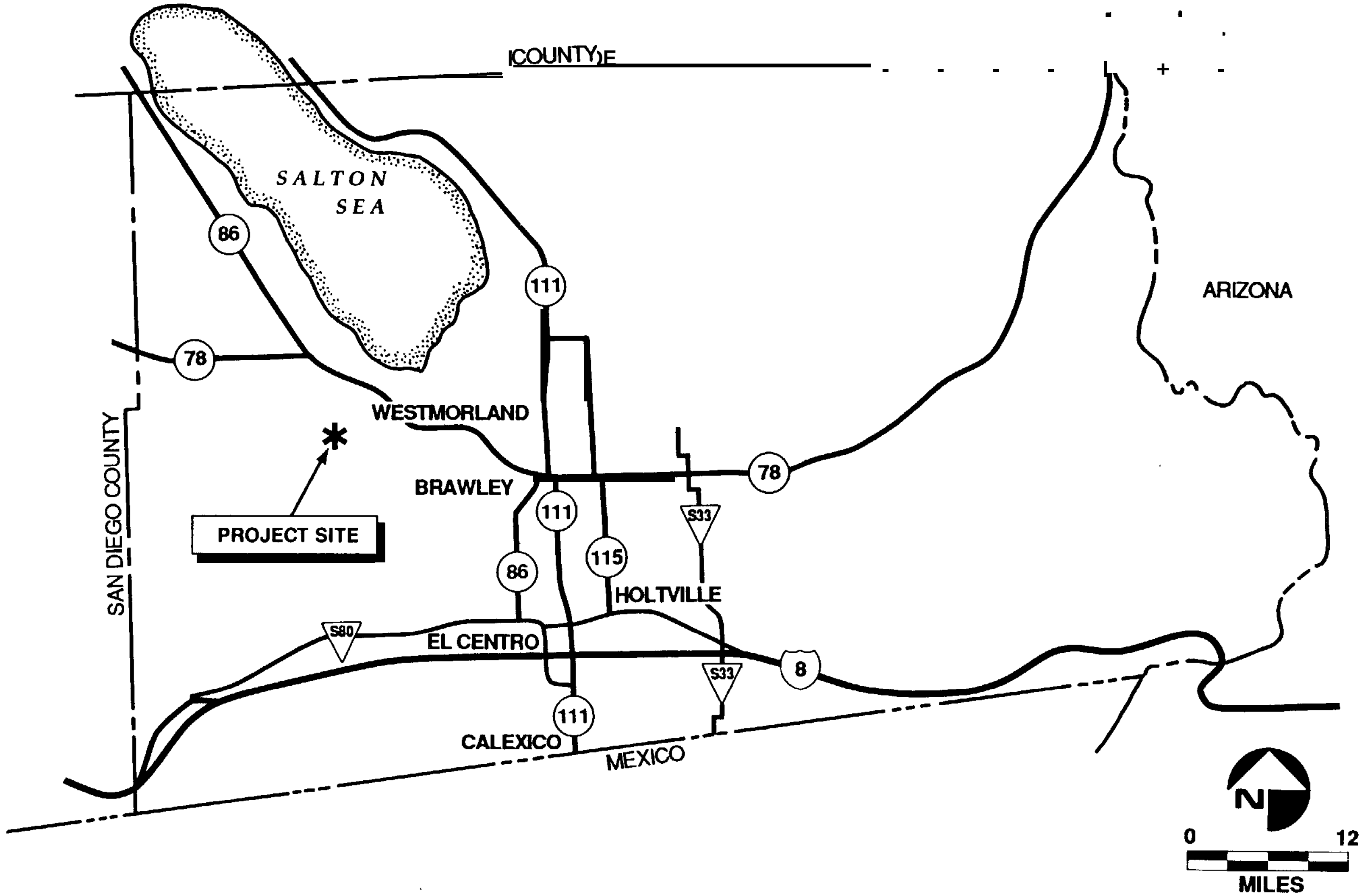
SECTION 1
EXECUTIVE SUMMARY

1.1 INTRODUCTION

Desert Valley Company is proposing to develop a Class II storage/disposal Monofill Facility for geothermal solids on 160 acres of privately-owned land located approximately 12 miles (19.3 km) west of the City of Westmorland in Imperial County, California (Figure l-l). The site would be developed in two phases with the first phase having a total useful life expectancy of 10 years.

The project is being proposed in response to a need for storage/disposal of nonhazardous geothermal materials. The proposed Monofill Facility will serve four geothermal power plants which at present include Vulcan, Del Ranch, Elmore, and Leathers. These power plants are owned by four partnerships, and one of the general partners of each partnership is a subsidiary of Magma Power Company, as is Desert Valley Company. The Monofill Facility will only accept nonhazardous geothermal filter cake and mud sump materials as described in Section 2.1 (Project Objectives). The geothermal filter cake exhibits properties which may have commercial value in the future. The proposed project would provide control in managing the filter cake for future commercial uses and in disposing of mud sump wastes. Presently, the filter cake is used for making concrete for onsite uses at existing power plants. Currently, the only alternative presently available for managing the mud sump materials is through disposal at a hazardous waste landfill and thereby mixing them with hazardous wastes.

In order to proceed with the proposed Monofill Facility development, the project applicant has applied to the County of Imperial for a General Plan Amendment, Solid Waste Management Plan (SWMP) Amendment, Zone Change, and Conditional Use Permit (CUP). The SWMP must be approved by the Imperial County Board of Supervisors, a majority of the cities in Imperial County, and transmitted to the California Waste Management Board for their approval. Because approval of the CUP, General Plan and SWMP Amendments, and Zone Change will represent a discretionary action by the County of Imperial Planning Commission and Board of Supervisors, and because the proposed project may significantly affect the environment, the California Environmental Quality Act (CEQA) requires the preparation of this environmental impact report (EIR).



ERC
Environmental
and Energy
Services Co.

Project Location as Depicted on Imperial County Regional Map

FIGURE
1-1

An EIR is an informational document which is intended-to inform public decision makers (in this case, the County Planning Commission and Board of Supervisors), other responsible or interested agencies, and the general public of the environmental effects of this proposed project. The EIR process has been implemented to enable public agencies to evaluate this project in terms of its environmental consequences, to examine and implement methods eliminating or reducing any adverse impacts, and to consider alternatives to the project as proposed. While CEQA requires that major consideration be given to avoiding environmental damage, the responsible public agencies remain obligated to balance possible adverse effects against other public objectives, including economic and social goals, in determining whether and in what manner this project should be approved.

This EIR has been prepared in compliance with the County of Imperial's ***Rules and Regulations to Implement the California Environmental Quality Act of 1970, amended February 9, 1988. The*** Imperial County Planning Department filed a Notice of Preparation (NOP) with the State Planning Office in March of 1989. Concerns generated during the NOP review were incorporated into a Draft EIR. The Draft EIR was circulated for public review in July 1989. The public review period was completed September 1, 1989 (see Appendix A Public Review).

During this period, subsequent analysis of the geothermal filter cake slated for shipment to the proposed Monofill identified certain Naturally Occurring Radioactive Materials (NORM). In light of this new information and the possibility that the presence of NORM in the filter cake may significantly affect the environment, the project applicant resubmitted a new application for the Monofill project. The new application is for the same project as addressed in the Monofill Draft EIR published July 1989, and includes new information regarding the presence of NORM in the geothermal materials proposed for storage/waste disposal.

The Imperial County Environmental Evaluation Committee (EEC) met on February 2, 1990, to discuss the new issue of NORM found in the geothermal filter cake to be stored/disposed of in the proposed Monofill. The original project description remained the same with the additional review and discussion concentrating on the presence of NORM found in the geothermal solids to be stored/disposed of in the Class II Monofill.

Upon completing review of the initial study. and resubmitted documents from the project applicant, certain changes were made by the EEC in areas of (1) Risk of Upset; (2) Human Health; and (3) Mandatory Findings of Significance.

As a result of the resubmitted project application, new information regarding the presence of NORM in the geothermal material, and the EEC's findings, the Desert Valley Company's Monofill Facility Draft EIR published in July 1989 has been revised.

This revised Draft EIR incorporates public comments addressing the accuracy of the Draft EIR published in July 1989, and analyzes the environmental impacts of the presence of NORM in the filter cake. The following sections have been revised to address the presence of NORM in the geothermal material: Section 1 (Executive Summary); Section 2.4.2 (Wastes to be Accepted at the Project Site); Section 3.2 (Hydrology/Water Quality); Section 3.3 (Air Quality/Climatology); Section 3.11 (Public Health and Safety); Section 4 (Unavoidable Adverse Environmental Effects); Section 5 (Alternatives); Section 6 (Cumulative Impacts); Section 7 (Agencies and Organizations Consulted); Section 8 (References); and Section 9.1 (Report Contributors).

The Imperial County Planning Department filed a NOP with the State Planning Office on February 6, 1990 (Appendix B). Concerns generated during the NOP review were incorporated into this revised Draft EIR.

Notice of the availability of the revised Draft EIR is being published in local newspapers concurrently with the distribution of this document. Comments may be made on the revised Draft EIR in writing before the end of the comment period. Written comments may be sent to the Imperial County Planning Department, 939 Main Street, El Centro, California, 92243, Attn. Mr. Jurg Heuberger. Following the close of the public comment period, responses to comments on the revised Draft EIR will be prepared and published, and, together with the revised Draft EIR, will constitute the Final EIR. A public hearing on the Final EIR will be held in Imperial County after the public review period.

The County of Imperial Planning Commission and Board of Supervisors will review the Final EIR for adequacy and will consider the Final EIR for certification. The Planning Commission and Board of Supervisors will make findings on the feasibility of reducing or avoiding significant environmental effects, and will then file a Notice of Determination with the State Office of Planning and Research, and County Clerk's office.

1.2 PROJECT DESCRIPTION

The proposed Monofill Facility will be a Class II disposal/storage site capable of accepting nonhazardous geothermal materials which consist of drilling mud and cuttings and silica filter cake solids which do not contain free liquids.

The project site is located approximately 12 miles (19.3 km) west of the City of Westmorland and 4 miles (6.4 km) south of the Salton Sea in the County of Imperial. The proposed project would develop 160 gross acres of privately-owned land in the Northeast Quarter of Section 33, Township 12 South, Range 11 East, San Bernardino Baseline and Meridian (SBB&M).

The proposed site is currently vacant, unirrigated desert land that is sparsely vegetated and slopes gently downward toward the northeast. The area immediately adjacent to the proposed site is also uncultivated desert. The closest paved road, State Route 86 (SR-86), is 1.25 miles (2 km) to the north. The area north and east of SR-86 is irrigated cropland. The nearest structure to the proposed project is the Elmore Desert Ranch, which is located approximately 2 miles (3.2 km) to the east-northeast_

The disposal site is to be developed in phases. Each phase will have a 300,000-cubic-yard capacity. Buffer zones are provided in the project design for the site perimeter and onsite geological and hydrological constraints. The facility will be constructed at a minimum to meet county and state requirements for a Class II waste disposal site. Other ancillary improvements include: a 1.25-mile (2 km) asphalt surfaced access road; an onsite trailer office; appropriate fencing; and a nonpotable onsite water well that may be capable of withdrawing 1 to 2 gallons per minute. Electrical services may be provided by an onsite generator or may be brought to the site per agreement with the Imperial Irrigation District (IID). Development of each phase is expected to require approximately 90 days and employ 8 to 20 people.

Operations will consist of disposal/storage of wastes by land compacting material in a multi-lined cell equipped with a primary and secondary leachate control system. Operation of the disposal/storage site will occur 12 hours per day, 7 days per week, and will utilize 3 to 5 employees. The site will only receive nonhazardous geothermal filter cake and mud sump wastes from the identified local geothermal plants in 8 to 10 truck trips per day during the first year, and 4 to 6 truck trips per day in subsequent years.

The first phase is expected to have enough capacity for 10 years. As each phase is completed, it will be closed in accordance with the regulations of the County (CUP), County Standards, State Solid Waste Management Board, and Water Resources Control Board.

1.3 SUMMARY OF IMPACTS AND MITIGATION MEASURES

The draft EIR has identified potentially significant environmental impacts of the project, mitigation measures and compliance criteria. Table l-l provides a summary of findings. For a detailed discussion of impacts and mitigation measures, see Section 3. Unavoidable adverse environmental effects and topical summaries of the issues are provided in Section 4.

In addition to mitigation measures in this draft EIR, a fully detailed mitigation monitoring plan and program will be required by the Imperial County Planning Department per AB 3180 as a condition of approval for the project. This draft EIR provides the framework for which a detailed mitigation monitoring plan can be written. The extensiveness and amount of detail necessary for the program's success cannot be fully determined until environmental analysis and public review have been completed.

As a condition of project approval, the mitigation monitoring plan will include the following features as well as a number of others:

- It will provide additional details regarding the roles and responsibilities of the mitigation monitoring system.
- It will define in a precise manner monitoring and compliance criteria.
- It will refine monitoring tasks by identifying subtasks.
- It will include proposed reporting documents.
- It will describe data management systems.
- It will define scheduling of monitoring activities.
- It will make field assignments by department.
- It will describe field logistics, including a communication system.
- It will specify responsibility for enforcement of the program.
- It will stipulate penalties for failure to implement mitigation measures.

After completion of the permitting process and prior to completion of construction, the applicant will also obtain Environmental Impairment Liability through the use of a letter of credit. This letter may be used for closure and post closure costs and for upset episodes. The letter of credit will be completed as specified by the California Waste Management Board (CWMB) form 101 or equivalent in the amount of 3 million dollars.

Table 1-1

SUMMARY OF POTENTIALLY SIGNIFICANT IMPACTS AND MITIGATION

Issue	Impact	Mitigation
Geology	Impacts on the geology of the site by the project will not occur. However, in the absence of mitigation measures, the nature of geologic features at the site and in the region could allow impacts, primarily related to water quality, to occur in the project area. A number of potentially significant geologic hazards were noted. These related to seismicity, geologic and soil stability, and the presence of local ground water reservoirs.	Project design (with specific regard to design parameters related to geology/seismicity) is in conformance with requirements for Class II waste management units listed in Title 23 of the California Code (Subchapter 15). The following additional mitigation measures have been identified which would reduce potential geologic impacts to the proposed project to non-significant. Final project design shall comply with all California Administrative Code, Title 24. Uniform Building Code, and RWQCB and County of Imperial standards regarding the nature, location, and construction of proposed facilities. Project design shall incorporate peak ground acceleration loading values of 0.60 g unless modified recommendations am provided by the geotechnical consultant. Final project design shall incorporate all measures deemed appropriate by the geotechnical engineer on the basis of existing and future site-specific investigations. Additional analysis of the project site shall be conducted to evaluate potential impacts associated with repeatable high ground acceleration, localized liquefaction potential, expansive and reactive soils, and wind generated erosion.

Table l-l (Continued)

SUMMARY OF POTENTIALLY SIGNIFICANT IMPACTS AND MITIGATION

Issue	Impact	Mitigation
Hydrology	**Surface Water**	
	Potential impacts from the proposed project related to surface water include increased on-offsite runoff volumes, flooding hazards, and erosion, as well as altered drainage patterns, and effects to existing drainage improvements.	The project shall reduce erosional impacts to the extent possible through use of protective facings, channelization of threatened drainages, or construction of energy dissipating or sedimentation facilities.
	The project has incorporated a number of measures to minimize these potential impacts including construction of a diversion berm around the proposed storage/disposal areas which will reduce potential flooding hazards to insignificant. Westward diversion of runoff from the proposed berm could produce potentially significant erosional impacts. A number of mitigation measures are available to mitigate these impacts to non-significant.	The project applicant must receive discretionary approval from Caltrans prior to making any modifications to Caltran's flood control levee.
	Groundwater	
	Due to the depth and intervening clay layer, no adverse impacts to ground water are anticipated.	Any impact on groundwater associated with the project will require approval from the Regional Water Quality Control Board (RWQCB).
	Non-potable water needs may be met by an on-site water well which is expected to yield 1 to 2 gallons per minute. This use is considered minor and would not represent an adverse impact to groundwater in the project area.	
	Water Quality	
	The proposed facility would contain a number of materials, including radiological constituents in the filter cake, which if introduced into surface or groundwater resources would result in significant water quality impacts.	To monitor the effectiveness of the contaminant within the Monofill, soil background as well as future groundwater samples shall be analyzed for radionuclides and other "footprint" chemicals. The monitoring program shall be approved by the RWQCB.

Table 1-1 (Continued)

SUMMARY OF POTENTIALLY SIGNIFICANT IMPACTS AND MITIGATION

Issue	Impact	Mitigation
Hydrology (Continued)	Title 23 of the California Code (Subchapter 15) includes a number of requirements for Class II facilities related to protection of ground and surface water quality. Project design includes a number of features intended to meet Title 23 requirements. However, the provision for detailed hydrologic data required under Title 23 has yet to be completed and incorporated into the project design. This may represent a significant impact if insufficient data were present to allow proper project design and implementation.	A detailed hydrological analysis of the project site and vicinity shall be conducted by a qualified hydrologist. This investigation shall be conducted pursuant to requirements in Title 23 of the California Code (Subchapter 15). This investigation shall be incorporated into the final project design and approved by the RWQCB. Upon review and acceptance of the soil and ground-water monitoring plan and hydrological analysis by the RWQCB it is anticipated that no significant adverse impacts will occur to water quality.
Air Quality	The primary air quality concern of the proposed project during both the construction and operation phases is that it could generate significant amounts of fugitive dust from on-site grading activities, wind erosion of exposed landfill area, and travel on paved and unpaved portions of the project site. Also of concern are the potential impacts associated with the radioactive materials present in the geothermal filter cake (see public health and safety).	Mitigation measures include the use of a soil sealant polymer to be sprayed on the geothermal material at the end of each day, as well as monitoring of wind speeds on the site. If wind speeds exceed 13 mph, the handling of geothermal filter cake and mud sump materials will cease. If wind speeds exceed 21 mph, all site activities which generate dust will cease. With proper mitigation measures implemented, fugitive dust emissions as well as emissions of solid constituents of the filter cake and mud sump materials will be reduced by 80-90 percent, or to a level of non-significant. In addition the Imperial County Air Pollution Control District (APCD), through their permitting process, will insure that the proposed project will not significantly impact the local and regional air quality.

Table 1-1 (Continued)

SUMMARY OF POTENTIALLY SIGNIFICANT IMPACTS AND MITIGATION

Issue	Impact	Mitigation
Noise	Development and operation of the proposed project will result in some increase in ambient noise levels in the project vicinity. However, due to the isolated nature of the project site, the proposed project will not expose any sensitive receptors to adverse noise conditions.	No mitigation measures are necessary.
Biological Resources	Construction of the project would result in the loss of approximately 35 acres of creosote bush scrub habitat. This loss is not considered to be significant The only sensitive plant species impacted by the project would be the Salton milkvetch. Impacts to the Salton milkvetch are not considered to be significant. The project may adversely impact the flat-tailed homed lizard (FTHL). The FTHL is regarded as a species of special concern by the California Department of Fish and Game (CDFG) and as a candidate for listing as threatened or endangered by the United States Fish and Wildlife Service (USFWS).	The final grading plan will be reviewed by a qualified biologist to ensure that no significant impacts to the FTHL will occur, and that impacts to the Salton milkvetch are minimized to the extent possible.
Archaeological Resources	Seven potentially important sites were identified within or adjacent to the project site. The project as presently designed would impact 4 potentially important sites. Sites identified as importance must be avoided or mitigated of direct or indirect project impacts.	Mitigation will be achieved through avoidance or through testing and data recovery.

Table 1-1 (Continued)

SUMMARY OF POTENTIALLY SIGNIFICANT IMPACTS AND MITIGATION

Issue	Impact	Mitigation
Land Use	Development of the project would change the existing open space land use designation to a heavy industrial designation. No adverse impacts to surrounding land uses are expected to occur from the proposed project. No adverse impact to Bureau of Land Management (BLM) land use policy and resource management guidelines are anticipated. However, the project is not consistent with the County's Ultimate Land Use Plan.	Impact to Imperial County's land use plans and policy can be mitigated by approval of a General Plan Amendment, a Rezone for the site, and a CUP. The SWMP must also beamended. In order to insure compliance with BLM land use policy, the proposed access road, through Section 28, must be approved by an authorized officer of the BLM.
Transportation	During operation the project will generate 3 to 5 employee trips and 8 to 10 trucks trips each day. Employee and truck transport traffic during operation are considered to represent an insignificant impact to traffic volume in the project vicinity. From a traffic safety standpoint, project traffic traveling westbound on SR-86 may constitute a traffic hazard when attempting to turn left onto the project access road. This impact, from a safety standpoint, is considered potentially significant and adverse.	Future planned improvements by Caltrans to SR-86 including a 4-lane highway in the project vicinity may mitigate safety impacts. If future improvements are not in place upon project start-up, the potential hazard caused by westbound project traffic turning left, across traffic, onto the project access road can be mitigated by construction of a left-turn pocket at the intersection of the access road and SR-86. This pocket as well as any roadway improvements on SR-86 and access and encroachment to SR-86 must be approved by Caltrans.
Visual Quality	The project may produce unavoidable visual impacts which are not considered to be significant. The project site would be modified from an inactive, undeveloped landscape to a monofill facility used for disposal of geothermal solids. The nearest residence (2 miles to the northeast) will not be impacted visually by the project. Views from other sensitive areas wouldbe minimal because of their distance from the site (3 miles or more). The structures and activity would be most evident to motorists along SR-86. Motorists distance from the project site (over 1.25 miles) combined with the speed at which typical viewers travel would serve to minimize impacts to visual quality.	Structures constructed on site shall be of earth-tone coloration to minimize potential visibility. If night lighting is required in the future, directional lighting fixtures shall be used to minimize night glare.

Table l-l (Continued)

SUMMARY OF POTENTIALLY SIGNIFICANT IMPACTS AND MITIGATION

Issue	Impact	Mitigation
So&economics	The proposed project is not labor-intensive either during construction or operation and therefore will not significantly affect local employment, population, or housing. No significant impacts are expected to existing public services or utilities. A small increase will be experienced in state and county sales and income tax revenue. Some government costs may increase slightly due to increased use of public roadways and services, and regulatory costs. These will be partially offset by permit fees, and other costs paid by the applicant	Nomitigation measures are required
Public Health and Safety (Designated Waste Constituents)	The California Solid Waste Management Board, Imperial County and the RWQCB administer waste generation and disposal regulations required by the federal government. The project design is in compliance with these regulations and thus insures that no significant hazards to public health will result from the proposed operations. The possibility exists for onsite health hazards due to mistakes in operating equipment or mechanical equipment failure. In any such event, the effects of mistakes or failures will not have any adverse impact on the surrounding areas.	

Table 1-1 (Continued)

SUMMARY OF POTENTIALLY SIGNIFICANT IMPACTS AND MITIGATION

Issue	Impact	Mitigation
Radiological Constituents	Development of the proposed Monofill Facility would create the potential for radiological impacts to workers and members of the public through the water (ground and surface), air (resuspended and wind-blown dust), and direct radiation pathways. As discussed in the EIR, the design of the proposed Monofill minimizes the potential for ground water being affected by leachate from the filter cake. The presence of NORM does not affect this evaluation. Based on conservative assumptions, doses to the maximally exposed worker are below the 500 mrem per year regulatory limit for non-nuclear workers (180 mrem to a worker unloading trucks at the Monofill). The nearest resident to the Monofill would receive an estimated maximum direct radiation dose of <.01 mrem per year. This is relative to a nominal annual background dose of approximately 300 mrem (NCRP 1987a). Exposure through the air pathway is conservatively calculated to be a 50 year committed effective (i.e., whole body cumulative lifetime) dose of 0.11 mrem to the nearest member of the public. These conservatively estimated exposures are well below regulatory criteria, and do not contribute significantly to the public's natural background dose.	As discussed, the project design includes mitigation measures to isolate the disposal activity from accidental contact by the general public, no further measures are required to meet regulatory criteria. Based on the principles of ALARA, mitigation measures are required to reduce worker radiological exposures to the lowest levels reasonable, not just to below relative regulatory criteria. The mitigation measures for non-radiation air quality effects will also reduce the radiation impacts. The operational procedures are to include dust control measures such as spraying the waste materials with a polymer particle binding compound at the end of each day. This should also be sufficient to reduce the impacts associated with radioactive airborne particles. The use of water or other wetting sprays during off-loading vehicles and placement of the materials would further reduce releases of airborne dust Other recommended mitigation measures include minimizing the presence of personnel in the work area. Truck drivers should remain inside their trucks with the windows closed. The site personnel should be inside vehicles with air conditioned cabs with high efficiency filters on the makeup air.

Table l-l (Continued)

SUMMARY OF POTENTIALLY SIGNIFICANT IMPACTS AND MITIGATION

Issue	Impact	Mitigation
Radiological Constituents (Continued)		Additional mitigation measures for reduction of radon emissions during operation and after are generally limited to adding moisture to maintain the initial moisture content. Additional mitigation measures after closure consist of increasing the thickness and integrity of the cover. A 2-foot clay and 6-foot soil cover is recommended. The doses to workers due to external gamma exposure can be reduced by applying the following three principles: reduction of time, increase distance from the source material. and provide shielding between the filter cake material and person. Further mitigation measures include conducting soil and groundwater monitoring to analyze for radionuclides. Monitoring will be conducted in accordance with RWQCB requirements; appropriate action levels based on monitoring data shall be established and enforced by the RWQCB and County of Imperial Department of Health Services, Division of Environmental Health.

Table l-l (Continued)

SUMMARY OF POTENTIALLY SIGNIFICANT IMPACTS AND MITIGATION

Issue	Impact	Mitigation
Radiological Constituents (Continued)		In addition, as part of **the** required air monitoring program, established by the Imperial County APCD, a radiological assessment shall be conducted on a quarterly basis. Monitoring shall be conducted in accordance with APCD requirements. Appropriate action levels for Ra 226 and Ra 228 have been established for worker and public exposure (see Section **3-** 11). If required, appropriate action will be taken and enforced by the Department of Health Services. As a **final** measure to reduce **onsite** health hazards and establish appropriate action levels for worker safety, the following written plans and procedures for facility operation will be **required:** • Emergency Response Plan; • Material Storage Handling Plan; • Site Operation Plan: • Employee Training Plan; • Soil/Ground Water Monitoring Plan • Ambient Air Monitoring Plan; **and** • Temporary Radiological Monitoring Program. Assuming all mitigation measures provided under air quality and public health and safety are implemented; the health risk to workers, due to radiation exposure, will be significantly lower than the "safe industry" standard established by the NCRP (1987b). The increment from radiological risks will be similar to common industrial practice and therefore is not considered to represent an adverse impact.

Table l-l (Continued)

SUMMARY OF POTENTIALLY SIGNIFICANT IMPACTS AND MITIGATION

Issue	Impact	Mitigation
Radiological Constituents (Continued)		The risk from radiation exposure at the nearest residence to the Monofill would represent an increment of approximately 1 percent over the risk associated with background radiation. This increase in radiation exposure is insignificant and is comparable to taking a 2-hour plane flight once per year (NCRP 1987a). The health risk associated with this increment of radiation is comparable to smoking 1.6 cigarettes or driving 30 miles in a car. The health risk to the closest residence from Monofill activities is considered to be insignificant when compared to other risks commonly accepted in our society.

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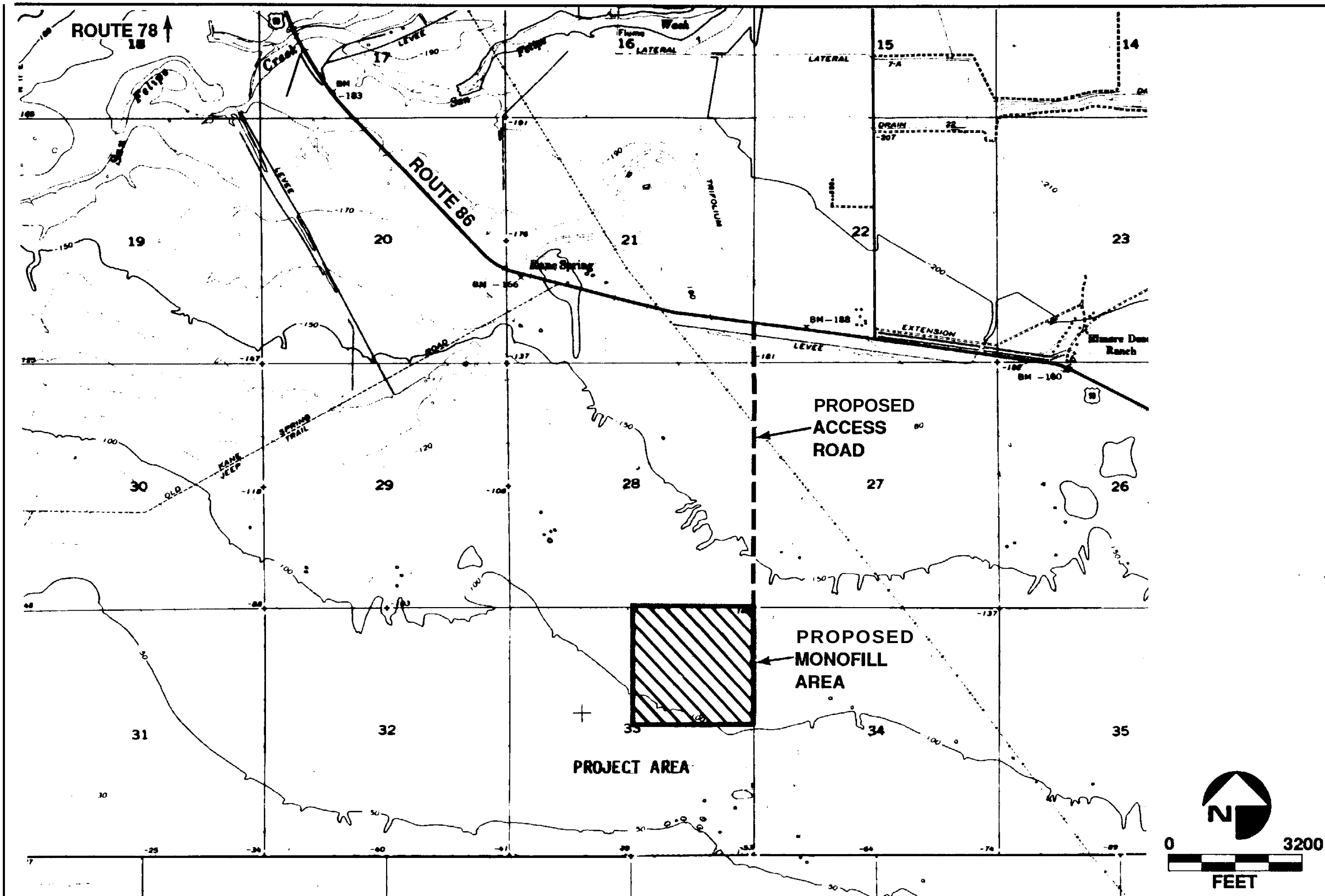
SECTION 2
PROJECT DESCRIPTION

2.1 PROJECT OBJECTIVES

It is the objective of the project applicant, Desert Valley Company, to establish and operate a Class-II storage/disposal site capable of storing designated nonhazardous geothermal filter cake materials and disposing of mud sump wastes. The proposed Monofill Facility is being proposed in response to a need for storage/disposal of nonhazardous geothermal materials. The project will accept nonhazardous geothermal filter cake and mud sump wastes produced in Imperial County by geothermal power plants owned by subsidiaries of Magma Power Company, which include Vulcan, Del Ranch, Elmore, and Leathers. At present, these geothermal power plants produce approximately 26,300 cubic yards per year of nonhazardous geothermal filter cake and have approximately 55,000 cubic yards of nonhazardous drilling mud sump wastes that need to be stored/disposed of at a permitted facility. The geothermal filter cake exhibits properties which may have commercial value in the future. The proposed project would provide control in managing the filter cake for possible future commercial uses and in disposing of the mud sump wastes. Presently the filter cake is used for making concrete for onsite uses at existing power plants. The only alternative presently available for managing mud sump materials is through disposing of them at a hazardous waste landfill and potentially mixing them with hazardous wastes.

2.2 PROJECT LOCATION

The proposed project site is located on the easterly flank of the Superstition Hills, approximately 12 miles (19.3 km) west of the City of Westmorland and 4 miles (6.4 km) south of the Salton Sea in the County of Imperial. The regional setting is shown on Figure l-l. The general vicinity of the project site is shown in Figure 2- 1. An aerial photograph of the proposed site is shown in Figure 2-2 as well as a plot plan in Figure 2-3). The project site is privately owned and includes the northeast quarter of Section 33, in Township 12 South, Range 11 East, SBB&M. The site constitutes 160 gross acres, of which approximately 26 acres will be developed in two phases as disposal area and ancillary facilities. The project also requires approximately 1.25 miles (2 km) of access road, of which 1 mile (1.6 km) partially crosses land administered by the Bureau of Land Management (BLM).



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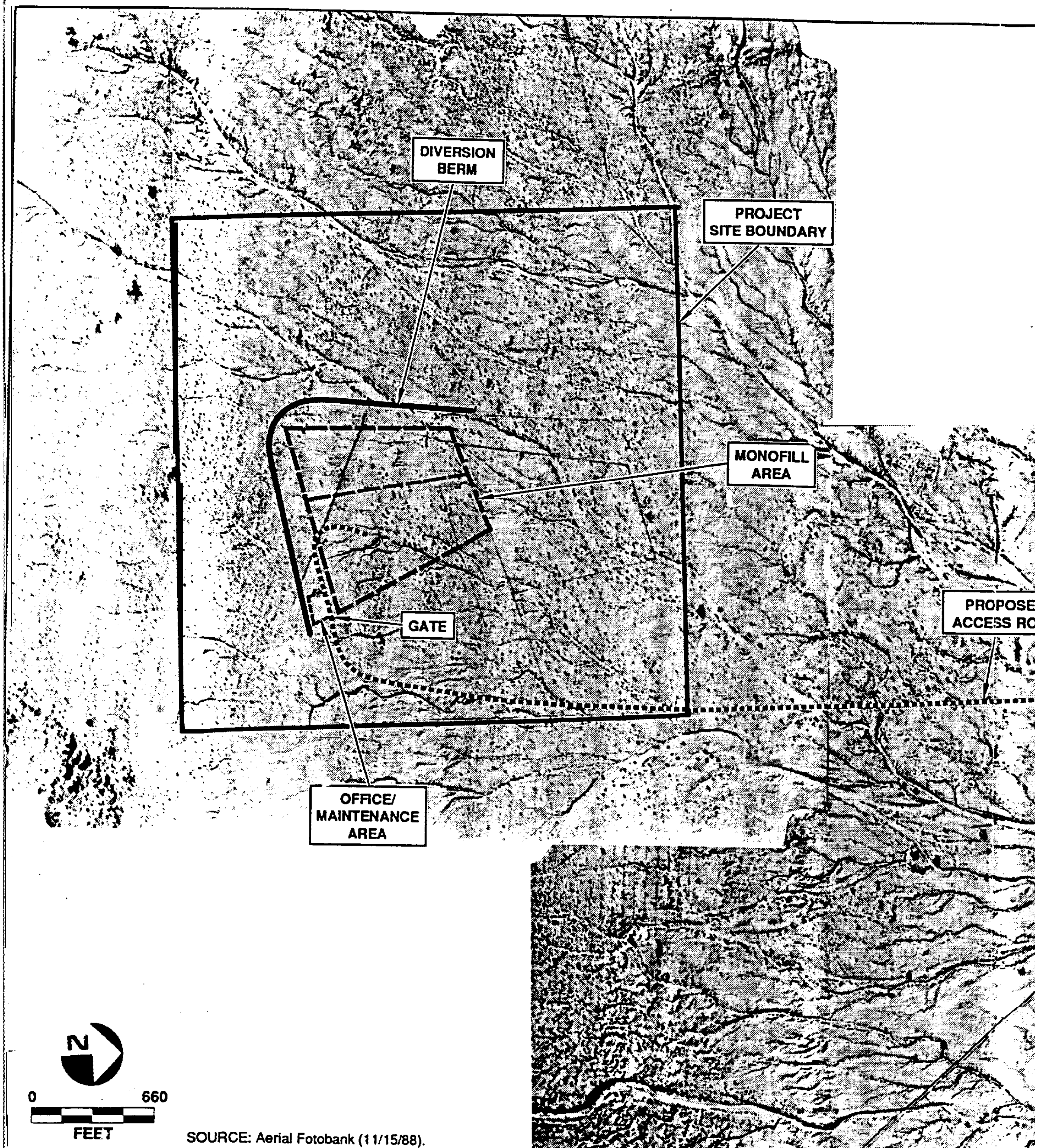
Project Site Location

FIGURE 2-1



SOURCE: Aerial Fotobank (11/15/88).

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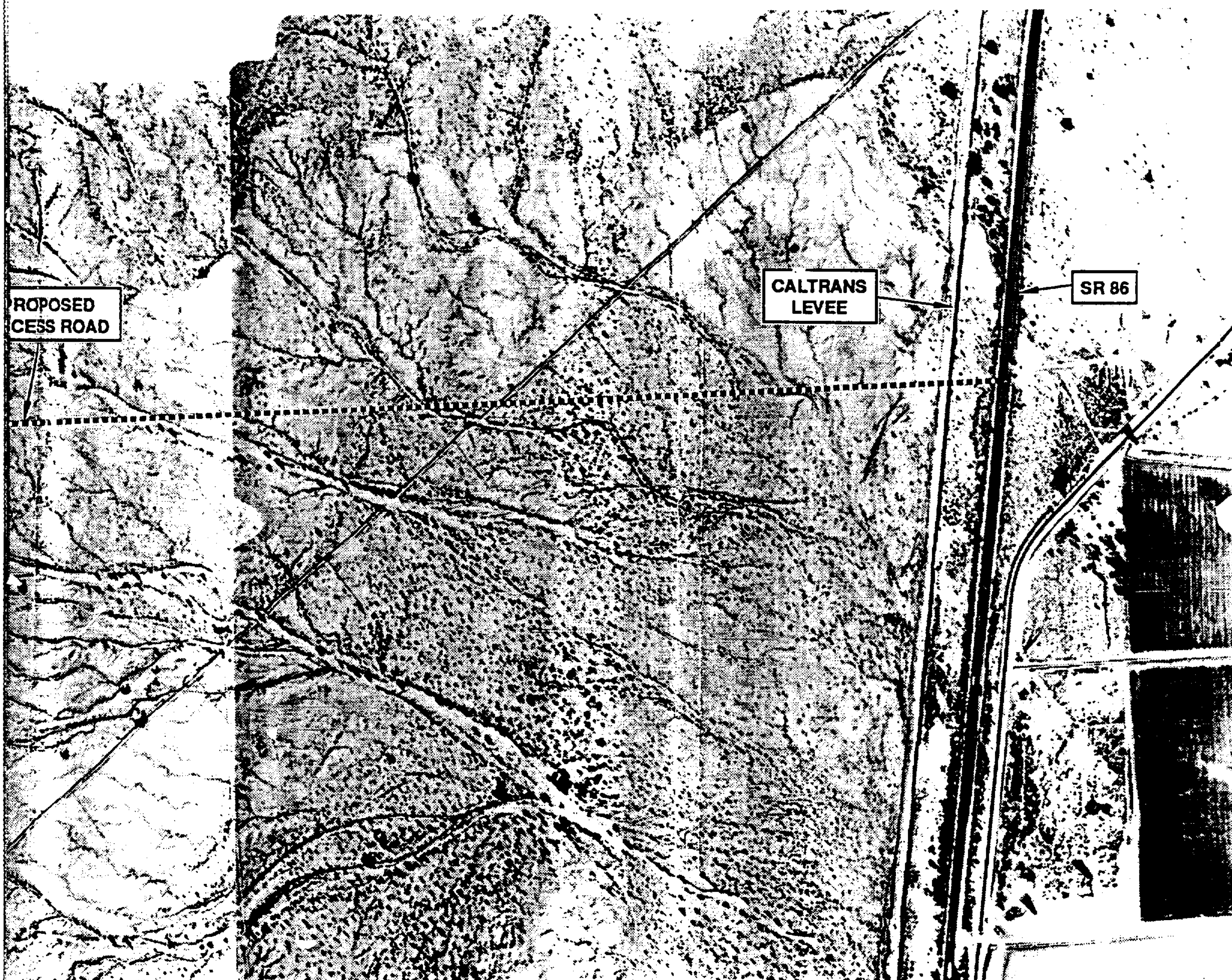
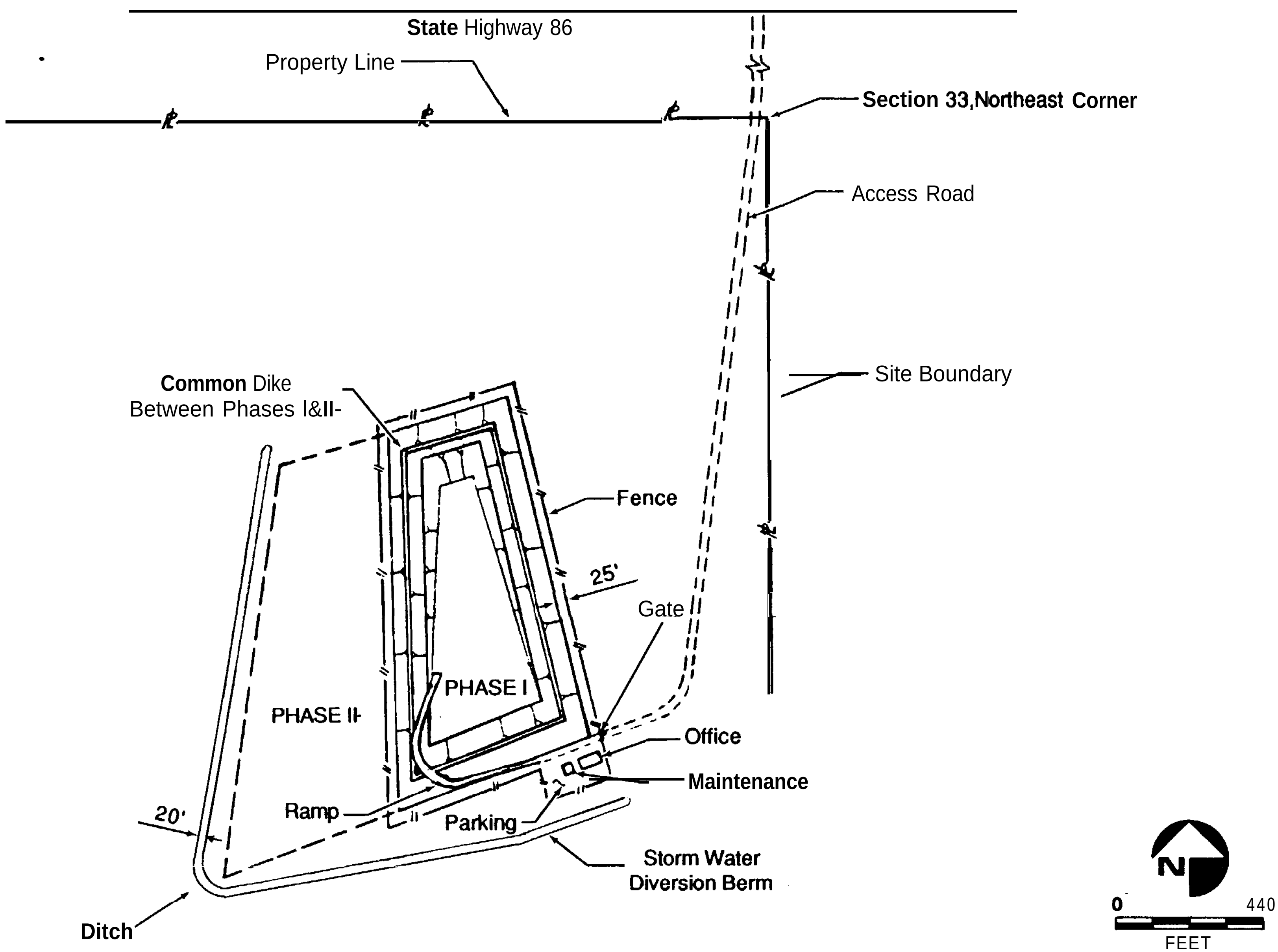
Aerial Photograph of Propos



Proposed Project Facilities

FIGURE

2-2



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Monofill Facility - Detail Site Plan

FIGURE 2-3

The proposed site is currently vacant, uninigated, desert land that is sparsely vegetated and slopes gently toward the northeast. There are numerous intermittent braided stream channels on the property which flow from southwest to northeast.

The area immediately adjacent to the proposed site is also uncultivated desert. The closest road, SR-86, is about 1.25 miles (2 km) away. The area north and east of SR-86 is irrigated cropland. The nearest dwelling is the Elmore Ranch which is located approximately 2 miles (3.2 km) to the east-northeast.

2.3 PROJECT SCHEDULING/ PHASING

It is proposed that development of the 160-acre disposal/storage site will take place in phases. Phases I and II are delineated in the detailed site plan shown in Figure 2-3. Phase II will be similar in Size and construction to Phase I and will be located within the 160-acre project area. The exact location and configuration of future phases will not be determined until Phase II is actually in operation. The construction and operational experience gained during Phase I and II will be used to determine the configuration and, to some extent, the location of the future phases. Future phases will require additional environmental review by Imperial County.

Each phase will develop approximately 10 acres and will consist of constructing a 300,000-cubic-yard disposal/storage cell. Construction of each phase is expected to require 90 days and employ 8 to 20 people. Construction of Phase I is expected to occur in early 1990. Construction of Phase II would be developed in sequence as needed and is expected to begin in the year 2000.

2.4 PROJECT CHARACTERISTICS

A full description of the technical project characteristics requires discussion of the definitions and criteria applied to the disposal site, wastes to be received, site preparation activities, and site operational procedures.

2.4.1 Definitions and Criteria

The following requirements, definitions, and criteria for the siting of a Class II facility are those of the California State Water Resources Control Board (1989).

Class II sites are those overlying usable ground water, with geologic conditions such that they would be either naturally capable of preventing lateral and vertical hydraulic continuity between liquids and gases emanating from the waste in the site and usable surface or ground waters, or those with a disposal area that has been modified to achieve these requirements.

Impervious formations, such as natural soil or the equivalent of artificially-constructed barriers, should have a permeability of 1 x 10^{-6} cm/sec and have adequate physical properties to prevent vertical movement of fluid, including waste and leachate, from waste management units to waters of the state as long as wastes in such units pose a threat to water quality. Class II units must confine wastes and byproducts within the boundary of the disposal area. Infiltration into adjacent nonwater-bearing sediments which do not have hydraulic continuity with usable water may be permitted.

Class II sites must meet the following criteria of the California Administrative Code (see Code of Regulations, Title 23, Chapter 3, Subchapter 15):

1. Class II units must be underlain by natural geologic materials having permeability of not more than 1 x 10^{-6} cm/sec or an equivalent liner system may be used.

2. Class II units shall be designed, constructed, operated and maintained to prevent inundation or wash-out due to 100-year storm events.

3. Class II units must have a 200-foot setback from any known Holocene fault.

4. Class II units must be designed, constructed, and maintained to preclude failure from rapid geologic change.

5. Class II units must be designed, constructed, and maintained to preclude failure from tidal waves.

6. Wastes must be a minimum of 5 feet above the highest anticipated elevation of underlying ground water.

Section 2532, Chapter 3, Title 23 of the California Administrative Code specifically allows the disposal of certain designated wastes (nonhazardous) in Class II disposal sites that meet the criteria outlined previously for Class II sites, when in the judgement of the regional board such disposal will not unreasonably affect water quality and as allowed in the County CUP. Such restricted disposal of designated wastes shall be subject to terms and conditions considered appropriate by the regional board and the County with most restrictive conditions applying to the site.

2.4.2 Wastes to be Accepted at the Project Site

As mentioned in Section 2.1, geothermal power plants in the Obsidian Butte area will be the proposed users of the storage/disposal site. The proposed Monofill Facility will accept nonhazardous geothermal filter cake and mud sump materials originating from these geothermal power plant operations in Imperial County. The proposed facility will receive approximately 72 cubic yards of filter cake material per day. In addition, the proposed facility will initially receive 35,000 to 55,000 cubic yards of nonhazardous mud sump materials. Minor amounts of additional mud sump materials will be received during the life of the facility for future well drilling operations.

A complete analysis, as detailed in California Code of Regulations Title 22, Environmental Health, Division 4, Chapter 30, Article 11, Criteria for Identification of Hazardous and Extremely Hazardous Waste, was done on representative filter cake and mud sump samples proposed to be stored/disposed of at the Monofill Facility. Typical analysis of materials to be accepted by the proposed Monofill Facility are shown in Appendix C. Tests run included the following:

- Acute toxicity (Performed by a fish bioassay)
- Persistent and Bioaccumulative Toxic Substances (Performed by analyzing for Total Threshold Limit Concentration (TTLC) and Soluble Threshold Limit Concentration (STLC) for the regulated metals and an EPA Method 8240 test for volatile organics)
- Ignitability Criteria
- Reactivity Criteria
- Corrosivity Criteria

A review of these tests by the Imperial County Health Center, Division of Environmental Health Services, in January 1989, concluded that the proposed geothermal wastes to be accepted by the Monofill Facility are nonhazardous as defined by the State of California Code of Regulations, Title 22 (See Appendix D, Evaluation of Submitted Monofill Project Waste Analysis Data).

During operation of the proposed Monofill Facility, Desert Valley Company will ensure that geothermal wastes accepted by the proposed facility are nonhazardous through compliance with the Imperial County Planning Department CUP (terms and conditions), Colorado River Basin Regional Water Quality Control Board, California Department of Health Services, and Imperial County Health Department regulatory requirements, among others, with the most restrictive conditions applying to the site.

Recent communications from the United States Department of Energy indicated that geothermal solids contain low levels of radioactive material from the decay of uranium and thorium which are present in geologic formations adjacent to brine deposits. A radiological assessment of the total radioactivity in the filter cake from geothermal power plants in the Obsidian Butte area was performed as shown in Appendix E (Radiological Assessment). Radiological analyses have determined that isotopes in the naturally occurring Uranium-238 (U-238) and Thorium-232 (Th 232) decay chains are present in various concentrations. Uranium and thorium and the associated decay products are common, and are found in measurable quantities in most soils. The radioactivity in the filter cake is a result of the decay of uranium and thorium, but at higher concentrations than observed in normal soils due to the chemistry associated with geothermal processes deep below the surface of the earth. The concentrations associated with these geothermal materials are similar to concentrations in low-grade uranium ores (NCRP 1975 and NCRP 1984).

As each isotope decays, it forms a new isotope which may also be radioactive. This decay chain continues until a stable (non-radioactive) isotope is formed. This sequence would normally produce each isotope in equal concentration, but the equilibrium could be disturbed by chemical processes, natural or human-induced. In the case of the geothermal power plants, the relative concentration of radioisotopes depends most directly on their solubilities in the brine. For this reason, uranium and thorium, which are soluble, stay in the brine while radium, which is less soluble, precipitates out of solution, Thus, the principal radionuclides produced in the decay chains appear to be Radium-2'26 (Ra-226) and Radium-228 (Ra-228).

Limits on the allowable release levels of radioactive material are covered in Title 40 CFR Parts 302 and 355. Release limits are isotope specific necessitating quantification and identification of individual isotopes. A combination of flow proportional counting and gamma ray spectroscopy was used to fulfill these requirements. For all samples, release limits were not detected. The radiological constituents identified in the geothermal filter cake are classified as NORMs, and are therefore exempt from licensing and permitting requirements under current California and federal regulations. Future regulations may address the handling of these materials and impose controls similar to those currently applicable to uranium mill tailings, the most analogous substance which is presently regulated by federal law. The Desert Valley Company has proposed a management plan for the filter cake which exceeds current criteria for tailings disposal under the Uranium Mill Tailings Act and associated regulations. It is reasonable to expect, therefore, that the proposed Monofill design will satisfy and exceed any operational or performance requirements that may subsequently be imposed.

For conservatism, the highest radionuclide concentrations from the five samples reported (Appendix C) are used to determine the significance of environmental impacts of disposal of the geothermal materials containing natural radionuclides. These results, which are used to characterize the materials, are given in Table 2- 1.

2.4.3 Site Preparation

To prepare the disposal site, required construction activities include: access road development; onsite grading, berm and levee development, soil compaction, installation of two plastic membranes; and other ancillary improvements required for safe operation.

2.4.3.1 Access Road

The proposed 1.25 mile access is a new roadway, the alignment is shown on Figure 2- 1. The access road will leave SR-86 at the section line intersect specified by Caltrans. Access and encroachment of the proposed access road and crossing of the existing levee will require permits and approval from Caltrans. After the road crosses the levee per Caltrans approval, it will proceed at grade level directly south to the Monofill Facility. The new

Table 2-1

RADIONUCLIDE CONCENTRATIONS[a]

Radionuclide	Concentration (pCi/g)
U-238 CHAIN	
Ra-226	250
Rn-222 -- noble gas	
Pb-2 14	210
Bi-2 14	170
Pb-210[(b)]	170
Po-210[(b)]	170
Th-232 CHAIN	
Ra-228[(b)]	180
Ac-228	180
Th-228[(c)]	50
Ra-224	44
Rn-220 -- noble gas	
Po-216	44
Pb-212	42
PO-212	27
Tl-208	16

a Assumed highest concentrations were applicable to all of material. Rounded values to two significant digits.

b This isotope does not have sufficient gamma emissions to be detected by the technique used by Dow. Concentration is estimated based on associated isotopes.

c Estimated.

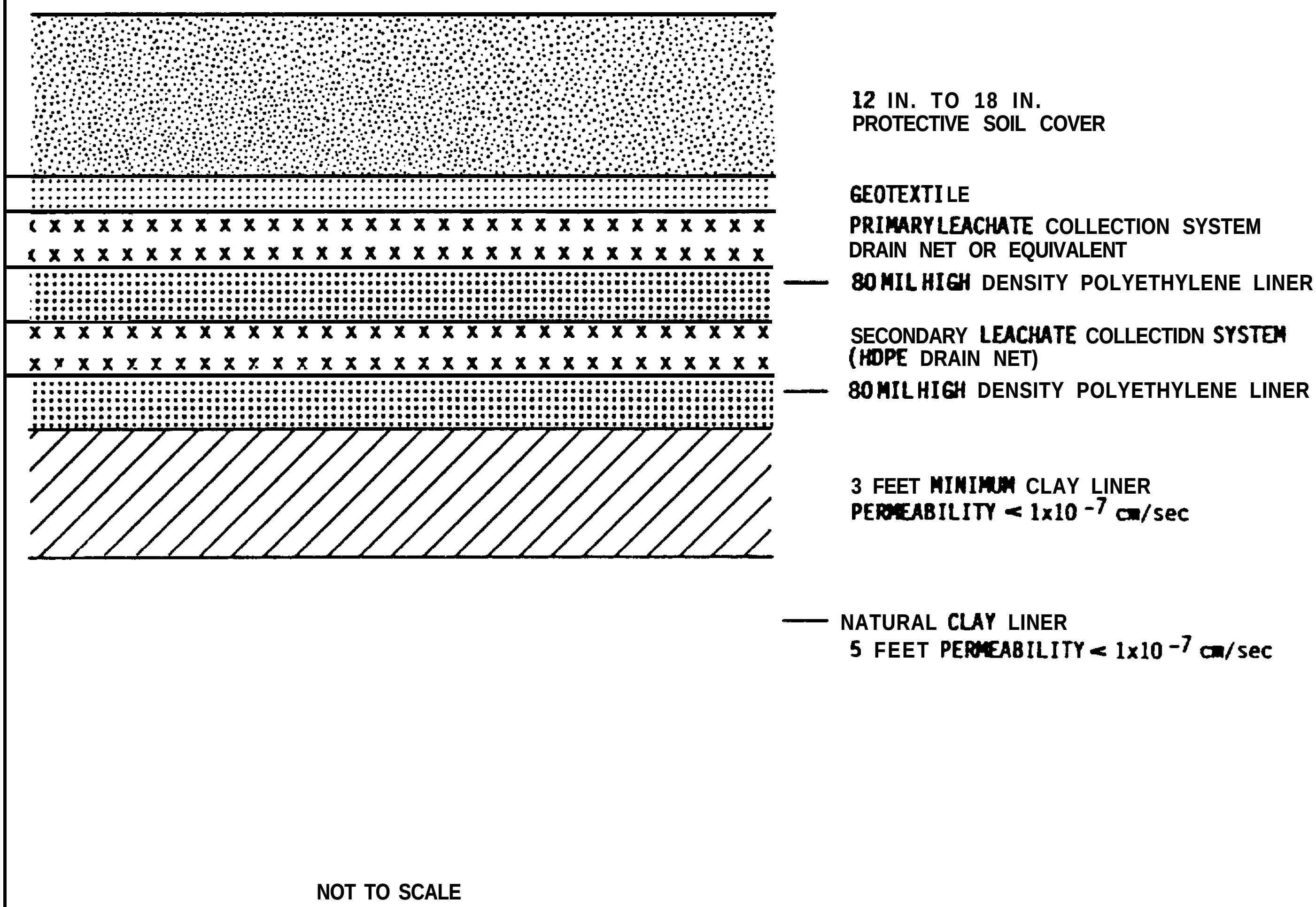
road will generally follow the section line and will require a 60-foot (18-m) easement. An easement must be obtained from the BLM for the portion of the road that will be in Section 28 (land administered by the BLM).

The road will be constructed to County and BLM specifications as applicable. The route will have a passing turn out every 1/3 mile (0.5 km). The road will be surfaced with asphalt and protected from erosion with a minimal borrow pit cut on the up-slope (south and west) side. All crossings of streams or wash channels will be made at the channel bottom level (no culverts or bridging will be used). These crossings will be protected from erosion with concrete aprons at the crossing banks and in the channel bottom.

2.4.3.2 **Disposal/Storage Area**

Site preparation involves primarily the construction of two terraced disposal areas beginning with the development of the lo-acre (Phase 1) area (see Figure 2-3). Each disposal area (for Phase I and Phase II) will develop a lo-acre monofill and will be constructed to have a permeability of 1 x 10^{-7} cm/sec, which exceeds the California Water Quality Control Board requirements. Three feet of compacted clay will form the bottom liner for each disposal area. A plastic membrane (HDPE, high density polyethylene) 80-mils thick will be placed on top of the compacted clay. On top of this plastic membrane will be a secondary leachate collection and removal system (LCRS) for leak detection. A drainage system will be placed on top of this followed by a second 80-mil plastic membrane. On top of the top liner will be a drain net, the primary LCRS, and a protective cover (Figure 2-4).

Side walls will be constructed of compacted clay keyed into the natural soil 5 fleet deep and the width of the grading equipment. Side wall liners will be constructed to the full depth of excavation and extend above grade to the full height of the dike. The excavation depth will range from 4 to 30 feet. A portion of clay required to build sidewalls may need to be obtained outside of the 160-acre project area and within the northern half of Section 33. The actual height above existing grade, the amount of clay required, and where the clay will be obtained will be determined and specified in detail in the final grading design application. Solids placed in the facility will be at a 3:1 maximum slope up to 15 feet above the side wall tops or approximately 35 feet above the existing grade.



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Typical Disposal Area Liner Cross Section

FIGURE **2-4**

To accommodate the probable maximum precipitation (PMP) from upslope areas (discussed in Section 3.2), a flood flow facility protection diversion berm will be constructed south and west of the disposal area (Figure 2-3). This berm will be constructed of compacted native material from facility overburden excavation spoil. The berm will be 24 inches high. The width is estimated to be 20 feet and will be determined by the width of the compaction material. This berm will divert surface flow about 1500 feet to the east of the monofill area. The PMP flow anticipated is 328 cubic feet per second. The south face of this berm will have a ditch upstream of the berm to prevent erosion and to control sediment entrainment.

Equipment required for construction will include scrapers, bulldozers, compactors, and water trucks.

2.4.3.3 **Other Ancillary Improvements**

A number of additional onsite improvements will be necessary for the safe operation of the disposal process. Several monitoring wells, as required by the County and or Regional Water Quality Control Board will be drilled around the site perimeter to enable monitoring of water quality to determine whether any leachate is contacting ground-water resources. A 6-foot (1.8-m) chain link fence will be erected around the active portions of the site, and a locking gate installed at the access road to prevent entry of wild or domestic animals and unauthorized persons to the project.

A trailer office and maintenance equipment structure will be placed on the site (Figure 2-3). A phone line will be established so that effective communication will be available in case of any emergencies. Onsite electrical needs will be supplied either through an agreement with IID or with a 25-kW (or less) diesel-powered generator. In the event IID supplies electrical needs, a 25-kV line will be brought out to the site using the proposed access alignment. The new transmission line will meet IID requirements. If electrical needs are supplied onsite by a generator, the unit will be fueled via a 1000-gallon above-ground diesel tank. The tank will be equipped with a secondary spill protection structure that will also act as a security wall. Water supply will be accomplished for potable use with a1000-gallon tank system. Water for use in operation or polymer preparation will be in a separate 1000-gallon system (nonpotable). The sewer system will either be an onsite septic tank unit or consist of portable facilities.

2.4.4 **Site Operation**

Mud sump wastes and filter cake material are generated as part of the geothermal technology of geothermal power plants located in Imperial County. During well drilling activities, drilling mud and cuttings are discharged into a clay-lined sump at the power plant facility permitted by the RWQCB, where water is evaporated. Once the sump material is free of liquids, it will be collected and disposed of at the proposed Monofill Facility. During operation of geothermal power plants, the brine clarification process generates about 0.5 cubic yards per day per megawatt of filter cake. Once the proposed Monofill Facility is in operation, filter cake will be loaded into a truck trailer and kept onsite. When the trailer is full, it will be hauled to the Monofill Facility. Presently, the filter cake is used for making concrete for onsite uses at existing power plants.

Currently, the only available method of disposing of the mud sump material is to dispose of it in a Class I hazardous waste landfill located approximately 5 miles east of the proposed Monofill Facility. Since this material is nonhazardous, it is proposed that this material be disposed of at the Monofill Facility.

Filter cake and drilling solids will be delivered by covered trucks from the Salton Sea area. The trucks will travel down Gentry Road, turn on Bowles, Lack, and Bannister roads, connect with SR-86, and finally follow the private road to the Monofill site. Four to six trucks per day will be transporting filter cake, an additional four to six trucks per day will be transporting drilling solids. Each of the trucks will be capable of hauling about 25 cubic yards of material. The covered load will be transported to the Monofill area where the load will be visually inspected and analyzed as required.

A material tracking and shipping system will be used for the hauling and disposal of all filter cake and mud sump materials as approved by the County. The generator, hauler, and disposer will certify compliance with requirements for documenting the proper handling of all materials to be stored/disposed of at the site.

After inspection, the material will be unloaded into the monofill. A diesel-powered bulldozer with a roller will be used to grade and compact the material. Water will be added, if necessary, when the material is placed, graded, or compacted to minimize dust generated during operations. In addition, the placed and stored material will then be sprayed, at the end of the day with a soil sealant polymer. The polymer penetrates the material and creates a stable crust which protects the material from wind. If wind speeds exceed 13 miles per hour, the handling of geothermal filter cake and mud sump materials will cease. If wind speeds exceed 21 miles per hour all site activities which generate dust will cease. A monitoring station will be located onsite to record wind speed and direction. This station will employ a series of lighted switch connections with the onsite office trailer, whereby switches will illuminate when critical wind speeds (i.e., 13 and 21 mph) are exceeded. The wind monitoring station will be designed and operated to conform with all applicable Air Pollution Control District (APCD) requirements.

During operation, 2 to 6 people will be employed at the proposed Monofill Facility. The site will accept material 12 hours per day, 7 days per week, or as approved. Once unloaded, the trucks will return to the geothermal power plants in the Obsidian Butte area.

2.5 CLOSURE PROCEDURE

Existing law requires any person operating a solid waste landfill, as defined, on January 1, 1988, to submit a closure plan and a postclosure maintenance plan, as specified, to the enforcement agency, as defined. The owner and operator are required to close and maintain the landfill during postclosure in accordance with those plans approved by the various enforcement agencies.

A closure plan means a plan describing the procedures to close and seal a solid waste landfill, prepared by the owner or operator in accordance with any permit conditions and standards which may be required by an enforcement agency, a regional water board, or the state water board.

A postclosure maintenance plan means a plan prepared by the owner or operator of a solid waste landfill to maintain the landfill for at least 30 years after closure in accordance with any permit conditions and standards which may be required by the CUP enforcement agency, a regional water board, or the state water board.

The enforcement agencies for closure of the proposed Monofill Facility will be the Solid Waste Management Board, Imperial County Planning Department, Imperial County Health Department, and RWQCB, Colorado River Region. The County of Imperial and the

RWQCB have authority to close the proposed Monofill Facility in the event of noncompliance.

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SECTION 3
DESCRIPTION OF BASELINE ENVIRONMENT; ANALYSIS OF IMPACTS; AND DISCUSSION OF MITIGATION MEASURES

3.1 GEOLOGY

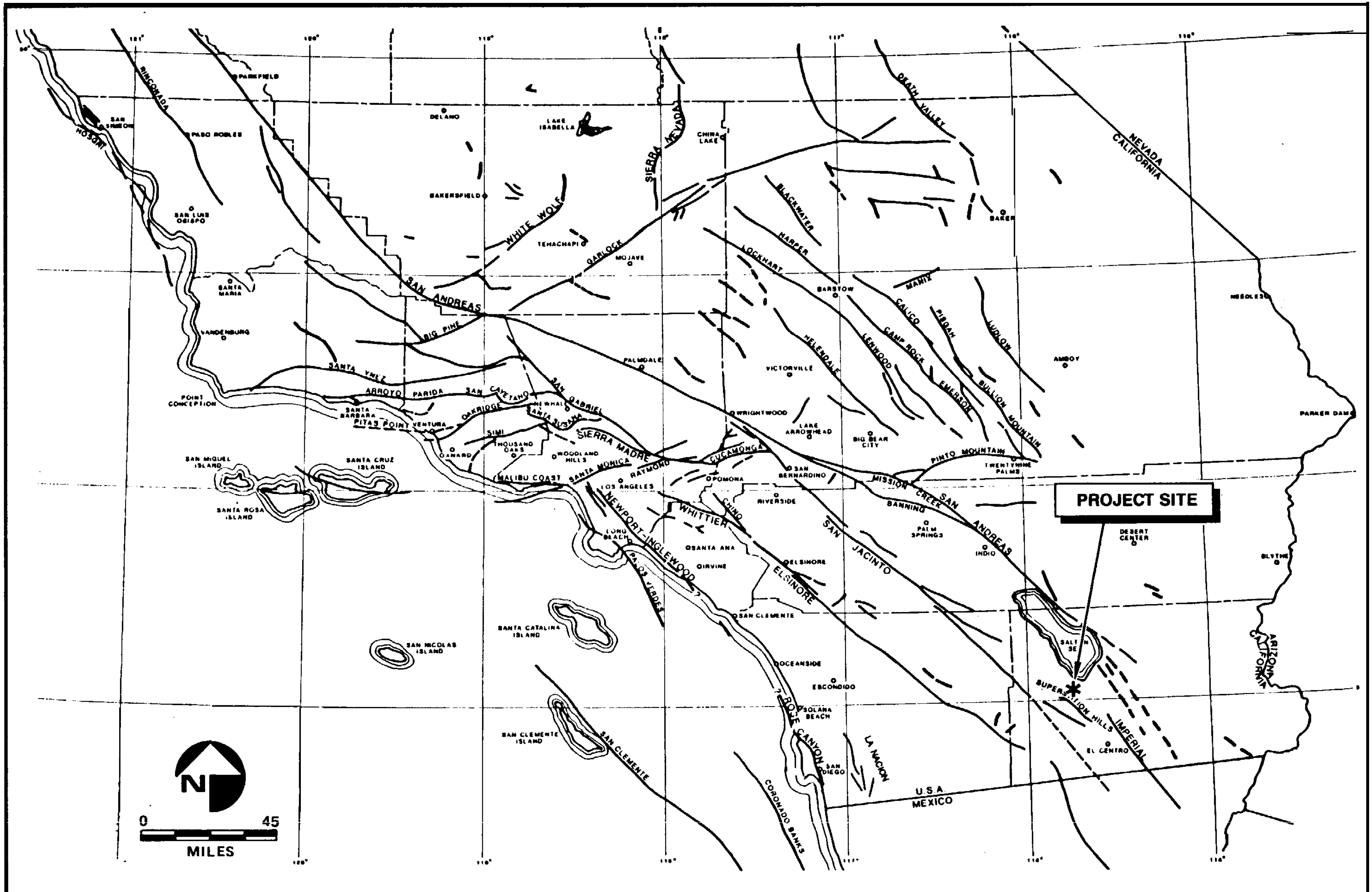
Preliminary geotechnical investigations of the project site were conducted by Targhee (1988). Specific methodology involved literature search, field reconnaissance and mapping, subsurface exploration and sampling, laboratory analysis, and data interpretation. This investigation is summarized below, with the complete text available for review at the Imperial County Planning Department. Additional data sources for the following analysis include: Borchardt 1984; California Division of Mines and Geology (CDMG) 1985; California Institute of Technology (Cal Tech) 1987; Crowell and Sylvester 1979; Elders 1979; Gilmore and Castle 1983; Greensfelder 1974; Hill 1977; Jones and Jones 1987; Kahle et al. 1988; Kleinfelder 1988; McEuen and Pinckney 1972; Morton 1977; Ploessel and Slosson 1974; Real et al. 1979; Seed and Idriss 1970; and United States Geological Service (USGS) 1980.

3.1.1 Geologic Setting

The project site is located within the Salton Trough, a structural basin comprising the northern extension of the Gulf of California Rift Zone (Elders 1979). The Salton Trough consists of a depressed crustal block within a complex plate boundary zone. The primary structural features of this zone are a series of parallel transform faults including the San Andreas, San Jacinto, and Elsinore fault zones (Figure 3-l).

Geomorphically the Salton Trough consists of a low-lying alluvial basin characterized by internal drainage and relatively low relief. Typical stratigraphy incorporates up to 21,000 feet of Late Cenozoic sediments and metasediments deposited primarily by the Colorado River (Gilmore and Castle 1983). Additional sources of sedimentation include wind and lake (lacustrine) deposition and the erosion of adjacent highlands.

The project site is characterized by generally low-lying level topography. Surface elevations range from approximately 40 to 140 feel below mean sea level (MSL), with a slight southwest to northeast gradient across the site.



SOURCE: Jennings, 1975

ERC Environmental and Energy Services Co.

Regional Fault Map

FIGURE

3-1

3.1.2 Stratigraphy

Surface exposures within the project site consist of recent alluvial and eolian (wind derived) deposits, as well as ancient shoreline and lacustrine materials associated with Cahuilla Lake (Figure 3-2). These units overlie a generally unconformable sequence of Quatemary through Paleozoic strata, and may extend locally to depths of up to several hundred feet,

Detailed geologic mapping and cross sections of the project site and vicinity are included in the geotechnical report as Figures 6 through 11 (Targhee 1988). Brief descriptions of surficial units and anticipated underlying strata are provided below in order of increasing age, with additional description located in the geotechnical report

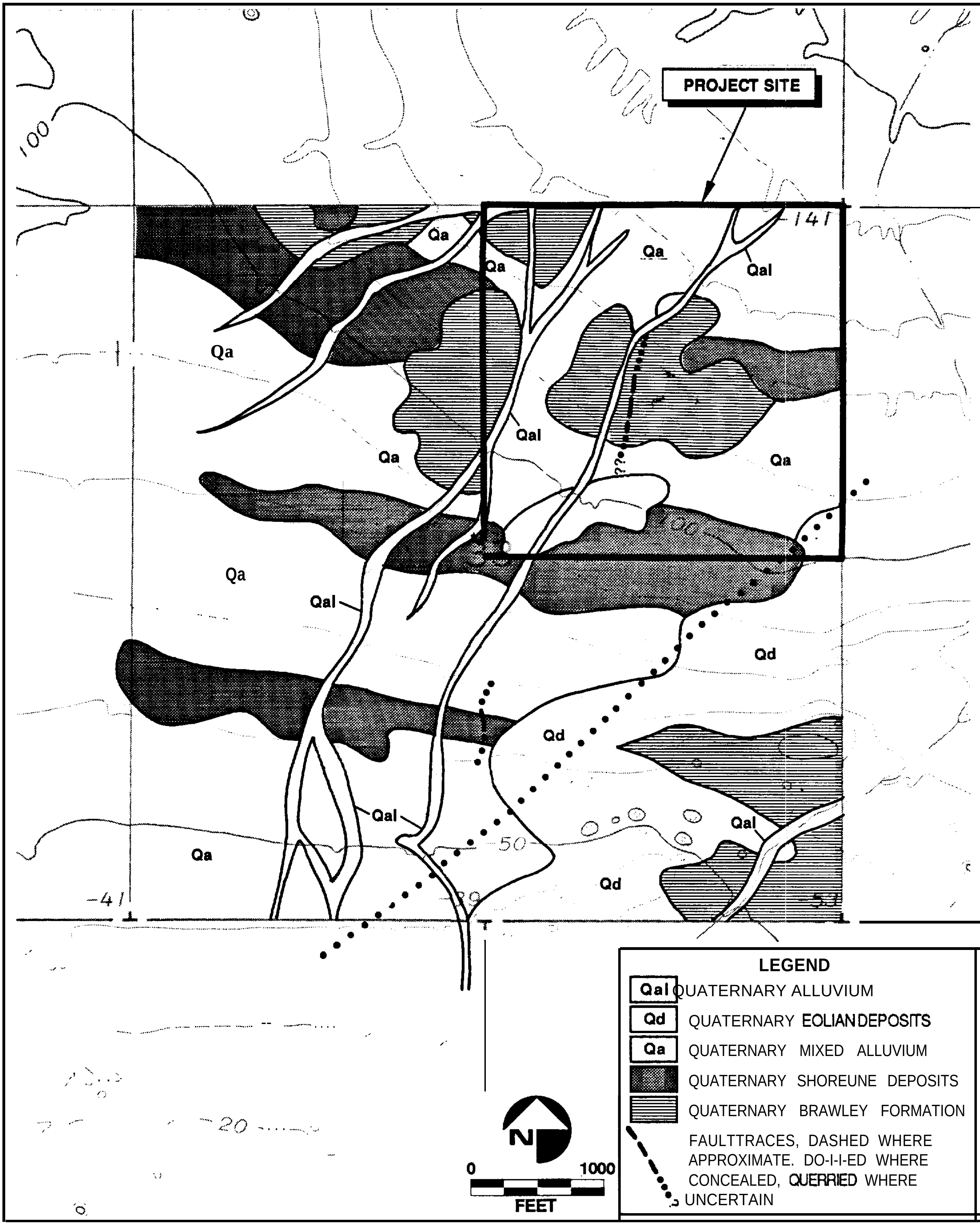
Quaternary AQuaternary'al)lluvium is defined here to include unconsolidated recent silt, sand, and gravel deposits associated with the larger ephemeral stream courses onsite. These deposits are generally limited to several meandering washes which traverse the site from southwest to northeast.

Quaternary Eolian Deposits (Od). Eolian deposits consist of significant accumulations of recent wind blown sand and silt, typically in the form of dunes. Active dune structures incorporating unconsolidated and mobile sand and silt deposits are limited to the extreme southeast comer of the site.

Quatemarv Mixed Alluvium (Oa). Mixed alluvium includes unconsolidated recent silt, sand, and gravel deposits associated with minor washes and sheet flow areas, minor eolian deposits, and less extensive shoreline and lacustrine materials. These materials are widely exposed throughout the project site.

Quatemarv Shoreline Deposits (Os). These deposits consist of unconsolidated sand and gravel ridges associated with Pleistocene/Holocene Cahuilla Lake. Fine material is generally absent and mollusk and gastropod shell fragments are common. Shoreline deposits are present in the southern and east-central portions of the site in the form of low east-west trending ridges.

Quatemarv Brawley Formation (Ob). The Brawley Formation consists locally of interbedded massive silty clay, clayey silt, and fine sand units of lacustrine origin. Relatively small exposures of the Brawley Formation occur throughout much of the project



ERC
Environmental and Energy Services Co.

Simplified Geologic Map of the Project Site and Vicinity

FIGURE

3-2

site, with these strata likely underlying the entire area. Regionally, the Brawley Formation attains a maximum thickness of approximately 2000 feet and has been interpreted as late-Pliocene to mid-Pleistocene in age.

Underlying Units. The project site is underlain by a thick, generally unconformable sequence of primarily nonmarine tertiary sedimentary strata including the Borrego, Palm Spring, and Imperial formations. Unconformably underlying these units are Tertiary volcanic units and Mesozoic granitic basement rocks associated with the southern California batholith. Descriptions of stratigraphic units in the project site vicinity and the Imperial Valley region in general can be found in Morton (1977).

3.1.3 Ground Water

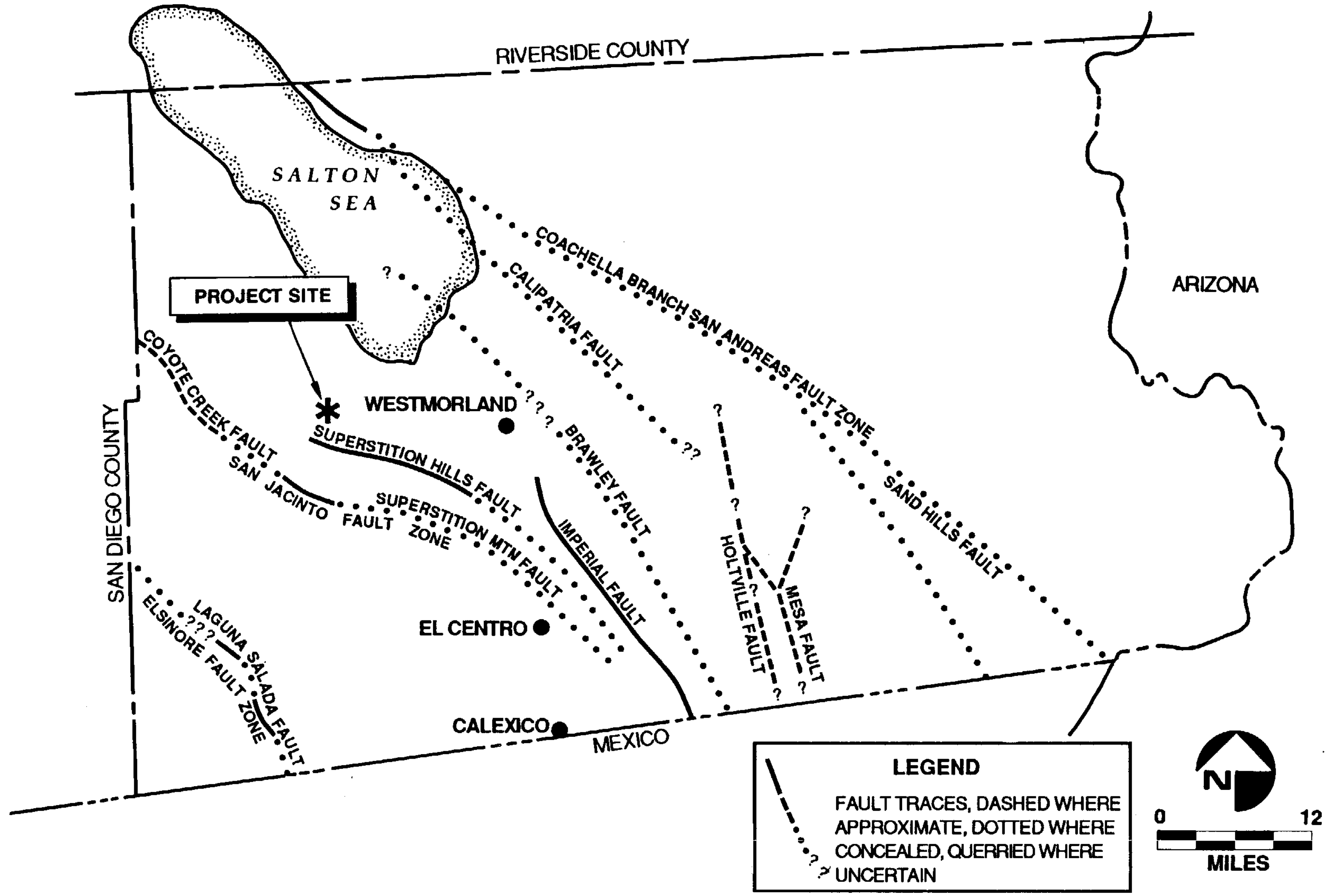
Ground water was encountered in two exploratory borings on the project site during the geotechnical investigation, including two in the immediate vicinity of the proposed storage/disposal facilities. Water levels ranged from 48 to 63 feet below the surface, with observed depths of 53 and 63 feet at two locations considered the most representative of static water conditions (as these areas were allowed additional time to stabilize before measurement). Measurements in other excavations may vary slightly from static water levels due to capillary action and/or confining overlying strata (Targhee 1988).

3.1.4 Structure/Seismicity Setting

3.1.4.1 Structure

The project site is located within the Salton Trough, a structural basin located within a complex plate boundary zone. Prominent structural features of the Salton Trough include a series of generally parallel northwest-southeast trending transform faults, and a number of inferred crustal extension zones located between certain transform faults.

Transform faulting in the Salton Trough region is characterized by strike-slip (horizontal) displacement and a lack of surficial expression (i.e., surface breaks, pressure ridges, offset stream courses, etc.). Some of the more active faults do exhibit surface expression, however, with a number of horizontal and vertical displacements clearly visible. Several active and potentially active faults are located within the project site vicinity as depicted on Figure 3-3. Active faults are defined as those exhibiting historic activity or displacement of



SOURCE; Crowell and Sylvester, Fuis etal. 1984, Jennings 1975, LLL 1975, Morton 1977

ERC Environmental and Energy Services Co.

Generalized Structure of Imperial Valley

FIGURE 3-3

Holocene deposits (i.e., 11,000 years or less in age), while potentially active faults displace Pleistocene (2 million years or less in age) but not Holocene strata (CDMG 1985). Additional descriptions of major active and potentially active faults in the project site vicinity are provided in Tables 3-l and 3-2.

A number of inferred crustal extension or spreading zones are located between portions of the Imperial, Brawley, Calipatria, and San Andreas faults (Figure 3-3). These areas mark complex structural boundaries where extensional forces produce crustal spreading or rifting. This same general phenomena is responsible for the separation of the Baja California peninsula from mainland Mexico, although crustal extension within the Salton Trough is compounded by additional tectonic movement such as uplift, subsidence, tilting, and folding of local strata (Crowell and Sylvester 1979).

Several local Holocene fault traces are also located within the project site and immediate vicinity (Figure 3-2 of this document and Figure 6 of the geotechnical report). These faults are more limited in extent than the regional structures described above, and are generally assigned a lower potential for seismic activity and magnitude. An exception to this is the Elmore Desert Ranch Fault, which apparently comprises a branch of the Superstition Hills Fault (Targhee 1989). This structure trends generally northeast-southwest from the western terminus of the Superstition Hills Fault, and passes within approximately 1 mile east of the project site. The Elmore Desert Ranch Fault has been assigned a maximum credible earthquake magnitude of 7.0 (Table 3-l).

Portions of the Elmore Desert Ranch Fault (3 miles northeast of the project site) and the Superstition Hills Fault (5 miles southwest of the project site) are located within Alquist-Priolo special studies zones. These zones delineate areas of active faults traces, and are established by the CDMG (pursuant to Public Resources Code § 2621 et seq.) to prohibit the location of developments and structures for human occupancy across such faults (CDMG 1985). No Alquist-Priolo special studies zones are located within the project site itself.

Two minor fault traces are located within the project site as depicted in Figure 3-2. Subsurface exploration of these structures identified near-vertical fracturing of Holocene clay beds, although evidence of recent fault movement was limited to offsite areas in the southern portion of Section 33 (Targhee 1989).

Table 3-1

MAJOR REGIONAL FAULTS AND SEISMICITY DATA

Fault	Minimum Distance and Direction from Site (Miles)	Maximum Credible Earthquake[1]	Approximate Peak Ground Acceleration*	Estimated Repeatable High Ground Acceleration3	Estimated Maximum Mercalli Scale Intensity4
Active Faults					
San Andreas	20 Northeast	7.5	0.275	0.180	VIII
Brawley	12 Northwest	7.0	0.290	0.190	VIII
Imperial	18 Southeast	7.2	0.275	0.180	VIII
Superstition Hills (Elmore Desert Ranch)	1 Southeast	7.0	0.60	0.40	IX
San Jacinto (Coyote Creek)	12 Southwest	7.2	0.310	0.20	VIII
Elsinore	25 Southwest	7.5	0.210	0.210	VIII
Poten tiallv Active Faults					
Calipatria	18 Northeast	7.5	0.290	0.190	VIII
Sand Hills	35 East	7.5	0.150	0.150	VII
Superstition Mountain	10 Southwest	7.0	0.360	0.234	VIII-IX
Laguna Salada	25 Southwest	7.25	0.175	0.175	VII-VIII

[1]Richter Magnitude, from Balderman (1989) and Kleinfelder (1988)
*From Greensfelder (1974) and Balderman (1989)
[3]From Ploessel and Slosson (1974)
[4]In association with peak ground acceleration, from USGS (1980); also see Table 3-2

Table 3-2

THE MODIFIED MERCALLI SCALE OF EARTHQUAKE INTENSITIES

If most of these effects are observed	*then the intensity is:*
Earthquake shaking not felt. But people may observe marginal effects of large distance earthquakes without identifying these effects as earthquake-caused. Among them: trees, structures, liquids, bodies of water sway slowly, or doors swing slowly.	*I*
Effect on people: Shaking felt by those at test. especially if they are indoors, and by those on upper floors.	*II*
Effect on people: Felt by most people indoors. Some can estimate duration **of** shaking. But many may not recognize shaking of building as caused by an earthquake; the shaking is like that caused by the passing of light trucks.	*III*
Other effects: Hanging objects swing. ***Structural*** effects: Windows or doors rattle. Wooden walls and frames creak.	*IV*
Effect on people: Felt by everyone indoors. Many estimate duration of shaking, but still may not recognize it **as** caused by an earthquake. The shaking is like that caused by the passing of heavy trucks, though sometimes, instead, people may feel the sensation of **a** jolt, as if **a** heavy **ball** had struck **the walls.** ***Other effects:*** Hanging objects swing. Standing autos rock. ***Crockery*** clashes, dishes rattle or glasses clink. Structural ***effects:*** Doors close, open or swing. Windows rattle.	*V*
Effect on people: Felt by everyone indoors and by most people outdoors. Many now estimate not only the duration of shaking **but also** its direction and have no doubt as to its cause. Sleepers wakened. ***Other effects:*** Hanging objects swing. Shutters or pictures move. Pendulum clocks stop, start or change rate. Standing autos rock. Crockery clashes, dishes rattle or glasses clink. Liquids disturbed, some spilled. Small unstable objects displaced or upset ***Structural effects:*** Weak plaster and Masonry **D*** crack. Windows break. Doors close, open or swing.	*VI*
Effect on people: Felt by **everyone.** many are frightened and run outdoors. People walk unsteadily. ***Other effects:*** Small church or school bells ring. Pictures thrown off **walls, knicknacks** and books off shelves. Dishes or glasses broken. Furniture moved or overturned. Trees. bushes shaken visibly, or heard to rustle. Structural effects: Masonry **D*** damaged, some cracks in Masonry **C*.** Weak chimneys **break** at roof line. Plaster, loose bricks, stones, tiles cornices. **unbraced** parapets and architectural ornaments fall. Concrete irrigation ditches damaged.	*VII*
Effect on people: Difficult to stand. Shaking **noticed** by auto drivers. ***Other effects:*** Waves **on** ponds; water turbid with mud. Small slides and caving in along sand or gravel banks. **Large bells** ring. **Furniture** broken. Hanging objects quiver. ***Structural effects:*** Masonry **D*** heavily damaged; Masonry **C*** damaged. partially collapses in **some** cases; some damage to Masonry **B*;** none to Masonry A*. Stucco and some masonry walls fall. Chimneys, factory stacks, monuments, towers, elevated **tanks** twist or fall. Frame houses **moved** on foundations if not bolted down; loose panel walls thrown out. Decayed piling broken off.	*VIII*
Effect on people: . General fright. People thrown **to ground.** ***Other effects: Changes in flow or* temperature** of springs and **wells.** Cracks in wet ground and on steep slopes. Steering of autos affected. Branches broken from trees. ***Structural effects:*** Masonry **D*** destroyed; Masonry **C*** heavily damaged, sometimes with complete collapse; Masonry B* is seriously damaged. General damage to foundations. Frame structures, if not bolted, shifted off foundations. Frames racked. Reservoirs seriously damaged. Underground pipes broken.	*IX*
Effect on people: General Panic. ***Other effects:*** Conspicuous **cracks in** grotmd. In areas of soft **ground,** sand is ejected through holes and piles up into a small crater, and, in muddy areas, water fountains **are** formed. ***Structural effects: Most*** masonry and frame structures destroyed along with their foundations. Some well-built wooden structures and bridges destroyed. Serious damage to dams, dikes and embankments. Railroads bent slightly.	X
Effect on people: General panic. Other effects: Large landslides. Water thrown on banks of canals, rivers, lakes. etc. Sand and mud shifted horizontally on **beaches and flat land.** ***Structural effects:*** General destruction of buildings. Underground pipelines completely out of service. Railroads bent greatly.	*XI*
Effect on people:* General** panic. Other ***effects: Same as for Intensity X. ***Structural effects:*** Damage nearly **total,** the ultimate catastrophe. Other ***effects:* Large *rock* masses displaced.** Limes of sight and level distorted. Objects thrown into air.	*XII*

***Masonry** A:	Good workmanship and mortar, reinforced, designed- to resist lateral forces.
*Masonry B:	Good workmanship and mortar, **reinforced.**
*Masonry C.	Good workmanship and mortar, unreinforced.
***Masonry** D:	Poor workmanship and 'mortar and **weak** materials, like adobe.

3.1.4.2 Seismicity

The Salton Trough is one of the most seismically active regions in the world. Perceptible earthquakes (Richter magnitude of approximately 3.0 and above) are a regular occurrence and numerous microearthquakes (Richter magnitude of 2.9 or less) are recorded daily (Cal Tech 1987).

Seismicity in the Salton Trough is generally characterized by two types of activity: mainshock-aftershock sequences (i.e., large-scale seismic events) and earthquake swarms. Earthquake swarms typically consist of a few tens to a few hundred low magnitude events occurring very close together in time and space. Swarms are not associated with large seismic events, but rather may be attributable to shear stress related to the emplacement of magnetic dikes in areas of crustal extension (Hill 1977). Current evidence suggests that both large-scale and earthquake swarm activity can occur along the same structure (as demonstrated by events along the Imperial Fault), although larger earthquakes are normally located on major faults and swarms tend to occur along parallel offset faults associated with inferred areas of crustal extension (Elders 1979).

Large-scale events (i.e., other than swarm-type earthquakes) often occur in mainshock-aftershock sequences, with the second earthquake (aftershock event) averaging approximately one magnitude less than the first (mainshock event). From 1852 to 1988, at least 27 earthquakes with estimated Modified Mercalli intensities of VI or greater have occurred within the Salton Trough (Kahle et al. 1988, Cal Tech 1987, Real et al. 1979, McEuen and Pinckney 1972).

The most recent major earthquakes (6.0 or greater in magnitude) in the Salton Trough region occurred in November 1987 along the Elmore Desert Ranch and Superstition Hills faults. These events generated magnitudes of 6.2 (1 1/23/87, Elmore Desert Ranch Fault) and 6.6 (1 1/24/87, Superstition Hills Fault), located approximately 2 and 5 miles south of the project site, respectively. It is estimated that these events produced nearby peak ground accelerations of over 0.5 g (Targhee 1988, see discussion on ground acceleration below under Geologic Hazards), with associated Modified Mercalli intensities of VIII or IX (Table 3-2). It is anticipated that similar earthquakes would be capable of producing significant effects on the project site (Table 3-2). Because of the proximity and earthquake potential of the Elmore Desert Ranch and Superstition Hills faults, they are considered the most likely source of maximum potential seismic impacts on the project site. .A number of other major fault structures are located in the project site vicinity and could generate significant seismic effects. The location and earthquake potential of selected major faults within the project site region are summarized in Table 3-l.

3.1.5 Existing Geologic Hazards

Existing geologic hazards associated with the project site include seismicity and geologic and soil stability as described below.

3.1.5.1 Seismic Hazards

The area is within an active seismic region subject to regular earthquake events, resulting in potential seismic hazards as described below.

Ground Rupture. Seismically-induced ground rupture is defined as the physical displacement of surface deposits in response to earthquake-generated seismic waves. Recent ground rupture was not observed on the project site during geotechnical investigation (Targhee 1988). The potential for seismic activity (and ground rupture) originating on faults within the site is considered low due to their small extent. Ground rupture may occur along project area faults, however, in response to activity along larger regional structures. The November 1987 earthquakes along the Superstition Hills Fault produced surficial ground rupture along a number of nearby structures, including the Elmore Desert Ranch Fault and several small unnamed faults west and south of the project site (Targhee 1988, Kahle et al. 1988).

Ground Acceleration. Ground acceleration is an estimation of the peak bedrock or ground motion associated with a specific earthquake event. It is expressed in terms of "g" forces, where "g" equals the acceleration due to gravity. Acceleration can be measured directly from seismic events or calculated from magnitude and fault distance data. Calculated ground acceleration parameters for the project site from maximum credible and probable earthquakes along selected faults are given in Table 3-l. Estimated Modified Mercalli intensities (derived from ground acceleration values) associated with these earthquake events are also listed in Table 3-l. Severe or extended ground accelerations can produce a variety of adverse structural effects, as described in Table 3-2. Potentially significant adverse effects from ground acceleration would be associated primarily with major earthquakes along regional faults (Table 3-l). Large earthquakes along more extensive faults (e.g., the San Andreas Fault Zone) can produce ground accelerations with longer wavelengths and durations than smaller faults, even though the latter structures may be closer and thus generate greater peak acceleration values. Both the wavelength and duration of seismic waves can contribute to the destructive potential of individual earthquake events.

Based on observed and calculated data, the maximum anticipated ground acceleration value on the project site is projected as 0.60 g associated with a magnitude 7.0 event along the proximal extent of the Elmore Desert Ranch Fault (Targhee 1989). Such an event would likely generate Modified Mercalli intensities of IX or more, potentially resulting in a variety of adverse effects (Table 3-2).

Liquefaction and Dynamic Settlement: **Liquifaction** and dynamic settlement of unconsolidated materials can be caused by a strong vibratory motion resulting from seismic activity. Loose, granular soils are most susceptible to those effects, while the stability of silty clay and clay materials is generally not as affected by vibratory motion. Among granular materials, finer textured varieties are more susceptible to liquefaction and settlement than coarse-grained types, and sediments of uniform grain size are more likely to liquefy than well-graded materials. Additionally, liquefaction is generally restricted to saturated or near-saturated materials at depths of less than 100 feet (Seed and Idriss 1970).

Preliminary analysis indicates that most portions of the project site expose or are underlain by clayey deposits which are not readily susceptible to liquefaction and settlement impacts. Local exposures of sandy alluvial and/or eolian materials, however, may represent isolated areas of greater liquefaction and dynamic settlement potential.

Landsliding. Seismically-induced landsliding is not considered a significant hazard on the project site due to the predominantly level topography.

3.1.5.2 Nonseismic Hazards

Nonseismic geologic hazards include a number of potential physical and chemical effects such as compaction, expansion, erosion, and reactive soils.

Compaction. Loose, well-graded soils (especially those containing oversize materials) can be subject to compaction and settlement hazards, including differential compaction (i.e., varying degrees of settlement over short distances). These effects are often accentuated by cut and fill operations, and are a critical concern in terms of structural integrity. A number of mechanisms may produce compaction effects including tectonic subsidence, hydrocompaction (saturation of dry unconsolidated sediments), significant withdrawal of fluids from porous media, or collapse into natural or man-made subsurface cavities. Preliminary investigation of the project site noted mostly firm, equigranular sediments not likely to be subject to significant compaction and settlement hazards (Targhee 1988).

Expansion.iments encountered during preliminary geotechnical investigation contain significant quantities of clay (Targhee 1988). These materials may exhibit expansive (shrink-swell) characteristics due to the water-holding capacity of clay minerals. Significant shrink-swell behavior can adversely affect the integrity of foundations, fill slopes, and associated structures.

Erosion. Erosional processes in the project site and vicinity are related primarily to storm runoff and eolian activity. Runoff on the site is largely confined to a number of small ephemeral drainages trending generally northeast-southwest. Channel walls and banks in these washes are subject to erosional impacts during larger storm events due to their often intensive nature. Some erosional effects may also occur outside of drainage channels as a result of sheet flow runoff. Such impacts would be expected to be minor, however, due to the presence of generally level topography and cohesive surficial deposits.

Eolian-generated erosion is associated with the occurrence of seasonally high wind speeds in the project vicinity. Finer grained silt, sand, and clay materials are susceptible to transport and redeposition by high winds, especially if disturbed by grading, vehicular travel, etc.

Reactive Soils. Surficial deposits on the project site are ostensibly alkaline in nature and may contain soluble sulfates and chlorides and/or exhibit low resistivity. Soils with these characteristics can produce corrosive effects to subsurface facilities such as steel or concrete foundations and pipelines. No such effects are currently known in the project site vicinity.

3.1.6 Geologic Impacts

The proposed storage/disposal facility was designed in conformance with the requirements for Class II waste management units listed in California Administrative Code

Sections **2530-32** and will exceed Class II requirements. These statutes require the following design parameters related to geology/seismicity:

- Underlying natural geologic units must exhibit permeability of not more than 1 x 10^{-6} cm/sec.
- Storage/disposal facilities must be set back a minimum of 200 feet from all active fault traces.
- Units must be designed, constructed, and maintained to preclude failure from "rapid geologic change." This phrase is defined in the regulations as "alteration of the ground surface through such actions as landslides, subsidence, and faulting."
- Units must be designed, constructed, and maintained to preclude failure from tsunamis (tidal waves).
- All wastes must be located a minimum of 5 feet above the highest anticipated elevation of underlying ground water.

The preliminary geotechnical investigation did not identify any impacts that would preclude development of the proposed project, although a number of potentially significant impacts were noted. These related to seismicity, geologic and soil stability, and the presence of local ground-water reservoirs. The following evaluation of these potential effects incorporates the described regulatory design requirements for Class II waste management units.

3.1.6.1 Seismic Hazard Impacts

Ground Rupture. Geotechnical analysis of the project site involved a number of subsurface excavations designed to identify and date potential fault structures on the project site. These investigations documented the presence of 3 active (Holocene) fault traces within Section 33, including one structure which was previously unmapped (Figure 3-2 and Targhee 1988). This previously unknown fault is located within the project site, adjacent to the proposed location of the storage/disposal cells. Pursuant to California Administrative Code requirements, proposed siting of these facilities has been set back 200 feet from the trace of the subject fault. Additional subsurface exploration did not identify any evidence of faulting for a distance of over 1000 feet to the east of the subject fault (Targhee 1988). Accordingly, it is concluded that no active fault traces are located within 200 feet of the proposed project facilities, and no significant effects associated with ground rupture are anticipated.

Ground Aċ -. Anticipated peak ground accelerations for maximum credible earthquakes along major faults in the project site vicinity are listed in Table 3-l. The maximum peak ground acceleration anticipated for the site is 0.60 g associated with a 7.0 magnitude earthquake along the Elmore Desert Ranch segment of the Superstition Hills Fault. Such an event would be expected to result in Modified Mercalli intensities of approximately IX, which could result in significant damage to reservoirs, embankments, and underground facilities (Table 3-2). The proposed structures incorporate the use of sloped embankments and subsurface drainage and liner facilities which may be subject to such potential impacts.

An additional potential concern involves the concept of repeatable high ground accelerations on the project site. Evaluation of repeatable high ground acceleration involves consideration of the full extent of ground acceleration values and durations (as opposed to a single high peak). The basic rationale for inclusion of repeatable high ground acceleration in the evaluation of seismic effects is that a single peak of intense motion (peak acceleration) may contribute less to cumulative damage potential than several cycles of less intense shaking (Ploessel and Slosson 1974). Repeatable high ground acceleration is generally given as 65 percent of peak acceleration values for areas within 20 miles of an earthquake epicenter and approaching 100 percent at greater distances (Ploessel and Slosson 1974). Estimated repeatable high ground accelerations for maximum credible earthquakes along major faults in the project site vicinity are listed in Table3- 1.

Liquefaction and Dynamic Settlement. No significant effects related to liquefaction and dynamic settlement are anticipated for the proposed project facilities due to the clay content of most surficial and underlying deposits in the vicinity. In the event that localized granular cohesionless materials (e.g., in alluvial washes) are encountered during project implementation, a number of standard measures are available (e.g., overexcavation and replacement with structural till) to mitigate potential liquefaction and dynamic settlement impacts below levels of significance. These measures would be identified during grading or construction by the geotechnical consultant (see Mitigation Measures).

Landsliding. No significant effects related to seismically-induced landsliding are expected from implementation of the proposed project due to the generally level nature of onsite topography. The proposed facilities do, however, incorporate a number of sloped embankments which are potentially subject to seismically-induced failure. Proposed design parameters include measures to mitigate these potential effects such as the use of approved and properly compacted fill (per direction by the geotechnical engineer), and incorporation of additional stabilizing techniques (e.g., buttressing or concrete facing) to meet seismic design specifications (see Mitigation Measures). Assuming these methods are properly implemented, no significant effects to proposed embankments are expected in response to seismic loading.

Tsunamis and Seiches. The proposed facilities would not be subject to impacts from tsunamis (tidal waves) due to their inland location.

Earthquake-induced seiches are the result of seismic waves producing massive wave-like or oscillatory movement in restricted bodies of water such as bays or lakes. The only sizeable body of water in the project vicinity is the Salton Sea, located approximately 4 miles northeast of the site. Because of this distance and the associated difference in elevation (the project site is approximately 100 feet higher in elevation than theSalton Sea) no impacts from seiches in the Salton Sea are expected.

The storage/disposal facilities themselves will not contain free liquid and thus are not subject to seiche effects.

3.1.6.2 Nonseismic Hazard Impacts

Compaction. No significant impacts related to compaction are anticipated from project implementation due to the generally firm, equigranular nature of most onsite sediments. If localized areas susceptible to compaction are encountered during grading or construction activities, it is anticipated that these potential effects can be mitigated through standard construction techniques (e.g., overexcavation and replacement with compacted structural fill) per direction by the geotechnical engineer (see Mitigation Measures).

Expansion. Project facilities may be subject to the effects of expansive soils due to the clayey nature of most surficial materials onsite. Design criteria for the proposed project include the requirement that underlying geologic materials have permeabilities of 1 x 10^{-6} cm/sec or less (Targhee 1988). This essentially restricts such underlying strata to clays, which may be subject to expansive behavior as described above. Because of the necessity to locate Class II waste management units in areas underlain by clay deposits, possible mitigation for expansive effects excludes the standard practice of removal and replacement with nonexpansive fill. A number of other potential methods are available, however, to reduce expansive behavior below levels of significance. These include techniques for soil moisture control (whereby moisture is prevented from moving into or out of expansive materials) to maintain constant moisture contents, and the addition of chemical stabilizing or cementing agents (Borchardt 1984, Jones and Jones 1987). The use of these techniques would require site-specific investigation and design by a qualified geotechnical consultant to ensure both mitigation of expansive effects and retention of required permeabilities. The preliminary geotechnical investigation did not identify expansive behavior as a potential problem in facility design or implementation. This issue should, however, be investigated and the result incorporated into final project design (see Mitigation Measures).

Erosion. The proposed project facilities may be subject to both fluid and wind erosion impacts. Specifically, the site of both the proposed storage/disposal facilities and the associated access road are crossed by minor drainage channels. Storm runoff in these channels could result in erosion of disturbed areas, road foundations, fill slopes, etc. The proposed project design incorporates measures to mitigate these potential effects, including the use of a protective berm to divert runoff around storage/disposal facilities, excavation of a borrow ditch on the up-slope side of the access road, and construction of the road at channel bottom elevation (to avoid the use of culverts or bridges) within crossings. Further protection at road/drainage crossings will be provided by the use of concrete aprons at the crossing banks and channel bottoms.

Disturbed areas of the project site may be susceptible to wind erosion impacts as described under existing conditions.

Reactivity. If reactive soils are present onsite they may pose significant adverse effects to certain proposed facilities, such as subsurface pipelines, foundations, or leachate systems. The potential for corrosive soils should be investigated by a qualified geotechnical consultant and the results incorporated into final project design. If reactive soils are encountered, it is anticipated that any potential impacts could be mitigated below levels of significance by utilizing standard construction techniques (such as the use of corrosion resistant materials).

Permeability. As described above under Expansion and Existing Conditions, the California Administrative Code requires that natural geologic materials underlying Class II waste management units exhibit permeability values of 1 x10^{-6} cm/sec or less. The preliminary geotechnical investigation of the site identified a thick (minimum 20-foot) underlying layer of silty clay classified as CH (inorganic clays of high plasticity) in the Unified Soils Classification System. Clays of this type typically exhibit permeabilities of less than 1 x 10^{-7} cm/sec, which would satisfy California Administrative Code requirements for the proposed project facilities.

Ground-water Depth. California Administrative Code requirements for Class II waste management units stipulate that all wastes must be located at least 5 feet above the highest anticipated elevation of underlying ground water. The preliminary geotechnical investigation of the site encountered ground water at depths ranging from 48 to 63 feet below the surface, with static ground water depths estimated at 53 to 63 feet (Targhee 1988). This depth of ground water would satisfy California Administrative Code requirements within the proposed design scenario.

3.1.7 Mitigation Measures

The proposed project incorporates a number of design features intended to meet the California Administrative Code requirements for Class II waste management units and to mitigate potential impacts identified during preliminary geotechnical investigation. A number of additional measures are identified below which will be incorporated into project design/approval to ensure adequate impact mitigation. Several of these relate to and/or will be supplemented by detailed geotechnical analysis conducted as part of grading/construction activities. Assuming all identified measures are properly implemented, it is anticipated that the proposed project will not result in significant unmitigated impacts related to geology, seismicity, or geologic hazards.

- Final project design shall comply with all California Administrative Code, Title 24, Uniform Building Code, and RWQCB and County of Imperial standards regarding the nature, location, and construction of proposed facilities.

- Project design shall incorporate peak ground acceleration loading values of 0.60 g unless modified recommendations are provided by the geotechnical consultant.

- Final project design shall incorporate all measures deemed appropriate by the geotechnical engineer on the basis of existing and future site-specific investigations. Additional analysis of the project site should be conducted to evaluate potential impacts associated with repeatable high ground acceleration, localized liquefaction potential, expansive and reactive soils, and wind generated erosion. Mitigation measures derived from these analyses may include the following types of requirements:

  - Overexcavation of unsuitable base materials and replacement with approved and properly compacted structural fill.

  - Use of moisture, chemical, engineering, and/or drainage methods to control expansive behavior of underlying clay soil, if appropriate.

  - Use of nonsteel or coated (usually polyethylene encasement) steel conduits, sulfate resistant cement, or other protective materials in areas of corrosive soils.

  - Appropriate design of fill slopes associated with berms, storage/disposal facilities, building pads, etc., to minimize potential seismically induced landsliding. This may include measures such as establishing maximum slope grades and the use of stabilizing materials or buttressing.

  - Proper design of surface and subsurface drainage devices.

  - Initiation of settlement monitoring if appropriate.

  - Appropriate design, location, and construction of erosion control methods and devices.

  - Scarification of all compacted areas to reduce erosion potential.

- Identification of appropriate wind erosion mitigation measures (if necessary) such as the use of chemical or physical stabilizers, appropriate operating schedules, etc.

3.2 HYDROLOGY/ WATER QUALITY

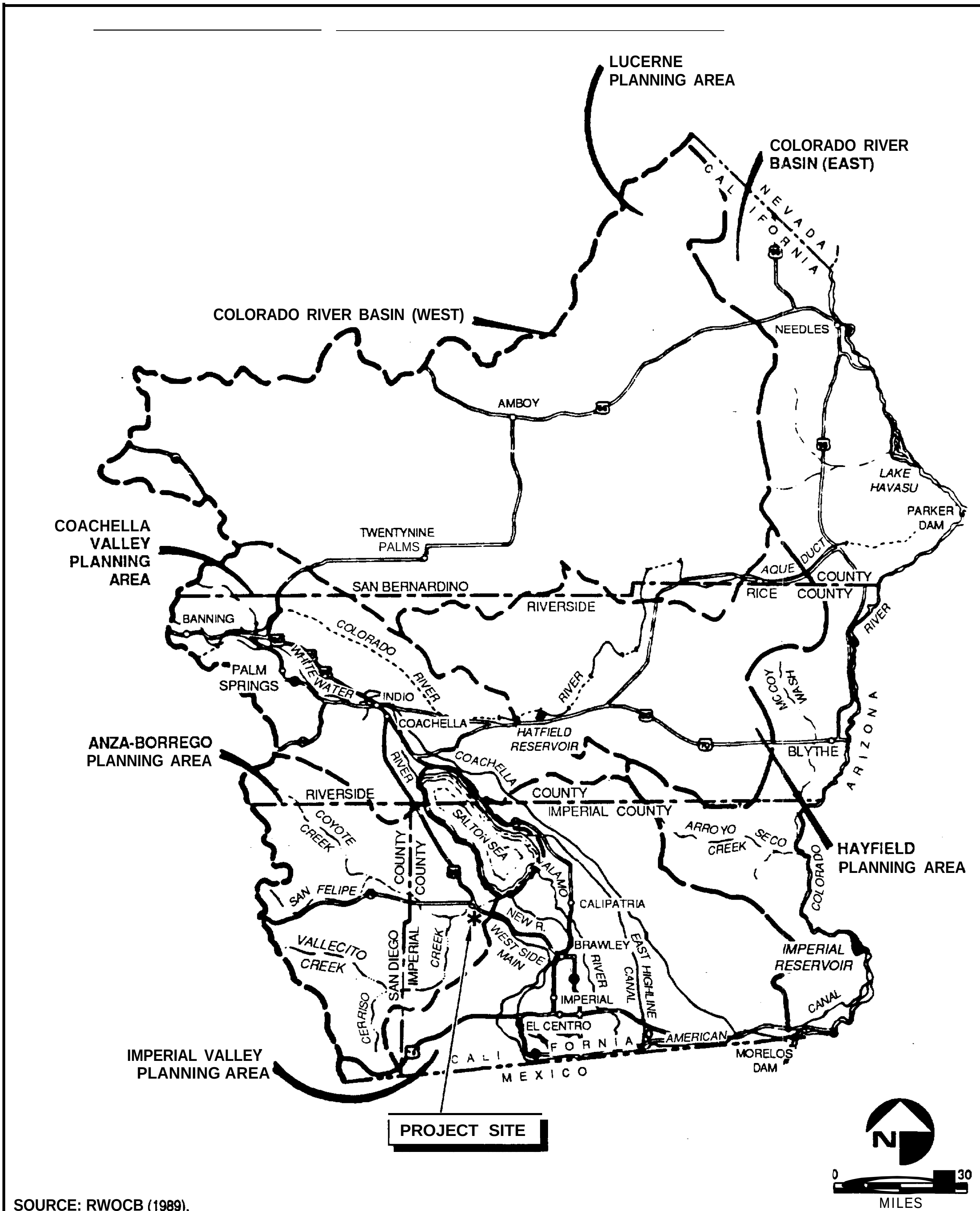
Preliminary hydrological analyses of the project site were conducted as part of the Conditional Use Permit Application (Targhee, Inc. 1988) and geotechnical investigation described in Section 3.1. These analyses involved literature search, floodplain mapping, subsurface (groundwater) exploration, and data interpretation. The results and recommendations of these hydrologic investigations are included in the proposed project design in the form of facilities such as protective berms, multi-layered liners, and dual leachate collection systems (see Section 2, Project Description). The hydrologic investigations of the project site are summarized below. Additional data sources utilized for the following evaluation include: California Regional Water Quality Control Board (RWQCB) (1984), County of Imperial (1985, 1973), Imperial Irrigation District (1988), and WESTEC Services, Inc. (1988, 1979).

3.2.1 Hydrologic Setting

3.2.1.1 Surface Water

The project site is located within the Anza-Borrego Planning Area of the West Colorado River Basin, one of 16 statewide hydrographic planning units established by the State Water Resources Control Board (Figure 3-4). Much of the basin's interior drainage flows into the Salton Sea, an artificial saline lake formed as a result of agricultural diversion from the Colorado River.

Surface drainage in the project site vicinity flows to the Salton Sea through a number of generally intermittent stream courses including San Felipe Creek and Carrizo Wash. The San Felipe Creek is in a separate drainage area from the immediate project site. Portions of San Felipe Creek near the Salton Sea exhibit perennial flow, likely as a result of locally shallow groundwater tables. Average runoff volume in San Felipe Creek (northeast of the



SOURCE: RWQCB (1989).

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Colorado River Basin Region Planning Areas

FIGURE 3-4

project site) over a lo-year period ending in 1983 was 3,150 acre-feet per year* (RWQCB 1984).

Average annual precipitation in the project site region is generally less than three inches, and occurs primarily during infrequent summer thunderstorms (RWQCB 1984). Individual storm events are often intense in nature, however, and combine with generally low infiltration rates to produce rapid (often sheeted) overland runoff flows into low-lying drainages.

Drainage within the project site and immediate vicinity occurs through a number of small intermittent stream channels flowing generally southwest to northeast. The project site as a whole slopes gently to the northeast and comprises part of an alluvial fan structure derived from the Superstition Hills to the south. A relative topographic high in the southeast comer of Section 33 splits the majority of runoff flowing from the south. Runoff flowing east is routed completely around the project site, while runoff moving west turns back to the northeast through Section 33 (Figure 3-5). Much of this runoff flows through two primary intermittent washes which traverse the western portion of the project site. These drainages are braided in nature, with several smaller washes located in the area of proposed construction. Onsite drainage courses are relatively small in size, with maximum depths of approximately 3.5 feet for narrow washes and 1 to 1.5 feet for channels exceeding 20 feet in width (Targhee, Inc. 1988).

Floodplain mapping of the project site vicinity has been conducted by the Federal Emergency Management Agency (FEMA). Identified 100-year floodplains in the region are associated primarily with San Felipe Creek and its larger tributaries in areas north and west of the site. No mapped 100-year floodplains extend into the project site, with the closest such floodplain located approximately one mile to the west along an unnamed tributary to San Felipe Creek (Targhee 1988). Portions of the project site are considered subject to flooding hazards, however, due to the intense and often sheeted nature of local storm runoff. The 24-hour PMP storm flow values anticipated within the area for the Monofill is 13.3 inches or approximately 328 cubic feet per second (cfs), or around 147,236 gallons per minute (gpm) (see Figure 3-5) (DOW Chemical 1989).

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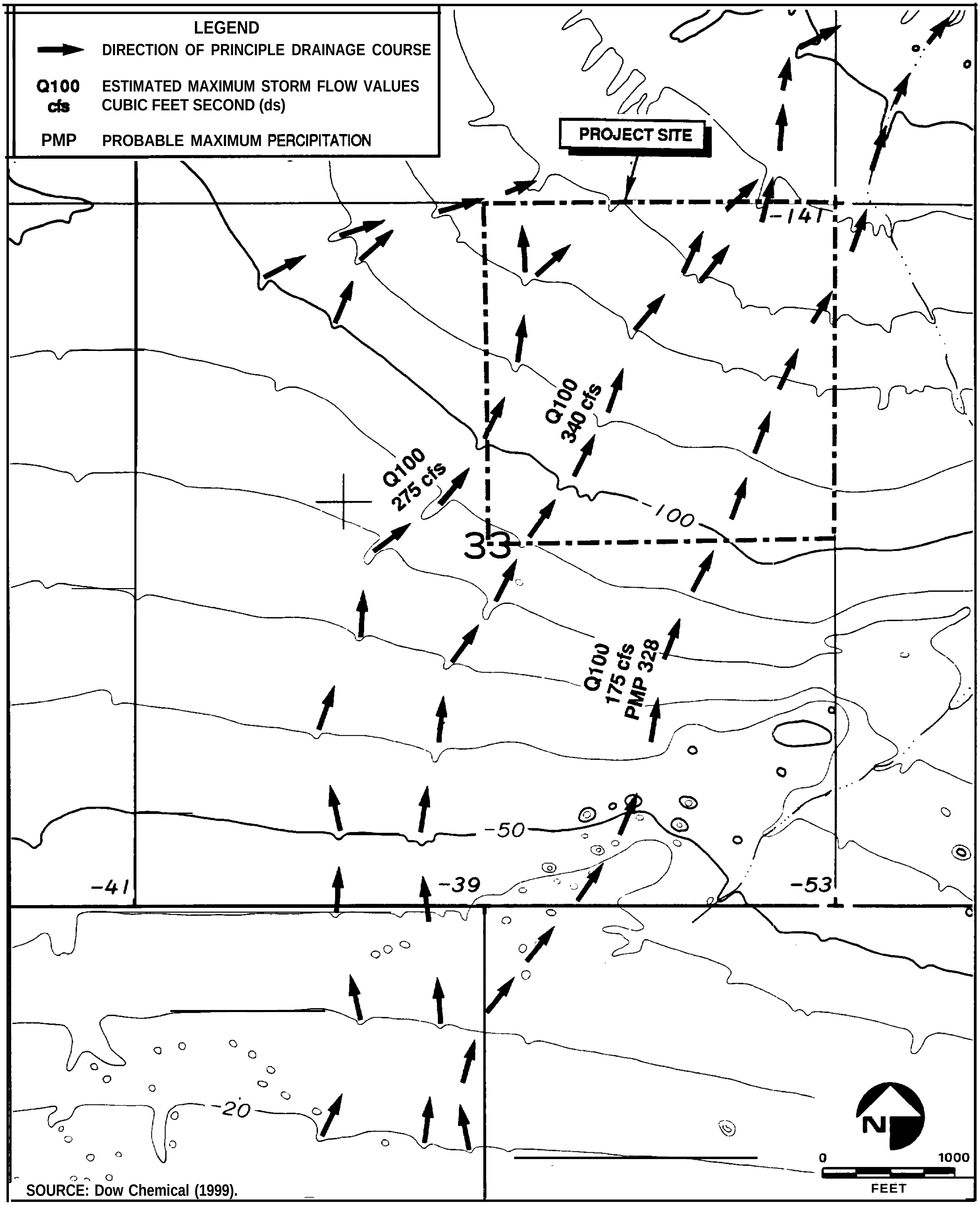
* One acre-foot equals the volume of water necessary to cover an area of one acre with one foot of water, or approximately 326,000 gallons.



SOURCE: Dow Chemical (1999).

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Existing Drainage Patterns and Volumes within the Project Site Vicinity

FIGURE 3-5

3.2.1.2 Groundwater

The Imperial Valley region is underlain by a thick sequence of predominantly Cenozoic sedimentary deposits which extend locally to depths of over 20,000 feet. The upper portion of this sequence consists of several thousand feet of generally non-marine Pliocene and Quatemary age strata which encompass the major groundwater aquifers in the region. Total regional groundwater reserves are estimated at 1.1 to 3 billion acre-feet, including deep, high-temperature geothermal brines. Total recoverable groundwater is estimated at approximately 20 percent of reservoir volume (County of Imperial 1985).

Total annual groundwater recharge in the Imperial Valley region is approximately 400,000 acre-feet, with the majority derived from the infiltration of agricultural irrigation (County of Imperial 1985). Natural groundwater recharge within the Imperial Valley region is derived primarily from the Colorado River, which provides approximately 17,000 acre-feet per year. Recharge also occurs in natural drainages through direct infiltration of storm runoff, although the quantities involved are relatively minor.

The project site and vicinity are located within the Ocotillo and Lower San Felipe groundwater subunits of the Anza-Borrego Hydrologic Planning Area. The movement of shallow groundwater in these areas generally parallels surface flow, trending northeast to the Salton Sea. Groundwater movements may be locally affected by pumping and geologic structure, however, resulting in variable flow characteristics. Approximately 10,000 acre-feet per year of subsurface flow reaches the Salton Sea within the Anza-Borrego Planning area. Groundwater storage capacity in the Anza-Borrego Planning Unit is estimated at seven million acre-feet, with safe yield given at approximately 22,000 acre-feet per year (RWQCB 1984).

Existing groundwater development in the project site vicinity is limited to two upgradient wells located approximately 5 to 6 miles west: Harper's Well (state well number 125/10E-26M) and the Mesquite Drill Hole (125/10E-34G). Both wells are located along Kane Springs Road and apparently have not been used for several years (Targhee 1988). Harper's well is reportedly 320 feet deep and exhibited a water level of 3.4 feet below surface grade (elevation - 118.4 MSL) in September 1962. The Mesquite drill hole is approximately 26 feet deep, with free water reported at 21.6 feet below the surface (elevation -116.6 MSL) in September 1962 (Targhee 1988).

A total of twelve bucket auger borings were drilled to depths of 20 to 65 feet on the project site during preliminary geotechnical excavation (Targhee 1988). Groundwater was encountered in 5 of these borings at depths ranging from 48 to 63 feet below the surface (Table 3-3). Water levels measured in boring numbers B-l and B-9 are considered the most representative of static water conditions, as they were measured the day after drilling allowing additional time for stabilization. Other observed water levels may vary slightly due to capillary action and/or confinement by impermeable strata (Targhee 1988). The location and contouring of measured groundwater levels in the project site vicinity are shown in Figure 3-6.

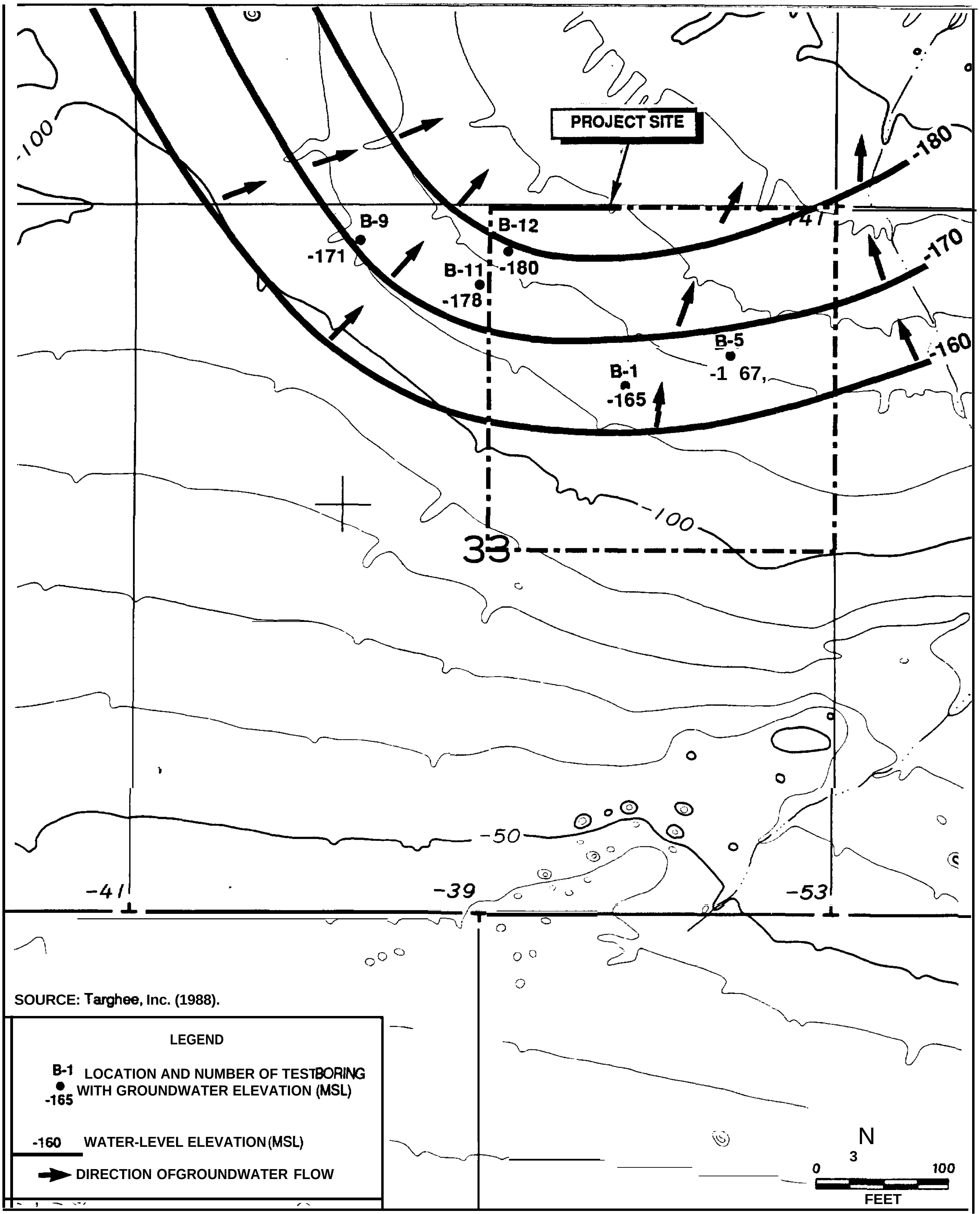
Table 3-3

OBSERVED GROUNDWATER LEVELS ON THE PROJECT SITE

Boring Number	Depth to Groundwater (feet)	Approximate Elevation (MSL)
B-l	53	-165
B-5	48	-167
B-9	63	-171
B-11	63	-178
B-12	58	-180

3.2.1.3 Water Quality

Surface water in the project site vicinity includes storm runoff and minor perennial flows. Intermittent storm flows tend to be of relatively short duration and high intensity, resulting in generally high total dissolved solid (TDS) levels and poor water quality. Existing and potential beneficial uses for surface water in San Felipe Creek include agriculture, groundwater recharge, recreation, and wildlife habitat (RWQCB 1984), although no known quantitative information is available. It is assumed that these surface flows are derived chiefly from shallow groundwater tables due to the lack of sufficient local precipitation or agricultural irrigation to sustain perennial flows. Water quality parameters would thus likely be similar to those described below for local groundwater aquifers,



SOURCE: Targhee, Inc. (1988).

LEGEND

B-1 -165 LOCATION AND NUMBER OF TEST BORING WITH GROUNDWATER ELEVATION (MSL)

-160 WATER-LEVEL ELEVATION (MSL)

DIRECTION OF GROUNDWATER FLOW

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FIGURE 3-6

Location and Elevation of Site Vicinity Groundwater Borings with Simplified Groundwater Countours and Flow Direction although this relationship could be altered by the occurrence of locally perched water tables or other structural complexities.

The project site and vicinity are underlain by the Ocotillo and Lower San Felipe groundwater subunits (RWQCB 1984). These basins do not receive substantial infiltration from agricultural runoff (as described for other portions of Imperial Valley), and consequently exhibit generally good water quality. Existing and potential beneficial uses for groundwater in the Ocotillo and Lower San Felipe subunits include municipal, industrial, and agricultural applications (RWQCB 1984). Table 3-4 provides qualitative data for groundwater resources within the project site. Groundwater within the project site generally exhibits poorer water quality than in the Ocotillo and Lower San Felipe subunits.

Both surface and groundwater flow from the project site vicinity move northeast into the Salton Sea. This salty lake also receives substantial agriculturally derived runoff and groundwater influx, resulting in generally poor water quality due to the concentration of chemicals, nutrients, etc. (Table 3-5).

3.2.2 **Impacts**

3.2.2.1 Surface Water

The proposed project would alter existing drainage patterns on the project site and the associated access road through grading and construction activities. Potential impacts from the proposed project related to surface water include increased on- and offsite runoff volumes, peak flow rates, flooding hazards, and erosion, as well as altered drainage patterns, decreased infiltration rates, and effects to existing drainage improvements.

The project site is subject to minor storm flooding effects as discussed in Section 3.2.1.1. Title 23 of the California Administrative Code (subchapter 15) requires that Class II disposal facilities be "designed, constructed, operated, and maintained to prevent inundation or washout due to floods with a 100-year return period" (§ 2531 [c]). These regulations also require calculation of probable 1000-year 24-hour storm flows in the area of proposed drainage improvements and flood protection facilities. The proposed project design includes several measures to meet these criteria including construction of a diversion berm around the proposed storage/disposal structures (Figure 3-7). This berm would be constructed to accommodate the PMP, which is greater than the 1000-year storm flows (see

Table 3-4

WATER QUALITY ANALYSIS FOR THE PROJECT SITE HYDROLOGIC SUBUNIT (mg/liter)

		Well Number Date Sampled	W-1 4/18/89	W-2 4/18/89	W-3 4/18/89	W-4 4/18/89
Analysis	Method	Detection Limit				
EC (field)			10500	5800	12500	7200
EC (laboratory			10000		13000	7100
PI-I			6.9		7.8	7.2
Total Dissolved Solids	160.1	10	6800	3700	8100	4600
Turbidity (NTU)	180.1	0.1	3000	240	2000	900
Total Alkalinity (as $CaCO_3$)	310.1	1.0	290	230	120	220
Chloride	352.3	1.0	2800	1400	3600	1900
Sulfate	375.4	2.0	1600	750	1900	950
Nitrate (as NO_3)	353.3	0.2	n/d	n/d	n/d	n/d
Fluoride	340.2	0.2	0.87	1.1	0.60	1.1
Total Hardness (as $CaCO_3$)	130.1	1.0	2600	780	3400	1600
Calcium	215.1	0.05	560	190	950	260
Magnesium	242.1	0.05	270	83	210	140
Sodium	273.1	0.5	1600	990	1800	1200
Potassium	258.1	0.5	26	18	40	18
Iron	236.1	0.01	n/d	0.037	0.024	0.04
Manganese	243.1	0.01	1	0.32	0.48	0.17
Copper	220.1	0.01	n/d	n/d	n/d	n/d
zinc	289.1	0.1	n/d	n/d	n/d	n/d

Notes: (1) Values in mg/l except for EC, pH, and turbidity
(2) n/d - none detected above stated detection limit
(3) Analyses by Del Mar Laboratories, Irvine, California

Source: Targhee 1989

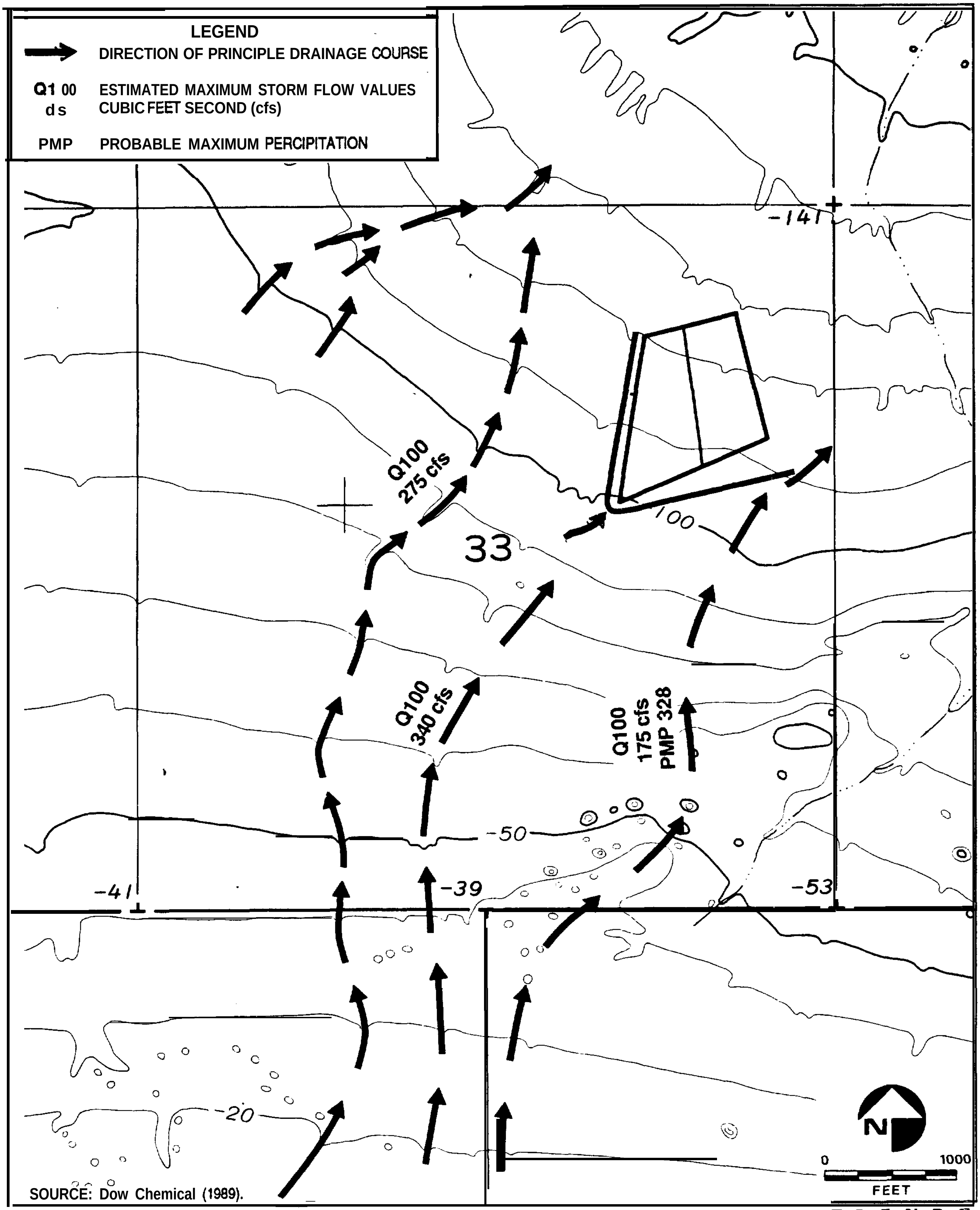
Table 3-5

SALTON SEA[1] WATER QUALITY ANALYSIS[2]

Constituent or Characteristic	Concentrations (mg/l)
pH	7.5
Calcium (Ca)	1246
Magnesium (Mg)	2633
Sodium (Na) + Potassium (K)	11,242
Bicarbonate (HCO_3)	181
Sulfate (S04)	9000
Chloride (Cl)	20,500
Total Dissolved Solids (TDS)	25,079

[1]Testing site located between the New and Alamo Rivers
[2]Sample Date 5/9/88

Source: Imperial Irrigation District 1988



SOURCE: Dow Chemical (1989).

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Simplified Post-Development Drainage Patterns and Volumes within the Project Site Vicinity

FIGURE 3-7

Appendix F for hydraulic design calculations). Additional design measures proposed to mitigate potential flooding impacts include the excavation of an appropriately sized borrow ditch along the upslope (i.e., south and west) sides of the proposed access road, and construction of road/drainage crossings at channel grade to preclude the use of bridges, culverts, etc. Provided these design measures are properly implemented, no significant impacts to proposed project facilities are anticipated from flooding hazards.

Development of the proposed project site and the associated access road would involve constructing approximately 35 acres of impervious or compacted surface. This would increase both the total volume and peak flow velocity of on- and offsite storm runoff due to reduced infiltration rates. Any such increases would likely be minor in nature, however, due to the relatively small extent of proposed improvements and the retention of precipitation which falls within the storage/disposal facilities themselves (and subsequently enters the leachate collection system). During larger storm events, additional runoff volume and velocity could increase both flooding and erosional impacts in downstream areas. Runoff leaving the project site eventually flows northeast into a larger intermittent drainage channel (the easternmost drainage depicted in Figure 3-7). This drainage continues north-northeast for approximately one mile before abutting a Caltrans flood control levee along the south side of Route 86. An area of approximately 150 acres around the terminus of the subject drainage course has been mapped as a 100-year flood zone. Additional runoff entering this drainage from implementation of the proposed project would incrementally increase the area of potential flooding hazards, although no significant impacts would be anticipated due to the small quantity of projected additional runoff.

Anticipated increases in runoff volume and velocity associated with the proposed project may produce erosional impacts during storm events, especially in areas of proposed drainage alterations.

The proposed runoff diversion berm would reroute existing drainage (included sheeted runoff not contained in defined channels) up to approximately 2,000 feet to the west (Figure 3-7). This would result in the alteration of several small existing intermittent washes and the creation of several new drainage channels. Drainage alteration would take the form of erosive enlargement (from the addition of rerouted runoff), abandonment (for certain areas immediately downstream of the berm), and physical alteration from construction activities (primarily at road/drainage crossings). Westward (diversion of runoff from the proposed berm could produce potentially significant erosional impacts to existing drainage channels. Specifically, the existing channel located immediately west of the proposed berm would receive additional runoff from the east (Figure 3-7). This would result in deepening and/or widening of the channel to accommodate increased runoff. New channels would likely be created in response to changing runoff directions and (initially) as a result of overflow in existing channels receiving additional runoff. Erosional impacts in this area could also potentially affect the proposed diversion berm through undermining and subsequent settling or failure of the berm structure. Erosional effects would continue downstream, although their intensity would decrease with distance due to evaporation, infiltration, and reductions in elevation and flow velocity. A number of standard measures are available to mitigate these types of impacts as described below in Section 3.2.3 (Mitigation Measures).

The proposed access road will be required to cross the previously described Caltrans levee as well as several small drainage channels (see Section 2.4.3.1, Access Road). Construction activities in the vicinity of the levee could adversely affect that structure through excavation, etc. No significant impacts are anticipated, however, as any modification of the existing levee would require prior discretionary approval from Caltrans. As described earlier in this section (and in Section **2.4.3.1),** all access road/drainage intersections will be constructed at channel grade to avoid erosional impacts to the roadway structure. These crossings will also utilize concrete aprons and channel linings to mitigate potential erosional impacts related to drainage alteration. Provided these measures are properly implemented, no significant erosional impacts are anticipated for proposed road/drainage crossings.

3.2.2.2 **Groundwater**

Groundwater levels on the project site range from approximately 48 to 63 feet below the surface (- 165 to -180 feet MSL). Because of this depth and the intervening clay layer (which will be retained in site for its low permeability properties), no contact with groundwater is anticipated as a result of proposed construction activities.

Preliminary project design includes an option to drill an onsite well and utilize groundwater for non-potable project needs (e.g., sanitation uses, polymer preparation, and dust abatement). Non-potable water needs on the project site are anticipated to be minor and would not result in significant impacts to local groundwater resources. The proposed groundwater well (if drilled) would be expected to yield approximately 1 to 2 gallons per minute (Targhee, Inc. 1988). Any impact on groundwater associated with the proposed project would require prior approval from the RWQCB, and the County, for modifications in volume, or use of the water from this well.

3.2.2.3 **Water Quality**

The proposed storage/disposal facilities would contain drilling fluid wastes and filter cake from geothermal operations as described in section 2.1 (Project Objectives). These materials contain a number of substances including fluoride, arsenic, salts, metals, and organic hydrocarbons (Appendix C) and NORMs (Appendix E). The introduction of these materials into surface or groundwater resources through percolation or inundation would result in significant water quality impacts. Impacts to water quality could also occur through sedimentation of local runoff associated with erosion, and the discharge of substances indirectly related to project construction or operation (e.g., diesel or automobile fuels). Potential impacts to water quality due to the presence of radiological constituents in the geothermal filter cake are discussed in Section 3.11.4, Impacts from Radiological Constituents.

Title 23 of the California Administrative Code (Subchapter 15) includes a number of requirements for Class II disposal facilities related to protection of water quality, including (from § 2532 and 2595):

- An underlying layer of natural geologic materials with permeabilities of 10^{-6} cm/sec or less. These materials must be of sufficient thickness to prevent the movement of fluids (including waste and leachate) into state waters.

- A liner system with a permeability of not more than 10^{-6} cm/sec in lieu of the natural geologic materials described above.

- Natural or artificial barriers to prevent lateral movement of fluid (including waste and leachate).

- A blanket type leachate collection and removal system.

- Establishment of background and detection groundwater monitoring programs (including vadose zone monitoring if deemed necessary by the RWQCB).

- Provision of detailed hydrologic data regarding local permeabilities, groundwater levels (including capillary fringe), and gradients; spring locations; and water quality.

All of the above requirements are intended to insure protection of ground and surface water quality and are subject to site-specific modification by the RWQCB. Such modifications may include the location and depth of monitoring wells, and the types and methodologies of soil and/or hydrologic investigations.

The proposed project design includes a number of features intended to meet the above Title 23 requirements as described below:

- Preliminary geotechnical evaluation of the site has identified a thick (minimum 10 feet) layer of clay with permeabilities of 10^{-7} cm/sec (Targhee 1988). These materials exceed the Title 23 requirements for class II disposal sites.

- Storage/disposal facility design includes four liners as depicted in Figure 2-4. This liner includes two 80 mil high density polyethylene liners, primary and secondary leachate collection systems, a minimum 3-foot clay base with permeability of less than 10^{-7} cm/sec, and protective geotextile and 12- to 1 S-inch soil covers. This liner complex exceeds Title 23 requirements for class II waste disposal facilities.

- Sloped sidewalls on the storage/disposal facilities to contain wastes. The previously described liner would extend up to the top of the sidewalls and be anchored into place.

- Several wells will be drilled in the project site vicinity to provide for background data collection and groundwater monitoring. The applicant will submit a proposed groundwater monitoring program to the RWQCB (outlining the number and location of wells, as well as the collection methodology), with that agency approving or disapproving the program (as appropriate) pursuant to pertinent regulatory or statutory requirements.

These preliminary project design features will satisfy most Title 23 requirements regarding Class II waste disposal sites. Final project design will take into account detailed hydrologic data required under Title 23. Detailed hydrologic data (see: Mitigation Measures), coupled with the preliminary project design features described above, would reduce potential impacts related to percolation of wastes and/or leachate below levels of significance.

Inundation of proposed storage/disposal facilities by storm runoff would result in potentially significant impacts to local surface water quality through the production of leachate. This could also subsequently affect groundwater resources through infiltration of contaminated runoff.

Title 23 of the California Administrative Code (subchapter 15) contains several requirements for Class II disposal facilities regarding flood hazards, including (from § 2532 and 2595):

- Design, construction, operation, and maintenance specifications to prevent inundation or washout due to floods with a 100-year return period.

- Estimated maximum 1000-year storm event.

The proposed project design includes a number of features intended to meet the above Title 23 requirements including:

- Location of project site outside of major 100-year floodplains. One of the criteria used to select the proposed site involved consideration of local flood hazards. The area proposed for facility location is not within any mapped floodplains, although some minor washout areas exists due to the braided (and sometimes sheeted) nature of local storm runoff.

- Construction of a protective berm around the proposed storage/disposal facilities. This berm would be designed to accommodate the PMP which is greater than the 1000-year storm flows, to prevent contact with wastes and associated runoff contamination. The access road will be designed to the Caltrans 100-year storm flow.

Assuming appropriate data generation regarding PMP storm flow (see Mitigation Measures) and berm design, the above measures are considered sufficient to satisfy Title 23 requirements and mitigate potential water quality impacts related to flood hazards below levels of significance.

The occurrence of shallow groundwater in the regional vicinity is evidenced by the existence of nearby springs and perennial surface flow in San Felipe Creek. The presence of near-surface water tables on the project site could potentially produce significant water quality impacts through contact with wastes and production of leachate. Title 23 of the California Code (§ 2530) requires that "All new landfills ... shall be sited, designed, constructed, and operated to ensure that wastes will be a minimum of 5 feet above the highest anticipated elevation of underlying groundwater." Project site selection incorporated these criteria, with preliminary subsurface exploration documentating onsite groundwater levels of between 48 and 63 feet below surface grade (Targhee 1988). No evidence was noted for the occurrence of perched groundwater tables onsite (e.g., intermittent spring or ponding sites), although such phenomena are considered potentially feasible due to the presence of relatively impermeable underlying clay strata. Project design incorporates a synthetic liner consisting of dual polyethylene membranes and a compacted clay layer which would directly overlie a minimum 5-foot depth of in situ clay deposits (see Figure 2-4). All clay materials used in this design would meet permeability criteria outlined in Title 23, with the overall liner and substrate design expected to reduce potential impacts related to the occurrence of shallow groundwater below levels of significance.

A number of potential impacts related to erosion from drainage alteration/diversion were discussed in section 3.2.2.1. Project-related erosion also poses potential impacts to surface water quality through increased sedimentation and turbidity levels in local runoff. Such potential impacts could become significant if substantial sedimentation were to reach perennial waters. This scenario is considered unlikely for the project site vicinity due to low precipitation levels and the nature of local drainage patterns. All runoff from the project site eventually flows into intermittent drainage to the east, which continues north until abutting a Caltrans flood control levee south of SR 86. Storm drainage is allowed to pond in this area, resulting in a detention basin effect and the likely deposition of most suspended and dissolved sediment load due to energy flow reduction. Some of this ponded water may eventually flow east to another intermittent drainage which passes under SR 86 (and continues north and east to the Salton Sea), although no significant sediment load from project-related erosion would be anticipated to reach this drainage. Additionally, erosion-control measures will be included into the project design (see Mitigation Measures) to prevent prevent significant offsite sediment transport. As a result of these considerations, no significant impacts to surface water quality are anticipated from project-related erosion.

Implementation of the proposed project would result in the onsite maintenance of a 1000-gallon above ground diesel storage tank, the operation of vehicles in and around the site, and the potential use of a leach field for disposal of employee-generated sewage. All of these activities could result in potentially significant water quality impacts related to accidental spills or leaks. The proposed project design includes several measures to prevent such impacts, including a spill protection facility associated with the proposed diesel tank to preclude runoff or percolation of spilled fuel. This facility would essentially consist of impermeable floor and sidewalls to confine any accidental spills. The proposed project design also encompasses designated vehicular operation and maintenance locations and methods to prevent accidental spills of fuel or other fluids, and adherence to RWQCB regulations regarding design, construction, and operation of the proposed septic system and wastewater leach field (if utilized). Proper adherence to these measures is considered sufficient to reduce potential water quality impacts from the introduction of hazardous substances indirectly related to the proposed project below levels of significance.

3.2.3 **Mitigation Measures**

The proposed project could cause a number of potentially significant impacts related to hydrology and water quality. All of these potential impacts can be mitigated below levels of significance through implementation of the proposed preliminary project design features, and during final project design incorporation of hydrological data obtained pursuant to requirements in Title 23 of the California Administrative Code and approved by the RWQCB. Hydrologic data that shall be included in the final project design will include (but not be limited to) the following information:

- An evaluation of the water-bearing characteristics of the natural geologic materials, including determination of permeability, delineation of all ground water zones, and the basic data used to determine the above.

- An evaluation of the inplace permeability of soils immediately underlying the Class II waste management unit including presentation of the permeability data in tabular form, a map of the unit showing test locations permeability data in tabular form, a map of the unit showing test locations where these permeability data were obtained, and an evaluation of the test procedures and rationale used to obtain these permeability data

- An evaluation of the perennial direction(s) of ground water movement within the uppermost ground water zone within one mile of the waste management facility perimeter.

- Estimates of the height of the capillary fringe above the uppermost ground water zone beneath and within one mile of the waste management facility perimeter, including an evaluation of all methods and the rationale used in their development.

- A map showing the location of all springs in the area proposed for-the monofill and within one mile of its perimeter, as well as a tabulation of mineral quality and flow data for each spring.

- A water quality evaluation of the water known to exist under or within one mile of the monofill facility perimeter, including all data necessary to establish water quality protection standards.

- A tabulation of background water quality data for all applicable indicator parameters and waste constituents.

- Establishment of a water quality monitoring system pursuant to direction by the RWQCB. Water quality monitoring to include determination of radionuclides.

- An evaluation of runoff quantities and drainage patterns within the project site and vicinity, including an estimate of the PMP storm event.

- An evaluation of potential erosional impacts associated with the proposed project and the generation of appropriate mitigating measures. Such measures may include the use of protective facings, channelization of threatened drainages, or construction of energy dissipating or sedimentation facilities (e.g., detention basins).

- Any construction activities located with a Caltrans right-of-way shall be coordinated with that agency prior to implementation. This includes proposed road construction in the vicinity of the Route 86 flood control levee.

- Road construction activities conducted on BLM land shall conform to all design specifications provided by that agency.

- Any use of groundwater or IID water supplies and conveyance facilities shall receive prior approval from the appropriate responsible agency.

3.3 AIR QUALITY/CLIMATOLOGY

3.3.1 Meteorology/Climate

The lower desert-type climate of Imperial County is typically well suited for good air quality because of the large dispersive capacity of the desert atmosphere. Uneven distribution of heating and cooling and low frictional drag from limited vegetation create strong winds that prevent significant pollution stagnation. Subsidence inversions that form in California coastal environments rarely occur over the desert and when they do form, their bases are so high as to have little impact on regional dispersion patterns. Low-level radiation inversions occur on most nights in low-lying areas and trap pollutants near their source, but they burn off rapidly after sunrise.

Whereas gaseous pollutant dispersion benefits from the strong winds and convective overturning, these same conditions lead to high dust levels, especially because of the low annual rainfall of only 2 to 3 inches. Disturbed desert soils are easily lofted into the air by turbulent motion with a resulting regional degradation of particulate air quality. Whenever the “desert pavement” crust is broken, the soil remains susceptible to wind erosion with the smallest dust particles carried for many miles before they are removed by gravitational settling. Without much moisture to help reform the protective soil crust, such erosion not only occurs after soil disturbance, but continues for a considerable period into the future.

Although there are no wind data at the project site itself, wind data from the Elmore Land Company property across SR-86 near the proposed disposal site were collected. The prevailing wind directions from this site, operated by Lawrence Livermore Laboratory (LLL) during its geothermal baseline studies in 1977, are summarized in Table 3-6. Since

Table 3-6

WIND DIRECTIONS NEAR MONOFILL FACILITY

(Frequency of Occurrence in Percent Shown in Parentheses;
Underline Winds Indicate Sea Breeze Wind Reversal in Summer)

Month, Year	Most Prevalent Wind Direction	2nd Most Prevalent Wind Direction	3rd Most Prevalent Wind Direction
December 1976	WSW (31.8)	W (15.0)	N (9.6)
January 1977	WSW (30.6)	W (15.6)	SW (9.0)
February 1977	WSW (24.0)	W (13.8)	WNW (12.0)
March 1977	W (27.6)	WNW (17.4)	wsw (11.4)
April 1977	w (22.2)	wsw (12.0)	WNW (10.8)
May 1977	W (37.2)	WNW (10.8)	<u>wsw</u> (10.2) <u>NE</u> (10.2)
June 1977	<u>NE</u> (18.6)	W (16.5)	<u>NNE</u> (8.4)
July 1977	<u>ENE</u> (18.9)	W (13.2)	<u>NE</u> (11.4)
August 1977	<u>ENE</u> (20.4)	<u>ESE</u> (10.8)	W (9.6)
September 1977	W (13.8)	wsw (11.4)	<u>NE</u> (9.0)
October 1977	wsw (15.9)	w (13.5)	SW (11.4)
November 1977	w (29.4)	WNW (15.9)	wsw (9.0)

more recent wind direction data are collected only at monitoring stations much further away from the project site, data from the Elmore Land Company property are considered more representative of the project area. For much of the year, west winds will blow from the project site toward Westmorland parallel to SR-86. In summer, as the land becomes much hotter than the Salton Sea during the daytime, a sea breeze develops from the northeast that blows up the slopes of Superstition Hills.

The closest available meteorological data' was obtained from the Imperial Valley Agricultural Center (IVAC) in El Centro, approximately 24 miles southeast of the project site. In the absence of site-specific meteorological data, data from the IVAC is assumed to be representative of the site. Table 3-7 summarizes wind speed data near the project site for the year 1988. On the average, wind speed varied annually over a wide range (O-25 mph). However, there were only about 5 days in the year in which the average wind speed during the day was high enough (>12 mph) to potentially cause significant dust emissions as a result of wind erosion of opened areas.

3.3.2 **Existing Air Quality**

Ambient air quality standards (AAQS) represent the maximum level of background pollution considered safe, with an adequate margin of safety, to protect the public health and welfare. The six primary pollutants of concern for this project for which standards have been established are sulfur dioxide, carbon monoxide, nitrogen dioxide, ozone, suspended particulate matter, and lead. National ambient air quality standards (NAAQS) were promulgated by the Environmental Protection Agency (EPA) in 1971, with states retaining the option to develop different (more stringent) standards. Due to unique air quality problems in California, the California Air Resources Board (ARB) has developed additional AAQS. The currently applicable state and federal standards are presented in Figure 3-8.

Ambient particulate, ozone, and lead concentrations are monitored at the Brawley and El Centro monitoring stations. In the absence of site-specific air quality data, data from these stations are assumed to be representative of the project site. Table 3-8 summarizes ambient air quality data at the Brawley and El Centro monitoring stations from 1985 through 1987.

Table 3-7

WIND SPEED SUMMARY FOR 1988
IMPERIAL VALLEY AGRICULTURAL CENTER STATION

Month	Daytime Wind Velocity (mph) Avg	Max	Min	Nighttime Wind Velocity (mph) Avg	Max	Min	No. of Days Wind Velocity Exceeds 12 mph
January	2.2	7.3	0.3	1.8	7.8	0.3	0
February	3.0	12.0	0.3	1.7	8.8	0.3	0
March	3.5	11.8	0.5	2.7	11.8	0.3	0
April	4.4	13.0	1.0	3.3	13.8	0.3	1
May	4.7	25.0	0.8	4.2	16.5	0.3	2
June	3.9	17.3	1.3	3.5	14.5	0.5	1
July	3.7	9.5	0.8	2.7	6.5	0.3	0
August	3.0	9.0	1.0	2.2	6.8	0.3	0
September	3.2	11.5	0.8	2.1	13.0	0.3	0.5
October	2.7	4.5	1.3	1.4	2.5	0.5	0
November	2.9	15.8	0.3	2.1	8.5	0	0.5
December	2.8	12.0	0	1.9	11.5	0	0
Annual	3.3	25.0	0	2.5	16.5	0	5.0

POLLUTION	AVERAGING TIME	CALIFORNIA STANDARDS (1)		NATIONAL STANDARDS (2)		
		CONCENTRATION	METHOD	PRIMARY	SECONDARY	METHOD
OZONE	1 Hour	0.09 ppm (180 µg/m^3)	Ultraviolet Photometry	0.12 ppm (235 µg/m^3)	Same as Primary Standards	Chemiluminescent Method
CARBON MONOXIDE	8 Hour	9 ppm (10mg/m^3)	Nondispersive Infrared Spectroscopy	9 ppm (10 mg/m^3)	Same as Primary Standards	Nondispersive Infrared Spectroscopy
	1 Hour	20 ppm (23 mg/m^3)		35 ppm (40 mg/m^3)		
NITROGEN DIOXIDE	Annual Average	–	Saltzman Method	0.05 ppm (100 µg/m^3)	Same as Primary Standards	Gas Phase Chemiluminescence
	1 Hour	0.25 ppm (470 µg/m^3)		–		
SULFUR DIOXIDE	Annual Average	–	Conducfimefric Method	0.03 ppm (80 µg/m^3)	–	Pararosaniline Method
	24 Hour	0.05 ppm (131 µg/m^3)		0.14 ppm (365 µg/m^3)	–	
	3 Hour	–		–	0.5 ppm (1300 µg/m^3)	
	1 Hour	0.25 ppm (665 µg/m^3)		–	–	
SUSPENDED PARTICULATE MATTER	Annual Geometric Mean	PM-10 30 µg/m^3	High Volume Sampling	PM-10 50 µg/m^3	60 µg/m^3	High Volume Sampling
	24 Hour	PM-10 50 µg/m^3		PM-10 150 µg/m^3	150 µg/m^3	
SULFATES	24 Hour	25 µg/m^3	AIHL Method No. 61	–	–	–
LEAD	30 Day Average	1.5 µg/m^3	AIHL Method No. 54	–	–	–
	Calendar Quarter	–	–	1.5 µg/m^3	1.5 µg/m^3	Atomic Absorption
HYDROGEN SULFIDE	1 Hour	0.03 ppm (42 µg/m^3)	Cadmium Hydroxide Stractan Method	–	–	–
VINYL CHLORIDE (CHLOROETHENE)	24 Hour	0.010 ppm (26 µg/m^3)	Gas Chromatography	–	–	–
ETHYLENE	8 Hour	0.1 ppm	–	–	–	–
	1 Hour	0.5 ppm				
VISIBILITY REDUCING PARTICLES	One Observation	In sufficient amount to reduce the prevailing visibility to less than 10 miles when the relative humidity is less than 70%		–	–	–

Note:

ppm = parts per million
µg/m^3 = micrograms per cubic meter
mg/m^3 = milligrams per cubic meter

(1) CO, SO_2(1 Hour), NO_2, O_3 and PM-10 Standards are not to be exceeded. All other Standards are not to be equaled or exceeded,

(2) Not to be exceeded more than once a year.

SOURCE: California Air Resources Board, 1989.

ERC Environmental and Energy Services Co.

California and Federal Ambient Air Quality Standards

FIGURE 3-8

Table 3-8

AMBIENT AIR QUALITY SUMMARY

Station Pollutant	Averaging Time	Maximum Concentration (a) 1985	1986	1987	Frequency Exceeding Standard(b) 1985(c) State	1985(c) Federal	1986(c) State	1986(c) Federal	1987(d) State	1987(d) Federal
El Centro										
Ozone (e)	1 -hour	0.13	0.09	0.09	41	1	0	0	0	0
PM- 10	24-hour	178	230	157	60	--	41	--	59	2
	Annual	51.4	47.4	53.6	—	—	—		—	—
TSP	24-hour	382	598	380	--	6	--	6	--	5
	Annual	107.7	111.7	113.1	—	—	—		--	--
Lead	30-day	0.19	0.16	0.08	0	0	0	0	0	0
	Quarterly	0.14	0.12	0.06	0	0	0	0	0	0
Brawley										
PM- 10	24-hour	191	191	148	58	--	38		56	0
	Annual	55.3	49.2	52.0	—	—	—		—	
TSP	24-hour	325	235	294	_	4	—	0		6
	Annual	118.9	10.23	109.4	—	—	—	—	--	
Lead	30-day	0.19	0.10	0.06	0	0	0	0	0	0
	Quarterly	0.14	0.09	0.05	0	0	0	0	0	0

Table 3-8 (Continued)

AMBIENT AIR QUALITY SUMMARY

<u>Notes</u>:

(a) Maximum concentration unit for ozone is in ppm. Concentration units for lead, total suspended particulate (TSP), and inhalable particulate matter less than 10 microns (PM- 10) are in $\mu g/m^3$.

(b) Frequency exceeding standard is expressed as the number of hours violation occurred for ozone, as the number of months (or quarters) violation occured for lead, and as a percent of the sample tested for particulate matter (PM-10 and TSP).

(c) In 1985 and 1986, the California 24-hr and annual PM-10 standards were 50 $\mu g/m^3$ and 30 $\mu g/m^3$, respectively. No state standard existed for TSP. In 1985 and 1986, the national 24-hr and annual TSP primary standards were 260 $\mu g/m^3$ and 75 $\mu g/m^3$, respectively. There were no national standards for PM-IO.

(d) In 1987, new national standards were adopted for PM-10 to replace the TSP standards. The 24-hr and annual national primary standards for PM-10 were 150 $\mu g/m^3$ and 50 $\mu g/m^3$, respectively. The state standards for PM-10 remained the same as in 1985 and 1986.

(e) California standard for ozone was 0.10 ppm for the years 1985-1987. The standard has been changed to 0.09 ppm in 1989.

Imperial County has been classified as a nonattainment area for ozone, although data from Table 3-8 indicate that both state and national ozone standards were not violated during the last 2 years (1986 and 1987) for which monitoring data were compiled. The county is currently designated as an unclassified area for particulates. Particulate matter standards, however, are routinely exceeded in Imperial County due to the inherent nature and problem associated with the desert environment in particular low annual rainfall and with mining and agricultural activities which represent typical developments in this county. For the remaining criteria pollutants, the Imperial County is designated as an attainment area.

In the Imperial County, it is the responsibility of the Air Pollution Control District (APCD) to ensure that state and national air quality standards are achieved. In order to ensure that the County can meet its attainment goal, the Imperial County APCD will only issue Authority to Construct (ATC) and Permit to Operate (PTO) to proposed projects which have been determined by the District to cause no potentially significant impacts on local and regional air quality.

3.3.3 **Air Quality Impact**

Atmospheric impacts from landfill disposal sites are typically associated with odors, litter, and gaseous emissions from organic matter decay processes. The proposed Monofill Facility, however, will not accept residential or commercial refuse, but rather for the disposal of nonhazardous geothermal filter cake and mud sump wastes originating in Imperial County. The nature of the material disposed will thus minimize any of the "traditional" impacts associated with disposal site operations.

The primary air quality concern of the proposed project during both the construction and operation phases is that it will generate significant amounts of fugitive dust from onsite grading activities, wind erosion of exposed landfill area, and travel on paved and unpaved portions of the landfill. Unfortunately, dust emission factors associated with these potential sources are often poorly described in standard air pollution references and may not be fully representative of activities at the site.

Also of concern are the potential air quality impacts associated with the radioactive materials in the geothermal filter cake. Potential impacts to air quality due to the presence of radiological constituents are discussed in Section 3.11.4, Impacts from Radiological Constituents.

Construction Impacts

Development of the proposed 160-acre landfill will take place in 2 phases, with a 300,000 cubic-yard capacity each. Each phase will develop 10 acres each. Construction of each phase is expected to last 90 days and employ 8 to 20 people.

During the construction and earthmoving activities associated with the development of each phase, short-term emissions of several criteria air pollutants would occur. Emissions of nitrogen oxides (NO,), carbon monoxide (CO), sulfur dioxide (SO_2), total suspended particulates (TSP), and total hydrocarbons (THC) will be generated from combustion of fuels by construction equipment. These emissions are only temporary and therefore generally do not significantly degrade the regional air quality. In addition, considerable dust will be generated by soil excavation, by heavy-vehicle movement on unpaved surfaces, and by exposure of unstabilized dry soil to wind erosion.

During construction activity for each stage of Phases I and II, water will be added to the soil of each lo-acre parcel to achieve the appropriate conditions for adequate earth compaction. The watering program is also designed for the purpose of mitigating fugitive dust emissions as well as for aiding the soil compaction process. Watering will be initiated prior to any earth-moving activity. In addition, even areas that do not need compaction but are subjected to earth-moving equipment will be watered sufficiently (e.g., twice daily with complete coverage). A watering program thus designed will substantially mitigate the fugitive dust emissions from construction. The EPA estimates that an effective watering program can reduce dust emissions by up to 50 percent (EPA AP-42 1985).

U.S. EPA Document AP-42, Section 11.2.4 (1985) provides an approximate emission factor for heavy construction operations of 1.2 tons of particles less than 30 µm in diameter per acre of construction per month of activity . Although the EPA's construction activity dust emission factor was developed for operations associated with the construction of shopping centers and apartment buildings and, therefore, is not fully representative of the construction activities associated with the proposed project, it does provide a rough order of magnitude estimate of the amount of dust generated during the construction phase of the proposed project. The uncertainty of the emission factor's applicability to the proposed project is reflected in a similar uncertainty in the predicted project impact. Therefore, the quantitative assessment of probable fugitive dust impacts that follows should be viewed as a broad estimate rather than a precise prediction.

Based on the assumption that development of a lo-acre disposal area will take approximately 3 months and that an effective watering program will be implemented to reduce fugitive dust emissions by 50 percent, this methodology predicts emissions of 18 tons of fugitive dust during the construction of each phase (0.20 tons/day). In comparison to the particulate emission rate of about 1882 tons per day generated throughout the Imperial County in 1987 (Imperial County APCD 1989), fugitive dust emissions from the proposed project represent only an insignificant fraction of the county's total particulate emission burden. In addition, with the heavier particles deposited near the disposal site, the proposed project's particulate impact on the regional air quality is much smaller than the ratio of 0.2 to 1882 would indicate. Thus since construction activities would be short term and would represent a negligible fraction of the total emission rates for Imperial County, construction emissions will not generate a significant impact to air quality in Imperial County.

Operational Impacts

Potential air quality degradation resulting from the operational phase of the proposed project would emanate from both stationary and mobile sources. Stationary source pollutant emissions include those generated by operation of the 25-kW diesel-powered generator (if a generator is used to supply onsite electrical needs). Mobile sources include waste hauling trucks, grading equipment, and other light-duty vehicles. In addition, fugitive dust emissions will be generated by vehicle movement, material transfer activities, and wind erosion of opened disposal/storage areas.

Assuming that a diesel-powered generator is used, emissions of criteria pollutants from the generator were conservatively estimated based on emission factors specified in the U.S. EPA Document AP-42, Table 3-6 (1985), and an assumed equipment operating schedule of 12 hours/day at full load. In addition to the generator, gaseous criteria pollutants are also generated from mobile sources. Under worst-case conditions (e.g., first year of operation), 10 hauling trucks, two pickup trucks (or other light-duty vehicles), and one bulldozer with rollers were assumed to constitute a typical work day. Emissions of criteria pollutants from mobile sources were calculated based on emission factors specified in EPA Document AP-42, Tables 1.2-1B and II-7.2, for gasoline-powered light-duty trucks and heavy-duty construction equipment, respectively. Table 3-9 summarizes

Table 3-9

MONOFILL LANDFILL OPERATIONAL COMBUSTION POLLUTANT EMISSIONS

Source	No. of Equipment	Hourly Emissions (lb/h lb/hr					Daily Emissions (lb/day)				
		NO,	CO	THC	SO_2	TSP	NO,	CO	THC	SO_2	TSP
Generator@	1	1.03	0.22	0.08	0.07	0.07	12.40	2.70	0.99	0.82	0.89
Bulldozer/Roller(b)	1	2.92	1.26	0.13	0.24	0.12	23.36	10.08	1.04	1.92	0.96
Hauling Trucks(c)	10	1.35	0.54	0.12	0.11	0.11	6.75	2.70	0.60	0.55	0.55
Pickups@	2	neg	neg	neg	neg	neg	0.05	0.37	0.04	-	-
Total		1.61	25.20	0.96	0.10	0.11	42.56	15.85	2.67	3.29	2.40

Notes:

(a) Emissions from the diesel-powered generator were calculated from emission factors specified in **AP-42,** Table 3.3-l (1985). The generator was assumed to operate at full load for 12 hours/day.

(b) Emissions from the bulldozer/roller were calculated from emission factors (in **lb/hr)** specified in **AP-42,** Table II-72 (1985). for heavy-duty diesel-powered construction equipment (roller). The **bulldozer/roller** was assumed to operate on the average at 70 percent load intermittently for a total of 8 hours per day.

(c) Emissions from the hauling trucks were calculated from emission factors (in **lb/hr)** specified in **AP-42,** Table B-7.2 (1985). for heavy-duty diesel-powered construction equipment (misc.). Bach truck was assumed to operate approximately 0.5 hours/day at an average load of 80 percent. It is further assumed that only 2 trucks would be present at the landfill at any one time.

(d) Emissions from the pickup trucks were estimated based on emission factors specified in AP-42, Table **1.2.1B** (1985). for low-altitude light-duty gasoline-powered trucks. The pickups were **assumed to be a** 1985-1986 model having an average mileage of 100,000. Bach pickup was assumed to travel approximately 1 mile round-trip on the landfill levees plus 2.5 miles ‘round-trip on the access road **during a normal working day. The assumptions used are conservative, actual routes may be less impactive to air quality.**

combustion pollutant emission rates from the proposed project. It should be noted that Table 3-9 does not include fugitive dust emissions which are discussed later in this section.

The emissions estimates shown in Table 3-9 represent a worst-case scenario which would occur only during the first year of project life when the level of activities is at its peak. During the subsequent years, since the number of hauling trucks required would be reduced to 6 trucks per day, which in turn will lower the required operating time of the bulldozer to approximately 5 hours per day, the daily emission rates from combustion sources would be lowered by 9 to 38 percent for different pollutants. In addition, another option is being evaluated which involves the purchase of electrical power from the local utility service station in lieu of onsite power generation. In this case, daily emissions of NO_x, SO_2, and TSP would be significantly reduced by approximately 80 percent. In either case, combustion pollutant emissions were estimated to be small, and thus would not be expected to generate significant impact on local and regional air quality.

In addition to combustion pollutants, fugitive dust will be generated during the operational phase of the proposed project. Dust will be 'kicked up" by movement of vehicles such as the hauling trucks or the bulldozer/roller as they drive on levees during waste dumping, grading, and compacting activities. Fugitive dust is also generated during the material transfer (dumping) operation and from wind erosion. Additional dust may be raised on the access road by the turbulent eddies generated in the lee of the larger vehicles. Each vehicle is expected to travel, on the average, a total of 1 mile round-trip on the levees and 2.5 miles round-trip on the access road (travel routes assumed are conservative, actual routes may be less impactive to air quality).

Uncontrolled fugitive dust emissions from vehicles traveling on the access road and the levees were estimated based on the methods provided in AP-42, Sections 11.2.1 and 11.2.6, for unpaved roads and industrial paved roads, respectively. Uncontrolled fugitive dust emissions from waste dumping activities and from wind erosion were estimated by the methods described in AP-42, Section 11.2.3, for aggregate handling and storage piles. It should be noted that the emission factors related to storage piles specified in the AP-42 document are for operations without compaction of the loose materials. The emission estimates for dust generated from wind erosion should be considered as a conservative worst-case for dust which can potentially be generated. The actual emission rate from wind erosion will vary depending on the degree of compaction. A high compaction level can reduce the fugitive dust emissions by as much as 50 percent.

Uncontrolled fugitive dust emissions associated with operation of the landfill are tabulated in Table 3-10. The uncontrolled emissions were estimated for 2 separate time periods. Scenario A involves activities during the first year of operation in which the landfill would receive up to 10 trucks per day of drilling mud and filter cake. Scenario B simulates activity level during the later years when the frequency of waste hauling truck arrivals at the landfill would be reduced to a maximum of 6 trucks per day as a result of the lower drilling mud disposal requirement predicted for the later years of the project life. Since Phase I would be properly closed during operation of Phase II and, therefore, will not continue to generate significant emissions, impacts from Phase II of the proposed project will be similar to the impacts predicted for Scenario B. As shown in Table 3-10, emissions due to wind erosion account for approximately 98 percent of the total uncontrolled fugitive dust emissions from both scenarios.

In order to control fugitive dust emissions from operation of the landfill, several fugitive dust suppression measures have already been incorporated into operation of the proposed project. A water truck will be kept accessible to spray down dusty areas during especially windy or active periods. Water will also be sprayed, if necessary, where the material is placed, graded, or compacted to minimize fugitive dust generation. In addition, at the end of the day, the placed and stored material would be sprayed with a soil sealant polymer to prevent long-term fugitive dust generation resulting from wind erosion. This combined watering and chemical treatment program can effectively reduce fugitive dust emissions by 80 to 90 percent (EPA AP-42 1985). Therefore, assuming an overall control efficiency of 80 percent, the total operational fugitive dust emission rates of PM and PM-10 were estimated to be 2,201.4 lb/day and 792.5 lb/day, respectively for Scenario A. For Scenario B, the controlled fugitive dust emissions rates were calculated to be 2,182.0 lb/day of PM and 785.5 lb/day of PM-10. For a worst-case analysis, the controlled emission estimates from Scenario A would be used to predict maximum potential impacts from the proposed project.

The short-term version of the Industrial Source Complex (ISCST) dispersion model was used to translate operational fugitive dust emissions into ambient air quality impact. Since detailed hourly meteorological data are not available, maximum hourly concentrations of particulate matter were estimated based on worst-case meteorological conditions. In this case, the wind speed was set at the minimum wind speed above which emissions would be

Table 3-10

MONOFILL LANDFILL UNCONTROLLED OPERATIONAL DUST EMISSIONS D

	Total Capacity Scenario A	Scenario B	Uncontrolled Emission Factor	Uncon Scenari TSP	P
A. Mobile Sources					
Levees Travel					
Mud Hauling Trucks (2)	**6 VMT/day**	2 **VMT/day**	6.48 lb **PM-10/VMT**	108.0	
Filter Cake Hauling Truck (2)	4 **MVT/day**	4 **VMT/day**	5.77 lb **PM-10/VMT**	64.1	
Pickups (2)	**2 VMT/day**	2 **VMT/day**	0.27 lb **PM-10/VMT**	1.4	
Bulldozer/Roller (3)	0.31 **acre/day**	0.19 acre/day	78.90 lb **TSP/acre**	24.5	
	Access Road Travel				
Mud Hauling Trucks (4)	15 **VMT/day**	**5 VMT/day**	1.54 lb **TSP/VMT**	23.1	
Filter Cake Hauling Trucks (4)	10 **VMT/day**	10 **VMT/day**	1.37 lb **TSP/VMT**	13.7	
Pickups (4)	5 **VMT/day**	5 **VMT/day**	0.13 lb **TSP/VMT**	0.65	
Total Mobile Source				235.5	
B. Material Handling (5)	310 ton/day	170 ton/day	0.00065 lb **PM-10/ton**	0.56	
C. Wind Erosion (6)	**10 acres**	10 acres	1077.1 lb **TSP/day-acre**	**10,771.0**	**3,8**
TOTAL PROJECT				**11,007.1**	**3,9**

Table 3-10 (Continued)

MONOFILL LANDFILL UNCONTROLLED OPERATIONAL DUST EMISSIONS DURING PHASE I

Notes:

(1) PM-10 is assumed to be 36 percent of TSP.

(2) Emissions from hauling trucks and pickups traveling on the levees were estimated from **AP-42,** Section 11.2.1, for unpaved roads, with the following assumptions:

- particle size multiplier = 0.36 (PM-IO)
- silt content of road surface material = 7.1 percent
- mean vehicle speed = 15 mph
- mean vehicle weight = 32.5 tons for mud hauling trucks
= 27.5 tons for filter cake hauling trucks
= 1 ton for pickups
- mean number of wheels = 18 for hauling trucks
= 4 for pickup
- number of days with ≥0.01 inch of precipitation per year = 30 days

(3) Emissions from bulldozer/roller were estimated based on the emissions factor of 1.2 tons/acre/month cited in **AP-42,** Section 11.2.4. for heavy construction operations. The size of the area disturbed (in acres) was calculated based on the assumption that the waste materials will be spread out initially over the landfill as a 0.5-ft thick layer.

(4) Emissions from hauling trucks and pickups traveling on the acess road were estimated from AP-42, Section 11.2.6, for industrial paved roads, with the following assumptions:

- industrial augmentation factor = 1
- number of traffic lanes = 1
- surface material silt content = 7.1 percent
- surface dust loading = 1,330 lb/mile
- average vehicle weight = 32.5 tons for mud hauling trucks
= 27.5 tons for filter cake hauling trucks
= 1 ton for pickups

(5) Emissions from material handling activities were estimated based on AP-42, Section 112.3, for aggregate handling and storage piles (batch drop operation), with the following assumptions:

- particle size multiplier = 0.36 (PM- 10)
- material silt content = 100 percent
- mean wind speed = 20 mph
- drop height = 10 feet
- material moisture content = 20 percent
- dumping device capacity = 25 cubic yards

(6) The IO-acre assumption is considered to be conservative as it includes sidewalls. Sidewalls will he treated with the soil-sealant polymer. Actual landfill area will be less than 10 acres. Emissions from wind erosion were calculated based on **AP-42,** Section 11.2.3, for aggregate handling and storage piles (wind erosion), with the following assumptions:

- material silt content = 100 percent
- number of days ≥ 0.01 inch in precipitation per year = 30 days
- percentage of time that the unobstructed wind speed exceeds 12 mph = 100 percent

generated from wind erosion (12 mph), and the modeling was performed for neutral stability.

Fugitive dust emissions were modeled as area sources which cover the lo-acre landfill disposal site associated with Phase I of the project. (The lo-acre estimate is considered to be conservative as it includes sidewalls which will be treated with the soil-sealant polymer. The actual landfill area will be less than lo-acres.) Only emissions of inhalable particulate matter less than 10 microns (PM- 10) were modeled since both the state and federal ambient quality standards are specified for PM-10 only. In addition, larger airborne particulate matter in general will tend to settle out very close to the source and, therefore, is not expected to cause significant air quality impact.

Table 3-11 shows the predicted maximum short-term and long-term pollutant concentrations. EPA recommended conversion factors of 0.4 and 0.1 were used to obtain maximum concentrations for the 24-hour and annual averaging periods, respectively, based on the model predicted l-hour concentrations. In general, as shown in Table 3.3-2, there are only 5 days out of the year when the average wind speed exceeds 12 mph. Since significant emissions from wind erosion generally occur only when the wind speed exceeds 12 mph, the annual average concentrations were estimated by multiplying the l-hour concentration by the conversion factor and an additional averaging factor of 5/365.

As shown in Table 3- 11, the location of the predicted maximum PM- 10 concentration is well within the project boundaries, approximately 1,050 feet (320 meters) from the Phase I disposal site. The Elmore Desert Ranch is the nearest sensitive receptor in terms of potential human exposure outside the Monofill Facility area. At the facility boundary, operational activities increase 24-hour PM-10 levels about 104 $\mu g/m^3$ above ambient level, assuming worst-case conditions. Within 2.2 miles, those levels are diluted to about 8 $\mu g/m^3$ above ambient. Compared to the California 24-hour standard of 50 $\mu g/m^3$ and the federal 24-hour standard of 150 $\mu g/m^3$, particulate levels from operational activities near the facility are significant, but such significance decreases considerably in moving downwind toward populated areas. Furthermore, it should be emphasized that the analysis procedures used to generate these results are extremely conservative. However, since ambient levels already routinely exceed standards, the additional contribution from operation of the facility will generate adverse impacts even if downwind values are relatively small and, therefore, may require further mitigation (see Section 3.3.4, Mitigation Measures).

Table 3-11

MAXIMUM PREDICTED SHORT-TERM AND LONG-TERM AVERAGE CONCENTRATIONS DUE TO LANDFILL ACTIVITIES AT MONOFILL

Receptor	Maximum l-hour Concentration ($\mu g/m^3$)	Maximum 24-hour Concentration (1) ($\mu g/m^3$)	Maximum Annual Concentration (2) ($\mu g/m^3$)
Location of Maximum (3) Concentration	512.0	204.8	0.70
Project Boundary (4)	260.7	104.3	0.36
Elmore Desert (5) Ranch	18.6	7.5	0.03

Notes:

(1) 24-hr concentration was calculated by multiplying the l-hour concentration by a conversion factor of 0.4.

(2) Annual concentration was calculated by multiplying the l-hour concentration by a conversion factor of 0.1 and an averaging factor of 5/365.

(3) Location of maximum concentration is at approximately 1,050 feet (320 m) north-northwest from the southwest comer of Phase 1 disposal area.

(4) Location of maximum concentration on the project boundary is at approximately 1,477 feet (450 m) northwest from the southwest comer of Phase I disposal area.

(5) Elmore Desert Ranch is at approximately 2.2 miles from the southwest corner of Phase I disposal area.

In addition to criteria pollutants, pollutants will be emitted into the atmosphere as the solid constituents of the disposed drilling mud and filter cake become airborne as parts of the total fugitive dust emissions. The primary pollutants of concern in this project are heavy metals, including cadmium, chromium, lead, and nickel; and other compounds such as arsenic and beryllium. Of these toxic materials, only emissions of lead are regulated under California and federal ambient air quality standards.

Maximum hourly concentration of lead at the property boundary was estimated based on the measured average weight percent of lead in the drilling mud and filter cake mixture (1x10-6 percent). The maximum l-hour concentration was then adjusted by a factor of 5/30 and 5/91.25 to obtain the 30-day and quarterly average concentrations, respectively. The monthly and quarterly concentrations of lead was estimated to be 0.0044 $\mu g/m^3$ and 0.0014 $\mu g/m^3$ above ambient. These incremental values were then added to the highest 30-day and quarterly ambient concentrations of lead reported for the period from 1985 to 1987 (see Table 3-8). Compared to the California 30-day standard and the federal quarterly standard of 1.5 $\mu g/m^3$, the total predicted concentrations of lead associated with the proposed project (0.194 $\mu g/m^3$ for the 30-day average and 0.141 $\mu g/m^3$ for the quarterly average) are substantially below the standards, even under worst-case conditions.

A screening analysis was performed to assess the potential risks associated with emissions of the remaining toxic pollutants. Table 3-12 summarizes the results from this preliminary analysis. Cancer risks associated with the proposed project for the residential population were estimated based on the maximum annual average concentration predicted outside of the project boundary for an exposure period of 70 years. For the employment population, the maximum average annual concentration within the project boundary was used to estimate cancer risk over an assumed maximum exposure period of 46 years. As shown in Table 3-12, excess lifetime cancer risk values for both the residential and employment population were less than 10^{-6}, which is the EPA suggested threshold under which the risk can be considered insignificant and, therefore, a more detailed risk assessment will not be necessary. In addition, due to the overly conservative nature of the assumptions used to estimate emission rates, as well as the remote location of the project site from potentially populated areas, it is expected that the proposed project will generate insignificant air toxic impacts on the vicinity of the project site.

Table 3-12

SUMMARY OF ESTIMATED CANCER RISKS

Carcinogen	Weight Percent in Mud (%)	Weight Percent in Filter Cake (%)	Average Weight Percent in Landfill Dust (a) (%)	Predicted Maximum Annual Average Concentration ($\mu g/m^3$) (b)		unit Risk Value	Excess Lifetime Cancer Risk (c)	
				Within Project Boundary	Outside Project Boundary		Residential	Employment
Arsenic	8.6×10^{-3}	2.4×10^{-2}	1.8×10^{-2}	1.2×10^{-4}	2.0×10^{-7}	4.3×10^{-3}	8×10^{-10}	2×10^{-7}
Berrylium	2.6×10^{-4}	1.0×10^{-3}	7.0×10^{-4}	5.0×10^{-6}	2.4×10^{-6}	2.4×10^{-3}	6×10^{-9}	4×10^{-9}
Cadmium	4.4×10^{-4}	2.0×10^{-5}	1.9×10^{-4}	1.4×10^{-6}	7.2×10^{-7}	1.2×10^{-2}	8×10^{-9}	6×10^{-9}
Chromium (d)	1.2×10^{-3}	1.0×10^{-4}	5.5×10^{-4}	4.2×10^{-6}	2.2×10^{-6}	1.5×10^{-1}	4×10^{-7}	2×10^{-7}
Nickle	1.4×10^{-3}	1.5×10^{-4}	6.6×10^{-4}	5.0×10^{-6}	2.6×10^{-6}	2.4×10^{-4}	6×10^{-10}	4×10^{-10}
Total							4×10^{-7}	4 x 10-7

Notes

(a) Average weight percent of each carcinogen in the landfill dust was calculated based on a mixture of 100 cubic yards (100 tons) of filter cake and 50 cubic yards (70 tons) of drilling mud.

(b) Predicted maximum annual average concentrations of each carcinogen were calculated at the location of maximum predicted concentration within the project boundary and at the project boundary based on the average weight percent of the compound in the landfill dust and the predicted ambient concentration at the corresponding locations.

(c) Excess lifetime cancer risk for the residential population was calculated based on the pollutant's unit risk value, the maximum annual average concentration predicted outside the project boundary, and an assumed exposure period of 70 years. Similarly, excess lifetime cancer risk for the employment population was calculated based on the pollutant's unit risk value, the maximum annual average concentration predicted within the project boundary, and an assumed exposure period of 12 hours/day for 46 years (CAPCOA 1987).

(d) Estimated cancer risks for chromium are worst case as it assumes hexavalent chromium.

3.3.4 Mitigation Measures

Although operational dust emissions from the proposed project will create only minor impacts downwind from the facility, such impacts, nevertheless, will contribute incrementally to a large-scale, regional dust problem already existing in Imperial County. Therefore, it may be necessary to implement additional mitigation measures to control fugitive dust emissions from the proposed project. For example, to further reduce fugitive dust emissions from mobile sources during operation of the landfii, the access road should be kept in good repair with adequate off-road drainage to prevent soil from washing onto the road during isolated storms. Furthermore, a gravel surface should be added to those levees used as internal access roads and all vehicles using these levees should be required to travel at speeds less than 15 miles per hour. Since the project may obtain clay outside the project area, the final grading plan should be approved by the Imperial County APCD with regard to any additional air quality impacts that may be generated. In addition, the Imperial County APCD will be responsible to ensure, through their permitting process, that the approved project will not cause significant impacts to the local and regional air quality.

3.4 NOISE

3.4.1 Existing Noise Environment

Community noise levels within the County of Imperial are generally presented in terms of daytime, nighttime, and evening hour A-weighted noise levels. Daytime hours correspond to the time period of 7 a.m. to 6 p.m., evening hours include 6 p.m. to 10 p.m., while the nighttime hours range from 10 p.m. to 7 a.m. The A-weighted scale measures noise levels corresponding to the human hearing range. The Imperial County Noise Element does not include a standard for designated open space, which is the current use of the site. Noise levels for heavy industrial areas with few residences, similar to the proposed project, should not exceed 75 dB(A) during the day, 65 dB(A) during the night, and 70 dB(A) in the evening hours. Appendix G contains definitions of acoustical terms used in this section.

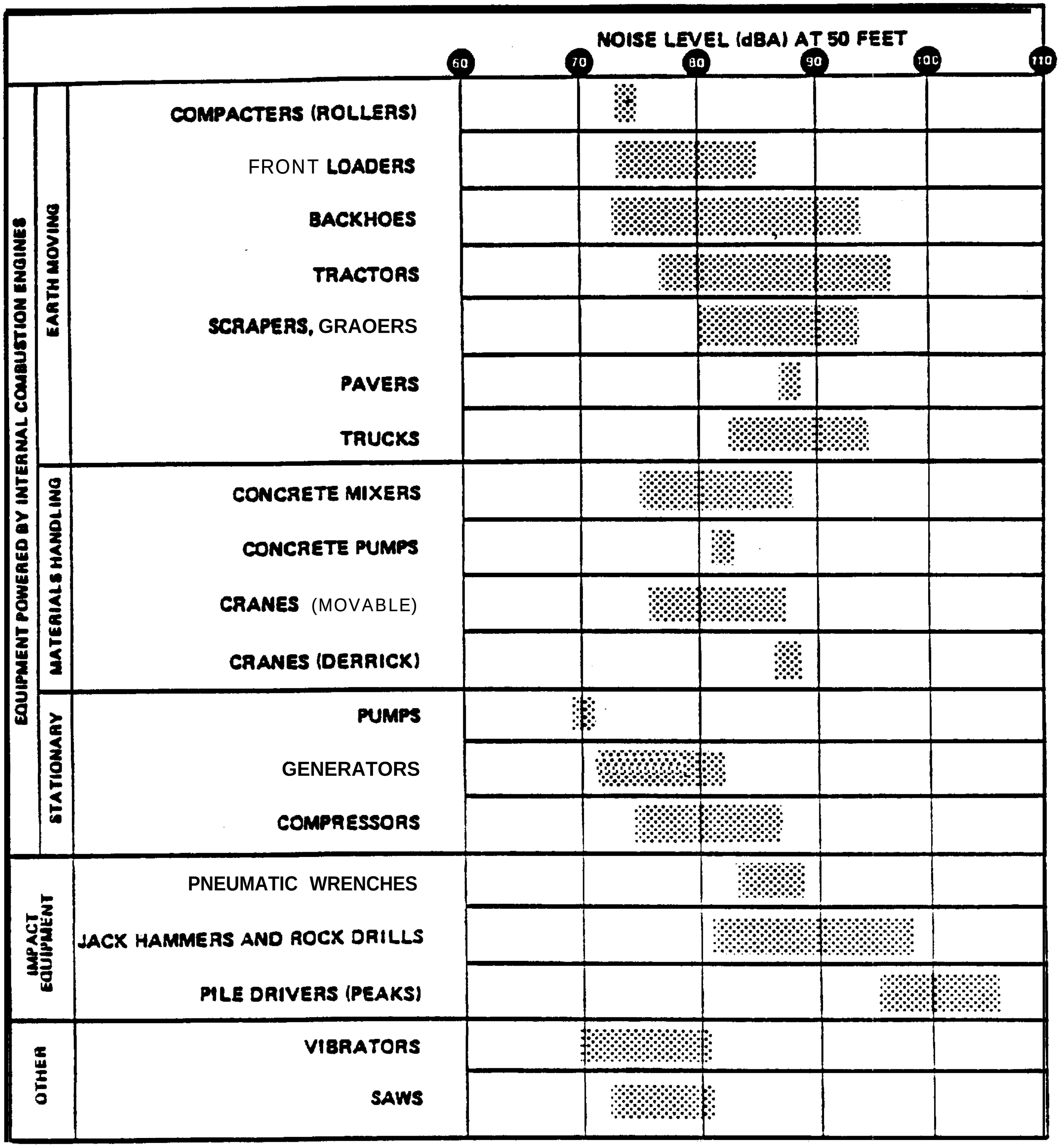
The existing noise levels at the site correspond to those of a remote, open space environment. The site is currently undeveloped desert and features no man-made noise sources. The only significant man-made noise source in the project vicinity is SR-86, located approximately 1.25 miles north of the closest project boundary. To determine the ambient noise conditions onsite, noise monitoring was conducted on March 23, 1989, using a Type 2 Larson-Davis (model 700) sound level meter. Measurements were taken at the northeastern comer of the project site between the daytime hours of 7:30 and 8:30 a.m. Based on the monitored data, the peak daytime equivalent noise level (L_{eq}) is 45.0 dB(A). It should be noted that because of the remote nature of the project site, ambient noise levels are easily influenced by noises such as wind.

3.4.2 Impacts

Development and operation of the proposed Monofill Facility would result in some increase in ambient noise levels in the project vicinity. The only sensitive receptors in the project vicinity are the Elmore Ranch, on the northern side of SR-86 approximately 2 miles east-north-east of the project site, and the San Sebastian Marsh, a Bureau of Land Management designated wildlife/recreation area, approximately 3 miles northwest of the site.

Construction-related noise will primarily result from heavy equipment operations and truck traffic associated with access road development, onsite grading, berm and levee development, and soil compaction. The construction period for each phase is projected to take 90 days. Equipment will likely include a scraper, bulldozer, compactor and a few water trucks. Typical noise emissions from such heavy-duty construction equipment are contained within Figure 3-9. Note that when two or more vehicles are used simultaneously, a combined noise level would be 3 dB(A) higher than the noise level of one vehicle. Because the closest noise sensitive receptor (residence) is approximately 2 miles from the proposed construction operations, the noise generated by project development would not generate significant impacts. Table 3- 13 summarizes the resultant noise levels at various distances from the typical construction equipment. As evidenced by this table, county standards would not be exceeded at any of the nearby sensitive receptors and no adverse short-term noise impacts would occur in the project vicinity. In addition to the heavy-duty equipment noise, vehicles used by construction employees to commute to and from the site would also contribute to local noise levels. Approximately 20 construction workers are anticipated during construction. These few additional trips are temporary and would not constitute a significant contribution to existing noise levels.

Upon operation of the Monofill Facility, noise would be generated by the trucks transporting the filter-cake and mud-sump materials from the four geothermal power plants to the facility, by the diesel-powered bulldozer or tractor grading and compacting the



NOTE: Based on limited available data samples.

SOURCE: EPA PB 206717, Environmental Protection Agency, Dec. 31, 1971, "Noise from Construction Equipment & Operations"

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Typical Construction Equipment Noise Generation Levels

FIGURE 3-9

Table 3-13

MAXIMUM NOISE LEVELS* OF HEAVY-DUTY
EQUIPMENT FOR FACILITY CONSTRUCTION AND OPERATION

Equipment Type	Proposed Use	Distance From Equipment 100 ft	500 ft	2000 ft	0.5 mile	over 1mile	2 miles **
Scraper	Construction	89dB(A)	78dB(A)	69dB(A)	67dB(A)	62dB(A)	58dB(A)
Bulldozer	Construction/ Operation	91dB(A)	81dB(A)	72dB(A)	70dB(A)	65dB(A)	61dB(A)
Compactor	Construction	70dB(A)	60dB(A)	51dB(A)	47dB(A)	44dB(A)	60dB(A)
Truck	Construction/ Operation	90dB(A)	80dB(A)	71dB(A)	69dB(A)	64dB(A)	40dB(A)
Generator	Operation	78dB(A)	68dB(A)	59dB(A)	57dB(A)	52dB(A)	48dB(A)
Tractor	Operation	91dB(A)	81dB(A)	72dB(A)	70dB(A)	65dB(A)	61dB(A)

* Assumes additional attenuation due to “soft,” unpaved site.
** Does not account for earthen levee attenuation.

material, by the truck spraying the soil sealant, and by an electrical generator if one is used to supply onsite electrical needs. Additional noise would also be generated by the employees commuting to the facility, although the number of employees would be minimal (e.g., 3 to 5 employees). Because of the low additional volume of daily truck and vehicle trips on the local roadways, the associated noise levels would be similar to those which are already experienced by local residents and, therefore, the project's contributions would not be considered adverse.

Increased on and offsite noise levels associated with the daily heavy equipment operations of the facility would be similar to those projected above for the construction activities. The operation activities, however, would be confined to the disposal/storage areas. The closest sensitive receptor, the Elmore Desert Ranch, would be approximately 2 miles from the nearest operations. In addition to distance from the site, an existing 4- to 5-foot-high earthen levee between SR-86 and the project site also serves as an effective attenuating barrier. The San Sebastian Marsh reserve is located 3 miles northwest from the proposed activities, and although the earthen levee is not present between the project and the San Sebastian Marsh, ambient noise levels at the San Sebastian Marsh would not be influenced by onsite operations. As shown in Table 3-13, operation of the Monofill Facility would not expose any sensitive receptors to adverse noise conditions. Due to the isolated nature of the project site, County of Imperial noise standards at the points of reception will not be exceeded.

3.4.3 Mitigation Measures

No adverse noise impacts are anticipated during construction and operation of the proposed facility; therefore, no measures are necessary.

3.5 BIOLOGICAL RESOURCES

The project area was surveyed for biological resources in March 1989. The entire 160-acre project site was transected in an east-west manner with special attention given to washes on-site. The proposed access corridor was also surveyed. The biological survey was conducted to determine the type of biological resources and to identify potential impacts associated with any sensitive species or habitats. A subsequent survey was undertaken to determine the presence of the flat-tailed homed lizard (*Phrynosoma mcallii*) in late June

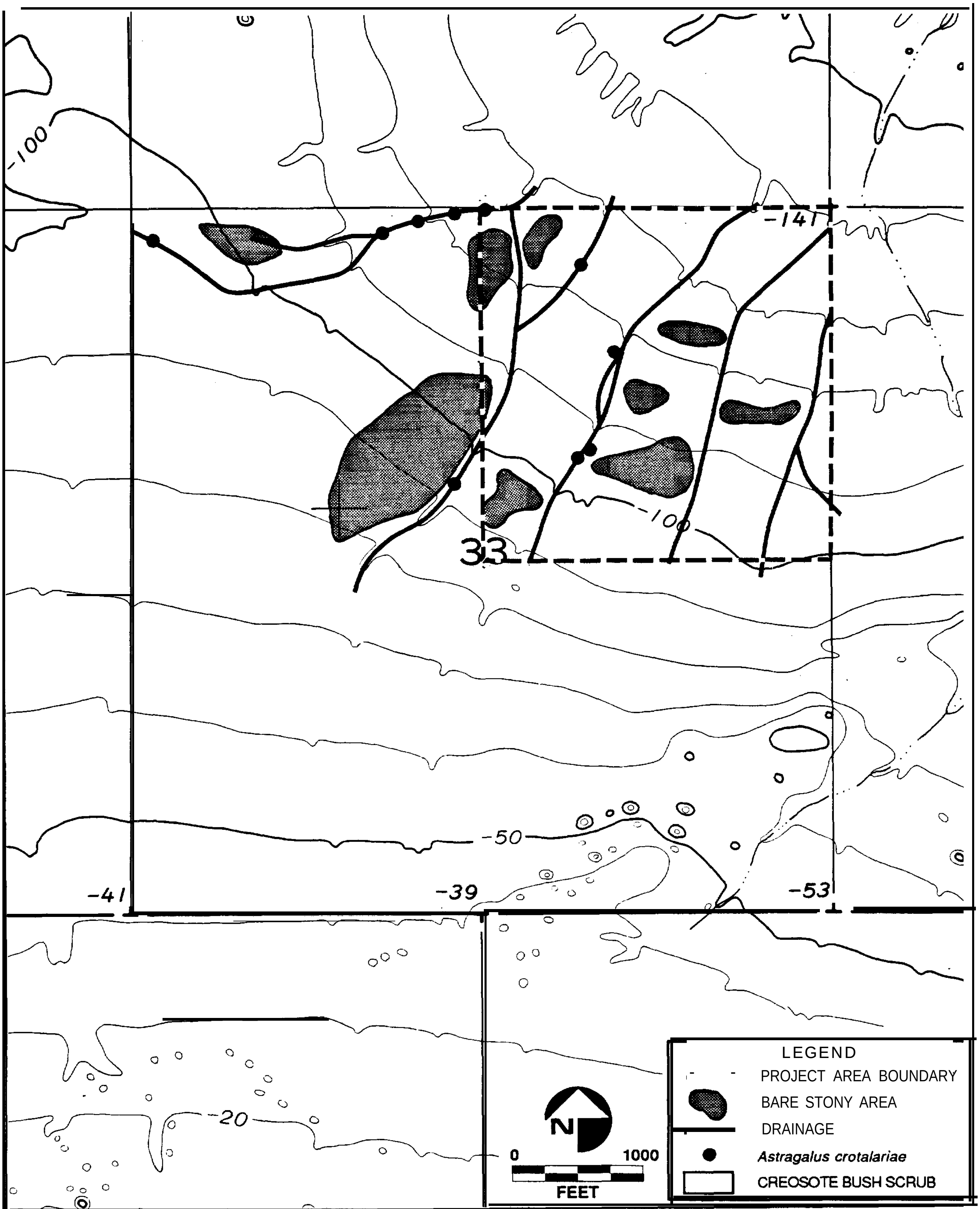
1989, the most active time of the year for the species. A complete technical **report is provided in Appendix** H. A summary of findings is provided in this section.

3.5.1 Vegetation

The entire north-east quarter of Section 33 supports an open creosote bush scrub (Holland 1986) (Figure 3-10). The creosote bush (*Larrea tridentata*) is the dominant shrub; the smaller burrobush ***(Ambrosia dumosu)*** and all-scale saltbush ***(Atriplex polycarpa) are*** also common and dispersed among the creosote bushes. Mormon tea ***(Ephedru trifurca)*** and dalea ***(Psorothumnus*** sp.) are present but are less frequent. Honey mesquite ***(Prosopis glandulosa) occurs*** onsite on approximately 12 to 15 poorly formed or disturbed mesquite hummocks. There are numerous well developed mesquite hummocks just south of the project site.

Several washes cross the project area and drain more or less to the northeast. The margins of these washes support additional plant species such as desert mat (*Coldenia plicata*), alkali golden-bush (*Haplopappus acradenius* ssp. ***eremophilus***), and Salton milkvetch (***Astragalus crotalariae***). Approximately 20 percent of the north half of Section 33 consists of stony ground devoid of vegetation, with a scattering of rigid spine flowers ***(Chorizunthe rigidu).*** Nonnative weeds (canary grass, ***Phalaris minor;*** woolly plantain, ***Plantago insularis;*** London rocket, ***Sisymbrium irio***; yellow sweet clover, *Melilotus indicus*) ***are*** sparsely distributed throughout the project area. The paucity of annuals or herbaceous perennials seen (e.g., desert lily, ***Hesperocallis undulata***; desert sunflower, ***Gerueu cunescens; Cryptantha*** sp.) may be due in part to the dryness of the preceding winter.

The vegetation along the access route does not differ from that in the north-eastern quarter of Section 33 except within 0.1 mile of Highway 86. There the alkali goldenbush and nonnative weeds grow somewhat more densely as a result of water occasionally accumulating behind the levee protecting the highway. Only in this area are shrubby tamarisks (*Tamarix* sp.) growing in the area. Table 3-14 lists all plant species observed on the proposed site and access road.



FIGURE

3-10

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Biological Resources of Monofill Site

Table 3-14

PLANT SPECIES OBSERVED ON PROPOSED PROJECT SITE AND ACCESS ROAD

Family Ephedraceae	
Ephedra trifurca	Mormon tea
Family Asteraceae	
Ambrosia dumosa	Burrobush
Geraea canescens	Desert sunflower
Haplopappus acradenius	Alkali goldenbush
Psathyrotes ramosissima	Velvet rosette
Stephanomeria sp.	Stephanomeria
Family Boraginaceae	
Coldenia plicata	Desert mat
Cryptantha sp.	Cryptantha
Family Brassicaceae	
Sisymbrium irio	London rocket
Family Chenopodiaceae	
Atriplex polycarpa	All-scale saltbush
Family Fabaceae	
Astragalus crotalariae	Salton milkvetch
Dalea emoryi	
Melilotus indicus	Yellow sweet clover
Prosopis glandulosa	Honey mesquite
Psorothamnus sp.	Dalea
Family Plantaginaceae	
Plantago insularis	Woolly plantain
Family Polygonaceae	
Chorizanthe rigida	Rigid spineflower
Family Solanaceae	
Lycium brevipes	
Family Tamaricaceae	
Tamarix sp.	Tamarisk
Family Zygophyllaceae	
Larrea tridentata	Creosote bush
Family Liliaceae	
Hesperocallis undulata	Desert lily
Family Poaceae	
Phalaris caroliniana	Canary grass

3.5.2 Wildlife

The density of populations of most animals in creosote bush scrub, especially in scrub as sparse as that of the project area, is very low. Wildlife observed or expected to occur on the project site is described as follows.

Birds

Five bird species were seen during the survey. Four of these were migrants or winter visitors; only the mourning dove ***(Zenaida macroura),*** of which one was seen along the access route near Highway 86, probably nests in or near the project site. Also, three of the distinctive globular nests of the verdin ***(Auriparus flaviceps acaciarum)*** were found in a mesquite near the access route; therefore, it is presumed that the species breeds in the project area. Additional resident species that may occur in the project area sporadically or in very low densities (the entire project area may be only part of the territory of a single pair) are the greater roadrunner (Geococcyx ***californianus***), homed lark ***(Eremophila alpestris leucansiptila),*** black-tailed gnatcatcher ***(Polioptila melanura lucida),*** Leconte's thrasher ***(Toxostoma leconteii leconteii),*** house finch ***(Carpodacus mexicanus frontalis),*** and Costa's hummingbird ***(Calypte costae).*** The lesser nighthawk ***(Chordeiles acutipennis),*** a summer visitor that arrives usually about the end of March, probably nests in the study area, as it lays its eggs on bare ground in creosote bush scrub. Though there is no suitable habitat for their nesting in the project site, the red-tailed hawk ***(Buteo jamaicensis),*** Say's phoebe ***(Sayornis saya),*** and common raven (Corvus ***corax***) nest in the region and presumably forage in the project area regularly. Many additional species of birds undoubtedly visit the site occasionally during migration or winter.

Mammals

A detailed determination of the mammals inhabiting the project area would require a nocturnal survey. Only the desert cottontail ***(Sylvilagus audubuni)*** was seen during the survey, along the proposed access route near Highway 86. Tracks and scat of the coyote (***Canis latrans***) were also noted in the study area. Burrows of small mammals such as the little pocket mouse ***(Perognathus Zongimembris),*** desert pocket mouse ***(P. penicillatus),*** desert kangaroo rat ***(Dipodomys deserti),*** Merriam's kangaroo rat ***(D. merriami),*** cactus mouse ***(Peromyscus eremicus),*** and deer mouse ***(P. maniculatus)*** were noted onsite. The round-tailed ground squirrel (***Spermophilus tereticaudus***) and white-tailed antelope squirrel

(***Ammospermophilus leucurus***) occur in the region and possibly in small numbers in the study area. A large hole seen at the base of a mesquite near the access route may be the entrance to a den of the coyote, gray fox (***Urocyon cinereoargenteus***), or kit fox (***Vulpes mucrotis***), any of which could occur in the project area in very low numbers.

Reptiles

Four species of lizards were noted during the survey: flat-tailed horned lizard (***Phrynosoma mcallii***), western whiptail (***Cnemidophorus tigris***), the zebra-tailed lizard (***Callisaurus draconoides***), and the desert iguana (***Dipsosaurus dorsalis***). Additional reptiles that may occur in the project area include the sidewinder (***Crotalus cerastes***), the side-blotched lizard (***Uta stunsburiana***), long-tailed brush lizard (***Urosaurus gruciosus***), leopard lizard (***Crotaphytus wislizenii***), common kingsnake (***Lampropeltis getulus***), night snake (***Hypsiglena torquata***), and shovel-nosed snake (***Chionactis occipitalis***). The variety of reptiles that may occur on the site is limited by the lack of rock outcrops and significant sandy areas. Because of the lack of water, no amphibians are expected.

3.5.3 High-Interest Species/Habitats

Habitats

None of the habitat types represented on the project site (open creosote bush scrub, dry washes, bare stony ground) is regarded as sensitive. Mesquite hummocks., considered important by the California Department of Fish and Game (CDFG), are well represented in the southeast comer of Section 33 but not in the project area or along the proposed access route. San Felipe Creek and San Sebastian Marsh, sensitive wetlands and home of the endangered desert pupfish (***Cyprinodon macularius***), lie 3 to 6 miles northwest to west of the study area and would not be affected by the proposed project. Drainage from Section 33 runs northeast where is it blocked by the levee protecting Highway 86 or through culverts under the highway and into the Trifolium canal.

Plants

High-interest plants include those listed by the U.S. Fish and Wildlife Service (USFWS 1985), California Department of Fish and Game (CDFG 1985), and California Native Plant Society (Smith and Berg 1988). The CNPS listing is sanctioned by the California

Department of Fish and Game and essentially serves as its list of "candidate" species for threatened or endangered status.

None of the plant species observed or expected to occur on the proposed site is currently listed as endangered, threatened, or sensitive by the U.S. Fish and Wildlife Service (USFWS 1985), the California Department of Fish and Game (CDFG 1985), or the California Native Plant Society (Smith and Berg 1988). There are, however, a number of sensitive species that occur in the region surrounding the project site which have potential to occur on site. These species include three federal candidates for listing, one of which is state-listed as an endangered plant species. The status of these species along with comments on the species' range, distribution in the region, and probability of occurring onsite is listed below (see Appendix H for an explanation of CNPS listings and codes and USFWS designations).

Ammobroma sonorae
Sand Food
USFWS: Candidate (Category C3c)
CNPS rating: List 1, 2-2-2
This purple flowered root-parasite is found primarily within the Algondones Dunes and adjacent sandy areas of the East Mesa of Imperial Valley. It is also found at a single location on West Mesa in the northeastern comer of Imperial County. The host species for this parasite include several perennial shrubs: ***Coldenia palmeri, C. plicata, Eriogonum deserticola,*** and possibly ***Pluchea sericea*** (WESTEC Services 1977) and appears on the surface of sand dunes as a tarnish-gray form resembling the top of a mushroom. This species was not detected onsite.

Astragalus crotalariae
Salton Milkvetch
CNPS rating: List 4, 1- l-2
This coarse and malodorous annual or short-lived perennial occurs on sandy flats and desert fans. This species has been recorded at a number of locations on the West Mesa of Imperial County and in particular was found south of Yuha Wash (WESTEC 198 1 b). It is also found in Baja California and adjacent Arizona. This species is associated with high selenium content in the soil, and heavy concentrations of this element within the plant makes this species highly toxic. Salton milkvetch was detected onsite in the numerous dry washes.

Astragalus lentiginosus var. borreganus
Borrego Milkvetch
CNPS rating: List 4, l-l-l
This purple-flowered legume occurs on dunes and sandy valleys below 1000 feet elevation in association with creosote bush scrub. Borrego milkvetch flowers from February to May. This species was not detected on the project site.

Pilostyles thurberi
Thurber's Pilostyles
USFWS: Candidate (Category C3c)
CNPS: List 4,1-1-1
This fleshy minute herb is parasitic on the branches of *Psorothamnus emoryi* in San Diego and Imperial counties, southwest Arizona and Baja California. Only the small brown flowers and overlapping bracts are visible on the host plant. This species was not observed onsite.

Opuntia wigginsii
Wiggin's Cholla
USFWS: Candidate (Category C2)
CNPS: List 1, 3-1-2
This shrubbery (l-3 foot dm) cactus is associated with sandy soils in creosote bush scrub habitat from eastern San Diego County to Arizona. This species was not detected onsite.

<u>Animals</u>

Kit fox *(Vulpes macrotis)* tracks and scat were observed near the southern end of the proposed access road. This species is declining in numbers, however, is not listed by state or federal agencies. Other sensitive species known from Imperial County occur in other habitats, either rocky hills (e.g., the desert bighorn sheep, *Ovis canadensis cremnobates)* or more humid areas (e.g., the badger, *Taxidea taxus*, and the Yuma cotton rat, *Sigmodon hispidus eremicus*). Certain scarce bats may occasionally forage or migrate over the study area, but there are no suitable roosting sites (caves, mine shafts, etc.), the resource critical to these species.

Of the many sensitive species of birds occurring in Imperial County, all but five are restricted to riparian or wetland habitats. None of the five that occurs in desert scrub was observed during the field survey and the habitat in the project area is unsuitable or marginal for all of them. None is listed as threatened or endangered by the CDFG or USFWS. The prairie falcon (***Falco mexicanus***), a third-priority species of special concern to the CDFG (Remsen 1978) nests in rocky hills and forages in creosote bush scrub, among other habitats. The nearest suitable nest sites are at least 5 miles from Section 33, so the area undoubtedly receives no more than very occasional visits by prairie falcons. The burrowing owl ***(Athene cunicularia hypugaea),*** a second-priority species of special concern, occurs sparsely in open creosote bush scrub in Anza-Borrego Desert State Park but is far more numerous in the agricultural areas of the Imperial Valley. No burrows or squirrel colonies constituting habitat for the species were noted during the field survey, and the area is either poor or unsuitable habitat for burrowing owls. The black-tailed gnatcatcher (***Polioptila melanura lucida***), a second-priority species of special concern, is common and widespread in the Anza-Borrego Desert and uncommon and localized to mesquite thickets in the Imperial Valley. It inhabits creosote bush scrub but usually scrub containing a higher density of large shrubs than is found in the project area. Probably black-tailed gnatcatchers occur in very low density in the north-eastern quarter of Section 33, as the habitat can be regarded as only marginal for them. The crissal thrasher ***(Toxostoma crissale coloradense)***, a third-priority species of special concern, requires dense mesquite thickets, so there is no habitat suitable for it near the project site. Western Imperial County constitutes a hiatus in the species' range between the Imperial Valley and the westernmost colony in the Borrego Valley. The LeConte's thrasher ***(Toxostoma Zeconteii Zeconteii)*** is regarded as a third-priority species of special concern by the CDFG but probably should be ranked higher, as it occurs in very low density (five pairs or less per square mile) even in prime habitat, and much of its range is subject to degradation by off-road vehicles. LeConte's thrasher occurs near the project area both to the north (near Salton City) and to the south (south side of Superstition Mountain, P. Unitt, pers. obs.). It is the sensitive bird most likely to occur in the project area. For nesting, however, it uses either cacti (for protection) or shrubs densely foliaged enough to conceal the nest. As both of these types of vegetation are absent from the study area, the project site is unlikely to constitute more than a peripheral portion of the territory of a pair of LeConte's thrashers.

Two species of sensitive reptiles may occur on the site: the Colorado desert fringe-toed lizard (***Uma notata)*** and the flat-tailed homed lizard ***(Phrynosoma mcallii***). Both are regarded as species of special concern by the CDFG and as candidates for listing as threatened or endangered by the USFWS. The fringe-toed lizard generally prefers dunes and other habitats sandier than are found in the study area, but may occur sparsely along the washes. The flat-tailed horned lizard is an uncommon resident of the Coachella and Imperial valleys in southeastern California; southwestern Yuma County, Arizona, and south to the desert plains around the Colorado River delta in northern Mexico (Stebbins 1954; Turner et al. 1980). These areas have received increasing levels of urban and agriculture development as well as increased off-road vehicle traffic. Consequently, the flat-tailed homed lizard has been given state protected status and is a candidate for state listing as endangered and classified as a Candidate 2 Category species for the federal list of threatened and endangered species (CDFG 1988).

The flat-tailed homed lizard is a particularly secretive and cryptic animal. Individuals are rarely seen therefore detection of the animals relies on indirect means, namely presence of scat. *Phrynosoma* scat is easily distinguished from other lizard scat in size, shape, texture, and contents (almost exclusively ants). The habitat preferred by the flat-tailed horned lizard is "areas of low relief with surface soils of fine packed sand, or [desert] pavement, overlain with loose, fine sand. The vegetation is usually a simple association of creosote bush and bur-sage ["burrobush"] (Turner et al. 1980). The project area thus appears suitable for the flat-tailed horned lizard. Turner et al. reported, however, that the habitat above the old shoreline of Lake Cahuilla (elevation 40 feet above sea level) is more favorable for the flat-tailed horned lizard than lower areas. As the study area lies at or below 50 feet below sea level, it is not anticipated to constitute prime habitat. Turner et al. (1980, Figure 5) found horned lizard scat in Section 27, immediately northeast of Section 33 and along the east side of the access route, and observed the lizards themselves near Highway 78, just west of Highway 86. Turner et al. however, did not report any evidence of the flat-tailed homed lizard on the project site.

A thorough survey was undertaken in late June (the most active time of the year for the species) to determine the presence of flat-tailed homed lizards. Within the project area three triangular transects were walked (section 27, 28, and 33). The transects resulted in one flat-tailed homed lizard scat per section (see Appendix H). In addition to scat identified, one flat-tailed homed lizard was observed off the transects near the NE corner of section 33. An index of relative abundance utilized by the BLM in assessing and comparing homed lizard utilization of an area is as follows:

RELATIVE ABUNDANCE INDEX

Low	1 to **<5** scat/person/hour
Medium	5 to 9 **scat/person/hour**
High	**>9** scat/person/hour

Using this index the sensitivity level of the project site overall is low with only one scat per hour per transect.

3.5.4 **Impacts**

Construction of the **Monofill** Facility would result in the loss of approximately **35** acres of creosote bush scrub (area of access road plus developed portion of the northeastern quarter of Section 33). Additional acreage may be lost upon implementation of final grading design. The biological significance of this loss may be judged by its effect on the habitat as a whole and by its effect on the component species within the habitat. Creosote bush scrub is not regarded as a sensitive habitat. The project's impact on the habitat as a whole is not considered significant, due to the abundance of creosote bush scrub in the surrounding region, the small proportion of the habitat in the vicinity to be eliminated by the project, and because of the public **(BLM)** ownership of the surrounding land (possibly affording some additional degree of protection).

The only individual species that may be affected significantly by the project is the flat-tailed homed lizard. The site is at best only marginally suitable for other sensitive animals such as the Colorado desert fringe-toed lizard or **LeConte's** thrasher, and because these species are not recognized as highly sensitive by government agencies, the impacts on them, if any, would not be considered significant. The degree of the project's impact on the flat-tailed horned lizard is considered to be potentially adverse yet insignificant due to its relative low abundance on the project site.

The only sensitive plant species in the project area is the **Salton** milkvetch. Even though some **Salton** milkvetch and suitable wash habitat would be eliminated by the project, because of the species' low ranking in the California Native Plant Society's hierarchy and the abundance of suitable habitat nearby, this loss is not considered significant.

3.5.5 Mitigation

The final grading plan shall be reviewed by a qualified biologist to ensure that no significant impacts to the flat-tailed horned lizard would occur and that impacts to theSalton milkvetch are minimized to the extent possible. Potential adverse impacts to the flat-tailed homed lizard can be further minimized through implementation of the following recommendations:

- All vehicles should remain on roads. No offroad vehicle travel should be authorized without prior approval by' BLM or CDFG.

- Access to the project area should be controlled by gating.

- Access roads should be paved to eliminate the amount of time the flat-tailed homed lizards spend on roads and potentially reduce lizard mortality.

- The loss of flat-tailed homed lizard habitat will be compensated commensurate with appropriate state and federal requirements.

3.6 CULTURAL RESOURCES

3.6.1 Existing Conditions

The cultural resource study included a literature review conducted at the Imperial Valley College Barker Museum, a field survey, testing to determine site importance sunder CEQA and eligibility to the National Register of Historic Places under the National Historic Preservation Act (NHPA). A full technical report is on file with the Imperial County Planning Department and the clearinghouse of Imperial Valley College. The following summarizes the findings of this report. The record search identified four sites IMP-128 IMP-2376, IMP-5574, and IMP-5575 recorded within a l-mile radius of the project area. The field survey located 16 sites and 18 isolate finds within or adjacent to the project area. The sites represent Late Period prehistoric occupation of the relic Lake Cahuilla shoreline circa 500 years B.P. These sites and isolates include pottery, projectile points, flakes, angular waste flakes, and hearths constructed of sandstone. Ten (IMP-6138, IMP-6139, IMP-6140, IMP-6143, IMP-6147, IMP-6148, IMP-6150, IMP-6151, IMP-6152, IMP-6153) sites and eighteen isolate finds are recommended as either not important under

CEQA or not eligible for inclusion in the National Register of Historic Places, given their small size, limited data base, and lack of a subsurface deposit. Further work at these sites would not significantly contribute to the archaeological record. **A** map showing cultural resources within the **monofill** project area and proposed access road is contained in the technical report. This map has not been reproduced in this section in order to protect these resources.

Site IMP-6141 was tested and found to contain a subsurface deposit to 30 centimeters. Surface artifacts include over 225 ceramic fragments, **85+** flakes, flake tools and milling tools, and possible hearths. Site IMP-6141 is recommended as important under CEQA and eligible to the National Register of Historic Places.

The remaining five sites (IMP-6142, IMP-6144, IMP-6145, IMP-6146, IMP-6149) need testing to determine site importance under CEQA or eligibility to the National Register of Historic Places under NHPA. Testing will provide information as to site size, depth, content, and potential to address important research questions.

3.6.2 Impacts

Ten sites and 16 isolates, identified as not important under CEQA or recommended as not eligible to the National Register of Historic Places under NHPA, need not be addressed as to impacts. The remaining five sites (IMP-6142, IMP-6144, IMP-6145, IMP-6146, IMP-6149) need to be tested to determine site importance or eligibility to the National Register of Historic Places, before impacts can be addressed. The proposed access road as presently planned will directly impact site IMP-6141 (MON-S-4). Sites IMP-6145 and IMP-6146 may be indirectly impacted through **monofill** construction. Formal determinations of eligibility for inclusion in the National Register must be submitted to the State of Historic Preservation Office for those properties located on public land which are slated for impacts. Concurrence of these determinations must be obtained prior to any surface disturbances.

3.6.3 Mitigation of Impacts

Under CEQA, only sites identified as important need to be addressed as to mitigation of impacts. For NHPA, sites eligible to the National Register of Historic Places need to be addressed as to mitigation of impacts. The project as currently proposed would impact one important and two potentially important sites: IMP-6141 (MON-S-4), IMP-6145 (MON-S-8), and IMP-6146 (MON-S-9). Impacts to these sites can be mitigated through avoidance or a data recovery program. If avoidance cannot be achieved, then sites IMP-6145 and IMP-6146 will need further evaluation to determine site importance or eligibility to the National Register of Historic Places before mitigation of impacts can be addressed. Site IMP-6141, identified as important and/or recommended as eligible to National Register of Historic Places needs to be mitigated of direct or indirect project impacts. Under federal guidelines, avoidance is the preferred alternative and an accepted road route is recommended if indirect impacts can be eliminated. Mitigation of impacts through a data recovery program would require several months for consultation with the State Historic Preservation office and the President's Advisory Council on Historic Preservation.

Should the final grading plan identify the need to use borrow material from outside of the direct project impact area, plan review and approval will be required from both Imperial County and the BLM with regard to avoiding importance cultural resources as identified in the Cultural Resources Technical Report. The review and approval are necessary, given the number of prehistoric sites in this area and the potential for sites outside the project area.

3.7 LAND USE

3.7.1 Existing Land Use

The Imperial County covers an area of 4597 square miles or 2,942,080 acres. Approximately 72 percent of county lands are undeveloped and under federal ownership and administration. Approximately 20 percent of the land is irrigated for agricultural purposes, most notably the central area known as the Imperial Valley. The developed area where the County's incorporated cities, a majority of the unincorporated communities, and supporting facilities are situated comprise less than 1 percent of the land. The Salton Sea covers approximately 7 percent of the county (County of Imperial 1985).

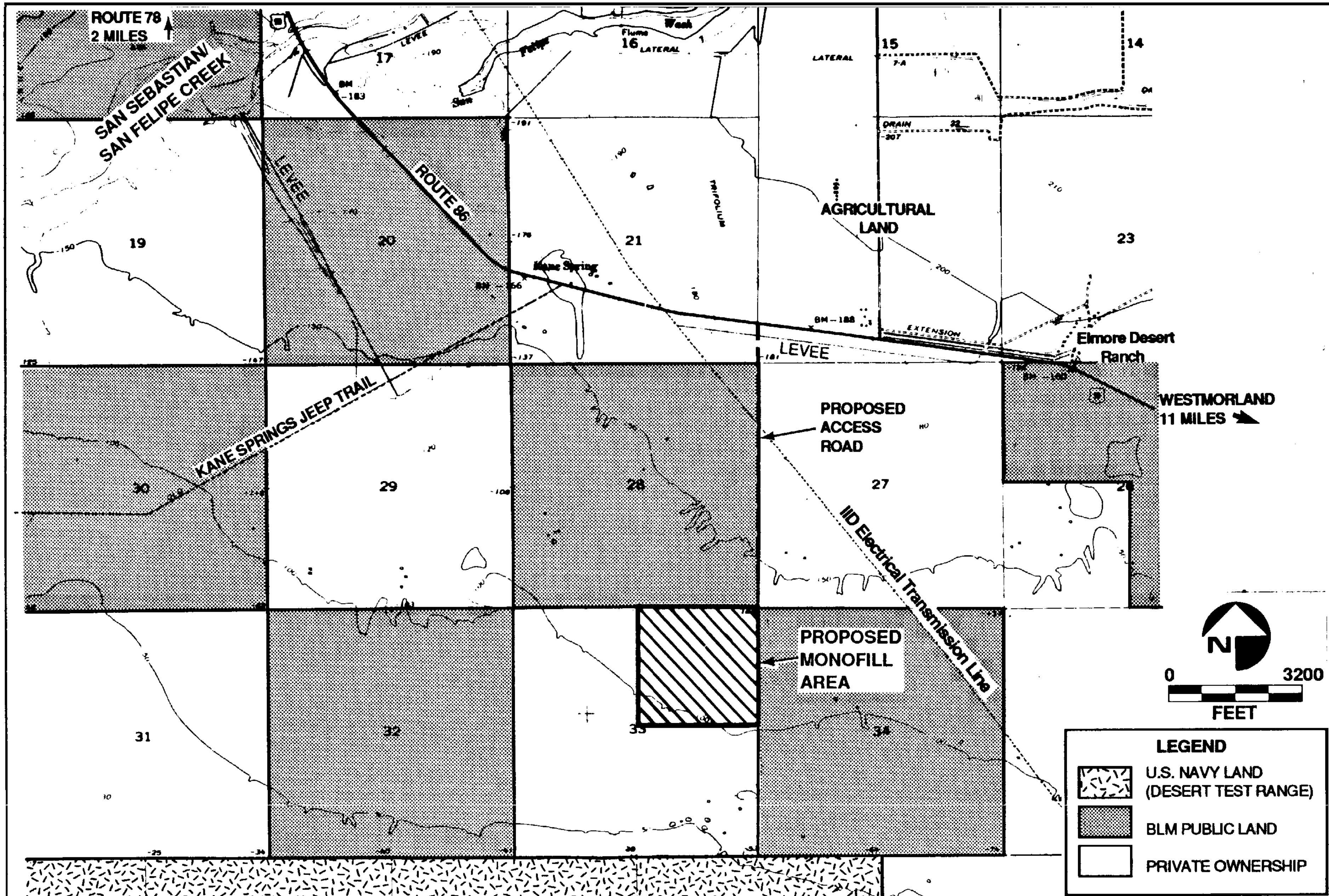
The majority of the development in the western portion of the valley is concentrated in the City of Westmorland, 12 miles east of the project site. Land use in the project vicinity is generally characterized by irrigated agricultural land interspersed with scattered rural residences to the north and east of SR-86 and uncultivated, vacant desert south and west of the highway. The nearest residence to the project site is located approximately 2 miles east-northeast at the Elmore Desert Ranch. The BLM's San Sebastian Marsh/San Felipe Creek reserve, categorized as an Area of Critical Environmental Concern (ACEC), is located 3 miles northwest of the site. The IT Class I (hazardous waste) disposal facility is located 5 miles southwest of the site. Directly south of the site is the U.S. Navy Test Range. Figure 3-l 1 illustrates the land uses existing in the project area.

Although the project site is privately owned, ownership of surrounding parcels varies: the BLM currently maintains title to Sections 28, 32, and 34, which are directly adjacent to the northern, western, and eastern boundaries of the site. The U.S. Navy owns the land directly south of the subject property and adjacent properties. Sections 27 and 29, to the northeast and northwest of Section 33, respectively, are also privately owned. The only existing improvements on these surrounding lands include an electrical transmission line and maintenance road which diagonally traverse Sections 21, 26, 27, 34, and 35 and are operated by the IID; the Kane Springs Jeep Trail, approximately 1.25 miles northwest of the site; and SR-86 to the north.

Regionally, the project vicinity can be accessed via SR-86; however, access to the site is limited to all-terrain or four-wheel drive vehicles or access by foot. The closest paved road is SR-86, 1.25 miles north of the property. The site is currently vacant desert land with no man-made structures present onsite. The only evidence of site disturbance is a dirt track or road that runs along the eastern boundary of Section 33, cuts midway through the section, and traverses north along the western boundary of Section 33. The predominant land use surrounding the project area is limited to desert open space and vehicle-oriented recreation Vehicle use is permitted on existing roads on public lands and in designated off-road vehicle (ORV) areas, although unauthorized ORV activity has historically occurred to a limited extent onsite.

3.7.2 Relevant Land Use Programs and Zoning

The majority of the area proposed for development of the Monofill Facility lies on privately-owned land, although 1 mile with 60 feet of the right-of-way for the proposed access road crosses Section 28, which is public land administered by the BLM. All private land is under the jurisdiction of Imperial County. Consequently, different land use plans apply to the private and public portions of the proposed development.



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Existing Land Uses and Property Ownership in Project Vicinity

FIGURE 3-11

Privately-held lands within Imperial County are subject to the land use guidelines contained in the County's Ultimate Land Use Plan of the General Plan (County of Imperial 1973), as well as any other zoning or land use regulations adopted by the county. The project site is currently designated by the County of Imperial as "Recreation/Special Public" and zoned "S" for open space use. The open space zone is applied to the unincorporated areas of the county which are not designated to the precise zoning map, Uses permitted within the open space zone include rural residential and some agricultural storage and production uses. With a conditional use permit (CUP), additional uses permitted within this zone include airports, oil and gas exploration/development, recreational facilities and events, parks, campgrounds, and hiking/motorcycle trails. The existing land use designation for the project site ("Recreation/Special Public") will change to "Heavy Industrial" (M-2) upon approval of the proposed project by the County Board of Supervisors.

The county has also adopted an open space element which has policies applicable to the project site. The open space element is designed to preserve unique resources and encourages activities which are compatible with the desert environment. Certain critical flora and fauna habitats and protected areas are identified; the project site is not within any of these critical areas. The element discusses preservation of natural resources, managed production of resources, and protection of public health and safety. Implementation programs are outlined for each of these objectives. The site is designated open space for the protection of public health and safety. This designation pertains to the special conditions associated with building on unstable soils (with respect to expansiveness and soil pressure limitations) such as those contained onsite. The implementation program for such a designation includes the preparation of detailed engineering or soils studies similar to the one conducted for the proposed project. An evaluation of this condition is detailed within the geotechnical analysis (Section 3.1).

The county's Solid Waste Management Plan (SWMP) was established to evaluate the county's solid waste management practices and future needs in accordance with state policy and guidelines. All solid waste management activities in Imperial County must be in conformance with the adopted plan. The SWMP contains a specific section pertaining to "special wastes," which arc defined as hazardous wastes and other wastes requiring special handling, including waste resulting from geothermal energy development, Currently, there are two Class III sites in Imperial County which may accept non-hazardous geothermal materials given approval by the RWQCB. There is only one disposal site in Imperial County capable of handling designated/special wastes and/or hazardous wastes.

Resource guidelines on public land administered by the BLM within the southern portion of the California Desert Conservation Area (CDCA) may supersede the land use regulations of the local jurisdiction. Most of the public lands within the CDCA have been assigned for management purposes to one of four multiple-use class designations. The class designations guide the type and degree of land use which is allowed within each class. The four multiple-use classes are:

- Class C (Controlled Use) - the most restrictive designation and is assigned as an interim measure to lands preliminarily recommended for wilderness preservation;

- Class L (Limited Use) - intended to protect sensitive resources, from being significantly diminished while providing for generally lower-intensity controlled multiple use of resources;

- Class M (Moderate Use) - allows a wide variety of uses, such as mining, livestock grazing, recreation, energy, and utility development, but is also designed to conserve desert resources and mitigate damage to the resources caused by the permitted uses; and

- Class I (Intensive Use) - provides for concentrated use of the land and resources with reasonable protection for sensitive natural and cultural values.

The public land that the proposed 60-foot access road right-of-way would cross is designated as Class M, Moderate Use. The need for access across public land to permit utilization of privately-owned lands is recognized within the plan. However, the routes of travel and construction standards are subject to BLM control to prevent any unnecessary or undue degradation of public lands and their resources. Within the "Moderate Use" category, new routes of access for motorized vehicles may be allowed upon approval by an authorized officer.

The CDCA plan also identifies ACEC and special areas, which are areas of public land where special management attention is required to protect or prevent irreparable damage to important resources. The project site is not within any ACEC or Special Areas, although the 6,337 acre San Sebastian Marsh/San Felipe Creek (ACEC #61) is located 3 miles northwest of the project site (Figure 3-l 1). This ACEC is protected for its prehistoric, historic, and Native American values, and the riparian habitat and wildlife resources it features.

3.7.3 **Impacts**

The proposed project would develop 35 acres of undeveloped desert land. The project improvements and onsite structures will include a 1.25-mile paved access road with periodic turnouts constructed south from SR-86 to the site, two lo-acre disposal/storage areas, a trailer office, a potential onsite waterwell, and a structure for equipment maintenance. An electrical transmission line may be extended to the site along the access road right-of-way, as an alternative to using diesel-generated power. In addition, the daily disposal/storage operation will employ the use of some heavy-duty equipment to transport and compact the material. Although development of the project would modify the character of the project site, operation of the facility would not create land use conflicts with the surrounding open space uses, nor would the project affect operations at the U.S. Navy Desert Test Range or affect unique resources or discourage activities associated with this desert environment. No existing residential uses are close to the project site, the nearest residence is 2 miles away and would not be significantly impacted by the project.

In order to construct and operate the proposed Monofill Facility, the applicant has applied to the County of Imperial for a General Plan Amendment and rezone for the site and a CUP. Before the proposed project can begin operations, the California Waste Management Board (CWMB) and the CWMB's local enforcement agency, the Imperial County Department of Health Services, must issue a Solid Waste Permit which finds that the project is in compliance with the SWMP. To be in compliance, an amendment to the plan must be prepared and approved which would include the proposedMonofill Facility into the county-wide SWMP. Approval of these measures would make the project consistent with the planning policies of the County of Imperial. The potential impacts to land use plans associated with each of the proposed actions are discussed below.

In accordance with the project description, the project site would be redesignated for "Heavy Industry" and rezoned "M-2" as applied for by the project proponent. The proposed General Plan Amendment and rezone would place the project in conformance with county land use policies.

Processing of a CUP for the Monofill Facility ensures that only compatible uses are allowed As discussed above, the proposed project would not impact any existing open space or residential uses in the project vicinity; therefore, no adverse impacts to county land use plans would occur upon project construction and operation.

The potential impact to BLM land use policy is associated with the proposed. access road and right-of-way. The "Multiple Use" category requires that new access routes must be approved by an authorized officer. The proposed alignment of the access road is along the eastern boundary of Section 28. This 60-foot right-of-way does not cross any significant natural resources (refer to the biological and cultural resource analyses, Sections 3.5 and 3.6). Thus the development of the access road across public land is not anticipated to adversely impact land use policy of the BLM. In addition, the project site is not within or adjacent to any ACEC or special area, and would not conflict with land use management guidelines for these resources.

3.7.4 Mitigation Measures

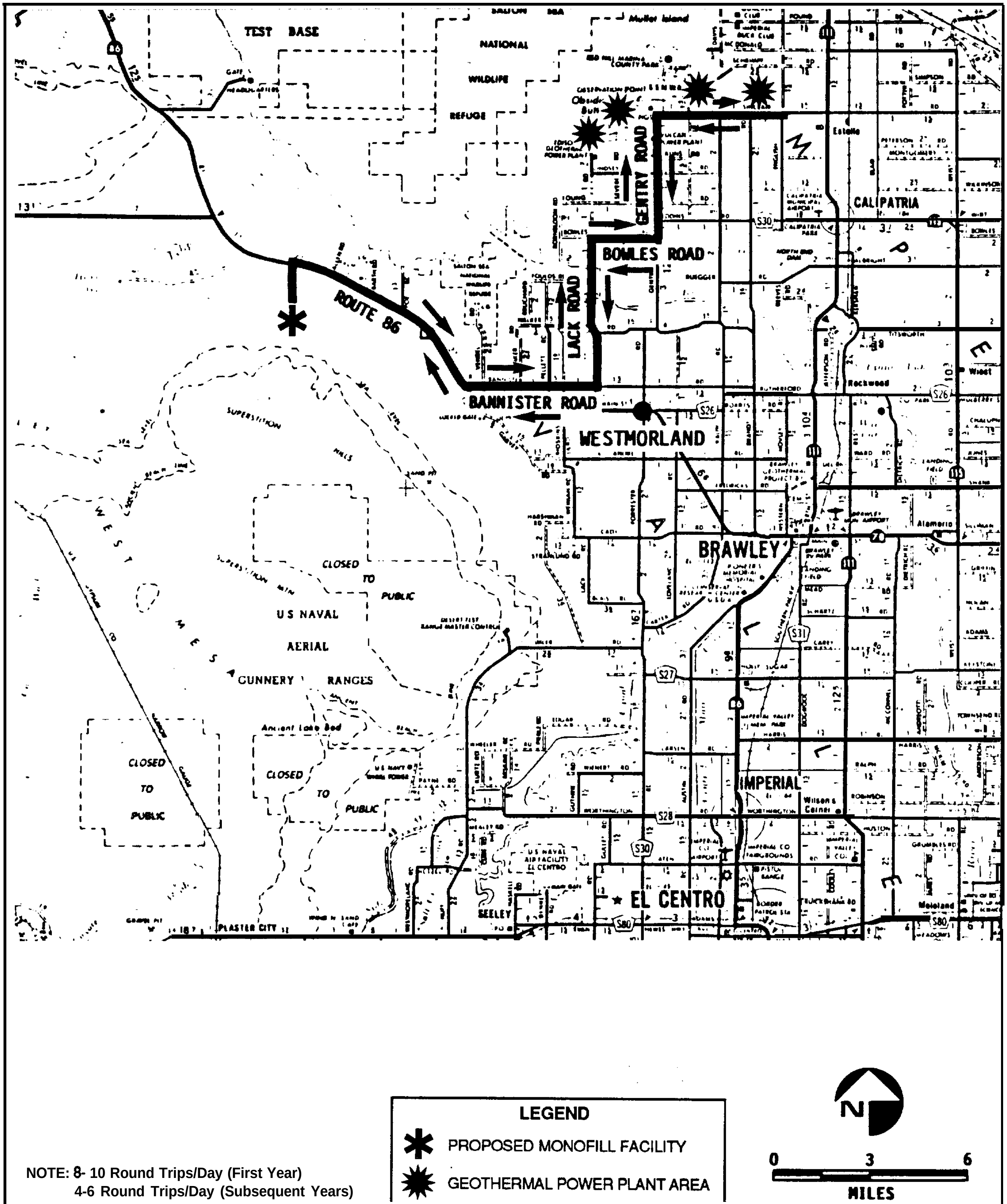
No land use compatibility impacts with surrounding uses have been identified within the analysis. No impacts to Imperial County land use plans and policy, including: the SWMP, would occur provided the appropriate amendments, rezone, and permit approvals are obtained from the county. No adverse impacts to BLM land use policy and resource management guidelines are anticipated, provided the BLM approves the proposed access road alignment. Therefore, no mitigation measures are necessary.

In the event that the project site is not used for the proposed Monofill facilities, on site zoning would revert back to the existing open space zone. This EIR is not intended to analyze or environmentally assess any other portion of Section 33, or any other project or purpose, other than that identified in the application, and the project description. No other M-2, heavy industrial use of environmental impacts are intended to be assessed by this EIR.

3.8 TRANSPORTATION SYSTEMS

3.8.1 Existing Circulation System

The study area is served primarily by SR-86 and by several county roads (Figure 3-12).



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Circulation of Trucks to the Proposed Monofill Facilii

FIGURE 3-12

SR-86 is used as part of a main cross-country route. In the project vicinity, SR-86 is a two-lane undivided road with a 55-mile-per-hour speed limit, the road width is 28 feet and there are no shoulders. The design capacity in the project vicinity is 5000 ADT. The average daily traffic (ADT) count is estimated to be 3,500 which is under design capacity (Nilson 1989).

According to Caltrans, given roadway geometrics and traffic characteristics, SR-86 has a traffic accident rate slightly higher than expected. Accident rates are higher than would be expected because traffic using SR-86 is comprised of approximately 35 percent large trucks (18 wheels or greater). SR-86 also serves a large number of recreational vehicles on weekdays and holidays. Heavy truck and recreational vehicle traffic increases risk particularly on two lane roads where passing is common. Another identified problem is the lack of left tum pockets. Many accidents arc a result of turning movements to side roads, roadside stands, and other activities that occur between public road connections.

The Caltrans 5-year Improvement Plan indicates that improvements (including expanding SR-86 to a 4-lane expressway from SR-78 south to Brawley) will be constructed between 1992 and 1993 (Nilson 1989). Design capacity after improvements are made in the project area is anticipated to be 30,000-40,000 ADT. Actual ADT in the year 2000 is expected to be 20,000. The large surplus between capacity and actual ADT is being provided to improve highway safety along SR-86.

County roads in the study area include Sinclair, Gentry, Bowles, Lack, and Bannister roads. Traffic counts for these county roads have not been estimated. Generally, state and county roadways have a maximum capacity of approximately 1500 vehicles per peak hour per lane with a more desirable, safe capacity of 660 vehicles per hour per lane.

3.8.2 Impacts

Traffic generated by the project will be composed of the following elements:: 1) workers commuting to the project during construction; 2) trucks and other heavy equipment required during construction; 3) truck transport of solid materials; and 4) operating crews commuting to the site.

Construction employee traffic along with the use of trucks and various other heavy construction equipment will be distributed throughout the construction periods and, due to its intermittent nature, will not figure significantly in area traffic percentages.

During operation, the proposed facility will generate between 3 and 5 two-way employee trips per day. Additionally, approximately 8 to 10 two-way trips per day by covered trucks (25 cubic yard capacity) will be generated as geothermal filter cake and muds are brought to the project site. The truck trips required to transport geothermal materials to the site will originate in the Obsidian Butte area. The trucks will travel down Sinclair, Gentry, Bowles, Lack, and Bannister roads, connect with SR-86 and turn onto the project access road to the Monofill Facility (Figure 3-12). Currently, this truck traffic is permitted to deliver materials to a Class-I disposal site located approximately 4 miles east of the proposed Monofill Facility. Operation of the proposed facility would result in an additional impact to a 4-mile section of SR-86, particularly at the point where the proposed facility will access SR-86.

Employee and truck transport traffic during operation are considered to represent an insignificant impact to traffic volume in the project vicinity. The project will add to the cumulative maintenance requirements on county roads in the project area. The project by itself is not considered to represent a significant impact to maintenance requirements on area roadways.

From a traffic safety standpoint, trucks and heavy equipment movement will constitute a cumulative impact on the area roads and SR-86 in that it will add incrementally to the truck burden. Project-generated truck traffic will cause short-term inconveniences on roads in the project area, especially during agricultural harvesting periods when unusually large numbers of farming vehicles and transport trucks would be on the roads, and on holidays when a large number of recreational vehicles utilize state highways including SR-86. Of particular concern will be the turning movements onto and off of SR-86 in which trucks and employee traffic enter or leave the project site. The impact, from a safety standpoint, generated at the project access point to traffic on SR-86 is considered potentially significant and adverse. Future planned improvements by Caltrans to SR-86, including a 4-lane highway in the project vicinity may mitigate safety impacts.

3.8.3 Mitigation Measures

It is within Caltrans' jurisdiction to warrant and approve any roadway improvements on SR-86. Desert Valley Company must obtain an access and enchroachment permit from Caltrans to access SR-86. Detailed design provided to Caltrans must take into consideration future improvements that will be made along SR-86 in the project vicinity. If future improvements planned by Caltrans, including widening of SR-86, are. not in place upon project start-up, the potential hazard caused by westbound trucks turning left across traffic onto the project access mad can be mitigated by the construction of a left-turn pocket at the intersection of the access road and SR-86. This turn pocket must be approved by Caltrans and take into consideration deceleration, turning width of trucks, and buffer areas to oncoming traffic. As an added safety precaution, trucks should be required to operate with headlights on at all times.

3.9 Visual Quality/Aesthetics

3.9.1 Existing Landform and Viewshed

The two factors which are most important in characterizing the visual resources of an area are scenic features (including both natural landforms and man-made objects of interest) and viewer sensitivity (or the values of the view to those who experience it).

The Monofill project site is in the Imperial Valley, south of the Salton Sea. The Imperial Valley is part of the larger physiographic province of the Salton Trough. This province is a very flat basin surrounded by mountains: the Peninsular Range to the west and the Chocolate, Orocopia, and Cargo Muchaco mountains to the east. Most of the trough is below sea level, and consists generally of desert, with agricultural land uses located to the north and south of the Salton Sea. The project site is typical of the Salton Trough: very level desert, with little topographic relief, and elevations below sea level. An aerial of the site offers an overall view of the subject property and its physical features (Figure 2-2).

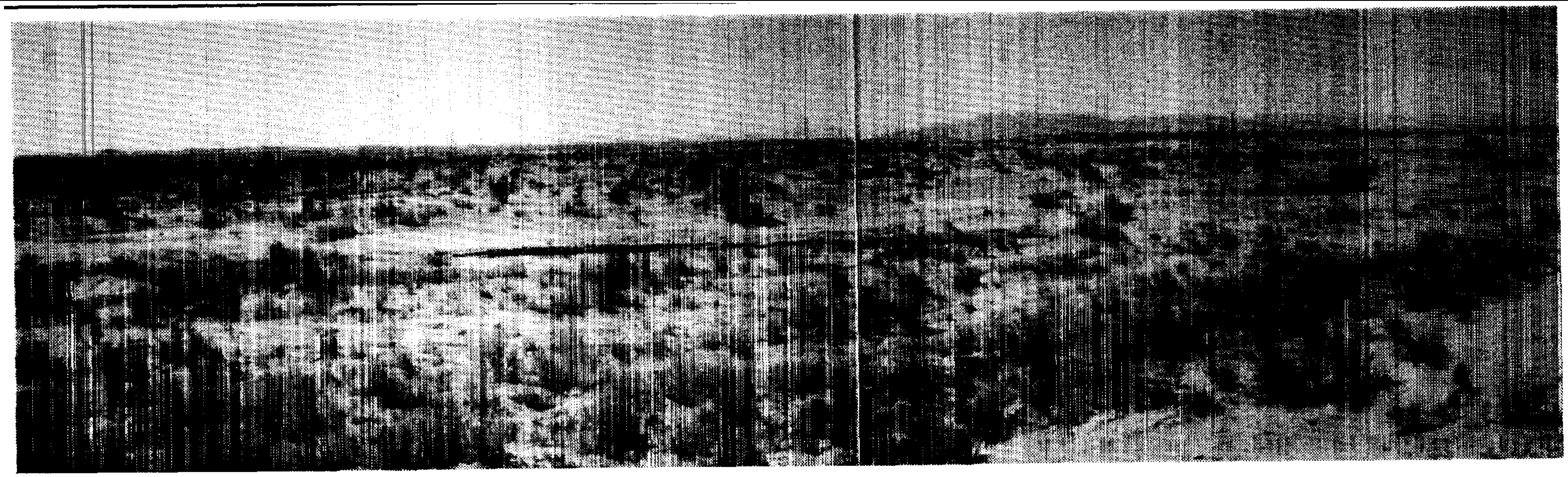
The project site is currently undeveloped and located within a fairly remote, unirrigated portion of open desert in the western portion of Imperial Valley. The City of Westmorland is located approximately 12 miles east of the site, with the intervening land between the site and the city supporting irrigated agriculture and scattered rural residences. The Salton Sea is situated approximately 4 miles north of the site. To the south-southwest are the

Superstition Hills and to the west is open desert. Lands immediately adjacent to the site are also uncultivated desert.

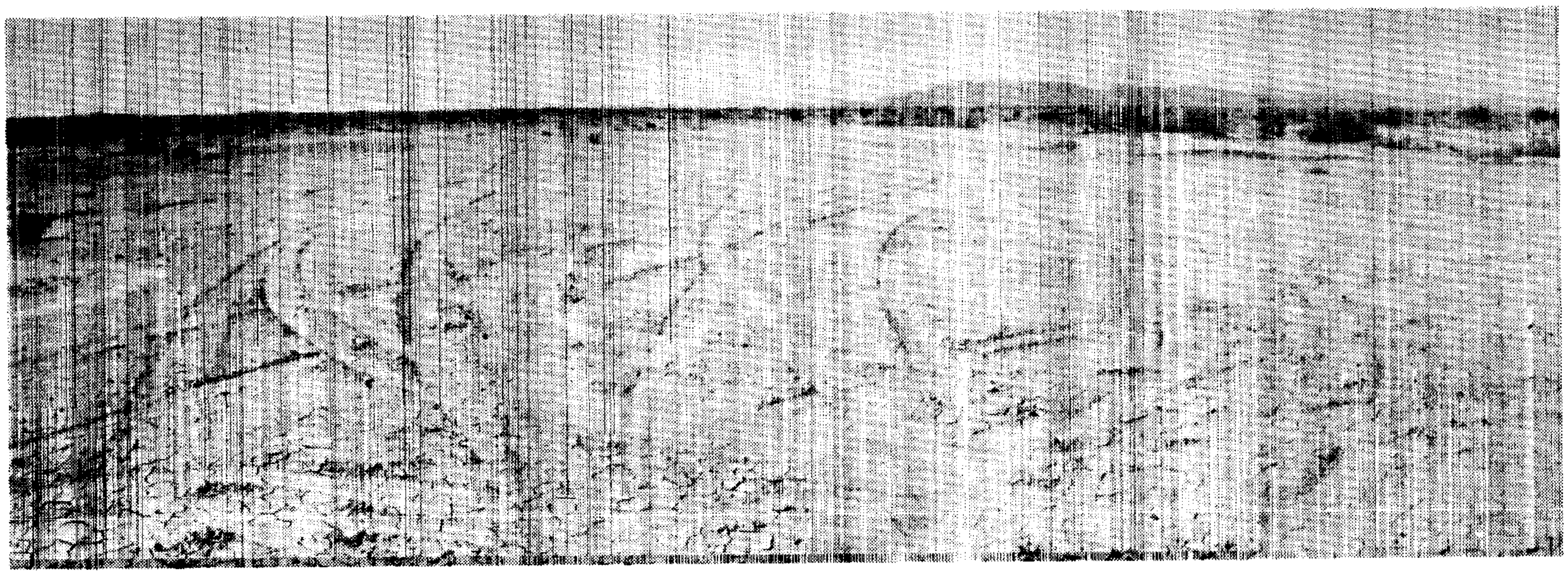
Topographically, the site slopes gently downward from a series of low-lying hills in the southeast toward the northeast at a 1.5 percent grade. The most prominent topographic feature within the project vicinity site is a sandstone outcrop which forms low hills in the southeast corner of Section 33. Elevations in the project vicinity are mainly below sea level and range from a high of 45 feet along the hills in the southeast of Section 33 to a low of -140 feet in the northeast comer of Section 33. Vegetation on the property and in the vicinity is sparse featuring some well-developed mesquite hummocks along the southeastern hills, with the remainder of the vicinity characterized by widely spaced, individual mesquite shrubs, scattered grasses, and forbs. Numerous intermittent braided stream channels or washes traverse the property flowing in a southwest to northeast direction. No man-made structures are present, and except for a slightly overgrown dirt track and a few older motorcycle trails, no other disturbance is evident onsite.

Surrounding the property is also open, unirrigated desert, with a few insignificant man-made improvements evident. The Kane Springs Jeep Trail crosses Section 29 approximately 1.5 miles northwest of the site, and an electrical transmission line and adjacent maintenance road operated by the IID diagonally traverses Sections 28, 27, and 34, approximately 0.5 miles northeast of the site. The most significant man-made structure visible from the property is SR-86. No night lighting exists in the project vicinity.

Views of the site (Figure 3-13) are primarily afforded to motorists along the SR-86, over 1 mile away at its closest point, which carries approximately 3,500 vehicle trips daily. These views are concentrated along the portion of the roadway which curves northward. Along the east-west trending portion of SR-86, a 4- to 5-foot earthen levee adjacent to the southern side of the roadway shields any views of the property from the motorists. For this reason, the south-east motorists have the clearest vantage of the property until the earthen levee interrupts the viewshed at the point where the electrical transmission line crosses the roadway overhead (Figure 2- 1). Those motorists traveling in the opposite lanes turn northward soon after the earthen levee ends, resulting in only a relatively quick view of the property. In addition, because of the undeveloped nature and uniformity of the project vicinity, the exact location of the site is not easily discemable when traveling past the area. Other potential viewers of the project site are recreationalists using the Kane Springs Jeep Trail, the San Sebastian Marsh (approximately 3 miles northwest of the site),



A.View of Site from State Route 86, Looking Southwest to West



B. View of Site from North Corner of Property, Looking Southwest to West

ERC Environmental and Energy Services Co.

Views in the Local Vicinity of Project Site

FIGURE 3-13

and any other public lands in the project vicinity. The nearest residence is located approximately 2 miles northeast of the site and is not afforded a view of the property due to the configuration of the levee. Highway 78, located 3.5 miles north of the site, is a designated scenic highway in this portion of Imperial County, although intervening topography does not permit a clear view of the site from this location.

Short-range views in all directions from the site are of nondistinctive open desert, with the exception of the low-lying hills to the southeast. Long-range views in the vicinity on clear days include mountains of the Peninsular Range to the west and Superstition Hills to the south-southwest. No outstanding topographic features are visible to the east. SR-86 is barely visible from the northern property boundary.

3.9.2 Impacts

Upon development of the Monofill Facility, the character of the project site would significantly change. Visible structures will include a 1.25mile paved access road with locking gate which will connect the project with SR-86, an onsite trailer which will serve as an office/laboratory, a potential electrical transmission line which may be extended to the site, and a 6-foot chain-link fence which will be erected around the active portions of the site. Each of the two phases of the facility will encompass 10 acres of land. The clay side walls of each stage area will be constructed to a height of approximately 20 feet, with the filter cake materials being stored at a height of 15 feet above the side walls. Therefore, the maximum height of each cell structure will be approximately 35 feet above the existing grade. These structures would be the most visible portions of the development.

The project site would be modified from an inactive, undeveloped landscape to an industrial land use with truck and equipment activity 12 hours per day every day. Views from the Kane Spring Jeep Trail and San Sebastian Marsh would be minimal because of their distance from the site. The nearest residence will not be impacted visually by the project. The structures and activity would be most evident to motorists along SR-86, and particularly those traveling the southbound lanes. For these motorists, the project would produce unavoidable visual impacts which are not considered to be significant. Visual impacts to motorists are not considered significant because most vehicles travel at a speed of 55 mph along SR-86 and their viewshed is limited by the short time it takes to travel past the site. Motorists' distance from the project site combined with the speed at which typical viewers travel would serve to minimize the impacts to visual quality in the project vicinity.

3.9.3 Mitigation

Visual impacts are considered unavoidable, yet not significant. Structures constructed on site should, however, be of earth tone coloration to minimize their potential visibility. If night lighting is required in the future, directional lighting fixtures shall be used to reduce potential glare onto adjacent properties and to minimize night glare.

3.10 SOCIOECONOMICS

3.10.1 Population Characteristics

The project site is located in a relatively unpopulated area of the county, with the closest permanent residence 2 miles away. Most of the population of Imperial County lives in the seven incorporated cities within the county. The largest of these cities is El Centro, which had an estimated 1988 population of 29,667, or 27 percent of the people in the county. Calexico's population in 1988 was 19,030 people, or 17 percent. Brawley also has less than 17 percent of the 1988 population with 18,659 residents within its city limits. The populations of the cities of Holtville and Imperial were 4986 and 4305, respectively, in 1988. Calipatria's population of 2782 represented 2.5 percent of the county's total, while the number of residents in Westmorland was 1893, or 1.7 percent of the total (WESTEC 1989b). Westmorland is the closest incorporated city in the project area.

3.10.2 Labor Force and Employment

The economy of Imperial County is strongly influenced by irrigated agriculture and the associated agribusiness. A large part of the fresh winter vegetables for the United States are grown in the Imperial Valley. Imperial County's employment sectors are dominated by the agricultural industry, with approximately 32 percent of the labor (or over 3 in 10 people) employed within the agricultural sector. Secondary to agriculture is the government, with approximately 27 percent of the employed labor. The wholesale and retail trade market employs approximately 19 percent of the county labor pool and the services industry employs approximately 12 percent. The remainder of the employment is within the mining, construction, manufacturing, and financial institution/real estate industries, each with less than 5 percent of the labor market.

Imperial County ranks 57th among California's 59 counties in terms of per capita personal income. The average per capita income of Imperial County residents was $10,391 in 1986 as compared to a California statewide average of $16,875. Total wage and salary employment in the county grew by 4.5 percent from 1985 through 1987, which is less than the rate of population growth of 5 percent. The low wages paid within the county are reflective of the dependence on agriculture.

3.10.3 Housing

In 1988, Imperial County had 35,730 housing units of which 61 percent were single-family units, 25 percent were multifamily units, and 14 percent were mobile homes (WESTEC 1989b). The mobile homes are particularly prevalent in the unincorporated areas such as retirement and vacation areas around the Salton Sea and Ocotillo. The incorporated cities contain nearly 83 percent of the county's multifamily residences. The household population averages 3.4 individuals, slightly higher than the national average. Household vacancy rates in the county for 1987 averaged 10 percent, although both El Centro and Holtville had vacancy rates less than 6 percent (WESTEC 1989b).

The county adopted a Housing Element to the General Plan to provide an assessment of housing needs and to develop strategy and an implementation program to satisfy the current and future needs. Particular emphasis is placed on the unincorporated portions of the county, although the incorporated areas are recognized as important. The policy applicable to the proposed Monofill Facility requires that adequate housing and supporting infrastructure are provided for employees of the project.

3.10.4 Public Services

Water/Sewer and Electrical. The IID supplies water and power to most users in the Imperial Valley. Operations are divided between a water division responsible for distribution and collection of water, and a power division responsible for generation and distribution of electrical power. The majority of the public water supply is imported from the Colorado River via the All American Canal system, which runs along the southern boundary of the valley. The IID operates the irrigation system and obtains water through an allotment provided by a federal treaty with Mexico, state compacts and federal and state agreement. Sewer service in the project region is provided largely through municipal treatment facilities and septic service, with no sewage treatment or conveyance capacity currently located on the project site.

The project site and lands surrounding the site are currently uninigated and undeveloped; no water or power facilities exist onsite. The IID maintains supply and distribution lines along SR-86 to irrigate the agricultural lands to the north; however, no facility extensions are present south of the roadway in the project vicinity. The neatest electrical transmission line to the site is located approximately 0.5 miles north of the northeast corner of the site and traverses Sections 21, 27, 28, 34, and 35.

Natural Gas service in the area is provided by the Southern California Gas Company. There are no facilities on the project site or in the vicinity. The nearest gas main is located at the closest residence, 2 miles from the site.

Solid Waste Disposal. There are 10 solid waste landfills throughout Imperial County. Currently, no solid or geothermal waste is generated from the project site. The closest county municipal landfill facilities to the project area are the Salton City landfill, which is approximately 25 miles north of the site, and the Brawley landfill, approximately 30 miles southeast of the site. The Brawley facility currently receives approximately 70 tons of refuse per day. The projected closure date for the facility is 1997, although1 the County Solid Waste Management Division is looking for alternatives to expand the lifespan of the facility (Grfanos 1989). In the case of the Salton City landfill, there is no projected date of closure due to the small amount of waste it receives each day.

Two of the Class III municipal waste disposal facilities can accept nonhazardous solid waste, generated by geothermal development, given approval by the RWQCB. These Class III facilities are assumed to have adequate separation from the usable ground water or have design features that protect water quality. The County Health Department monitors the landfills and submits monthly reports to the California Waste Management Board. The California Waste Management Board is required to inspect these landfill sites at least once every 8 years, but their policy is to inspect them at least every 4 years (WESTEC 1989b). There is currently only one Class I facility in the county that can accept hazardous solid/liquid waste and special/designated waste from geothermal production. This Class I disposal facility is located approximately 5 miles southeast of the project site.

Fire and Police Protection. Fire protection in the site vicinity is provided by the Westmorland Volunteer Fire Department under contract with the county. The station is located in Westmorland approximately 15 miles from the project site. The projected emergency response time to the project site is 20 minutes. Secondary response to the site for a major fire would come from the Salton City station, north of the project site.

Police services are provided by the Imperial County Sheriffs Department. Staff includes 56 sworn officers, including the Sheriff, resulting in a level of service ratio of 1 sworn officer to 532 residents. To all police agencies in the state, the optimum ratio is 2 sworn officers per 1000 people. The nearest substations are located in Salton City, approximately 25 miles from the site, and Brawley, approximately 25 to 27 miles from the project site. The projected emergency response time to the project area is approximately 20 minutes from both stations. The Salton City station would provide primary response to the project site, while the Brawley facility would provide alternative response, except at night. A number of factors may determine other response alternatives, including the location of officers within the area at any given time. The California Highway Patrol and U.S. Border Patrol frequently travel SR-86; therefore, alternative police protection is fairly available in the project vicinity.

Telephone Service. Telephone service to the project vicinity is provided by Pacific Telephone. Currently, the nearest line to the project area runs parallel to SR-86.

3.10.5 Impacts

Population/Employment/Housing. The proposed disposal facility would employ 3 to 5 people upon operation of the facility; during construction, the facility would require between 4 and 20 employees. In addition to the short-term increase in local employment opportunities during development of the project, small direct employment benefits would occur locally as a result of the project operation.

Housing requirements would be negligible, due to the very low number of employees at the facility. Most of the projected construction and operation labor force for the project is expected to be current residents living in nearby communities. These residents would already be housed, and would not produce a new demand for housing. Any new housing demand that may be generated is expected to be minimal.

Public S ˙e - Potable water will be trucked in from an offsite source and stored onsite in a l,OOO-gallon tank. Non portable water may be obtained from an onsite well (see Section 3.2, Hydrology, for further discussion) or may be trucked in from an offsite source and stored in a separate l,OOO-gallon tank. Any use of IID water supplies or facilities to provide water will require prior approval from that agency. Sewer services will be provided by an onsite septic tank unit or be periodically hauled from the site. No expansion or extension of IID water facilities within the area will be required upon operation of the Monofill Facility, and therefore, no impact to existing water facilities is anticipated.

It is proposed that a diesel-powered electrical generator would supply the electrical energy needs on site. However, as an alternative, a 25-kV electrical transmission line may be run from the existing transmission line in the project vicinity, 0.5 miles north of the site. The potential line would run within the proposed easement for the facility access road. In the case that the transmission line is needed, additional IID structures (i.e., power poles and lines) would need to be extended to the project site to accommodate the facility. The project applicant would need to reach a mutual agreement with the IID prior to extending service to the proposed project. The amount of additional facilities and electrical energy required on site would be minimal and would not require additional generating capabilities to service the project needs. It is anticipated that a mutual agreement can be made with the IID and therefore no impact to IID's power service to Imperial County is anticipated.

The amount of solid waste generated at the proposed Monofill Facility would be minor and would consist of office and maintenance waste. The refuse would be transported offsite to either the Salton City or Brawley landfills, depending on the transport company. Due to the minor amount of waste that will be generated by the proposed project and existing capacity of nearby landfills; no adverse impacts to solid waste facilities are anticipated upon project implementation.

The project would employ a minimal number of people and, therefore, no adverse impact is anticipated to occur as a result of project implementation on police services in the project area.

The on site office and maintenance area are the two possible areas where flammables may be present. With appropriate fire extinguishers and proper training in the use of the extinguishers, no additional demand or adverse impact to fire services is anticipated to occur upon project development.

No natural gas or telephone needs are proposed for the project; therefore, no impact to these services would occur upon project implementation.

3.10.6 Mitigation Measures

No adverse impacts to population, employment, housing, or public services in Imperial County have been identified, therefore, no mitigation is required. As part of the approval of this project, an emergency contingency plan will be prepared for the proposed project to outline responses to a variety of onsite emergencies that may arise during construction and operation of the Monofill Facility. This contingency plan will ensure that onsite personnel are aware of how to respond to emergencies if necessary.

3.11 PUBLIC HEALTH AND SAFETY

3.11.1 Regional Perspective

The generation, transport, and disposal of waste today is carefully regulated. It is a matter that requires scrutiny of waste streams from industrial and commercial activities in order to comply with a variety of regulations.

The California Solid Waste Management Board and the Regional Water Quality Control Board administer waste generation and disposal regulations required by federal government programs. In California, these regulations are part of the California Administrative Code. Title 14 regulations administered by the Solid Waste Management Board govern the generation, classification, and transportation of wastes. Title 23 regulations administered by the Regional Water Quality Control Board govern the disposal of wastes to land. All waste generators and disposal/storage operations must comply with the regulations or be subject to fines and possibly criminal actions.

Detailed information concerning the requirements for designated waste generation and transport may be found in Title 14 of the California Administrative Code, Article 7 Disposal Site Standards; and in Title 23 of the California Administrative Code, Chapter 3, Subchapter 15, Section 2532, Class II: Waste Management Units for Designated Waste and 2522, Designated Waste.

There are no directly applicable regulations relating to NORM. NORM such as are present in the filter cake are not under the jurisdiction of the U.S. Nuclear Regulatory Commission (NRC) nor does the State of California have a regulatory program for NORM wastes from geothermal activities. The California Department of Health Service (DHS) which has primary responsibility for radiological health programs in California, has not developed a regulatory program for NORM wastes. The levels set forth in Title 17 of the California Administrative Code as applicable to other radiological activities can be regarded as relevant guidance. Those regulations establish 500 millirem per year (mrem) as the maximum acceptable dose to members of the general public. The National Council on Radiation Protection (NCRP), a non-profit organization chartered by Congress has recommended changing the criteria for routine exposures of the general population from 500 mrem per year to 100 mrem per year (NCRP 1987). The proposed revisions of the NRC regulations (Federal Register 51/9:1092 1092, January 9, 1986) have incorporated. the NCRP recommendation of 100 mrem per year. If the NRC proposed regulations are adopted, the California Title 17 regulations will also be changed.

The US. Environmental Protection Agency promulgated standards for certain sources of airborne radiation emissions in late 1989 under the Clean Air Act (EPA 1989). Although these regulations do not apply to this facility, they are similar to other regulations and may be used as a base of comparison for assessing the emissions from this facility. The basic pertinent regulations for radiation emissions for the Clean Air Act are:

- Rn-222 flux: 20 pCi/sq. m-set (radon emission per square meter area per second[1]
- Emissions (excluding radon) shall not cause members of the public to receive annual radiation doses greater than 10 mrem effective dose equivalent.

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[1] pCi - A picocurie, 10^{-12} Curie, is the amount of an isotope necessary to have 2.2 decays per minute. 1 pCi of pure Radium-226 weights 10^{-12} grams.

These criteria are for the person receiving the maximum off-site dose. They are intended for the closest actual resident, not a hypothetical residence.

Workers in nuclear industry positions, referred to as nuclear radiation workers, are allowed to receive up to 5000 mrem per year. Non-radiation workers; who are basically a sub-category of the general population who may in the course of work on a specific site, be exposed to low levels of radiation, below the NRC and NCRP radiation exposure criteria for the general population, are not under the jurisdiction of the licensing agency. The on-site personnel and truck drivers transporting the geothermal material to the proposed Monofill Facility may be included in this category. A guiding principle for non-radiation workers is that of maintaining exposures As Low As Reasonably Achievable (ALARA). Under the ALARA principles, unnecessary exposures are avoided and unavoidable exposures arc minimized to the extent practicable.

The requirements for classification and management of the Monofill Facility fall under the jurisdiction of the Colorado River Basin Regional Water Quality Control Board and the County Department of Health Services, which is the enforcement agency for the State Solid Waste Management Board. The County Permits granted to the proposed facility will dictate the requirements for the handling and classification of wastes.

3.11.2 Present Project Site Perspective

As the proposed site is on undeveloped desert land, there are presently no pubic health and safety considerations associated with the site.

3.11.3 Impacts From Operations and Designated Waste Constituents

The project design and state requirements are intended to ensure that no significant hazards to public health will result from the proposed project. Requirements include measures to isolate the disposal activity from accidental contact by the general public. A 6-foot chain link fence will enclose the active disposal area and a locking gate will be constructed at the access road where it enters the site. The fence will be posted with appropriate warning signs. In addition, site design and operating procedures, in accordance with state regulations will help ensure that ground and surface water will not become contaminated by leachate from the storage/disposal area.

Health and safety considerations concerning potential traffic concerns and. air quality impacts are discussed in Section 3.3 and 3.8, respectively.

As the proposed disposal site will not be accepting any decomposable wastes (i.e., garbage) several potential public health impacts usually associated with disposal sites (including proliferation of potential disease vectors) will not be of concern.

The possibility exists that employees at the facility will make mistakes in operating equipment and monitoring the operating processes, and almost any mechanical equipment may fail occasionally. Such mistakes and failures could be the cause of fires and other accidents. In any such event, the effects of the mistakes or failures will have no significant adverse impact on the surrounding area. Impacts from such events will be confined to the grounds of the facility itself and to plant employees or operators of the trucks delivering the geothermal materials.

3.11.4 Impacts From Radiological Constituents

Development of the proposed Monofill Facility would create the potential for radiological impacts to workers and members of the public through the water (ground and surface), air (resuspended and wind blown dust), and direct radiation pathways.

Potential impacts on water and air quality from the radiological constituents in the filter cake have been assessed and provided as part of the project application (See Appendix E). Further evaluation of impacts from radiological constituents is provided in Appendix I. In performing the assessment, the maximum measured concentrations in the filter cake (see Table 2-l) have been conservatively used as representative of all the material. Both Appendices E and I provide analysis which address exposures to workers and. the general public due to radioactive materials in the geothermal filter cake.

3.11.4.1 Water Quality

The only potential access to groundwater would be from leachate migration from the disposal cell at the Monofill Facility. However, there are a number of cumulative factors that should prevent any radionuclide contamination from ever reaching the groundwater. These are:

- The absence of free liquid in the filter cake shipped to the Monofill eliminates any driving force from within the cell.

- The radionuclides, particularly the parent radium constituent present in each decay chain, are tightly "bound" in a barium matrix which minimizes any leaching of constituents by water infiltration into the cell.

- Significant precipitation infiltration into the cell is prevented by the lack of available percolating water since evapotranspiration rates far exceed precipitation; and the multi-barrier construction of the cell wall further inhibits any infiltration into the cell.

- When water enters the cell, the leachate collection system would remove the water for mixing with the soil sealant polymer.

- Further, as described in Section 3.2 the depth of the underlying groundwater and intervening clay layer would assure no adverse impacts to the groundwater.

Similarly, no radiological impacts to surface water quality will occur. The lack of permanent on-site and local surface water and the incorporation of surface water, including storm water, management measures such as diversion berms will minimize any potential dispersion of particulates through this pathway. Adherence to established control procedures will minimize the potential for release of particulates prior to burial, and use of sealants will further prevent the mobilization of radionuclides on the surface from erosion.

3.11.4.2 Air Quality

Potential radiological air quality impacts from the proposed Monofill Facility include radon emission from the geothermal filter cake material and suspension of dust during loading, off loading, and placement and compaction of the geothermal filter cake material. The airborne materials may be inhaled by workers or transported by atmospheric diffusion to people offsite with a radiation dose resulting from inhalation of the radon decay products and dust.

The radiological impacts were calculated for the loading of the filter cake on to trucks at the power plant, the transport of the material to the Monofill Facility, and unloading and emplacement of the filter cake in the disposal cell. Impacts were assessed to the workers involved in each activity, to the nearest permanent residents to the power plant and Monofill sites, and for an “onlooker” who occupies the same position close to the transport route for the passage of all the trucks. The analytical approach, assumptions employed, input parameters, and calculated exposures (doses) for each of these activities are detailed in Appendix I and Appendix E. For each activity, the doses to the maximally exposed worker and off-site resident, and the total exposure of the population of workers, are calculated

The radiological significance of an activity is evaluated against dose levels established by regulatory authorities. The level of radiation exposure resulting from the proposed Monofill Facility is also compared to the background levels each individual is exposed to from natural sources. The NCRP has estimated the average background exposure is 300 mrem per year in the United States. This value can vary significantly depending on an individual’s lifestyle, occupation, and geographic location. It should be noted that a significant fraction of the natural background dose is due to indoor radon.

The impacts of particular radionuclides vary because of the different types and energies of radiation emitted during decay. The relative significance of the different isotopes from a dosimetric viewpoint is taken into account in analyzing the potential impacts through Dose Conversion Factors (DCFs) which relate the amount of material inhaled or ingested to the resultant dose. Because the inhalation of material results in its incorporation to the body for some extended period of time, the concept of a Committed Effective Dose: Equivalent (CEDE) is used. The CEDE includes factors to account for doses to individual organs in the body, the relative importance of those organs to overall risks, and the dose contribution over a lifetime from the uptake of the radioactive material and its distribution within the body. The reported doses are expressed as CEDE unless indicated otherwise.

Radon Emissions from Disposal Area

Radon releases during initial placement conditions were calculated using the RAECOM diffusion code which is used by the U.S.Nuclear Regulatory Commission for licensing uranium mill tailings sites (Rogers 1984) (see Appendix I). The assessment indicates that without any cover the estimated off-site concentration of radon, due to releases from geothermal materials, at the nearest residence (the Elmore Desert Ranch 2.2 miles to the northeast) is approximately 0.004 pCi/l. This concentration is significantly less than natural ambient concentrations of radon (i.e., 0.5 pCi/l, NCRP 1975). Doses to the public during operations are insignificant due to the distance from the filter cake piles and the effects of atmospheric dilution and dispersion. Furthermore, for the total site the long-term doses after closing the disposal cells will be lower (about 0.002 pCi/l) due to confinement by the cap.

Radon emissions from the surface of the prosed disposal cells with no cover were calculated to be approximately 245 pCi per square meter per second, if the material is allowed to dry out. The use of a 2-foot compacted clay cover and 2 feet of soil as currently proposed will reduce the radon emissions to approximately 76 pCi per square meter-second (see Appendix I). Additional depth of cover would reduce the flux. The concentration of radon at the offsite resident location (2.2 miles) would be about 0.002 pCi/l for the flux of 76 pCi/square meter-second.

Radon emissions within the cell boundary would therefore be above the EPA Clean Air Act offsite emission standard of 20 pCi/square meter-second. Though EPA standards do not apply to the proposed project, it may be conservatively used for comparison purposes.

Exposure From Inhalation of Suspended Dust

The calculated 50-year committed effective doses[2] (whole body) due to inhalation of particulates are summarized in Table 3-15 for both workers and members of the public. Assuming that workers will be exposed to the 24-hour maximum dust concentration 8 hours per day for the full year (see dust concentrations, Table 3-l 1), doses to onsite workers could be 50 mrem CEDE (Appendix I). Using these same worst-case assumptions, the dose at the property boundary could be 5.4 mrem CEDE (Appendix I). Using worst-case assumptions, the dose at the property boundary for continuous exposure could be 1.1 mrem CEDE (Appendix I). Using the same conservative assumptions for airborne dust loading, an average annual wind speed of 3.3 miles per hour, and a conservative wind frequency of 10 percent into the 22.5 degree sector (e.g., the average frequency for a sector is about 6 percent), the dose to the nearest residence (Elmore Desert Ranch) is 0.11 mrem CEDE (Appendix I) .

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[2] The 50-year committed effective dose is the dose which will accumulate during the 50 years following inhalation of the isotopes.

Table 3-15

CALCULATED MAXIMUM SO-YEAR EFFECTIVE DOSE COMMITMENT DUE TO INHALATION FOR EACH ACTIVITY (mrem)

Location	Distance From Disposal Area	Whole-Body (CEDE)
Monofill Site		
Onsite Worker	Onsi te	50
Property Boundary	450 meters	1.1
Closest Resident - Elmore Desert Ranch	3500 meters (2.2 miles)	0.11
Geothermal Plant Site		
Loading Trucks	Onsite	15
Offsite Resident	800 meters	0.09

Source: Rogers and Associates, January 1990 (Appendix I)

Estimated conservative radiation doses due to exposure from inhalation of suspended dust are significantly less than EPA Clean Air Act Standards of 10 mrem along the property boundary and beyond to the nearest residence. Using EPA Clean Air Act Standards as guidelines for comparison, no adverse impacts are anticipated beyond the project boundary due to radiation exposure from inhaling suspended dust.

The conservative estimate of the inhalation radiation exposure to the worker during unloading and emplacement is one-half of the proposed NRC criteria of 100 mrem per year and therefore is not considered to represent a significant adverse impact. The inhalation doses for workers at the geothermal plants who load the filter cake into trucks and for the resident living closest to the plants are also given in Table 3- 15. The closest resident lives 0.5 miles from one plant and up to 3 miles from the other plants. The assumptions for these calculations are similar to those for the Monofill and are given in Appendix I. The site will be operated in compliance with county air quality standards and is proposed to use extensive dust control measures, such as water sprays and soil sealants. These measures are expected to limit dust loading to less than 100 µg/cubic meter which will reduce the doses for the Monofill site in Table 3-15 by about a factor of two.

External Gamma Radiation Exposure

The Radioactive substances in the geothermal waste materials emit low levels of gamma radiation. The gamma radiation results in the potential exposure of people in the area of the geothermal filter cake material to external radiation. The concentrations of naturally occurring materials in the geothermal filter cake are low enough and the sites are large enough that there is no potential exposure to people in the offsite area from filter cake loading, transportation, or placement on the site (See Appendices E and I).

There are basically two groups of people who may be adversely exposed: truck drivers hauling the waste to the disposal site and site personnel who off-load the filter cake, place, and compact it.

Table 3- 16 provides calculated maximum whole body gamma exposures for each proposed activity. The maximum projected external gamma doses for on-site workers would be 180 mrem. This dose is for the bulldozer operator who assists in off-loading materials from trucks, placing the material in the disposal area, and compacting the material.

Table 3-16

CALCULATED MAXIMUM WHOLE-BODY GAMMA EXPOSURES FOR EACH ACTIVITY (mrem/year)

Population	Activity: Truck Loading and Transport	Activity: Unloading and Emplacement
1. Worker (Maximally Exposed Individual)	51	180
2. Offsite Nearest Resident	<0.01(2)	<0.01(1)

(1) Closest permanent resident at Elmore Desert Ranch at 2.2 miles from Monofill Facility.
(2) People present on transport route (Appendix E).

The maximum projected annual individual dose to a worker at the Monofill Facility of 180 **mrem is less than half of the permissible annual exposure level of 500 mrem for a non-nuclear worker set forth in 10 CFR 20 and CAC 17-30268. However, it is more than the 100 mrem proposed by the NRC. Though the proposed NRC dose** standard does not apply to the proposed project, it may be used for comparison purposes.

3.11.5 Mitigation Measures

As discussed, the project design includes mitigation measures to isolate the disposal activity from accidental contact by the general public and minimize radiation exposures to the public. Although there are no specific radiation regulations, the exposures are below related regulations used for comparisons.

Based on the principles of ALARA, mitigation measures are listed to reduce worker radiological exposures to as low of levels as reasonable, not just to below relatable regulatory criteria.

The mitigation measures proposed for non-radiation air quality effects will also reduce the radiation impacts. The operational procedures are to include dust control measures such as spraying the waste materials with a polymer particle binding compound at the end of each day. This should also be sufficient to reduce the impacts associated with radioactive airborne particles. The use of a water or other wetting sprays during off-loading vehicles and placement of the materials would further reduce releases of airborne dust.

Other mitigation measures include minimizing the presence of personnel in the work area. Truck drivers should remain inside their trucks with the windows closed. The site personnel should be inside vehicles with air conditioned cabs with high efficiency filters on the makeup air. Even without the dust mitigation measures, these measures should reduce the dust loading to about 100 micrograms per cubic meter, a reduction factor of about four, and are estimated to reduce inhalation does for onsite workers to less than about 13 mrem/year. Furthermore, the air quality regulations require limiting the annual average dust loading to 100 μg/cubic meter. It is recommended that control measures be used to attain this on the site, not just at the boundary.

The proposed non-radiation related mitigation measures will not significantly reduce the release of radon from the filter cake material. However, they will reduce the exposures to onsite workers. Air filters for air conditioned cabs will reduce the concentration of the particulate radioactive decay products of radon, the primary source of radiation exposure from radon. The filtration efficiency should be over 90 percent, and will be easily over 75 percent providing a reduction factor of four. As a further precaution, half-mask high-efficiency particulate air (HEPA) respirators will also be required for loading and unloading operators. These respirators are NIOSH/MSHA approved for dust, fumes, and mists with a personal exposure limit (PEL) less than 0.05 milligrams/cubic meter and radionuclides.

The mitigative measures for reduction of the radon emissions are generally those applicable for:

- Reduction of the releases during the operating phase.
- Reduction of the releases after closure of the site.

Each of the proposed cells is scheduled for about a lo-year operating phase. Therefore, the releases associated with operations will only occur during this period. However, because of the long radioactive half-life of the materials in the waste, the releases after closure are essentially infinite in time. Therefore, mitigative measures for reducing the long-term releases must be effective for many years. For example, addition of water will increase the moisture content and reduce the radon release, but the moisture will not be retained over a long period of time. Increase moisture reduces the rate of diffusion of radon in soil, which, due to radioactive decay during the diffusion, reduces the release of radon.

The viable mitigative measures for the operating phase are generally limited to adding moisture to maintain the initial moisture content. This will also control the resuspension of dust. The waste material will contain about 20 percent moisture when it is delivered to the Monofill. If the compacted material is watered sufficiently to keep the moisture at 20 percent, the flux will be reduced from the normal operation estimate of 245 pCi/square meter-second to about 120 pCi/square meter-second. Increasing the moisture to near saturation, about 30 percent, would reduce the flux to about 32 pCi/square meter-second. There would be corresponding reductions in radon concentrations and radiation exposures from the radon.

The mitigative measures for reducing the releases after closure are increasing the thickness and integrity of the cover. The waste will dry out due to the arid environment and the radon release from the surface of the waste will increase. The cover both retains some moisture and reduces the radon release during the decay of radon. The cover of 2 feet of clay and 2 feet of soil will reduce the radon flux to about 76 pCi/square meter-second. An additional cover of 6 feet more of soil will reduce the flux to about 20 pCi/square meter-second. An additional 3 feet of soil (total of 2 feet of clay and 11 feet of soil) will result in a long-term flux of about 10 pCi/square meter-second.

The doses due to external gamma exposure can be reduced by applying the following three principals: reduction of time, increase distance from the filter cake material and by providing shielding between the source material and person.

These principles have different applications for the two scenarios of the truck driver and the on-site equipment operator. The time of exposure for the truck driver can be reduced significantly by keeping him away from the truck, except when he is driving it. The exposure time and hence the dose can almost be reduced by a factor of about two.

It will be difficult to reduce the exposure time or increase the working distance for the on-site equipment operator who is placing and compacting the filter cake materials. The individual operator time could be reduced by using more operators, but the total dose would remain about the same, or might actually increase due to reduced efficiency. The gamma dose to the vehicle operator can be reduced by placing appropriate shielding on the vehicle. A reduction factor of about three in the gamma exposure rate can be obtained by proper placement of about an inch of lead shielding on the vehicle. Shielding would reduce the calculated worst-case dose to the equipment worker to about 63 mrem/year.

As a final measure to reduce on-site health hazards and establish appropriate action levels for worker safety, the following written plans and procedures for facility operation will be required:

- Groundwater Monitoring Plan as required by the RWQCB and Department of Health Services. This plan should include analyses of groundwater for determination of radionuclides. Groundwater samples should be analyzed on a quarterly basis for gross alpha and beta activities, and gamma spectroscopy. These data should be compared to baseline values submitted by the project applicant for soil and groundwater. Appropriate action levels should be established and enforced by the RWQCB and Department of Health Services.

- Ambient Air Monitoring Plan as required by the Imperial County APCD and Department of Health Services. As part of Imperial County's APCD requirement for air monitoring, a radiological assessment should be conducted each quarter. Appropriate action levels have been established for worker and public exposure in "California Radiation Protection Regulations" (California Administrative Code Title 17-30344). Title 17 establishes the following action levels for Ra226 and Ra228: worker exposure (Ra226 concentration of 5.00E-11 uCi/ml and Ra228 4.00E-11 uCi/ml) and public exposure (Ra226 2.00E-12 uCi/ml and Ra228 1.00E-12 uCi/ml).

- Radiological Monitoring Program as required and enforced by the Department of Health Services. This program should be conducted to ensure the expected minimal exposure/dose at and around the Monofill. It will consist of onsite workers wearing film badge dosimeters which measure external radiation exposure. Workers may not receive more than the occupational dose limit set by Title 17-30265 for whole body exposure of 1.25 mrem per calendar quarter.

- Other recommended operation plans include Emergency Response Plan, Material Storage Handling Plan, and Site Operation Plan.

As a condition of project approval, these mitigation monitoring plans will:

- Provide details regarding the roles and responsibilities of the mitigation monitoring data.

- Define in a precise manner monitoring and compliance criteria.

- Refine monitoring tasks by identifying subtasks.

- Include examples of proposed reporting documents.

- Describe data management systems.

- Define scheduling of monitoring activities.

- Make field assignments by name.

- Describe field logistics, including a proposed communication system.
- Specify responsibility for program enforcement.
- Stipulate penalties for failure to implement mitigation measures.

After completion of the permitting process and prior to completion of construction, the applicant will obtain Environmental Impairment Liability through the use of a letter of credit. This letter may be used for closure and post-closure costs and for upset episodes. The letter of credit will be completed as specified by the California Waste Management Board (CWMB) form 101 or equivalent.

3.11.6 Risk Assessment

A health risk assessment has been conducted which investigates the potential for human health impacts associated with radiation exposure. This study is reviewed and summarized in this section. The risk assessment is presented in Appendix I.

It should be noted that the risk assessment assumes that all recommended mitigation measures provided in Sections 3.3.4 (Air Quality), 3.2.3 (Hydrology/Water Quality), and 3.11.5 (Public Health and Safety) will be implemented. Table 3-17 provides estimated radiation exposure based on the indicated mitigation measures. It should be recognized that the health effects of radiation exposures are based on extrapolations of effects that have been observed at very high doses. This extrapolation is performed based on the assumptions of "no threshold" and "linear effects." This means that the effect is directly proportional to the dose, and that there is no threshold below which there is no effect. There is some evidence that both of these assumptions are conservative.

The exposures due to radon are given in WLM or working level months in Table 3-17. The release and environmental transport of radon is given using the units of concentration, pCi/l; however, since the radiation risk from radon is due to the radioactive decay products, a unit of exposure reflecting the presence of the decay products is used to assess exposure to people. The unit used is "working level." This unit, based on exposure for the nominal 188-hour occupational month may be termed the working level month (WLM). These units are described in Appendix I.

Table 3-17

RISK ASSESSMENT, MITIGATED DOSES FOR **MONOFILL** ACTIVITIES

Activity	Gamma Dose (mrem/year)	Inhalation Particulate Dose (mrem/year)	Radon Exposure (WLM)	Total Dose Commitments (mrem/year)
MONOFILL SITE				
Workers	60[a]	10[b,d]	0.01[c,d]	70
Offsite Resident @ 2.2 miles				
During Operation	co.01	0.05[b]	0.00045[e]	0.05
After Closure	co.01	—	0.00014[f]	---
Site Boundary				
During Operation	<0. 1	0.60[b]	0.0047[c]	0.60
GEOTHERMAL FACILITY				
Loading Trucks	51[a]	15[e]	---	66
Offsite Resident @ 0.5 miles	co.01	0.093[e]	0.00045	0.103
TRUCK DRIVER	51[e]	---	---	51

Based on doses from Tables 3- 15 and 3- 16, and radon exposures from text and Appendix I.

(a) Mitigation based on shielding on off-loading and compaction equipment.
(b) Mitigation based on dust control to reduce airborne dust to 100 micrograms per cubic meter.
(c) Mitigation based on spraying uncovered areas of pile to reduce radon flux and control dust.
(d) Mitigation based on using air conditioned cabs with filtered makeup air.
(e) No mitigation assumed.
(f) Based on a cover of 2 feet of compacted clay and 8 feet of soil.
— Not calculated, insignificant compared to other values.

The impact of radiation exposure may be expressed in terms of fatal cancers resulting from exposure. The cancer risk to the maximum exposed individual (Monofill workers) and to individuals living in the area of maximum annual air concentration were evaluated.

The results of the risk assessment show that risk to workers due to radiation exposure will be significantly lower than the "safe industry" standard established by the NCRP (1987b). The increment from radiological risks will be similar to common industrial practice and therefore is not considered to represent an adverse impact.

The risk from radiation exposure at the nearest residence to the Monofill would. represent an increment of approximately 1 percent over the risk associated with background radiation. The increase in radiation exposure is 0.9 percent of the EPA standard for public exposure, and is insignificant, comparable to taking a 2-hour plane flight once per year (NCRP 1987a). The health risk associated with this increment of radiation is comparable to smoking 1.6 cigarettes or driving 30 miles in a car. Variations in natural background radiation as well as doses from a variety of human activities (e.g., diagnostic medical exams, smoke detectors, eating barbecued meat) make any impact associated with this project's low risk statistically undetectable. Thus, the health risk to the closest residence from Monofill activities is considered to be insignificant when compared to other risks commonly accepted in our society.

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SECTION 4
UNAVOIDABLE ADVERSE ENVIRONMENTAL EFFECTS

The foregoing analysis indicates that the proposed Monofill Facility Class II disposal site could result in several adverse environmental effects. Such effects are primarily in the areas of air quality, noise, biology, archaeology, land use, transportation, and visual resources. Aspects of the project which are not completely amenable to mitigation by any reasonable means are discussed below.

4.1 AIR QUALITY

An air quality impact will result from fugitive dust emissions during construction activities. Full mitigation of this impact is not possible given the climatic conditions and the extensive earth moving required. Mitigation measures will substantially reduce emissions; however, the impact could still be considered adverse because of the existing poor air quality of the region relative to the particulate matter standards. The impact will be temporary, lasting 90 days each time a new cell is developed. Fugitive dust emitted during operation will produce an unavoidable adverse impact to air quality. However, assuming recommended mitigation measures in Sections 3.3.4 and 3.11.5 are implemented, this impact to air quality is not considered to be significant. Gaseous emissions from both construction and operations will produce a negligible impact to air quality.

4.2 NOISE

As discussed in Section 3.4.2, ambient noise levels will be slightly increased in the project vicinity due to temporary construction activities and operation of the disposal site; however, the remote location and lack of sensitive receptors will make this unavoidable adverse impact insignificant.

4.3 BIOLOGY

Development of the project will cause a loss of 35 acres of natural desert habitat for the life of the project. All vegetation and wildlife will be lost or displaced from the developed areas. This impact is not considered significant, as no rare and endangered species or rare habitats were found onsite. The only sensitive plant species impacted by the project would be the Salton milkvetch. Impacts to the Salton milkvetch are not considered to be significant. The project may adversely impact the flat-tailed homed lizard which is regarded as a species of special concern by the CDFG and as a candidate for listing as threatened or endangered by the USFWS. However, potential impacts to the flat-tailed homed lizard are not considered significant.

4.4 ARCHAEOLOGY

Cultural resources have been identified onsite by extensive surface investigation. A comprehensive mitigation program consisting of a test phase has been conducted which indicates mitigation measures which will reduce this unavoidable impact to insignificance. Refer to the technical cultural resources report conducted for this project which is on file with the Imperial County Planning Department and the clearinghouse of Imperial Valley College.

4.5 LAND USE

The 160-acre parcel presently zoned as “open space: will be lost for open space purposes; however, since this area is not significant from a biological, visual, or recreational standpoint, the land use impact is considered unavoidable yet not significant.

4.6 VISUAL RESOURCES

The existing viewshed will be unavoidably altered by the project. Vacant desert area will be replaced by a disposal site with fencing, access road, and equipment for operation onsite. The lack of sensitive receptors in the area and the distance (1.25 miles or 2 km) from travelers on SR-86 will reduce this visual resources impact to insignificance.

4.7 TRAFFIC/ CIRCULATION

From a traffic safety standpoint, turning movements onto and off of SR-86 in which trucks and employee traffic enter or leave the project site may generate a potentially unavoidable significant adverse impact. This potential hazard can be mitigated to below a level of significance by constructing a left turn pocket (in accordance with Caltrans requirements) at the intersection of the proposed access road and SR-86, or through completion of future Caltrans improvements to SR-86.

4.8 HEALTH AND SAFETY

Radiological impacts such as doses to workers and the public will occur, but will be rninimized by dust control and containment in the proposedMonofill Facility. Assuming all recommended mitigation measures provided under air quality, Section 3.3.4, and public health and safety, Section **3.11.5,** are implemented, the health risk to workers, due to radiation exposure, will be significantly lower than the "safe industry" standard established by the NCRP (1987b). The increment from radiological risks will be similar to common industrial practice and, therefore, is not considered to represent an adverse impact.

The risk from radiation exposure at the nearest residence to the Monofill would represent an increment of approximately 1 percent over the risk associated with background radiation. This increase in radiation exposure is insignificant and is comparable to taking a 2-hour plane flight once per year (NCRP 1987a). The health risk associated with this increment of radiation is comparable to smoking 1.6 cigarettes or driving 30 miles in a car. The health risk to the closest residence from Monofill activities is considered to be insignificant when compared to other risks commonly accepted in our society.

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SECTION 5

ALTERNATIVES TO THE PROPOSED PROJECT

5.1 ALTERNATE LOCATIONS

In a study conducted by Targhee, Incorporated (1988) for Desert Valley Company, numerous potential locations in the Imperial Valley were considered for their suitability as alternative locations for a Class II disposal site. The Targhee study is on file with the Imperial County Planning Department. Analysis of most of these sites was terminated at a certain point because of unsuitable geologic conditions, land use conflicts, or haul distances too lengthy to serve feasibly the four geothermal power plants located in the Obsidian Butte area.

The screening process used to identify areas for field investigations of alternative sites in Imperial County was conducted in sequential phases. The initial screening was performed using published information for the Imperial County area. The entire county was considered for alternative sites, based on several factors that determine suitability for siting the proposed facilities. Land use, geologic units, and Holocene faults were key considerations. Consideration of alternative locations in all agricultural areas (including the existing geothermal power plant sites) and all lands set aside by the government were considered unfavorable for siting because of potential land use conflicts.

The water code requirement that waste management units be underlain by natural geologic materials having permeability of 10^{-6} cm/sec or less essentially requires that sites be located in areas of clay beds. In Imperial County, the Tertiary claystones and the Quatemary lake beds are considered most favorable for siting as they are most likely to contain clay beds with permeability less than 10^{-6} cm/sec. Of the two, the Quatemary lake beds are preferred as these geologically younger beds are more likely to be flat-lying or at low angles while the Tertiary units in this area commonly are uplifted and tilted. Quatemary lake beds in the central part of the Imperial Valley were also considered more favorable because haul distances to a proposed site in these beds would be significantly shorter than to locations in the Tertiary claystone units exposed in the northwest and southwest parts of the valley. Consideration of clay beds in the Bouse Formation, along the Colorado River, was terminated because of their distance from the Obsidian Butte area and potential impacts to the Colorado River surface waters.

The government code requirement that waste management units have a 200-foot setback from any known Holocene fault is an important consideration in Imperial Valley and an important factor in the consideration of alternate sites. Analysis of all site selection criteria revealed an area generally southwest of Kane Spring and north of the Superstition Hills as being likely to contain the most suitable sites for the proposed project. This area is mainly underlain by Quatemary lake deposits. It is outside the government reservations and away from agricultural lands. The area is not crossed by the main Holocene faults and the preliminary information from USGS indicated only a few minor faults in the area.

According to the Targhee Study (1988) the screening of the area southwest of Kane Spring identified five privately-owned sections for further evaluation: Section 25, T12S/R10E; Section 35, T12S/R10E; Section 31, T12S/R11E; Section 33, T12S/R11E; and Section 3, T13S/R10E. These sections were the focus of the additional geologic exploration performed in the area southwest of Kane Spring, as described below.

Following reference to available maps and reports prepared by others, investigation of the area began with interpretation of aerial photographs to identify geologic features and plan access to the sections selected for further evaluation. The area was then examined in the field and geologic features were mapped on overlays to 1:12,000 aerial photographs. Backhoe test pits were excavated in the five selected sections to further examine the near-surface geology and samples of soils were tested in the laboratory to confirm the field classifications.

The results of the investigations of the five selected sections in the area southwest of Kane Spring indicated that three of the sections were likely to contain suitable sites meeting the basic selection criteria: Sections 31 and 33 in T12S/R11E and Section 35 in T12S/R10E. Although each of these sites met the selection criteria upon further evaluation., Section 33 revealed several environmental and economic benefits over the other two sections.

The first benefit is the shortest road distance. This section requires construction of an access road of 1.2 miles rather than 3 and 5-1/2 miles for the other two sections. This has both economic and environmental benefits because there is less road to build and therefore less land is developed for building the road. The second benefit is that access roads for the other two sections would have to cross major washes and would have to be designed to withstand higher drainage flows with increased risk of road washout. Finally, the proposed Section 33 unlike the other two sections is not in the drainage flow of the San

Felipe Creek, a sensitive wildlife management area. Because the other two sections are so located, siting the project in either section would likely result in impacts to wildlife/vegetation.

Results of further investigation in Section 33 indicated a preferred location for development of the proposed project in the Northeast Quarter of Section 33, Township 12 South, Range 11 East SBB&M. This location was found to best meet all criteria for site selection including geologic units, Holocene faults, flooding, conflicting uses of nearby parcels, haul distances, and impacts to sensitive environmental resources.

The remote location, lack of sensitive receptors, and relatively barren nature of the proposed site indicate that the environmental impacts associated with the project would not be reduced by a change in location (see Section 3 for a full discussion). While the project objectives could be accomplished at another location, further analysis of alternative locations for the proposed project is not warranted.

5.2 ALTERNATIVES TO THE PROPOSED METHOD OF LAND DISPOSAL

52.1 Alternative Technologies

Because radioactivity is a characteristic of atomic nuclei, no chemical or thermal treatment will alter the basic character of the waste. Moreover, any such technique, such as incineration or stabilization/fixation, would require substantial materials handling and would be very likely to increase occupational exposure and public exposure through increased air emissions, without any reduction in the radioactivity of the material. Thus, the increased costs and risks would not reduce the impacts of the project, and could substantially increase the adverse impacts. In addition, the chemical structure of the waste, as discussed in this EIR, already consists largely of silica and barium sulfate material which has a very low solubility. Hence, any such techniques would not materially reduce the radiologic impacts from the project. Therefore, no feasible technological alternatives to land disposal are available for NORM (EPA 520/1-89-007, Draft Environmental Impact Statement for Proposed NESHAPS for Radionuclides).

5.2.2 Alternative Project Designs

The proposed project has been sized to accept a known volume of waste from four existing geothermal power plants for a 20-year period. Therefore, there is no alternative capacity for the project. A larger project would have proportionately greater impacts, while a smaller project would not meet the project objective of a 20-year disposal capacity.

The proposed project has been designed to function at the equivalent protectiveness level of a Class I hazardous waste disposal facility, which is the most stringently protective type of land disposal facility presently feasible under current laws and regulations. An alternative with fewer protections would result in greater environmental impacts. A facility design with a more protective liner and leachate collection system would 1) be more stringent than that presently required for hazardous or low-level radioactive waste disposal sites under 40 CFR Part 264 or 10 CFR Part 61, respectively; and 2), in light of the hydrologic characteristics of the site as discussed in this EIR, be overdesigned because the existing design already mitigates to insignificance any impact to ground water or surface water.

Other NORM disposal sites have used trench disposal, rather than the disposal proposed for the project. Trench disposal may result, under certain circumstances, in lower air emissions because a smaller surface area of the waste is exposed. However, the trench technology has been used exclusively at unlined sites, such as the existing Utah NORM site, where other protections are unavailable. Moreover, trenching is infeasible at the proposed site because the capacity of the site would be drastically reduced to less than the project objective of 20 years. In order to achieve the project objective, a much larger site would have to be constructed, which would require infringing on fault zones and would present a larger, more complicated final cover and maintenance program with a concomitantly increased risk. Therefore, the trench disposal method is considered an inferior and unnecessary alternative to the proposed project.

As discussed in Section 3.11 .5, cover design is an important element in minimizing project impacts. The project cover design, with the mitigation measures suggested herein, will mitigate to insignificance any impact resulting from emissions after closure. A more extensive cover design is unnecessary because it will not result in any reduced impacts from the project.

5.3 No PROJECT

Under this alternative, the proposed Monofill Facility would not be developed. Conditions described in the setting portions of the EIR would not be changed as a result of this alternative.

Open space uses on the site will continue because there would be little incentive to terminate open space uses for private development of the site. In addition, the visual character of the site would remain as it currently exists, i.e., open space with no onsite structures.

The project objective of providing control in managing filter cake for future commercial uses and control in disposing of mud sump wastes without potentially mixing these materials with hazardous waste would not be met. The current option of disposing of these materials at a hazardous waste landfill and potentially mixing them with hazardous waste would remain the only option available to the geothermal power plants. Disposing of non-hazardous materials in a Class-I landfill would take up valuable capacity that otherwise could be used for disposal of hazardous wastes.

Shipment to a hazardous waste facility may no longer be a feasible option due to the radioactivity in the filter cake because of regulatory restrictions on mixing hazardous and radioactive materials. It is also understood that the operating permit for the proposed California low level radioactive waste (LLRW) disposal facility will not allow acceptance of NORM. The basis for this is a desire to refrain from using highly valuable disposal volume for material that does not require the level of isolation needed for LLRW. The haul distances to the existing Utah NORM facility would result in high transport costs and larger transportation doses than in the case of the proposed Monofill. It is also likely that potential releases from the Utah site would be greater since the proposed Monofill design provides superior isolation through additional engineered barriers.

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SECTION 6
CUMULATIVE IMPACTS

As described in Section **3.10** of this report, the construction and operation of the proposed disposal site is not labor intensive and, therefore, no significant <u>direct</u> growth-inducing impacts on employment, population, housing, or public services are expected. Since the proposed project will be privately used, it will not induce new industries to consider locating in Imperial County and, therefore, no significant indirect growth-inducing impacts on employment, population, housing, or public services arc expected.

There are no other projects in the area that are in the planning process that could create cumulative impacts. The project will add to the cumulative fugitive dust emissions in Imperial County. The project will also add to the cumulative maintenance requirements on Sinclair, Gentry, Bowles, Lack and Bamisks roads. These impacts are not considered to be significant.

The proposed project will have two potential impacts on air quality, increased particulates (via fugitive dust emissions) and radionuclide emissions, both of which are discussed elsewhere in this EIR. With respect to particulate emissions, Imperial County is a nonattainment area for particulates under the Federal Clean Air Act.

However, as discussed in Section 3.3.4 of this EIR, the mitigation measures suggested herein will mitigate any air quality impacts to insignificance. In addition, the ambient air quality impact from the project's fugitive emissions decreased by over 95.6 percent within 2 miles of the project, to an immeasurable quantity. The Imperial County APCD has advised the project applicant that this amount of residual particulate emissions (no radionuclide particulate) at the boundary of the 2-mile radius is insignificant both from a project-specific and cumulative perspective (Torres 1990). Moreover, consultation with the agencies identified in Section 7 has indicated that there arc no existing or proposed facilities in the area (i.e., within 2 miles) of the proposed project which emit any particulates. Therefore, because there are insignificant additive components to the project's estimated impact, the cumulative impacts from fugitive dust emissions are expected to be insignificant.

In addition, as discussed in Section 3.11.4 of the EIR, the project will have certain radiologic impacts. We have not identified any existing or proposed facilities in the area of the project with known radionuclide. emissions. As the radionuclide impact will be basically associated with the fugitive emissions and there are insignificant additive components to the project's estimated impact, the cumulative impacts are expected to be insignificant. Moreover, there are no legal standards for radiologic impacts which will be exceeded, either individually or cumulatively, from the proposed project. Finally, as discussed in Section 3.11.4.2, the project will increase local radiologic impacts by 0.03 percent over the existing background levels of radiation, which amounts to an insignificant, localized cumulative impact that requires no additional mitigation measures.

SECTION 7
AGENCIES AND ORGANIZATIONS CONSULTED

7.1 PUBLIC AGENCIES

Federal

U.S. Department of Agriculture, Soil Conservation Service
U.S. Department of the Interior
- Bureau of Land Management, El Centro Office
- Fish and Wildlife Service, Salton Sea National Wildlife Refuge

State of California

Department of Fish and Game, Region 5
Department of Transportation, District 11
Regional Water Quality Control Board, Colorado River Basin Region
Waste Management Board

County of Imperial

Planning Department
Air Pollution Control District
Department of Public Works
Division of Environmental Health Services

Other Agencies

Imperial Irrigation District
Imperial Valley College Museum
Imperial County Fire Department
Imperial County Sheriffs Department

7.2 OTHER ORGANIZATIONS

Lawrence Livermore Laboratory
Desert Valley Company
Targhee, Incorporated
Dow Chemical

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SECTION 8

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SECTION 9
CERTIFICATION OF ACCURACY AND QUALIFICATIONS

9.1 REPORT CONTRIBUTORS

This environmental impact report was prepared by ERC Environmental and Energy Services Company (ERCE) of San Diego, California, for the County of Imperial Planning Department. Members of the ERCE professional staff contributing to this report are as follows:

Dennis Gallegos; B.A. Anthropology
Kimberly Glasgow; B.A. Geography/Environmental Studies
Robert Homer; M.S. Environmental Health
Jonathan Herwig; M.A. Geological Sciences, Certified Geologist State of California
Stephen Lacy; M.S. Biology
Thuy Le; B.S. Chemical Engineering
Dennis Marcin; B.S. Geology
E. Smith Murphy; Ph.D. Physics
Michael Nienberg; Dr. P.H. Environmental Management and Planning
Andrew Pigniolo; B.A. Anthropology
John Porteous; M.A. Environmental Resource Management
Elyssa Robertson; B.A. Biology
Jerre Stallcup; M.A. Zoology
Philip Unitt; B.S. Zoology

Rogers and Associates Engineering Corporation provided the necessary expertise to review the Dames and Moore "Radiological Assessment" prepared for the proposed Monofill Facility. Members of the Rogers and Associates professional staff contributing to this report are as follows:

David E. Bemhardt; M.P.H.
Vem C. Rogers; Ph.D. Nuclear Engineering

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APPENDIX A

NOTICE OF PREPARATION
DRAFT EIR JULY 1989

PUBLIC REVIEW
DRAFT EIR JULY 1989

NOTICE OF PREPARATION

TO: State Clearing House/OPR
1400 tenth Street
(Address)
Sacramento, CA 95814

FROM: Imperial County Planning
939 Main Street
(Address)
El Centro, CA 92243

SUBJECT: Notice of Preparation of a Draft **Environmental Impact Report**

Imperial County Planning Dept. will be the Lead Agency and will prepare an environmental impact report far the project identified below. We need to know the views of your agency as to the scope and content of the environmental information which is germane to your agency's statutory responsibilities in connection with the proposed project. Pour agency will need to use the EIR prepared by our agency when considering your permit or other approval for the project.

The project description, location, and the probable environmental effects are contained in the attached materials. A copy of the Initial Study XX is, ___ is not, attached.

Due to the time limits mandated by State law, your response must be sent at the earliest possible date but not later than 30 days after receipt of this notice.

Please send your response to Richard Cabanilla, Planner III at the address shown above. We will need the name for a contact person in your agency.

Project Title: Class II Facility/Monofill Project

Project Applicant, if any: Desert Valley Company

DATE March 15, 1989

Signature

Title JURG HEUBERGER, PLANNING Director

Telephone (619) 339-4236

Reference: *California* Administrative Code, Title 14, Sections 15082(a), 15103, 15375.

Mail to: State Clearinghouse, 1400 Tenth Street, Room 121, Sacramento, CA 95814 — 916/445-0613

NOTICE OF COMPLETION AND ENVIRONMENTAL DOCUMENT TRANSMITTAL FORM

See NOTE below
SCH # ____________

1. Project Title: Class II Facility, MonoFill Project-Desert Valley Company
2. Lead Agency: Imp. County Planning Department 3. Contact Person: Richard Cabanilla
3a. Street Address: 939 Main Street 3b. City: N/A
3c. County: Imperial 3d. Zip: 92243 3e. Phone: (619) 339-4236

PROJECT LOCATION 4. County: Imperial 4a. City/Community: West of Westmorland
4b. Assessor's Parcel No. 019-100-14-01 Section 33 Twp. T12S Range R11E
5a. Cross Streets: N/A 5b. For Rural, Nearest Community: Westmorland

6. Within 2 miles: a. State Hwy # 86 b. Airports ------ c. Railways ------- d. Waterways ------

7. DOCUMENT TYPE

CEQA
01. X NOP
02. ___ Early Cons
03. ___ Neg Dec
04. ___ Draft EIR
05. ___ Supplement/Subsequent EIR (Prior SCH No.: ____________)
06. ___ NOE
07. ___ NOC
08. ___ NOD

NEPA
09. ___ NOI
10. ___ FONSI
11. ___ Draft EIS
12. ___ EA

OTHER
13. ___ Joint Document
14. ___ Final Document
15. ___ Other ____________

8. LOCAL ACTION TYPE
01. ___ General Plan Update
02. ___ New Element
03. X General Plan Amendment
04. ___ Master Plan
05. ___ Annexation
06. ___ Specific Plan
07. ___ Community Plan
08. ___ Redevelopment
09. X Rezone
10. ___ Land Division (Subdivision, Parcel Map, Tract Map, etc.)
11. X Use Permit
12. ___ Waste Mgmt Plan
13. ___ Cancel Ag Preserve
14. ___ Other ____________

9. DEVELOPMENT TYPE
01. ___ Residential: Units ______ Acres ______
02. ___ Office: Sq. Ft. ______ Acres ______ Employees ______
03. ___ Shopping/Commercial: Sq. Ft. ______ Acres ______ Employees ______
04. X Industrial: Sq. Ft. N/A Acres 160 AC. Employees ______
05. ___ Water Facilities: MGD ______
06. ___ Transportation: Type ______
07. ___ Mining: Mineral ______
08. ___ Power: Type ______ Watts ______
09. ___ Waste Treatment: Type ______
10. ___ OCS Related
11. ___ Other: ______

10. TOTAL ACRES: ____________ 11. TOTAL JOBS CREATED: ____________

12. PROJECT ISSUES DISCUSSED IN DOCUMENT
01. X Aesthetic/Visual
02. ___ Agricultural Land
03. X Air Quality
04. X Archaeological/Historical
05. ___ Coastal Zone
06. ___ Economic
07. ___ Fire Hazard
08. X Flooding/Drainage
09. X Geologic/Seismic
10. ___ Jobs/Housing Balance
11. ___ Minerals
12. X Noise
13. X Public Services
14. ___ Schools
15. X Septic Systems
16. ___ Sewer Capacity
17. ___ Social
18. X Soil Erosion
19. X Solid Waste
20. ___ Toxic/Hazardous
21. X Traffic/Circulation
22. ___ Vegetation
23. X Water Quality
24. ___ Water Supply
25. ___ Wetland/Riparian
26. X Wildlife
27. ___ Growth Inducing
28. X Incompatible Landuse
29. X Cumulative Effects
30. ___ Other ____________

13. FUNDING (approx) Federal $ ____________ State $ ____________ Total $ ____________

14. PRESENT LAND USE AND ZONING:

"S" -Open Space

15. PROJECT DESCRIPTION:

See Attached -- Project Description

16. SIGNATURE OF LEAD AGENCY REPRESENTATIVE: [signature] DATE: March 15, 1989

NOTE: Clearinghouse will assign identification numbers for all new projects. If a SCH number already exists for a project (e.g. from a Notice of Preparation or previous draft document) please fill it in.

FORM REVISED 4/86 - REPLACES CA189 MARK DISTRIBUTION ON REVERSE

REVIEWING AGENCIES

X Resources Agency	X Caltrans District 11
___ Boating/Waterways	___ Dept. of Transportation Planning
___ Conservation	___ Aeronautics
X Fish and Game	___ California Highway Patrol
___ Forestry	___ Housing & Community Dev't.
___ Colorado River Board	___ Statewide Health Planning
___ Dept. Water Resources	___ Health
X Reclamation	___ Food & Agriculture
___ Parks and Recreation	___ Public Utilities Commission
X Office of Historic Preservation	___ Public Works
X Native American Heritage Commission	___ Corrections
___ S.F. Bay Cons. & Dev't. Commission	___ General Services
___ Coastal Commission	___ OLA
___ Energy Commission	___ Santa Monica Mountains
___ State Lands Commission	___ TRPA
___ Air Resources Board	___ OPR - OLGA
X Solid Waste Management Board	___ OPR - Coastal
___ SWRCB: Sacramento	X Bureau of Land Management
X RWQCB: Region A 7 ___	___ Forest Service
___ Water Rights	___ Other: ___
X Water Quality	___ Other: ___

FOR SCH USE ONLY

Date Received at SCH ___
Date Review Starts ___
Date ~~n~~ Agencies ___
Date to SCH ___
Clearance Date ___

Catalog Number ___
Applicant ___
Consultant-Contact ___ Phone ___
Address ___

Notes: ___

IMPERIAL IRRIGATION DISTRICT

OPERATING HEADQUARTERS . P 0. BOX 937 • IMPERIAL. CALIFORNIA 92251

IIDAGM

April 10, 1989

Mr. Jurg Heuberger, Planning Director
Imperial County Planning Department
Attention: Mr. Richard Cabanilla
Planner III
939 Main Street
El Centro, CA 92243-2856

Dear Mr. Heuberger:

Subject: Notice of Preparation (NOP) for Class II Facility Monofill Project/Desert Valley Company

This is in response to the NOP dated March 15, 1989, sent to the State Clearinghouse. Due to the nature of this proposal and the comments which are provided with this letter, the District recommends a full Environmental Impact Report be prepared.

There are three general areas that are of concern to the District:

- The information and environmental evaluation refer to the development of a water well to meet the water needs of the proposal. There is no reference to water quality in the area. The District will be interested in any proposal for groundwater development as indicated in our letter of February 16, 1989, to the Imperial County Planning Department, Subject: Imperial County Groundwater Policy. In paragraph (16) c. reference is made to "There may not be any further need of water to the site through a new system or substantial alteration to the IID system." The District has not had any inquiry regarding water supply.

- A diesel-power generator is proposed as the on-site power source. The environmental evaluation in paragraph (16) a. indicates that "This project analysis does not evaluate the impacts due to electricity being provided to the site by the Imperial Irrigation District." There has been no discussion with the District on how service could be made to this proposed project.

- The response to the question "Storm water Drainage?" is "Maybe." In the environmental evaluation at paragraph (16) e. reference is made to the effects of a 100-year storm on adjacent lands. The diversion berm around the site will increase flow to the receiving channels and increase the potential for erosion. The District will be very interested in the drainage plan for the proposed project which should be clearly defined and the impacts evaluated in the Environmental Impact Report.

We also have some concern that the rezoning would result in a Zone M-2, Heavy Industrial. In contrast to the statement in the environmental evaluation at paragraph (21) which says "Further environmental documentation will be necessary in the future for any other activities ...." we understand that under this type of zoning numerous uses can be permitted as a matter of right without substantial review by the permitting agency.

Thank you for the opportunity to provide these comments. Please contact Dr; Robert Lang at 339-9254 if you should need further information.

Sincerely,

CHARLES L. SHREVES
General Manager

MONOFILL2

DEPARTMENT OF FISH AND GAME

330 Golden Shore, Suite 50
Long Beach, CA 90802
(213) 590-5113

April 13, 1989

Richard Cabanilla, Planner III
Planning Department
County of Imperial
939 Main Street
El Centro, CA 92243

Dear Mr. Cabanilla:

The Department of Fish and Game (Department) has reviewed the Notice of Preparation of a Draft EIR for the Class II Facility Monofill Project/Desert Valley Company, consisting of a storage/ disposal facility for geothermal solids, an access route to the proposed site, and the infrastructure necessary to operate the facility. The facility will be located west of Westmoreland in the northeast quarter of Section 33, T. 12S, R. 11E, Imperial County. To enable our staff to adequately review and comment on this project, we recommend the following information be included in the Draft EIR:

1) A complete assessment of flora and fauna within the project area. Particular emphasis should be placed upon identifying endangered, threatened, and locally unique species; 2) documentation of direct, indirect, and cumulative impacts expected to adversely affect biological resources within and adjacent to the project site; 3) mitigation measures proposed to offset such impacts; and 4) assessment of growth-inducement factors potentially affecting natural open space and biological resources. Set aside natural open space in sufficient acreage to provide habitat for native wildlife and include landscape programs, with native trees and shrubs, to provide habitat for wildlife.

In addition, we have the following specific concerns which should be addressed in the DEIR:

The Initial Study indicates that there are no rare or endangered species within the project site. However, the project site is within the range of the flat-tailed horned lizard (Phyrnosoma m'calli), a state candidate for listing as endangered. Although surveys have not been performed in the immediate area, the flat-tailed horned lizard (FTHL) has been found in adjacent areas.

In preparing the DEIR for this project, the project proponent should perform a thorough survey of the area to determine if FTHL are present. In addition, if there is any blow-sand habitat on the project site, surveys for the Colorado Desert fringe-toed lizard (Uma notata), a federal candidate, Category. 2, species should also be undertaken. These surveys should be performed by investigators trained in the techniques necessary for locating these reptiles and should be performed during the most active time of year for each species. In addition to surveys, the project proponent should determine the impacts to these species.

Impacts to the groundwater and San Sebastian Marsh/Felipe Creek should also be addressed in the EIR as well as impacts from hazardous spills that may occur at the site or during transport to the site.

The project as described does not detail the work proposed for streambed alteration activity. The project sponsor must identify specific streambed alterations and flood control structures proposed in order for the Department to properly comment on this document. The applicant should be aware that if mitigation measures are not provided in this document, the Department may require such mitigation measures through jurisdiction established under Fish and Game Code Sections 1601-1603.

Diversion, obstruction of the natural flow or changes in the bed, channel, or bank of any river, stream, or lake will require notification to the Department of Fish and Game as called for in the Fish and Game Code. This notification (with fee) and the subsequent agreement must be completed prior to initiating any such changes. Notification should be made after the project is approved by the lead agency.

Thank you for the opportunity to review and comment on this project. If you have any questions, please contact Jack L. Spruill of our Environmental Services staff at (213) 590-5137.

Sincerely,

Chuck Hanry

Fred Worthley for
Regional Manager
Region 5

cc: K. Nicol
Office of Planning & Research

PUBLIC REVIEW

The Monofill Facility Draft EIR was available for a 45-day public review period (July - September 1989) following the Notice of Completion. Copies were distributed to local libraries for easy public access. Private and governmental agencies or organizations known to have a direct interest in or review and approval authority over all or portions of the project were mailed copies of the Draft EIR by the Imperial County Planning Department or the State Clearinghouse.

Comments addressing the accuracy of the Draft EIR were received during the public input period. The letters and responses follow.

STATE OF CALIFORNIA—OFFICE Of THE GOVERNOR GEORGE DEUKMEJIAN, Governor

OFFICE OF PLANNING AND RESEARCH

1400 TENTH STREET
SACRAMENTO, CA 95814

Richard Cabinilla
Imperial County Plng Dept.
939 Main Street
El Centro, CA 92243

September 1, 1989

Subject: Class II Facility, Monofill/ Desert Valley Company - SCH# 89032206

Dear Mr. Cabinilla:

The State Clearinghouse submitted the above named draft Environmental Impact Report (EIR) to selected state agencies for review. The review period is closed and the comments of the individual agency(ies) is(are) enclosed. Also, on the enclosed Notice of Completion, the Clearinghouse has checked which agencies have commented. Please review the Notice of Completion to ensure that your comment package is complete. If the package is not in order, please notify the State Clearinghouse immediately. Remember to refer to the project's eight-digit State Clearinghouse number so that we may reply promptly.

Please note that Section 21104 of the California Public Resources Code requires that:

> "a responsible agency or other public agency shall only make substantive comments regarding those activities involved in a project which are within an area of expertise of the agency or which are required to be carried out or approved by the agency."

Commenting agencies are also required by this section to support their comments with specific documentation.

These comments are forwarded for your use in preparing your final EIR. If you need more information or clarification, we recommend that you contact the commenting agency at your earliest convenience.

This letter acknowledges that you have complied with the State Clearinghouse review requirements for draft environmental documents, pursuant to the California Environmental Quality Act. Please contact Garrett Ashley at 916/445-0613 if you have any questions regarding the environmental review process.

Sincerely,

David C. Nunenkamp
Chief
Office of Permit Assistance

cc: Resources Agency

Enclosures

Mail to: State Clearinghouse, 1400 Tenth Street, Room 121, Sacramento, CA 95814 — 916/445-0613

NOTICE OF COMPLETION AND ENVIRONMENTAL DOCUMENT TRANSMITTAL FORM

See NOTE below
SCH # 89032206

1. Project Title: Class II Facility. Monofill Project-Desert Valley Company

a. Lead Agency: Imperial County Planning Dept. — 3. Contact Person: Richard Cabanilla

3a. Street Address: 939 Main Street 3B. City: El Centro

3c. County: Imperial 3d. 92243 Zip: 3e. Phone: (619) 339-4236

PROJECT LOCATION 4. County: Imperial 4a. City/Community: West of Westmorland

4b. Assessor's Parcel No. 0191001401 4c. Section 33 Twp. T12S Range R11E

5a. Cross Streets: N/A 5b. For Rural, Nearest Community: Westmorland

6. Within 2 miles: . . State Hwy # 86 b. Airports N/A c. Railways N/A d. Waterways N/A

7. DOCUMENT TYPE

CEQA

01. ___ NOP 06. ___ NOE
02. ___ Early Cons 07. XX NOC
03. ___ Neg Dec 08. ___ NOD
04. XX Draft EIR
05. ___ Supplement/Subsequent EIR (Prior SCH No.: ______)

NEPA

09. ___ NOI 11. ___ Draft EIS
10. ___ FONSI 12. ___ EA

OTHER

13. ___ Joint Document
14. ___ Final Document
15. ___ Other ______

8. LOCAL ACTION TYPE

01. ___ General Plan Update
02. ___ New Element
03. XX General Plan Amendment
04. ___ Master Plan
05. ___ Annexation
06. ___ Specific Plan
07. ___ Community Plan
08. ___ Redevelopment
09. XX Rezone
10. ___ Land Division (Subdivision, Parcel Map, Tract Map, etc.)
11. XX Use Permit
12. ___ Waste Mgmt Plan
13. ___ Cancel Ag Preserve
14. ___ Other ______

9. DEVELOPMENT TYPE

01. ___ Residential: Units ______ Acres ______
02. ___ Office: Sq. Ft. ______ Acres ______ Employees ______
03. ___ Shopping/Commercial: Sq. Ft. ______ Acres ______ Employees ______
04. XX Industrial: Sq. Ft. N/A Acres 160 AC Employees ______
05. ___ Water Facilities: MGD ______
06. ___ Transportation: Type ______
07. ___ Mining: Mineral ______
08. ___ Power: Type ______ Watts ______
09. ___ Waste Treatment: Type ______
10. ___ OCS Related
11. ___ Other: ______

10. TOTAL ACRES: ______ 11. TOTAL JOBS CREATED: ______

12. PROJECT ISSUES DISCUSSED IN DOCUMENT

01. XX Aesthetic/Visual
02. ___ Agricultural Land
03. XX Air Quality
04. XX Archaeological/Historical
05. ___ Coastal Zone
06. ___ Economic
07. ___ Fire Hazard
08. XX Flooding/Drainage
09. XX Geologic/Seismic
10. ___ Jobs/Housing Balance
11. ___ Minerals
12. XX Noise
13. XX Public Services
14. ___ Schools
15. XX Septic Systems
16. ___ Sewer Capacity
17. ___ Social
18. XX Soil Erosion
19. XX Solid Waste
20. ___ Toxic/Hazardous
21. XX Traffic/Circulation
22. ___ Vegetation
23. XX Water Quality
24. ___ Water Supply
25. ___ Wetland/Riparian
26. XX Wildlife
27. ___ Growth Inducing
28. XX Incompatible Landuse
29. XX Cumulative Effects
30. ___ Other

13. FUNDING (approx) Federal $ ______ State $ ______ Total $ ______

14. PRESENT LAND USE AND ZONING: "S" - Open Space

15. PROJECT DESCRIPTION:

Desert Valley Company, Subsidiary of **Magma Power** Company, is proposing to obtain a **Zone Change,** General Plan **Amendment** and Conditional Use Permit for Storage **and Disposal** of Geothermal **Materials** into a **Monofill/Class** II Facility in a "Phased" **process.**

CLEARINGHOUSE CONTACT: GARRETT ASHLEY
916-445-0613

STATE REVIEW BEGAN: 7-18-89

DEPT REV TO AGENCY: 8-25

AGENCY REV TO SCH: 8-30

SCH COMPLIANCE : 9-1

PLEASE RETURN NOC WITH ALL COMMENTS

AQMD/APCD: 10 (Resources File Date: 7/22)

FAX TELEPHONE: 916-323-3018

W/C N/C
- Resources
- Conservation
- Fish & Game
- [redacted]
- Parks & Rec OHP
- NAHC
- [redacted]
- ✓ Solid Waste
- Ca St Water Res Cnt Bd
- Wtr Qual (4TH)
- [redacted]

W/C N/C
- RWQCB# 7
- Caltrans# 11
- [redacted]

Imperial County Sheriff - Coroner's Office

OREN R. FOX

SHERIFF • CORONER • MARSHAL

July 24, 1989

Jurg Heuberger, Planning Director
County of Imperial, Courthouse
El Centro, CA 92243

RE: COMMENTS ON EIR "DESERT VALLEY COMPANY"

Dear Mr. Heuberger:

Reference page 3-91 in the report -

<u>Fire and Police Protection</u> - line 9

> The nearest (Sheriff's) substations are located in Westmorland, 15 miles' from the site, and Salton City, approximately 25 miles from the project site."

- - - - - - - - - - - -

The City of Westmorland has a Police Department but, does not contain a Sheriff's Station. The primary station to respond to the site location is Salton City Station. Brawley station personnel, approximately 25-27 miles southeast of the site would be alternate responders, except at nights. There are certain factors that may determine other alternatives that could/should be used.

Sincerely,

OREN R. FOX
SHERIFF-CORONER
IMPERIAL COUNTY, CALIFORNIA

ORF:wr

Imperial County Sheriff's Department

Response

1. Comment noted: Section 3.10.4 (Public Services) has been revised.

IMPERIAL IRRIGATION DISTRICT
OPERATING HEADQUARTERS • P O BOX 937 • IMPERIAL. CALIFORNIA 92251

IIDAGM August 2, 1989

RECEIVED
AUG 08 1989
IMPERIAL COUNTY
PLANNING DEPARTMENT

Mr. Jurg Heuberger, Planning Director
Imperial County Planning Department
939 Main Street
El Centro, CA 92243-2856

Subject: Notice of Public Review of Draft EIR on Desert Valley Company's "Class II/Monofill" Project Draft Environmental Impact Report (DEIR)

Dear Mr. Heuberger:

This is in response to your letter of July 12, 1989, requesting comments on the DEIR. Since the submittal of our letter of April 10, 1989, which is included in the document, we responded to you May 12, 1989, regarding minor amendment changes and then provided you a copy of a June 23, 1989, letter to the Desert Valley Company providing further details of our concerns.

Reference is made on Page 3-80 to the rezoning of the project site from "S" open space to M-2. The DEIR and General Plan Amendment should include a reversionary zoning condition that would result in this area reverting to the existing open space zone if not used for this specific project.

Reference is made on Page 3-92 to location with respect to an electrical transmission line. Service by the District to the project for a 25-kilowatt load would need to be provided by constructing approximately 1.5 miles of three-phase distribution line for which rights-of-way would be required. The developer would need to fund the cost of such an extension at a cost of $23,760. Should the project require service to 270 horsepower (informal communication from developer) a major upgrade of the existing facilities with associated impacts would be required at a substantially higher cost to the developer.

A few editorial comments are also provided for your consideration. In Section 3.10.4 on Page 3-89, the text should indicate that IID supplies untreated water and power to most of the users in Imperial Valley but does not provide sewer services (see also Page 3-92). The last sentence of the first partial paragraph on Page 3-90, "IID is currently overdrawing its allotment of Colorado River water and is exploring possible sources of additional fresh water to meet the future needs of the County," is not correct and should be deleted.

Thank you for the opportunity to provide input regarding this proposed development.

Sincerely,

CHARLES L. SHREVES
General Manager

Copy to Mr. Paul Neil
Desert Valley Company

MONOFILL

Imperial County, Imperial Irrigation District

Response

2. Comment noted: Section 3.7.4 (Land Use Mitigation Measures) has been revised.

3. Comment noted: The EIR states that the project applicant would need to reach a mutual agreement with the IID prior to extending service to the proposed Monofill.

4. Comment noted: Section 3.10.4 (Public Services) has been revised.

5. Comment noted: Section 3.10.4 (Public Services) has been revised.

STATE OF CALIFORNIA GEORGE DEUKMEJIAN, Governor

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
COLORADO RIVER BASIN . REGION 7
73-271 HIGHWAY 111, SUITE 21
PALM DESERT, CALIFORNIA 92260
Phone: (619) 3467491

RECEIVED
AUG 28 1989

August 25, 1989

County of Imperial Planning Department
Court House
El Centro, CA 92243

Re: Draft Environmental Impact Report SCH No. 89032206, Desert Valley Company. Monofill Facility, Imperial County, California

The staff of the Regional Board has reviewed the subject report and has the following comments:

6 1. As noted on page 1-7, the provision for detailed hydrologic data required under Title 23, Chapter 3, Subchapter 15 has yet to be completed and incorporated into the project design. Sufficient data should be collected prior to implementing the proper project design.

7 2. Page 2-9 of the subject report states, in part, that "...Desert Valley Company will ensure that geothermal wastes accepted by the proposed facility are nonhazardous...with the most restrictive conditions applying to the site." Additional information should be presented on the methods the Desert Valley Company plans to use to ensure that all wastes which are designated for disposal at the monofill will be characterized as nonhazardous. This should include load-checking capability for the trucks which will be entering and leaving the monofill facility.

8 3. Page 2-10 of the subject report states, in part, that "...a flood flow facility protection diversion berm . ..will be 24 inches high." The Regional Board staff would like to know how the value of 24 inches was calculated, and how this figure would ensure that a probable maximum precipitation (PMP) of 328 cubic feet per second would not overflow or destroy this diversion berm.

9 4. the probable maximum precipitation (PMP) should be expressed in inches of rain per hour, in addition to the amount expressed (328 cubic feet per second or 147,226 gallons-per-minute).

10 5. Page 2-13 of the subject report states, in part, that "... the placed and stored material will then be sprayed, at the end of the day with a soil sealant polymer." The Regional Board staff would like to know what the composition of such a 'soil sealant polymer'

is, as well as its Material Safety Data Sheet and the polymer's potential impacts on water quality.

6. **On** pages 2-13 and **3-91** of the subject report, the location of the Class I hazardous waste landfill in relation to the proposed **monofill is** incorrectly stated.

7. The ground water levels are given as ranging between 48 to 63 feet below the surface at the proposed location. This information confirms the Regional Board staff's contention that the pre-siting conditions as specified in Title 23, Chapter 3, Subchapter 15 should be strictly adhered to. Specifically, adherence to Article 9, **2595.(g)(7)(A),** Waste Management Unit Characteristics, which states:

   > "Background water quality for an indicator parameter or a waste constituent in ground water **shall be** based on data from quarterly sampling of wells upgradient from the waste management unit for one year."

8. On page 3-27 of the subject report, it is mentioned in part that, "Existing and potential beneficial uses for ground water in the Ocotillo and Lower San Felipe subunits include municipal, industrial, and agricultural applications." Also, that "These basins do not receive substantial infiltration from agricultural runoff, ...and consequently exhibit generally good water quality." The Regional Board staff confirms these points.

9. On page 3-23 of the subject report, it is mentioned, in part, that "Establishment of background and detection ground water monitoring programs (including vadose zone monitoring if deemed necessary by the RWQCB)." Vadose zone monitoring is deemed necessary by the Regional Water Quality Control Board.

10. Page 3-34 of the subject report states, in part, that "The exact number and location of wells as well as the data collection and monitoring methodology will be determined by the RWQCB." This is incorrect. The Regional Board will approve or disapprove, as appropriate, the ground water monitoring program submitted by Desert Valley Company that fulfills statuary or regulatory requirements.

11. A postclosure maintenance plan must be designed for the proposed facility for a time period as long as applicable according to Subchapter 15, and not 30 years as stated on page 2-14.

12. On pages 3-78 and 3-90 of the subject report, there are statements to the effect that there are five (5) Class III municipal waste

disposal facilities in Imperial County which can accept geothermal wastes. Please find enclosed a letter from the Regional Board dated July 28, 1989 and signed by Phil Gruenberg, Executive Officer, which explains some of the regulations covering disposal of geothermal wastes into two Imperial County Class III Waste Management Facilities.

13. The Regional Board staff recommends that further delineation of the two minor fault traces, described on page 3-7 and shown in Figure 3-2 (enclosed), be conducted. This is because of the 200-foot setback from any known Holocene fault requirement as described in Subchapter 15.

Should you have any questions or comments, please contact either Paul Sweeney or Adnan Abdalla at (619) 346-7491.

for Jack Salvy

PHIL GRUENBERG
Executive Officer

PS/sw

Enclosures

cc: Paul Neil, Desert Valley Company

File Ref.: Working File; Desert Valley Company **Monofill**

California Regional Water Quality Control Board, Colorado River Basin

Response

6. Comment noted: Section 3.2.3 states that the final project design will incorporate hydrologic data obtained pursuant to requirements in Title 23 of the California Code and approved by the RWQCB. Section 3.2.3 further states hydrologic information that will be incorporated into the final project design.

7. Detailed information on how Desert Valley Company will ensure that geothermal wastes accepted by the proposed Monofill facility are nonhazardous is provided in the Report of Waste Discharge for Monofill Desert Valley Company, dated July 1989. This document provides supporting information for the proposed facility's waste discharge permit and is on file with the RWQCB Region 7.

8. Appendix F presents the hydraulic design calculations for sizing the diversion berm and access road drainage structures for the proposed Monofill facility. The 24-hour probable maximum precipitation (PMP) at the site is 13.3 inches. For design of the diversion berm it was conservatively assumed that 4.03 inches fall in the first hour.

9. Comment noted: Section 3.2.1.1 (Surface Water) has been revised.

10. The soil sealant polymer is a patented formulation composed primarily of high grade latex acrylic-balanced copolymers prepared in an emulsion form. Manufacturer's literature is contained in Tab 8 of the Report of Waste Discharge for Monofill Desert Valley Company, dated July 1989,

    The proposed monofill will adhere to Title 23 of the California Code (subchapter 15) as described in Section 3.2.2.3 (Water Quality). Therefore the potential impacts from using the soil sealant polymer on water quality are not considered to be adverse.

11. Comment noted: Section 3.10.4 (Public Services) has been revised.

12. Comment noted: Background water samples were obtained in April 1989 from four groundwater wells installed near the outside slope of the proposed Monofill. Additional samples were taken during July 1989, and will be taken in October 1989 and January 1990. Refer to the report of Waste Discharge for Monofill for further discussion on background water quality sampling.

13. Comment noted.

14. Comment noted: The proposed project will meet all pertinent regulatory requirements, including Vadose Zone monitoring as outlineed in Title 23, Chapter 3, Subchapter 15, Section 2559 of the California Code.

15. Comment noted: Section 3.2.2.3 (Water Quality) has been revised.

16. Section 2.5 (Closure Procedure) states: "A post closure maintenance plan shall be prepared to maintain the landfill for <u>at least</u> 30 years after closure in accordance with any permit conditions and standards which may be required by the CUP enforcement agency, a regional water board, or state water board."

17. Comment noted: Section 3.7.2 (Relevant Land Use Programs and Zoning) and Section 3.10.4 (Public Services) have been revised.

18. Comment noted: Section 3.1.6 discusses Title 23 requirements and field investigations related to onsite faulting. Field analysis included several test pits, auger borings, and backhoe trenches to delineate geologic structure. Project site location was derived in part from the interpretation of field data and the setback requirements listed in Title 23, Chapter 3, Subchapter 15, of the California Code. It was concluded by the geotechnical consultant that the proposed site would satisfy the requirement of a 200-foot setback from any known Holocene fault. Additional information (including detailed geologic mapping and excavation logs) is contained in the Report of Site Selection and Geologic Exploration (1988), which is on file with the Imperial County Planning Department. It should also be noted that additional geotechnical evaluation of the project site will be conducted during grading and construction activities. Should additional information regarding the location of onsite faulting be identified, this data would be utilized to modify the

project design or location as appropriate to satisfy all pertinent regulatory and statutory requirements.

United States Department of the Interior
BUREAU OF LAND MANAGEMENT

El Centro Resource Area
333 South Waterman
El Centro, California 92243

TAKE PRIDE IN AMERICA

IN REPLY REFER TO:

CA-24333
2800
(C-067.21)

August 25, 1989

Richard Cabanilla
County of Imperial
Planning Department
939 Main Street
El Centro, California 92243

Dear Mr. Cabanilla:

The following are comments on the Draft Environmental Impact Report (DEIR/SCH #89032206) for the proposed Desert Valley Company's "Class II/Monofill" project.

SECTION 2 PROJECT DESCRIPTION

Pg 2-9, 2.4.3 Site Preparation

2.4.3.1 Access Road

19 It is *unclear* whether the access road straddles the section line or is entirely on the west side. If it does straddle the section line, why does it do so?

SECTION 3 DESCRIPTION OF BASELINE ENVIRONMENT; ANALYSIS OF IMPACTS; AND DISCUSSION OF MITIGATION MEASURES

Pa 3-62. 3.5 Biological Resources

It should be mentioned here that a subsequent survey was undertaken in late June to determine the presence of fiat-tailed horned lizards (the most active time of the year for the species).

3.5.1 Vegetation, Para. 1, Line 6

Mesquite hummocks should not be down played. Their lack of abundance makes them that much more valuable to the Overall habitat in the project area. Mesquite hummocks provide important cover, nesting habitat (Verdin 3.5.2),
(21) foraging for Black-tailed Gnatcatchers (a second-priority spp. of special concern), substrate for mammal burrows, and are a source of food for wildlife. Therefore, all mesquite hummocks should be avoided.

Pg 3-72, 3.5.5 Mitigation, #3

No data was found in the document to support statement that paving a road will eliminate the amount of time the Flat-tailed horned lizard will spend on a
(2 roadway, It may work the opposite and increase lizard mortality as they use the pavement to warm themselves. This proved to be the case for FTHLs on a paved road In the Imperial Sand Dunes during fringe-toed lizard surveys in June 1989.

The Bureau also recommends that full compensation for loss of FTHL habitat as outlined in the Management Strategy for the FTHL BLM Administered lands within the CDCA (Appendix D), be included as a mitigation measure.

Pg 3-73, 3.6 Cultural Resources

E.6.1ting Conditions, Para. 1, Line 3

The National Register of Historic Places largely derives from the National Historic
(23) Preservation Act and not from the National Environmental Policy Act (NEPA). NEPA is but one of several federal laws which come into play since public lands are involved in the project.

Para. 3, Line 3

(2 Same as above.

Pg 3-74, 3.6.2 Impacts, Para. 1, Line 1

Formal determinations of eligibility for inclusion on the National Register must
(2 be submitted to the State Historic Preservation Office for those properties located on public land which are slated for impacts. Concurrence of these determinations must be obtained prior to any surface disturbances.

Para. 1, Line 2

(26) See comment above for pg 3-73.

3.6.3 Mitigation of Impacts. Para. 1

27 Avoidance of cultural resources is the Bureau's normal preferred alternative and an acceptable road reroute is suggested if indirect impacts can be eliminated. Mitigation will require several months for consultation with the State Historic Preservation Office and the President's Advisory Council on Historic Preservation.

Para. 1. Line 2

28 See comment above for pg 3-73.

Para. 2

29 The Bureau must be consulted and permits secured if "borrow materiat" is considered for removal from public lands.

SECTION 4. UNAVOIDABLE ADVERSE ENVIRONMENTAL EFFECTS

Pg 4-2. 4.3 Biology

30 We do not Concur that potential impacts to the FTHL are not Considered significant. FTHLs are limited in range to Imperial County, Eastern San Diego County, and southern Riverside County in California, as well as, southwestern Arizona and northern Mexico. Nowhere within their range are FTHLs abundant, even in their most preferred habitats, Therefore, any toss of habitat is significant.

4.4 Archaeology

31 A specific mitigation measure has not as yet been identified for cultural re-Sources.

Thank you for the opportunity to comment on the DEIR. If you require any further information or clarification of the comments, please don't hesitate to give us a call at 352-5842.

Sincerely,

G. Ben Koski

G. Ben Koski
Area Manager

United States Department of Interior, Bureau of Land Management

Response

19. The EIR states that the access road will generally follow the section line. The exact location of the access road will be determined in the final grading plan. The final road grading plan will take into account biological, cultural, and hydrologic constraints, and will meet with Imperial County as well as BLM approval.

20. Comment noted: Section 3.5 (Biological Resources) has been revised.

21. Comment acknowledged: See Section 3.5.3 (High-Interest Species/Habitats).

22. The proposal to pave the project access road was derived from a similar recommendation generated by BLM staff biologists for the GEO East Mesa Geothermal Development project (WESTEC Services, Inc. 1988). See also Response number 19.

    The flat-tailed homed lizard Management Plan was in draft form and unavailable during preparation of the Monofill Draft EIR. Additional mitigation requirements related to the management plan are included in this revised Draft EIR.

23 - 28. Comments noted: Section 3.6 (Cultural Resources) has been revised.

29. Comment noted: Section 3.6 (Cultural Resources) has been revised. The project applicant will comply with all pertinent regulatory requirements for implementation of proposed activities, including the acquisition of appropriate permits for the use of borrow material from public lands if necessary.

30. Comment noted: The conclusion of adverse yet not significant impacts to the flat-tailed homed lizard was based on field observations of relatively poor habitat conditions and low abundance of the species onsite. These assumptions and the conclusion of no significant impacts are still considered valid, although as stated in response number 22 and the revised Section 3.5 (Biological Resources), the loss of flat-tailed homed lizard habitat will be mitigated in accordance with all applicable federal and state requirements.

31. Comment noted: Specific Mitigation for cultural resources is identified in the cultural resources technical report for the Monofill project. This document is on file with the Imperial Valley Planning Department, the Bureau of Land Management, and the Imperial Valley College Barker Museum.

Stat8 of California | Environmental Affairs Agency

Memorandum

To : Garrett Ashley
Stat8 Clearinghouse
1400 10th Street
Sacramento, CA 95814

Date: SEP 01 1989

Richard Cabanilla
Imperial County Planning Department
939 Main Street
El Centro, CA 92243

From : George H. Larson, Manager
Resource Conservation and
Local Planning Divisions
CALIFORNIA WASTE MANAGEMENT BOARD

Subject: SCH# 89032206 Draft Environmental Impact Report (DEIR) for a Class II Facility, Monofill Project - Desert Valley Company, Imperial County

California Waste Management Board (CWMB) staff have reviewed the DEIR for a Class II Facility, Monofill Project. Desert Valley Company, a subsidiary of Magma Power Company is proposing to develop a Class II storage and disposal monofill facility for nonhazardous geothermal solids originating from the Obsidian Butte area. The proposed site is 160 acres of privately owned land. Board staff offer the following comments:

3 The proposed permitted daily tonnage should be included in the EIR. A Conditional Use Permit application received by this Board on August 21, 1989, indicates that the daily tonnage would range from 250 to 4000 tons per day. Board staff suggest that if 4000 tons per day is the anticipated daily tonnage, the Solid Waste Facilities Permit and the Conditional US8 Permit should reflect this amount. Environmental assessment of impacts, such as traffic, noise, ambient air quality resulting from fluctuating tonnages can be difficult.

3 It would be helpful if the EIR included a description of methods for screening for hazardous constituents such as lead, cadmium, barium, soluable salts, solvents, petroleum or oils. A description of a contingency plan should contaminated material enter the facility should also be included.

34 The EIR should include a description of how this monofill area is secured to protect the public from possible injury.

35 A description of the groundwater monitoring plan and monitoring for leachate should be included in the EIR, including frequencies and methods of data reporting.

36 It would be helpful if the Final EIR identified financial mechanisms for closure/post-closure activities as required by AB 2448 (Eastin).

37 The Relevant Land Use Programs and Zoning section indicates that this facility is not yet identified in the Imperial County Solid Waste Management Plan (CoSWMP). CWMB staff have responded to the proposed CoSWMP amendment.

Listed below are the Board and Local actions which must take place prior to concurrence with a Solid Waste Facilities Permit.

CWMB Regulatory Responsibilities

1. Determination of Conformance (7.3 GC 66784)

   Before the landfill can be established (this includes construction), the CWMB must determine whether or not the proposed facility conforms to the Imperial County Solid Waste Management Plan.

2. Solid Waste Facilities Permit (7.3 GC 66796.41)

   Prior to the commencement of landfill operations at this site, the CWMB must concur in a Solid Waste Facilities Permit prepared by the Local Enforcement Agency.

   For assistance in permitting this facility, contact the Imperial County Department of Health Services, the Board's Local Enforcement Agency.

Local Actions

1. Finding of consistence with the General Plan (7.3 GC 66796.4)

   Before the CWMB can concur in a Solid Waste Facilities Permit, the local government, in whose jurisdiction the facility is located, must make a finding that the proposed facility is consistent with the General Plan.

   Before this finding can be made, two conditions must be met:

   a. the, facility must be designated as a solid waste facility in the General Plan, and

b. The adjacent land uses must be compatible with the site.

Thank you for the opportunity to review this DEIR. If you have any questions concerning these comments, contact Jeannie H. Blakeslee of the Board's Local Planning Division at (916) 327-0454.

State of California, California Waste Management Board

Response

32. **The** tonnage numbers noted vary due to phasing of site operation, and due to the different moisture content between the filter cake and mud sump materials.

Environmental assessment of impacts in the EIR including traffic, noise and ambient air quality were determined based on volume or the maximum cubic yards of filter cake and mud sump materials to be received by the proposed Monofill facility per day. Environmental assessment was based on the proposed Monofill facility initially receiving up to 150 cubic yards of filtercake and 150 cubic yards of mud sump materials per day (Section 2.4.4, Site Operation). After approximately one year, the proposed Monofill Facility will receive approximately 72 cubic yards of filter cake and minor amounts of mud sump materials (Section 2.4.2, Wastes to be accepted at the Project Site).

33. **See** response number 7.

The proposed Monofill Facility will receive only two waste streams, silica filtercake generated by geothermal power plants, and clay drilling muds and cuttings generated during drilling of geothermal wells. As stated in the EIR, Section 2.4.2 (Wastes to be Accepted at the Project Site), a complete analysis, as detailed in California Code of Regulations Title 22, Environmental Health, Division 4, Hazardous Waste, was done on representative filter cake and mud sump samples. Analysis of these materials is provided in Appendix C of the EIR. Review of these tests determined that the materials are non-hazardous.

Section 2.4.2 further states that during operation of the proposed Monofill Facility, Desert Valley Company will ensure that geothermal wastes accepted by the proposed facility are nonhazardous through compliance with the Imperial County Planning Department CUP (terms and conditions), Colorado River Basin Regional Water Quality Control Board, California Department of Health Services, and Imperial County Health Department regulatory requirements.

34. Section 3.11, Public Health and Safety, provides a description of how the proposed Monofill will be secured to protect the public from possible injury. As discussed in this section, the project design and state requirements include measures to isolate the disposal activity from accidental contact by the general public. No further measures are required.

35. See response number 6.

Section 3.2 Hydrology/Water Quality, specifically Section 3.2.3 Mitigation Measures item 8, states that; establishment of a water quality monitoring system subject to approval by the Regional Water Quality Control Board must be incorporated into the final project design to avoid potentially significant impacts related to hydrology and water quality.

36. Closure and post-closure cost estimates are presented in Volume 2 Report of Waste Discharge, Section 7 Closure and Post Closure Maintenance Plan (Desert Valley Company July 1989). This report is on file with the Regional Water Quality Control Board-Region 7.

37. Comments noted: Section 3.7.3 (Land Use Impacts) has been revised Section 3.7 (Land Use) lists actions which must take place prior to concurrence with a Solid Waste Facilities Permit.

APPENDIX B

NOTICE OF PREPARATION AND RESPONSES

Notice of Preparation

Appendix 3

To: State Clcarlnghousc
(Agency)
1400 Tenth Street, Room 121
(Address)
Sacramento, CA 95814

Subject: Notice of Preparation of a Draft Environmental Impact Report

Lead Agency:

Agency Name Planning-Imperial County
Street Address 939 Main Street
City/State/Zip El Centro, CA 92243
Contact Richard Cabanilla

Consulting Firm (If applicable):

Firm Name N/A
Street Address
City/State/Zip
Contact

Imperial County will be the Lead Agency and will prepare an environmental impact report for the project identified below. We need to know the views of your agency as to the scope and content of the environmental information which is germane to your agency's statutory responsibilities in connection with the proposed project, Your agency will need to use the EIR prepared by our agency when Considering your permit or other approval for the project.

The project description, location, and the potential environmental effects are contained in the attached materials. A copy of the Initial Study (☒ is ☐ is not) attached.

Due to the time limits mandated by State law, your response must be sent at the earliest possible date but *not later than 30 days after receipt* of this notice.

Please send your response to Richard Cabanilla at the address shown above. We will need the name for a contact person in your agency.

Project Title: Desert Valley Company (DVC) Class II Facility, Monofill Project

Project Location: West of Westmorland — Imperial
City (nearest) — County

Project Description: (brief)

DVC re-submitted applications for the "monofill", Class II, project for a Conditional Use Permit, Zone Change, General Plan Amendment for storage/disposal of geothermal solids. New revised project Includes the analysis of "Naturally Occurring Radioactive Material" (NORMS) in the geothermal solids. (See attached for details).

Date February 6, 1990

Signature

Title Planning Director

Telephone (619)339-4236

Reference: California Administrative Code, Title 14, (CEQA Guidelines) Sections 15082(a), 15103, 15375.

Revised October 1989

Notice of Completion

Appendix F

See NOTE below

Mail to: State Clearinghouse, 1400 Tenth Street, Sacramento, CA 95814 916/445-0613

SCH # 89032206

Project Title: Revised Class II Facility Monofill Project- Desert ~~Valley Company~~

Lead Agency: Imperial County Planning Department

Contact Person: Richard Cabanilla

Street Address: 939 Main Street

Phone: (619)339-4236

City: El Centro, CA **Zip:** 92243

County: Imperial

Project Location

County: Imperial **City/Nearest Community:** Westmorland

Cross Streets: N/A **Total Acres:** 160 acres

Assessor's Parcel No. 019-100-14-01 **Section:** 33 **Twp.** 12 **Range:** 11 **Base:** SBB&M

Within 2 Miles: State Hwy #: 86 Waterways: -- Airports: -- Railways: Schools:

Document Type Revised

CEQA: ☒ NOP ☐ Early Cons ☐ Neg Dec ☐ Draft EIR ☐ Supplement/Subsequent ☐ EIR (Prior SCH No.) ☐ Other

NEPA: ☐ NOI ☐ EA ☐ Draft EIS ☐ FONSI

Other: ☐ Joint Document ☐ Final Document ☐ Other

Local Action Type

☐ General Plan Update
☒ General Plan Amendment
☐ General Plan Element
☐ Community Plan
☐ Specific Plan
☐ Master Plan
☐ Planned Unit Development
☐ Site Plan
☒ Rezone
☐ Prezone
☒ Use Permit
☐ Land Division (Subdivision, Parcel Map, Tract Map, etc.)
☐ Annexation
☐ Redevelopment
☐ Coastal Permit
☐ Other

Development Type

☐ Residential: Units Acres
☐ Office: Sq.ft. Acres Employees
☐ Commercial: Sq.ft. Acres Employees
☒ Educational Sq.ft. N/A Acres 160 Employees
☐ Recreational
☐ Water Facilities: Type MGD
☐ Transportation: Type
☐ Mining: Mineral
☐ Power: Type Watts
☐ Waste Treatment: Type
☐ Hazardous Waste: Type
☐ Other:

Project Issues Discussed In Document

☒ Aesthetic/Visual
☐ Agricultural Land
☒ Air Quality
☒ Archeological/Historical
☐ Coastal Zone
☐ Drainage/Absorption
☐ Economic/Jobs
☐ Fiscal
☒ Flood Plain/Flooding
☐ Forest Land/Fire Hazard
☒ Geologic/Seismic
☐ Minerals
☒ Noise
☐ Population/Housing Balance
☒ Public Services/Facilities
☐ Recreation/Parks
☐ Schools/Universities
☒ Septic Systems
☐ Sewer Capacity
☒ Soil Erosion/Compaction/Grading
☒ Solid Waste
☐ Toxic/Hazardous
☒ Traffic/Circulation
☐ Vegetation
☒ Water Quality
☐ Water Supply/Groundwater
☐ Wetland/Riparian
☒ Wildlife
☐ Growth Inducing
☒ Landuse
☒ Cumulative Effects
☒ Other NORMS

Present Land Use/Zoning/General Plan Use

"S" Open Space

Project Description

See attached--Revised Project Description

NOTE: Clearinghouse will assign identification numbers for all new projects. If a SCH number already exists for a project (e.g. from a Notice of Preparati or previous draft document) please fill it in.

Revised October 19

Reviewing Agencies Checklist

KEY
S = Document sent by lead agency
X = Document sent by SCH
✓ = Suggested distribution

Resources Agency ✓
- ___ Boating & Waterways
- ___ Coastal Commission
- ___ Coastal Conservancy
- ___ Colorado River Board
- ___ Conservation
- ✓ Fish & Game
- ___ Forestry
- ✓ Office of Historic Preservation
- ___ Parks & Recreation
- ✓ Reclamation
- ___ S.F. Bay Conservation & Development Commission
- ___ Water Resources (DWR)

Business, Transportation & Housing
- ___ Aeronautics
- ___ California Highway Patrol
- ✓ CALTRANS District # 11
- ___ Department of Transportation Planning (headquarters)
- ___ Housing & Community Development

___ **Food & Agriculture**

Health & Welfare
- ___ Health Services ______

State & Consumer Services
- ___ General Services
- ___ OLA (Schools)

Environmental Affairs
- ___ Air Resources Board
- ___ APCD/AQMD
- ✓ California Waste Management Board
- ___ SWRCB: Clean Water Grants
- ___ SWRCB: Delta Unit
- ✓ SWRCB: Water Quality
- ___ SWRCB: Water Rights
- ✓ Regional WQCB # 7 (Palm Desert)

Youth & Adult Corrections
- ___ Corrections

Independent Commissions & Offices
- ___ Energy Commission
- ✓ Native American Heritage Commission
- ___ Public Utilities Commission
- ___ Santa Monica Mountains Conservancy
- ___ State Lands Commission
- ___ Tahoe Regional Planning Agency

✓ Other Bureau of Land Management

Public Review Period (to be filled in by lead agency)

Starting Date February 6, 1990   Ending Date March 8, 1990

Signature ______   Date February 6, 1990

Lead Agency (Complete if applicable):
Consulting Firm: N/A
Address: ______
City/State/Zip: ______
Contact: ______
Phone: ( ) ______

For SCH Use Only:
Date Received at SCH ______
Date Review Starts ______
Date to Agencies ______
Date to SCH ______
Clearance Date ______
Notes:

Applicant: Desert Valley Company
Address: 480 West Sinclair Road
City/State/Zip: Calipatria, CA 92233
Phone: (619) 248-2267

Revised October 1989

COOPERATIVE EXTENSION
UNIVERSITY OF CALIFORNIA
IMPERIAL COUNTY

1050 E. HOLTON ROAD
HOLTVILLE, CA 92250-9615

TELEPHONE:
(619) 352-9474

FAX NUMBER:
(619) 352-0846

February 9, 1990

To: Jurg Heuberger
Planning Director

From: Refugio O. Gonzalez
County Director

Refugio O. Gonzalez

Re: Desert Valley Company Class II Facility

I am returning both copies of the EIR's (Conditional Use Permit) for Desert Valley Company; Magma.

The farm advisors in our department have reviewed the document and find that the project poses no adverse conditions to commercial agriculture.

cd
Enc

RECEIVED
FEB 14 1990
IMPERIAL COUNTY
BUILDING DIVISION

STATE OF CALIFORNIA—THE RESOURCES AGENCY

GEORGE DEUKMEJIAN, Governor

DEPARTMENT OF FISH AND GAME
330 Golden Shore, Suite 50
Long Beach, CA 90802
(213) 590-5113

February 26, 1990

Richard Cabanilla
Planning Imperial County
939 Main Street
El Centro, CA 92243

Dear Mr. Cabanilla:

We have reviewed the Notice of Preparation of a Draft EIR for the Desert Valley Company (WC) Class II Facility, Monofill project. To enable our ebff to adequately review and comment on this project, we recommend the following information be included in the Draft EIR:

1) A complete assessment of flora and fauna within and adjacent to the project area, with particular emphasis upon identifying endangered, threatened and locally unique species and sensitive and critical habitats. 2) A discussion of direct, indirect, and cumulative impacts expected to adversely affect biological resources, with specific measures to offset such impacts. 3) A discussion of potential adverse impacts from any increased runoff, sedimentation, soil erosion, and/or urban pollutants on streams and watercourses on or near the project site, with mitigation measures proposed to alleviate such impacts. Stream buf Per areas and their maintenance in a natural condition through non-structural flood control methods should also be considered in order to continue their high value as wildlife corridors.

More generally, there should be discussion of alternatives to not only minimize adverse impacts to wildlife, but to also include direct benefit to wildlife and wildlife habitat. Those discussions should recognize the Department of Fish and Game's policy that there should be no net loss of wetland acreage or habitat values and that we oppose projects which do not provide adequate mitigation for such losses.

Diversion, obstruction of the natural flow, or changes in the bed, channel, or bank of my river, stream, or lake will require notification to the Department of Fish and Game as called for in the Fish and Game Code. This notification (with fee) end the subsequent agreement must be completed prior to initiating any such changes. Notification should be made after the project is approved by the lead agency.

Thank you for the opportunity to review and comment on this project. If you have any questions, please contact Jack L. Spruill of our Environmental Sex-vices staff at (213) 590-5137.

Sincerely,

Rolf E. Mall for

Fred Worthley
Region Manager
Region 5

RECEIVED
MAR 12 1990
IMPERIAL COUNTY
BUILDING DIVISION

cc: Office of Planning & Research

Southern California Edison Company
P. O. BOX 788
RIALTO, CALIFORNIA 92376
2885 FOOTHILL BOULEVARD
SAN BERNARDINO, CALIFORNIA 92402

JOHN D. WYATT
REGIONAL AFFAIRS MANAGER
EASTERN DIVISION

TELEPHONE
(714) 820-5250

March 7, 1990

Mr. Jurg Heuberger, Planning Director
Imperial County
939 Main Street
El Centro, CA 92243-2856

RE: Desert Valley Company - Class II Facility
Monofill Project

Dear Jurg:

Our Planning and Research organization has carefully reviewed the draft Environmental Impact Report sent for our review, We have found no significant impact that this project will have on our Company and its operation.

Thank you for the opportunity to comment.

Sincerely,

Jack

JDW: lmr

RECEIVED
MAR 12 1990
IMPERIAL COUNTY
BUILDING DIVISION

APPENDIX C

ANALYSIS OF TYPICAL MUD SUMP AND FILTER CAKE MATERIALS

MED-TOX ASSOCIATES, INC.

NVIRONMENTAL & OCCUPATIONAL HEALTH SERVICES
C'40 Vincent Rood Pleasanr Hill, CA 94523 • (415) 930-9090 • FAX# (415) 930-0256

LABORATORY ANALYSIS REPORT

MAGMA POWER COMPANY
11770 BERNARDO PLAZA COURT
SUITE 366
SAN DIEGO, CA 92128
ATTN: Paul Neil

PURCHASE ORDER NO: 2623

REPORT DATE: 01/25/89

DATE SAMPLED: 09/88

DATE RECEIVED: 01/13/89

MED-TOX JOB NO: 8901059

ANALYSIS OF: ONE MUD SAMPLE FOR CORROSIVITY, IGNITABILITY, REACTIVITY, FLOURIDE, CAM-17 METALS, GC/MS VOLATILE ORGANICS, AND FISH BIOASSAY

Sample Identification Client Id.	Lab No.	Corrosivity* (pH)	Ignitability* (^oF)	Reactivity* Cyanide (ppm)	Reactivity* Sulfide (ppm)	flouride (mg/kg)
Mud Sump Elmore 10/11	OZA	8.5	>186	<2	<2	NO
Detection Limit		NA	NA	2	2	10
EPA kthod		9045	1010	Draeger tube	Lead Acetate Test	300

NA = Not Applicable

< = Less than: below reliable limit of detection

• Subcontracted to a DOHS certified Laboratory

For Jack Sheets

Jack Sheets, Manager
Organic Laboratory

Results FAXed to Paul Neil 01/20/89 & 01/25/89

MAGMA POWER COMPANY

CLIENT ID: Elmore 10/11
CLIENT JOB NO: -
DATE RECEIVED: 01/13/89

MED-TOX LAB ND: 8901059-02D
MED-TOX JOB NO: 8901059
REPORT DATE: 01/25/89

CAM-17 METALS IN SOIL

CDDE	METAL	CONCENTRATION (mg/kg)	T-TLC (mg/kg)	DETECTION LIMIT (mg/kg)	METHOD REFERENCE
Sb	Antimony	ND	500	5	7040
As	Arsenic	9.9	500	0.5	7060
Ba	Barium	230	10,000	1	7080
Be	Beryllium	0.5	75	0.2	7090
Cd	Cadmium	0.4	100	0.2	7130
Cr	Chromium	12	2,500	1	7190
co	Cobalt	3	8,000	1	7200
CU	Copper	17	2,500	0.5	7210
Pb	Lead	67	1,000	1	7420
Hg	Mercury	ND	20	0.2	7471
Mo	Molybdenum	ND	3,500	3	7480
Ni	Nickel	8.5	2,000	0.5	7520
Se	Selenium	ND	100	2	7740
A9	Silver	ND	500	0.3	7760
Tl	Thall ium	ND	700	3	7840
V	Vanadium	18	2,400	5	7910
Zn	Zinc	81	5,000	2	7950

ND = Not detected at or above indicated method detection limit

MAGMA POWER COMPANY

CLIENT ID: **Elmore 10/11**
CLIENTJOB ND: **-**
DATE RECEIVED: **01/13/89**

MED-TOX LAB NO: **8901059-02E**
MED-TOX **JOB** ND: 8901059
REPORT DATE: **01/25/89**

ANALYSIS OF EXTRACT **FROM THE CALIFORNIA WASTE EXTRACTION TEST**
FOR CAM-17 **METALS**

CODE	METAL	CONCENTRATION (mg/L)	STLC (mg/L)	DETECTION LIMIT (mg/L)	METHOD REFERENCE
Sb	Antimony	ND	15	0.5	7040
As	Arsenic	0.33	5.0	0.05	7060
Ba	Barium	2.6	100	1	7080
Be	Beryllium	ND	0.75	0.02	7090
Cd	Cadmium	ND	1.0	0.02	7130
Cr	Chromium	ND	560	0.05	7190
Co	Cobalt	ND	80	0.1	7200
Cu	Copper	0.05	25	0.03	7210
Pb	Lead	2.3	5.0	0.05	7420
Hg	Mercury	ND	0.2	0.006	7471
Mo	Molybdenum	ND	350	0.3	7480
Ni	Nickel	0.11	20	0.05	7520
Se	Selenium	ND	1.0	0.02	7740
Ag	Silver	ND	5.0	0.03	7760
Tl	Thallium	ND	7:0	0.3	7840
V	Vanadium	ND	24	0.5	7910
Zn	Zinc	2.3	250	0.02	7950

ND = Not detected at or above indicated method detection limit

MED-TOX ASSOCIATES, INC.

MAGMA POWER COMPANY

CLIENT ID: Elmore 10/11
CLIENT JOB NO: -
DATE SAMPLED: 09/23/88
DATE RECEIVED: 01/13/89

MED-TOX LAB NO: 8901059-02C
MED-TOX JOB NO: 8901059
DATE ANALYZED: 01/24/89
REPORT DATE: 01/25/89

EPA METHOD 8240
GC/MS VOLATILE ORGANICS

COMPOUND	CAS #	CONCENTRATION (ug/kg)	DETECTION LIMIT (ug/kg)
Acetone	67-64-1	ND	100
Benzene	71-43-2	ND	5
Bromodichloromethane	75-27-4	ND	5
Bromoform	75-25-2	ND	5
Bromomethane	74-83-9	ND	10
2-Butanone	78-93-3	ND	100
Carbon Disulfide	75-15-o	ND	10
Carbon Tetrachloride	56-23-5	ND	5
Chlorobenzene	108-90-7	ND	5
Chloroethane	75-00-3	ND	10
2-Chloroethyl Vinyl Ether	110-75-8	ND	10
Chloroform	67-66-3	ND	5
Chloromethane	74-87-3	ND	10
Dibromochloromethane	124-48-1	ND	5
1,1-Dichloroethane	75-34-3	ND	5
1,2-Dichloroethane	107-06-2	ND	5
1,1-Dichloroethene	75-35-4	ND	5
1,2-Dichloroethene, total	540-59-0	ND	5
1,2-Dichloropropane	78-87-5	ND	5
cis-1,3-Dichloropropene	10061-01-5	ND	5
trans-1,3-Dichloropropene	10061-02-6	ND	5
Ethylbenzene	100-41-4	ND	5
2-Hexanone	591-78-6	ND	50
Methylene Chloride	75-09-2	ND	10
4-Methyl-2-pentanone	108-10-1	ND	50
Styrene	100-42-5	ND	10
1,1,2,2-Tetrachloroethane	79-34-5	ND	5
Tetrachloroethene	127-18-4	ND	5
Toluene	108-88-3	35	5
1,1,1-Trichloroethane	71-55-6	17	5
1,1,2-Trichloroethane	79-00-5	ND	5
Trichloroethene	79-01-6	ND	5
Vinyl Acetate	108-05-4	ND	50
Vinyl Chloride	75-01-4	ND	10
Xylenes, total	------	14	10

ND = Not Detected at or above indicated method detection limit
Analytical Method: EPA 8240, SW-846 3rd Edition, 1986

BROWN AND **CALDWELL** LABORATORIES **TOXICITY** BIOASSAY

1255 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

Log No.: E89-01-250-2

Date Sampled: 01/13/89
Date Received: 01/13/89
Date Reported: 01/19/89

Ned-Tox Associates, Inc.

Report To:

ATTN: Mr. Jack Sheets

Page two of two

L. D. Lesley
Laboratory Director

CALIFORNIA HAZARDOUS WASTE ASSESSMENT BIOASSAY: SCREEN

Description 8901 059-2A

Organism Pimephales promelas, fathead minnow Source Thomas Fish Company

Water Fresh with Matrix Source Emeryville Temperature Range 14.0 - 15.0 °C

Modifiers Dechlorinated Tap Water

ion: Air X Oxygen ___ None ___

Bioassay Conditions	Time, Hrs	Control		Dilution 250mg/l		250mg/l		750mg/l		750mg/l							
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Organisms Surviving	Start	10	100	10	100	10	1-o	10	100	10	100						
	24	10	100	10	100	10	100	10	100	10	100						
	48	10	100	10	100	10	100	10	100	10	100						
	72	10	100	10	100	10	100	10	100	10	100						
	96	10	100	10	100	10	100	10	100	10	100						
Dissolved Oxygen mg/L	Start	9.2		9.0		8.8		8.9		9.3							
	24	8.4		9.2		9.0		8.7		9.0							
	48	8.3		9.1		9.0		9.1		9.0							
	72	9.1		9.8		9.5		9.3		9.4							
	96	9.3		8.9		9.5		9.4		9.4							
pH	Start	7.7		8.0		8.0		8.2		8.1							
	24	7.5		7.5		7.5		7.6		7.6							
	48	7.6		7.6		7.6		7.6		7.6							
	72	8.2		8.0		8.0		8.0		8.0							
	96	7.7		7.6		7.6		7.6		7.6							

RESULTS 96 hr TLm* >750mg/L Toxicity Units Not established Percent survival in undiluted sample Not applicable

Length of fish, cm: Max. 5.5 Min. 2.5 Mean 5.1

Weight of fish, g.: Max. 0.48 Min. 0.14 Mean 0.34

*In cases where 96 hour mortality does not equal or exceed 50% in at least one dilution of the sample, no TL_m value established

By J. R. Mosley

MED-TOX
ASSOCIATES, INC.

ENVIRONMENTAL & OCCUPATIONAL HEALTH SERVICES
3440 Vincent Road Pleasant Hill, CA 94523 • (415) 930-9090 • FAX# (415) 930-0256

LABORATORY ANALYSIS REPORT

MAGMA POWER COMPANY
11770 BERNARDO PLAZA COURT
SUITE 366
SAN DIEGO, CA 92128
ATTN: Paul Neil

PURCHASE ORDER NO: 2624

REPORT DATE: 01/25/89

DATE SAMPLED: 10/88

DATE RECEIVED: 01/13/89

MED-TOX JOB NO: 8901059

ANALYSIS OF: ONE FILTER CAKE SAMPLE FOR CORROSIVITY, IGNITABILITY, REACTIVITY, FLOURIDE, CAM-17 METALS, GC/MS VOLATILE ORGANICS, AND FISH BIOASSAY

Sample Identification Client Id.	Lab No.	Corrosivity* (pH)	Ignitability* (^{o}F)	Reactivity* Cyanide (ppm)	Reactivity* Sulfide (ppm)	Flouride (mg/kg)
Filter Cake	01A	6.3	>186	<2	<2	12
Detection Limit		WA	NA	2	2	10
EPA Method		9045	1010	Draeger tube	Lead Acetate Test	300

NA = Not Applicable

< = Less than: below reliable limit of detection

* Subcontracted to a DOHS certified Laboratory

Dan Sandy for Jack Sheets
Jack Sheets
Inorganic Group Leader

Results FAXed to Paul Neil 01/20/89 & 01/25/89

MAGMA POWER COMPANY

CLIENT ID: Filter cake
CLIENT JOB NO: -
DATE RECEIVED: 01/13/89

MED-TOX LAB NO: 8901059-01D
MED-TOX JOB ND: 8901059
REWRT DATE: 01/25/89

CAM-17 METALS IN SOIL

CODE	METAL	CONCENTRATION (mg/kg)	TTLC (mg/kg)	DETECTION LIMIT (mg/kg)	METHOD REFERENCE
Sb	Antimony	13	500	5	7040
AS	Arsenic	51	500	0.5	7060
Ba	Barium	620	10,000	1	7080
Be	Beryllium	12	75	0.2	7090
Cd	Cadmium	ND	100	0.2	7130
Cr	Chrani um	ND	2,500	1	7190
co	Cobalt	5	8,000	1	7200
CU	Copper	260	2,500	0.5	7210
Pb	Lead	40	1,000	1	7420
Hg	Mercury	ND	20	0.2	7471
Mo	Molybdenum	ND	3,500	3	7480
Ni	Nickel	3.0	2,000	0.5	7520
Se	Selenium	ND	100	2	7740
Ag	Silver	0.3	500	0.3	7760
Tl	Thallium	ND	700	3	7840
V	Vanadium	3	2,400	5	7910
Zn	Zinc	170	5,000	2	7950

ND = Not detected at or above indicated method detection limit

MED-TOX ASSOCIATES, INC.

MAGMA POWER COMPANY

CLIENT ID: Filter cake
CLIENT JOB NO: -
DATE RECEIVED: 01/13/89

MED-TOX LAB ND: 8901059-01E
MED-TOX JOB NO: 8901059
REPORT DATE: 01/25/89

ANALYSIS OF EXTRACT FROM ME CALIFORNIA WASTE EXTRACTION TEST
FOR CAM-17 METALS

CODE	METAL	CONCENTRATION (mg/L)	STLC (mg/L)	DETECTION LIMIT (mg/L)	METHOD REFERENCE
Sb	Antimony	ND	15	0.5	7040
As	Arsenic	3.1	5.0	0.05	7060
Ba	Barium	10	100	1	7080
Be	Beryllium	ND	0.75	0.02	7090
Cd	Cadmium	ND	1.0	0.02	7130
Cr	Chromium	ND	560	0.05	7190
co	Cobalt	ND	80	0.1	7200
cu	Copper	1.6	25	0.03	7210
Pb	Lead	1.0	5.0	0.05	7420
Hg	Mercury	ND	0.2	0.006	7471
Mo	Molybdenum	ND	350	0.3	7480
Ni	Nickel	ND	20	0.05	7520
Se	Selenium	ND	1.0	0.02	7740
Ag	Silver	ND	5.0	0.03	7760
Tl	Thallium	ND	7.0	0.3	7840
V	Vanadium	ND	24	0.5	7910
Zn	Zinc	3.4	250	0.02	7950

ND = Not detected at or above indicated method detection limit

MED-TOX ASSOCIATES, INC.

MAGMA POWER COMPANY

CLIENT ID: Filter cake
CLIENT JOB NO: -
DATE SAMPLED: 10/31/88
DATE RECEIVED: 01/13/89

MED-TOX LAB NO: 8901059-01C
MED-TOX JOB NO: 8901059
DATE ANALYZED: 01/24/89
REPORT DATE:' 01/25/89

EPA METHOD 8240
GC/MS VOLATILE ORGANICS

COMPOUND	CAS #	CONCENTRATION (ug/kg)	DETECTION LIMIT (ug/kg)
Acetone	67-64-1	ND	100
Benzene	71-43-2	ND	5
Bromodichloromethane	75-27-4	ND	5
Bromoform	75-25-2	ND	5
Bromomethane	74-83-9	ND	10
2-Butanone	78-93-3	ND	100
Carbon Disulfide	75-15-o	ND	10
Carbon Tetrachloride	56-23-5	ND	5
Chlorobenzene	108-90-7	ND	5
Chloroethane	75-00-3	ND	10
2-Chloroethyl Vinyl Ether	110-75-8	ND	10
Chloroform	67-66-3	ND	5
Chloromethane	74-87-3	ND	10
Dibromochloromethane	124-48-1	ND	5
1,1-Dichloroethane	75-34-3	ND	5
1,2-Dichloroethane	107-06-2	ND	5
1,1-Dichloroethene	75-35-4	ND	5
1,2-Dichloroethene, total	540-59-O	ND	5
1,2-Dichloropropane	78-87-5	ND	5
cis-1,3-Dichloropropene	10061-01-5	ND	5
trans-1,3-Dichloropropene	10061-02-6	ND	5
Ethylbenzene	100-41-4	ND	5
2-Hexanone	591-78-6	ND	50
Methylene Chloride	75-09-2	ND	10
4-Methyl-2-pentanone	108-10-l	ND	50
Styrene	100-42-5	ND	10
1,1,2,2-Tetrachloroethane	79-34-5	ND	5
Tetrachloroethene	127-18-4	ND	5
Toluene	108-88-3	ND	5
l,l,l-Trichloroethane	71-55-6	ND	5
1,1,2-Trichloroethane	79-00-5	ND	5
Trichloroethene	79-01-6	ND	5
Vinyl Acetate	108-05-4	ND	50
Vinyl Chloride	75-01-4	ND	10
Xylenes, total	------	ND	10

ND = Not Detected at or above indicated method detection limit
Analytical Method: EPA 8240, SW-846 3rd Edition, 1986

BRO[redacted]DWELL LABORATORIES [redacted] **TOXICITY BIOASSAY**

1255 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

Log No.: E89-01-250-1

Date Sampled: 01/13/89
Date Received: 01/13/89
Date Reported: 01/19/89

Report To:

Med-Tox Associates, Inc.
3440 Vincent Road
Pleasant Hill, CA 94523

ATTN: Mr. Jack Sheets

Page one of two

L. D. Lessley
Laboratory Director

cc:

CALIFORNIA HAZARDOUS WASTE ASSESSMENT BIOASSAY: SCREEN

Sample Description 8901059-1A

Organism Pimephales promelas, fathead Source Thomas Fish Company

Dilution Water Fresh with Matrix Modifiers Source Emeryville Dechlorinated Tap Water Temperature Range 14.0 - 15.0 °C

Aeration: Air X Oxygen ___ None ___

Bioassay Conditions	Time, Hrs	Control		Dilution 250mg/L		250mg/L		750mg/L		750mg/L							
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Organisms Surviving	Start	10	100	10	100	10	100	10	100	10	100						
	24	10	100	10	100	10	100	10	100	10	100						
	48	10	100	10	100	10	100	10	100	10	100						
	72	10	100	10	100	10	100	10	100	10	100						
	96	10	100	10	100	10	100	10	100	10	100						
Dissolved Oxygen mg/L	Start	9.2		9.3		9.1		8.7		9.2							
	24	8.4		8.8		8.6		8.8		9.0							
	48	8.3		8.4		8.3		8.7		9.1							
	72	9.1		9.5		9.4		9.0		9.5							
	96	9.3		9.4		9.4		9.2		9.8							
pH	Start	7.7		7.9		7.9		8.1		8.1							
	24	7.5		7.4		7.4		7.4		7.4							
	48	7.6		7.5		7.5		7.5		7.5							
	72	8.2		8.1		8.0		7.9		7.9							
	96	7.7		7.6		7.6		7.6		7.5							

RESULTS 96 hr TL_m* >750mg/L Toxicity Units Not established Percent survival in undiluted sample Not applicable

Length of fish, cm: Max. 3.5 Min. 2.5 Mean 3.1

Weight of fish, g.: Max. 0.48 Min. 0.14 Mean 0.34

*In cases where 96 hour mortality does not equal or exceed 50% in at least one dilution of the sample, no TL_m value established.

Analyst J. R. Mosley

DOW CHEMICAL U.S.A.

January 25, 1990

MICHIGAN DIVISION
MIDLAND, MICHIGAN 48667

Paul Neil
Magma Power Company
11770 Bernardo Court, Suite 366
San Dirge, CA 92128

Paul:

Enclosed is the summary of the gamma ray spectroscopy work performed on the filtercake samples from the Vulcan, Del Ranch and Elmore facilities. I hops that the information is helpful La the ● va&urtioa of the risk assessment for thr planned monofill. If there is more information that I can supply, please contact me.

Ward L. Rigot/dp

Ward L. Rigot
Research Leader
Analytical Sciences
1602 Building

dmp

Encl.

EXPERIMENTAL

Gamma spectroscopy identifies individual gamma transitions which occur following either beta or alpha decay. These transitions are discrete and detection of different energy transitions can be made using high resolutio HPGe semi-conductor detectors.

For the analysis of samples which have low levels of radioactivity, it is necessary to use long acquisition times. For these analyses, acquisition times of 3 hours were used. Identification of isotopes is performed by measuring the energies of the transitions and correlating them to known transition ● rwrqiar of individual isotopes. Table I lists the major transitions identified in the acquired spectra.

TABLE I
Gamma-Ray Emission Lines Identified

Isotope	Gamma-Ra Energy
^{208}Tl	383
	660
^{212}Pb	238
^{214}Bi	649
	934
	1120
	1238
	1378
	1764
^{214}Pb	242
	352
	786
^{224}Ra	241
^{226}Ra	186
^{228}Ac	129
	209
	328
	911
	969

Once identification of the isotopes is made, quantification is possible. order to perform quantification, The detector efficiency must be known. Since *the* efficiency is a function of energy, calibration of the detector system is necessary. This is done by comparing detector responses to a kn radiation source. National Institute for Standards and Technology, NIST (formerly NBS) supplies these standards. The standard used for our measurements was SRM 42768, which is a mixture of three long lived isotope covering the energy range necessary to quantify all identified isotopes in mowing the detector efficiency for each energy transition, the branching ratio to the individual transitions and the weight of the sample which was afyrw$, quantification of the individual isotopes can be made. The following qurtion is used for these calculations.

$$\text{Activity/gram} = \text{cps}/(\epsilon \times \text{b.r.})/\text{weight}$$

where:

Activity/gram - activity units are becquerels (3.7×10^{10} bq = 1 Curie)

cps = counts per second for thr measured transition

ϵ = detector efficiency

b.r. = branching ratio for the measured transition .

RESULTS

Table II lists the results for thr individual isotopes analyzed by gamma spectroscopy.

TABLE II

Isotopic Composition by Gamma Spectroscopy

	Del Ranch 504 Clarifier	Del Ranch 524 Clarifier	Vulcan 8/31/89	Elmore 504	Elmore 524
^{226}Ra	254 ± 13	22 ± 5	199 ± 10	202 ± 10	10 ± 4
^{214}Pb	206 ± 10	9 ± 1	189 ± 9	172 ± 8	1 ± 1
^{214}Bi	173 ± 8	8 ± 1	159 ± 8	160 ± 8	1 ± 1
^{228}Ac	183 ± 9	9 ± 1	161 ± 8	89 ± 5	n.d.<1
^{224}Ra	44 ± 5	6 ± 1	29 ± 3	36 ± 4	n.d.<1
^{212}Bi	41 ± 6	n.d.<2	22 ± 6	17 ± 3	n.d.<1
^{212}Pb	42 ± 2	2 ± 1	11 ± 2	24 ± 2	n.d.<1
^{208}Tl	16 ± 1	n.d.<1	7 ± 1	8 ± 1	n.d.<1
^{212}Po	27 ± 2	n.d.<1	15 ± 1	11 ± 1	n.d.<1
TOTAL[1]	986 ± 23	56 ± 6	792 ± 20	743 ± 20	12 ± 5

1- Total Activity in pCi/gram identified by gamma spectroscopy

It is known that radium will by trapped in barium crystals preventing the escape of all the daughters of the radioactive radium isotopes. Knowing the daughters are present, activities of the daughters can be calculated using standard decay/buildup formula. Table III lists the isotopes present from these calculations and total activities from calculated plum measured isotopes.

TABLE III

Calculated Activities From Radioactive Daughters of Measured Isotopes

	Del Ranch 504 Clarifier	Del Ranch 524 Clarifier	Vulcan 8/31/89	Elmore 504	Elmore 524
^{222}Rn	254 ± 13	22 ± 5	199 ± 10	202 ± 10	10 ± 4
^{218}Po	254 ± 13	22 ± 5	199 ± 10	202 ± 10	10 ± 4
^{214}Po	173 ± 8	8 ± 1	159 ± 8	160 ± 8	1 ± 1
^{210}Pb	173 ± 8	8 ± 1	139 ± 8	160 ± 8	1 ± 1
^{210}Bi	173 ± 8	8 ± 1	159 ± 8	160 ± 8	1 ± 1
^{210}Po	173 ± 8	8 ± 1	159. ± 8	160 ± 8	1 ± 1
^{220}Rn	44 ± 5	6 ± 1	29 ± 3	36 ± 4	n.d.<1
^{216}Po	44 ± 5	6 ± 1	29 ± 3	36 ± 4	n.d.<1
^{228}Ra	183 ± 9	9 ± 1	161 ± 8	89 ± 5	n.d.<1
TOTAL[1]	1471 ± 42	97 ± 11	1253 ± 38	1208 ± 40	24 ± 4
TOTAL[2]	2457 ± 59	153 ± 16	2045 ± 52	1948 ± 49	36 ± 6

1- Total activity from calculations of Radium Daughters
2- Total Activity from Measurements (Table III) and Calculations

APPENDIX D

EVALUATION OF SUBMITTED MONOFILL PROJECT MATERIAL ANALYSIS

RECEIVED

· IMPERIAL COUNTY HEALTH CENTER,
DIVISION OF ENVIRONMENTAL HEALTH SERVICES FEB 02 1989 Phone: (619) 339-4203 Ext 203
COURTHOUSE • 939 W. Main Street
El Centro, CA 92243

MEMORANDUM

DATE 1/30/89

TO: Jurg Heuberger, Planning Director - Planning Department Imperial County

FROM: Lee Cottrell, M.D., Health Officer-Department of Health Services/ Thomas L. Wolf, Director-EHS

SUBJECT: EVALUATION OF SUBMITTED MONOFILL PROJECT WASTE ANALYSIS DATA

Per your request, my staff has reviewed the data submitted January 27, 1989, of filter cake and drilling mud materials from Magma Geothermal operations. Such analysis results of the particular waste materials submitted indicate they are non-hazardous as defined by Title 22, CCR.

It is understood that this review is for informational purposes, and is not intended as a clearance for future wastes originating from Magma or any other geothermal operations. It will be the responsibility of the waste generator to identify each "batch" of waste to the facility operator to insure compliance with the condition you are intending of limiting receipts at the site to non-hazardous geothermal waste.

cc: Paul Neil
Desert Valley Company
11770 Bernardo Plaza Ct.
San Diego, C.

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APPENDIX E

RADIOLOGICAL ASSESSMENT

REPORT
PROPOSED DESERT VALLEY COMPANY MONOFILL
RADIOLOGICAL ASSESSMENT

JANUARY, 1990

Dames & Moore

ONE BLUE HILL PLAZA, SUITE 530, PEARL RIVER, NEW YORK 10965

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SECTION 1
SUMMARY

1.1 INTRODUCTION

Desert Valley Company is proposing to develop a Class II storage/disposal Monofill Facility for geothermal solids (filter cake). This project and associated potential impacts have been described in an Environmental Impact Report (EIR). Subsequent analyses of the geothermal filter cake slated for shipment to the Monofill have identified elevated levels of Naturally Occurring Radioactive Materials (NORM). This report discusses the radiological characteristics of the filter cake and the potential impacts from shipment of the solids for disposal at the proposed Monofill Facility.

NORM is, by definition, naturally occurring, as compared to the products of nuclear reactors or other man generated activities. All materials contain some concentration of radioactive constituents. Uranium and thorium are particularly common, and are found in measurable quantities in most soils. The radioactivity in the filter cake is a result of the decay of uranium and thorium, but at higher concentrations than is observed in normal soils due to the chemistry associated with geothermal processes deep below the surface of the earth.

As each isotope decays, it forms a new isotope which may also be radioactive. This decay chain continues until a stable (non-radioactive) isotope is formed. This sequence would normally produce each isotope in equal concentration, but the equilibrium could be disturbed by chemical processes, natural or human-induced. In the case of the geothermal power plants, the relative concentration of radioisotopes depend most directly on their solubilities in the brine. For this reason, uranium and thorium, which are soluble, stay in the brine while radium, which is less soluble, precipitates out of solution. The brine is reinjected into the geothermal resource.

1.2 WASTE CHARACTERISTICS

The filter cake consists of solids precipitated from the geothermal brine during the energy recovery process. Radiological analyses have determined that certain isotopes in the naturally occurring Uranium-238 and Thorium-232 decay chains are present in elevated concentrations above nominal background. It is apparent that the chemical and physical processes described above have retained the uranium and thorium isotopes in the brine, and the decay chains in the filter cake are headed by Radium-226 and Radium-228.

The proposed Monofill would be more protective of human health and the environment than facilities presently required by the Federal Government for materials such as uranium mill tailings. The Monofill, which is designed to satisfy hazardous waste landfill requirements, will provide superior containment relative to a typical tailings impoundment or stabilization project. The Monofiil design calls for leachate collection and synthetic liners in addition to a compacted liner and cap, whereas an on-site stabilization project would use only a compacted liner and cap. In contrast to the level of disposal technology used for the different categories of materials, the filter cake is less radioactive than uranium mill tailings. Measured concentrations in the filter cake range from 199 to 254 pCi/g for Ra-226[1] which is the parent nuclide for the decay chain in the filter cake, (Dow, 1989a). This can be compared to a typical Ra-226 level of 450 pCi/g in uranium mill tailings. Therefore, while the isotopes present are somewhat similar, the filter cake is less of a radiological concern than mill tailings.

The radium isotopes heading each decay chain are bound in a natural barium matrix within the filter cake (Dow, 1989). This condition limits the leachability of the radiological constituents and, in effect, adds an additional barrier to the Monofill design.

1.3 ENVIRONMENTAL IMPACTS

Development of the proposed Monofill Facility would create the potential for radiological impacts to workers and members of the public through the water (ground and surface), air (resuspended and wind-blown dust), and direct radiation pathways. As discussed in the EIR, the design of the proposed Monofill minimizes the potential for ground water being affected by leachate from the filter cake. The presence of NORM does not affect this evaluation.

Based on conservative assumptions, doses to the maximally exposed worker are below the 500 mrem per year regulatory limit for non-nuclear workers (330 mrem to

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[1] pCi - A picocurie, 10^{-12} Curie, is the amount of an isotope necessary to have 2.2 decays per minute. 1 pCi of pure Radium-226 weighs 10^{-12} grams.

a worker unloading trucks at the Monofill). The nearest resident to a plant would receive an estimated maximum direct radiation dose of 0.5 mrem per year. This is relative to a nominal annual background dose of approximately 300 mrem (NCRP, 1987a). Exposure through the air pathway is conservatively calculated to be a 50 year committed effective (i.e. whole body cumulative lifetime) dose of 0.1 mrem to the nearest member of the public. These conservatively estimated exposures are well below regulatory criteria, and do not contribute significantly to the public's natural background dose.

1.4 REGULATORY IMPACTS

The radiological constituents identified in the geothermal filter cake are classified as NORM, and are therefore exempt from licensing and permitting requirements under current California and Federal regulations. Future regulations may address the handling of these materials and impose controls similar to those currently applicable to uranium mill tailings, the most analogous substance which is presently regulated by Federal law. The Desert Valley Company has proposed a management plan for the filter cake which exceeds current criteria for tailings disposal under the Uranium Mill Tailings Act and associated regulations. It is reasonable to expect, therefore, that the proposed Monofill design and operations will satisfy and exceed any operational or performance requirements that may subsequently be imposed.

SECTION 2
PROJECT DESCRIPTION

Operation of geothermal power plants results in the precipitation of solids from the high pressure, high temperature brine. It is proposed to dispose of the filter cake formed from the collection of these solids in a dedicated Monofill. This proposed Monofill Facility has been designed to exceed California requirements for a Class II landfill and to meet seismic and liner requirements for a Class I hazardous waste landfill. A cross section of the proposed Monofill is shown in Figure 2-1.

2.1 WASTE CHARACTERISTICS

Analysis of the filter cake from the plants operated by Red Hill Geothermal indicate elevated concentrations of Naturally Occurring Radioactive Materials (NORM). This is typical of materials generated through recovery of subsurface resources. For example, natural gas and the scale formed in oil wells contain significant concentrations of NORM, and phosphates such as are used in fertilizers are particularly high in uranium. The brine collects uranium and thorium through leaching and maintains the solution under high temperatures and pressures. As shown in Table 2-1 and Figures 2-2 and 2-3, the radioactive constituents are part of the natural Uranium 238 and Thorium 232 decay chains. The chemistry associated with the brine and geothermal energy recovery process and differences in solubilities result in non-equilibrium along the decay chain in the filter cake. This is significant because tests have revealed that the uranium and thorium isotopes are not present in the precipitate, and therefore are not of dosimetric concern during handling activities. The relevant portions of the decay series are headed by Radium-226 and Radium-228.

Radon is a component of the decay chains present in the filter cake. The presence of this radioactive gaseous constituent of the brine was recognized in the analysis of potential air quality impacts from geothermal power performed by Livermore Laboratory in 1979 (Gudiksen, 1979). Issues associated with the other isotopes arise due to the formation of filter cake during the Magma process for energy recovery. Isotopes in the U-238 and Th-232 decay chains, such as are present in the filter cake, are typically found in surface soil at background levels ranging from undetectable to 3 pCi/g. Tailings from uranium mills would typically have Ra-226 in concentrations of 450 pCi/g (Berlin, 1989). Evaluation of the radiological make-up of the filter cake

TABLE 2-I

FILTER CAKE RADIOLOGICAL CONSTITUENTS

Isotope		Del Ranch First Clarifier (2) pCi/g	Del Ranch Second Clarifier (3) pCi/g	Vulcan (4)
Ra-226		254 ±13	22±5	199 ±10
Rn-222	(1)	254	22	*199*
Po-218	(1)	254	22	*199*
Pb-214		206 ±10	9±1	189 ±9
Bi-214		173 ±8	8±1	159 ±8
Po-214	(1)		8	159
Pb-210	(1)	173173	8	159
Bi-210	(1)	173	8	159
Po-210	(1)	173	8	159
Ra-228	(1)	183	*9*	161
Ac-228		183 ±9	9±1	161 ±8
Th-228		nd	nd	nd
Ra-224		44 ±5	8±1	29 ±3
Rn-220	(1)	44	8	29
Po-216	(1)	44	8	29
Pb-212		42 ±2	2±1	11 ±2
Bi-212		41 ±6	nd	22 ±6
Po-212		27±2	nd	15 ±1
Tl-208		16 ±1	nd	7 ±1

(1) Activity of pure alpha emitters inferred based on most direct parent measured by gamma spectroscopy (shown in italics)

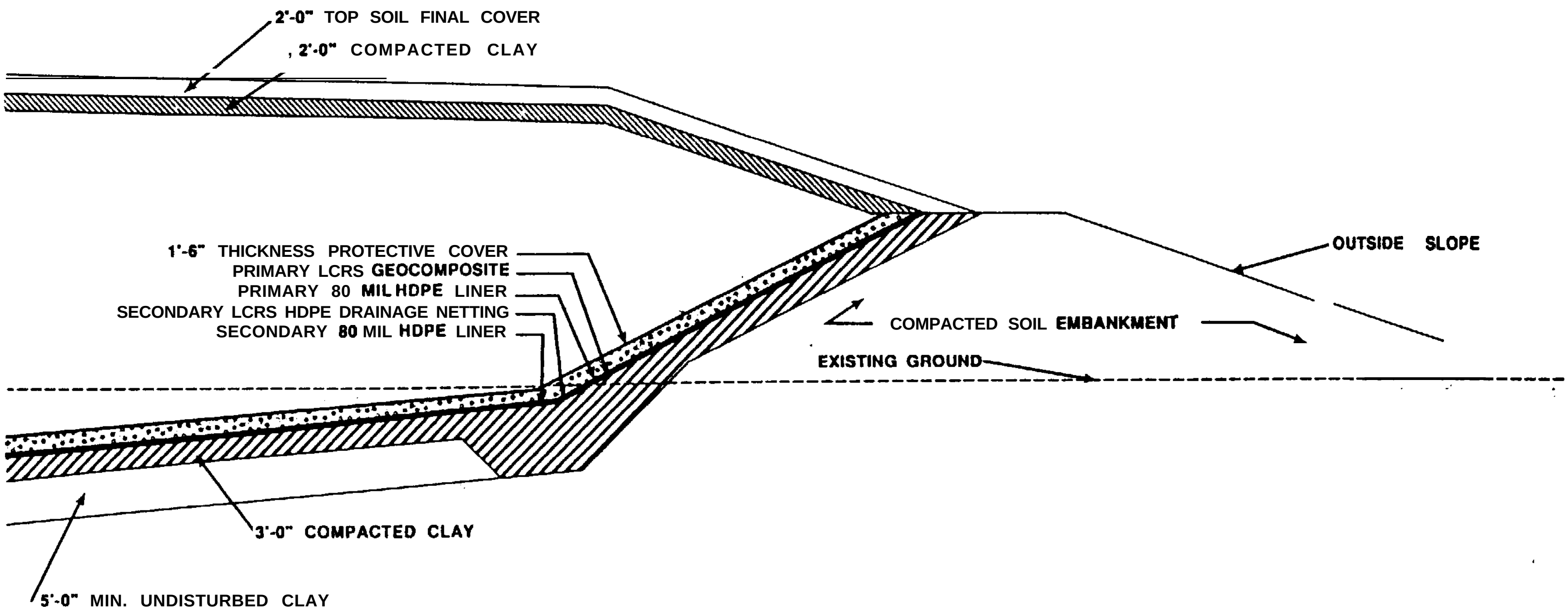
(2) Del Ranch First Clarifier produces 11 yd3 per day of filter cake

(3) Del Ranch Second Clarifier produces 7 yd3 per day of filter cake

(4) Vulcan Clarifier produces 18 yd3 per day of filter cake

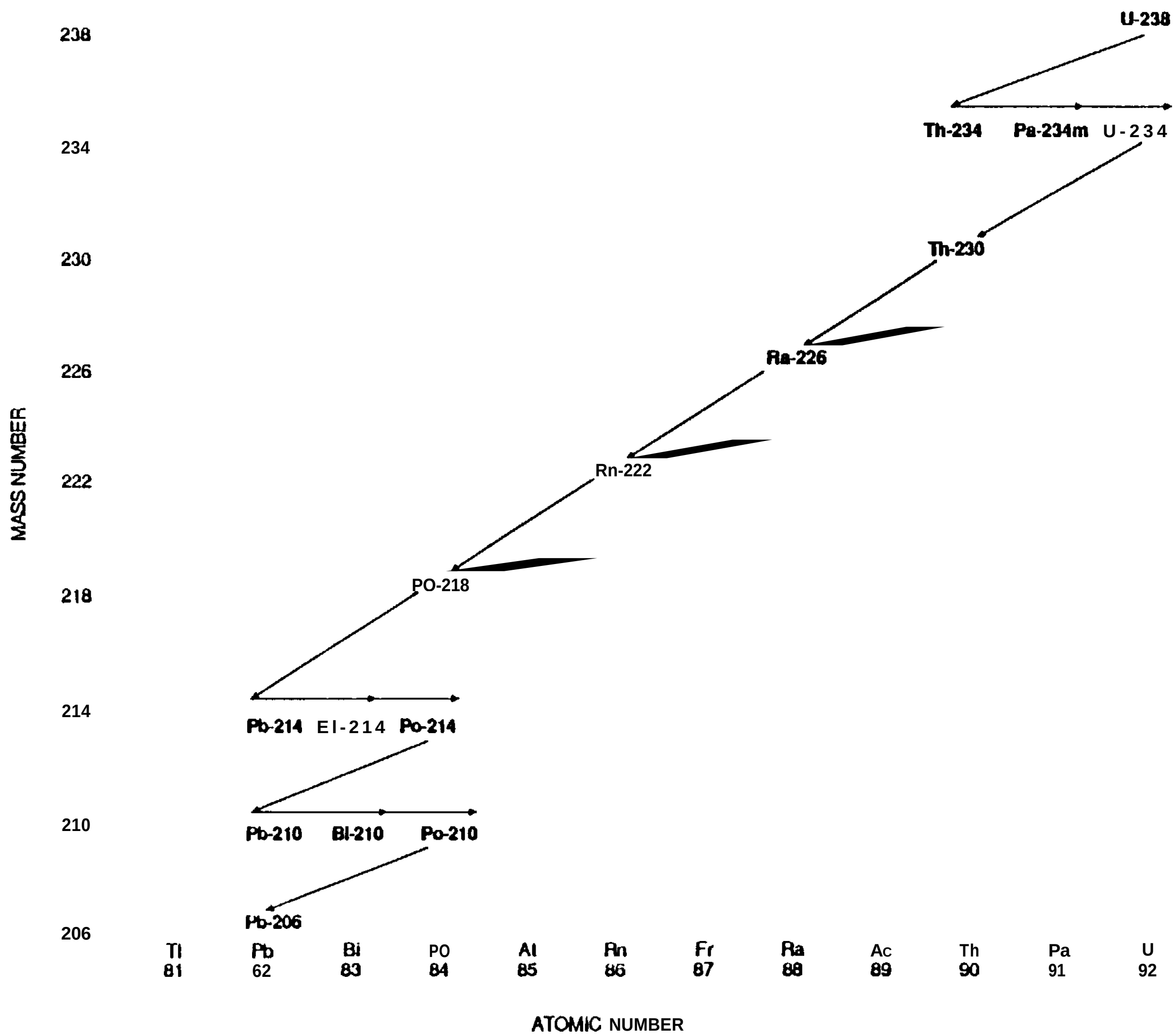
(5) nd - Not Detectable

As a conservative assumption, filter cake from the Elmore and nearly complete Leathers plants is assumed to be similar to Del Ranch.



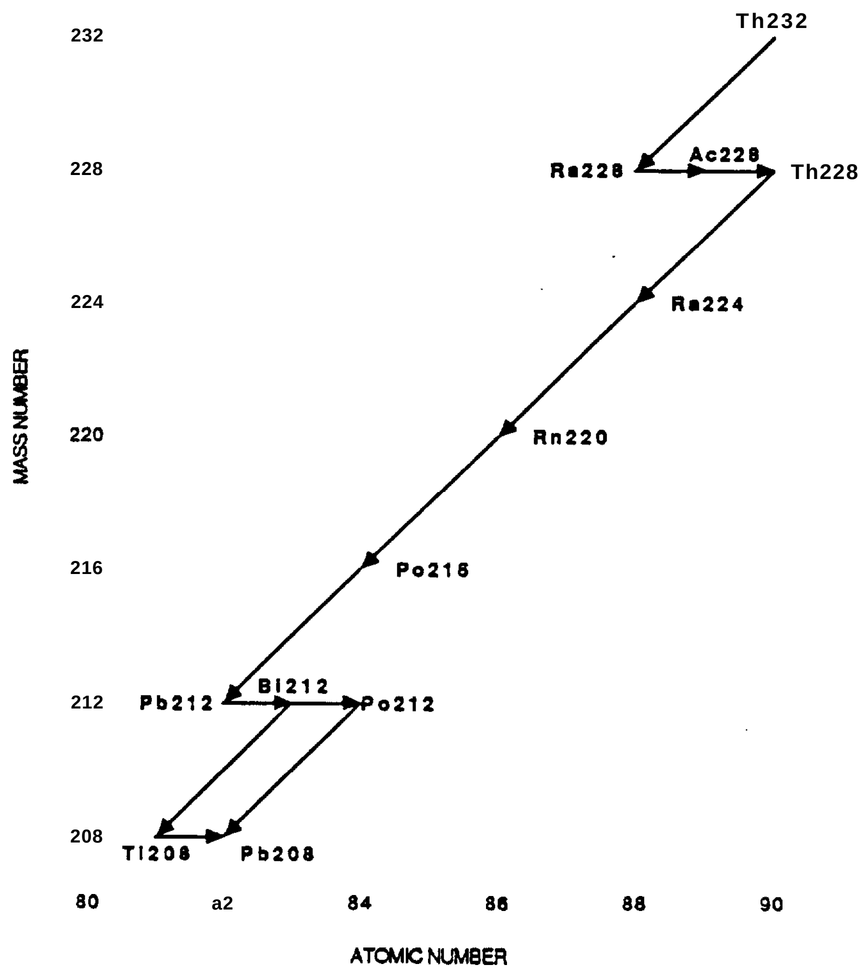
SOURCE : MONOFILL DESIGN REPORT (DESERT VALLEY, 1989)

Desert Valley Company Monofill		
Typical Section Proposed Monofill		
DATE: 11/89	JOB NO. 19588-001	FIGURE
Dames & Moore PEARL RIVER, NEW YORK		2-1

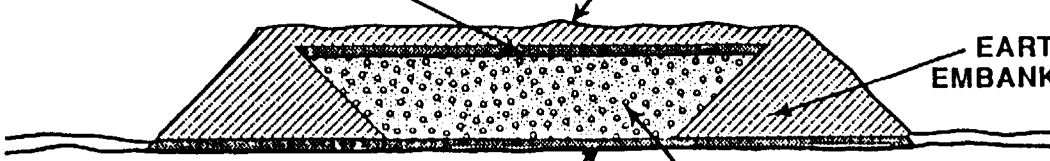

U-238
Th-234
Pa-234m
U-234
Th-230
Ra-226
Rn-222
PO-218
Pb-214
EI-214
Po-214
Pb-210
BI-210
Po-210
Pb-206
MASS NUMBER
238
234
230
226
222
218
214
210
206
Tl 81
Pb 62
Bi 83
PO 84
At 85
Rn 86
Fr 87
Ra 88
Ac 89
Th 90
Pa 91
U 92
ATOMIC NUMBER

D

DATE:



Desert Valley Company Monofill		
Thorium-232 Decay Chain		
DATE: 11189	JOB NO. 19588-001	FIGURE
Dames & Moore PEARL RIVER, MEW YORK		2-3

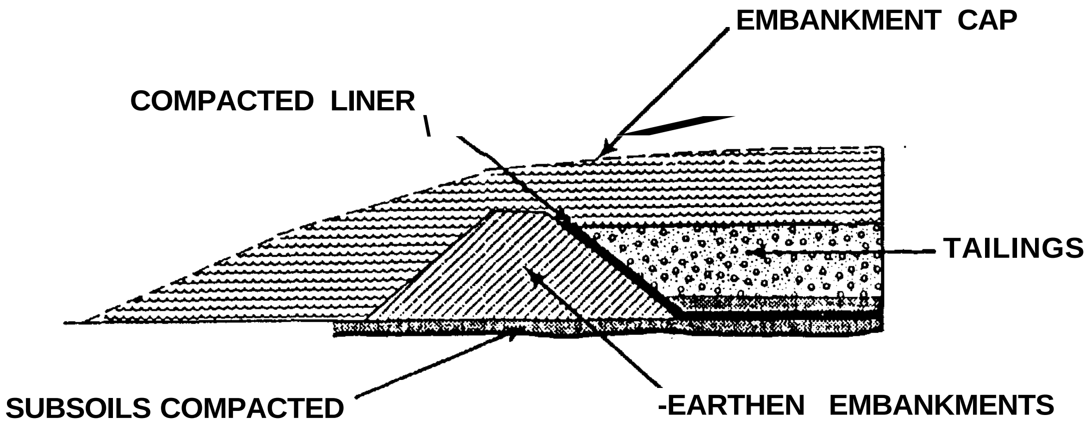


Desert Valley Company Monofill

Above-Grade Disposal of Uranium Tailings

DATE: 11/89 JOB NO. 19588-001 FIGURE 2-4

Dames & Moore
PEARL RIVER, NEW YORK



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Desert Valley Company Monofill

Cross Sectlon through
Tailings Impoundment

DATE: 11/89	JOB NO. 19588-001	FIGURE
Dames & Moore PEARL RIVER. NEW YORK		2-s

suggests a similarity with uranium mill tailings, though the filter cake contains lower concentrations than generally found in tailings by approximately a factor of two.

Government programs have been implemented to provide enhanced environmental isolation of mill tailings piles. Such activities would either involve stabilization of the tailings impoundment or excavation and placement of the materials in a specifically designed on-site disposal facility. As shown in Figures 2-4 and 2-5, such designs would generally incorporate a compacted liner, compacted berms, and a cap to retard infiltration. The proposed Monofill Facility would provide superior environmental isolation through a combination of engineered features (double leachate collection, compacted liner and cap) and natural barriers (clay deposits). These design factors are more stringent than those required for uranium mill tailings facilities.

2.2 MONOFILL DESIGN

The Monofill will be developed in two phases, each estimated to hold ten years of geothermal solids. The proposed facility has been designed to meet the California Class I landfill standards for seismic and liner design for hazardous wastes. As shown in Figure 2-1, the liner system consists of the following components:

- A leachate collection system consisting of a geocomposite (a polyethylene drainage net covered with a geotextile filter fabric). The geocomposite will be sloped to a central collection pipe in each cell which will carry leachate to the primary leachate sump. A minimum of 18 inches of protective cover will be placed over the leachate collection system prior to emplacing waste.

- A primary liner consisting of high density polyethylene 80 mils in thickness.

- A secondary leachate collection system consisting of a polyethylene drainage net sloped to a central drain pipe which will run lo the secondary leachate sump.

- A bottom composite liner system consisting of an 80 mil HDPE liner over a minimum of three feet of compacted clay with a maximum permeability of 10^{-7} cm/sec

- A minimum of five feet of natural clay soils with a maximum permeability of 10^{-7} cm/sec. This natural clay will be keyed into to a depth of five feet by the compacted clay liner which will provide a lateral cutoff wall.

Dust generation during operations will be minimized through wetting of dusty areas and spraying of emplaced material with a soil sealant polymer.

After each phase's cell has been filled, that cell will be covered with a composite liner consisting of two feet of compacted clay covered with a 30 mil thick PVC membrane. The PVC will be overlain with a geotextile and two feet of soil cover. The clay will be compacted to the same specifications as the clay liner and will have a maximum permeability of 10^{-7} cm/sec. The soil cover will be constructed of on-site sandy-clayey soils. The top twelve inches will be treated with a soil binder and the surface sealed with a polymer to minimize wind and rain erosion.

SECTION 3.0
RADIOLOGICAL ASSESSMENT

Potential impacts on water and air quality from the radiological constituents in the filter cake have been assessed. In performing the assessment, the maximum measured concentrations in the filter cake (see Table 2-1) have been conservatively used as representative of all the material. The radiological assessment of operation of the proposed Desert Valley Monofill has been performed on a highly conservative basis in order to bound the determination of potential impacts. This analysis addresses exposures to workers and the general public due to direct radiation from the filter cake and inhalation of airborne radioactive materials.

The radiological significance of an activity is generally evaluated against dose levels established as acceptable by regulatory authorities. In the case of geothermal operations, there are no directly applicable regulations because Naturally Occurring Radioactive Materials (NORM), such as are present in the filter cake, are not under the jurisdiction of the Nuclear Regulatory Commission (NRC) nor have rules been established by the State of California. However, the levels set forth in Title 17 of the California Code as applicable to other radiological activities can be regarded as relevant guidance. Those regulations establish 500 millirem per year (mrem) as the acceptable dose to members of the general public. Workers in nuclear industry positions, referred to as nuclear or radiation workers, are allowed to receive up to 5000 mrem per year. A guiding principle for radiation protection, established in regulation, is that of maintaining exposures As Low As Reasonably Achievable (ALARA). Under ALARA, unnecessary exposures are avoided and unavoidable exposures are minimized to the extent practicable.

The level of radiation exposure resulting from an activity can also be compared to the background levels each individual is exposed to from natural sources. The National Council on Radiation Protection (NCRP), a non-profit organization chartered by Congress, has estimated the average background exposure is 300 mrem per year in the United States. This value can vary significantly depending on an individual's lifestyle, occupation, and geographic location.

The impacts of particular radionuclides vary because of the different types and energies of radiation emitted during decay. The relative significance of the different isotopes from a dosimetric viewpoint is taken into account in analyzing the potential impacts through Dose Conversion Factors (DCF's) which relate the amount of material inhaled or ingested to the resultant dose. Because the inhalation of material results in its incorporation into the body for some extended period of time, the concept of a Committed Effective Dose Equivalent (CEDE) is used. The CEDE includes factors to account for doses to individual organs in the body, the relative importance of those organs to overall risks, and the dose contribution over a lifetime from the uptake of the radioactive material and its distribution within the body.

3.1 Water Quality

The only potential access to groundwater would be from leachate migration from the disposal cell at the Monofill facility. However, there are a number of cumulative factors that should prevent any radionuclide contamination from ever reaching the groundwater. These are:

- The absence of free liquid in the filter cake shipped to the Monofill eliminates any driving force from within the cell.
- The radionuclides, particularly the parent radium constituent present in each decay chain, are tightly "bound" in a barium matrix which minimizes any leaching of constituents by water infiltration into the cell.
- Significant precipitation infiltration into the ceil is prevented by the lack of available percolating water since evapotranspiration rates far exceed precipitation: and the multi-barrier construction of the cell wall further inhibits any infiltration into the cell.
- When water enters the cell, the leachate collection system would remove the water for mixing with the soil sealant polymer.
- Further, as described in the Environmental Impact Report (EIR) the depth of the underlying groundwater and intervening clay layer would assure no adverse impacts to the groundwater.

Similarly, no radiological impacts to surface water quality will occur. The lack of permanent onsite and local surface water and the incorporation of surface water, including storm water, management measures such as diversion berms will minimize any potential dispersion of particulates through this pathway. Adherence to established control procedures will minimize the potential for release of particulates prior to burial, and use of sealants will further prevent the mobilization of radionuclides on the surface from erosion.

3.2 Air Quality

The radiological impacts were calculated for the loading of the filter cake on to trucks at the power plant, the transport of the material to the Monofili Facility and unloading and emplacement of the filter cake in the disposal ceil. These are the three project activities which could affect air quality. An assessments of the impacts to the workers involved in each activity, to the nearest permanent residents to the power plant and Monofiil sites, and for an "onlooker" who occupies the same position close to the transport route for the passage of all the trucks was performed. The analytical approach, assumptions employed, input parameters, and calculated exposures (doses) for each of these activities are detailed in Appendix A. For each activity, the doses to the maximally exposed worker and offsite resident, and the total exposure of the population of workers, are calculated. In each instance, highly conservative assumptions as to dose levels and exposure times have been made to arrive at worst case (upper bound) estimates of individual doses. The following sequential approach was used to assess the radiological impacts:

- The radiological sources, in terms of airborne concentrations of particuiates and gases (radon (W-222) and thoron (Rn-220)), and gamma exposure levels directly adjacent to ail filter cake were characterized from the highest measurements recorded at any power plant site (Del Ranch).
- The viable dispersion pathways for each step in the activities of 'truck loading through emplacement in the disposal cell at the Monofiii Facility were defined. Dispersion to receptors for direct exposure, and inhalation of particulates and radon and thoron gases were assessed for each step.
- Concentrations at the receptors (onsite and transport workers, offsite residents and onlookers) were evaluated and the doses calculated to exposed individuals.

The calculated 50 year committed effective doses[2] (whole body) due to inhalation of particuiates are summarized in Table 3-1 for both workers and. members of the public. The maximum projected dose to a worker is 14.0 mrem, while a member of the public could, conservatively, receive 0.1 mrem.

The gaseous emanation from the filter cake, radon and thoron, also contribute to the worker doses. During loading a worker could receive a CEDE of 32 mrem, while an

2 The 50 year committed effective dose is the dose which will accumulate during the 50 years following inhalation of the isotopes.

unloading and emplacement worker could receive 76 mrem CEDE. Doses to the public during operations are minimal due to the distance from the filter cake piles and the effects of dilution and dispersion. This will also apply after closure when the radon source term will additionally be reduced through confinement by the cap.

Table 3-1

Calculated Maximum 50 Year Effective Dose Commitment
Due to Inhalation For Each Activity
(mrem)

Population	ACTIVITY Truck Loading	 Transport	 Unloading and Emplacement
1. Worker (Maximally Exposed Individual)	5.9	Negligible	14.0
2. Off-site Nearest Resident	0.1 (1)	Negligible	0.1 (2)

(1) Closest permanent resident assumed at 0.5 miles from the Elmore Power Plant site boundary.
(2) Closest permanent resident at Elmore Desert Ranch at 2.0 miles from Monofill facility.

3.3 Direct Radiation

The calculated whole body gamma doses to the maximally exposed individual are summarized in Table 3-2 for both workers and members of the public. The maximum projected annual individual dose to a worker at the Monofill facility of 240 mrem is less than half of the permissible annual exposure level of 500 mrem for a non-nuclear worker set forth in 10 CFR 20 and CAC 17-30268, and the maximum annual dose of 0.52 mrem to an offsite hypothetical resident is a negligible fraction of this value and represents an increase of less than 0.5 percent over average background levels. Thus, the radiological impacts from the proposed operations are well within regulatory standards as applied to non-nuclear workers. While the 10 CFR 20 and CAC 17-30265 guidelines permit higher exposure levels for “nuclear* workers, (5000 mrem) it is not the intention to treat the workers involved as nuclear workers. Thus the lower limit will be considered_ as the criterion.

Table 3-2

Calculated Maximum Whole Body Gamma Exposures for Each Activity
(mrem/yr)

	ACTIVITY		
Population	Truck Loading	Transport	Unloading and Emplacement
1. Worker (Maximally Exposed Individual)	60	49	240
2. Off-site Nearest Resident	0.52(1)	0.002 (1.54 X 10^{-6}/shipment)	0.15(2)

(1) Closest permanent resident assumed at 0.5 miles from the Elmore Power Plant site boundary.
(2) Closest permanent resident at Elmore Desert Ranch at 2.0 miles from Monofill facility.

3.4 DOSE ASSESSMENT SUMMARY

Table 3-3 summarizes the doses from various Monofill activities levels to the public. These levels of exposure can be compared to several standards and guidances which do not directly apply in this situation. The State of California, in CAC Title 17, establishes a maximum dose to a member of the public of 500 mrem per year. The NCRP recommends that exposure of the public be limited to 100 mrem per year (NCRP, 1987b). The U.S. Environmental Protection Agency has established standards for radionuclide emissions to limit doses to 10 mrem per year (EPA, 1969). Exposures of members of the public from operation of the proposed facility will be well below any and all of these criteria.

The doses to workers (Table 3-4) have been calculated to be well below current regulatory requirements of 500 mrem/yr (CAC, Title 17) as established for non-radiation workers and members of the public. These are intended as bounding estimates and the actual doses and risks are expected to be much lower.

Table 3-3

Monofill Dose Assessment For Public

Activity	Gamma Dose (mrem/yr)	Particulate Dose (CEDE-mrem)	Radon Dose (CEDE-mrem)	Annual Total Dose Commitments (mrem)
PUBLIC:				
Loading- Residents @ 0.5 miles	0.52	0.1	0.0003	0.6
Unloading- Residents @ 2 miles	0.15	0.1	Neg	.25

Table 3-4

Monofill Dose Assessment For Workers

Activity	Gamma Dose (mrem/yr)	Particulate Dose (CEDE-mrem)	Radon Dose (CEDE-mrem)	Annual Total Dose Commitments (mrem)
WORKERS:				
Loading	60	5.9	32	90
Unloading	240	14	76	330
Truck Driver	49	Neg	Neg	49

SECTION 4
UNAVOIDABLE ADVERSE ENVIRONMENTAL EFFECTS

Unavoidable programmatic impacts are discussed in the EIR. Radiological impacts such as doses to workers and the public will occur, but will be minimized to insignificance by dust control and containment in the proposed Monofill Facility. Environmental release pathways would be the same as though addressed in the EIR for the non-radiological constituents of the filter cake. Therefore, the remaining radiological impacts are considered unavoidable yet not significant.

SECTION 5
ALTERNATIVES TO THE PROPOSED PROJECT

5.1 ALTERNATE LOCATIONS

The Environmental Impact Report (ERC, 1989) discusses the siting program carried out in selecting the proposed location. The screening and evaluation process identified the proposed location as best meeting the site selection criteria regarding geologic units, Holocene faults, flooding, land use conflicts, haul distances, and impacts to sensitive environmental resources. The presence of NORM does not alter the conclusions of this process because the site selection criteria are identical.

5.2 NO PROJECT

Foregoing development of the proposed Monofill Facility would eventually require the adoption of an alternative management practice for the geothermal solids. The programmatic issues associated with such alternatives, including shipment to a hazardous waste landfill, are discussed in the EIR.

Radiological impacts from disposal of the filter cake would increase if the material were shipped to a different facility. Doses due to handling would remain the same, but transportation doses would increase due to the longer distances between the plants and any available hazardous waste landfill. Environmental releases, such as to the ground water, would be similarly negligible in either the proposed Monofill or an alternative hazardous waste landfill. Shipment to a hazardous waste facility may no longer be a feasible option due to the radioactivity in the filter cake because of regulatory restrictions on mixing hazardous and radioactive materials.

The alternative of shipment to a radioactive waste disposal facility would be uneconomical and likely ineffective in mitigating radiological impacts. It is understood that the operating permit for the proposed California low level radioactive waste (LLRW) disposal facility will not allow acceptance of NORM. The basis for this is a desire to' refrain from using highly valuable disposal volume for material that does not require the level of isolation needed for LLRW. The haul distances to the existing Utah NORM facility would result in high transport costs and larger transportation doses than in the case of the proposed Monofill. Transportation would require one truck per day per plant at a cost of about $2 per mile, for 4 trips per day, 365 days per year, over 1000 miles per trip, annual transport cost of about $3 million. Disposal cost would be, at a minimum, $10 per cubic foot, or $7 million per year for the four geothermal plants combined. It is also likely that potential releases from the Utah site would be greater since the proposed Monofill design provides superior isolation through additional engineered barriers.

SECTION 6
GROWTH INDUCING CUMULATIVE IMPACTS

The EIR discusses the potential for growth inducing impacts from the proposed project. The presence of NORM in the filter cake does not alter the basis for or conclusions from the evaluation presented in the EIR.

SECTION 7
AGENCIES AND ORGANIZATIONS CONSULTED

7.1 PUBLIC AGENCIES

State of California

Regional Water Quality Control Board, Colorado River Basin Region
Department of Health Services

County of Imperial

Planning Department
Division of Environmental Health Services
Air Pollution Control District

7.2 OTHER ORGANIZATIONS

Desert Valley Company
Dow Chemical

SECTION 8
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Appendix A

Calculation of Radiological Impacts From Filter Cake

Appendix A Contents

Al .O GAMMA DOSE

The gamma dose rate 3 feet from the surface of the filter cake is conservatively estimated at 0.100 mrem/hr, which is the maximum level of exposure to the filter cake measured at any of the geothermal power plants. The measurement was made in the area in front of a filter cake storage bin at the Del Ranch facility.

Al .1 Truck Loading Operation

Al. 1.1 Occupational Gamma Dose

The total annual dose (D) to onsite workers performing the operation of loading the filter cake onto the hauling trucks is determined from:

$$D = 0.100\frac{mrem}{hr} \times \frac{labor\ hours}{year}$$

where $D = \textbf{dose}\frac{mrem}{year}$

$\textbf{Dose}\ Rate = 0.100\frac{mrem}{hr}$

The highly conservative assumptions used to calculate the workers exposure are:

- Each of the four power plants will on average ship one truck load of filter cake/day, 7 days/week for 365 days. This is based on using a 25 yd^3 capacity truck to haul 18 yd^3 $\frac{72 yd^3}{4\ plants}$ of filter cake/day.
- 3 employees will be involved in the loading process for a period of 2 hours/day-employee. This is based on the use of excavating and loading equipment capable of moving the 18 yd^3 of material at the rate of 12 yd^3/hr.
- Each employee works at a distance of 3 feet from the filter cake.
- Each employee works a maximum of 300 days/year.

Based on these assumptions, the maximally exposed individual at each facility would receive an annual dose (D) of:

$$D = 0.100\frac{mrem}{hr} \times 2\frac{hr}{day} \times 300\frac{day}{yr} = 60\frac{mrem}{yr}$$

The total annual dose to all workers at each facility performing the loading operations is:

$$D = 0.100\frac{mrem}{hr} \times 2\frac{hr}{day} \times 365\frac{day}{yr} \text{ x } 3\ workers = 219$$

Al .1.2 Off-Site Non-Occupational Gamma Dose

The predicted gamma dose rate (DR) to an occupant of the nearest residence is determined from:

$$DR = \frac{3\ ft}{3168\ ft} \times 0.100\frac{mrem}{hr} = 9.5 \times 10^{-5}\frac{mrem}{yr}$$

since 0.100 mrem/hr is assumed at a distance of 3 feet from the filter cake.

The assumptions used to calculate the residents' exposure are:

- Nearest permanent residence to each facility is no closer than 0.5 miles from the site boundary, 0.6 miles (3166 ft) from the filter cake.
- Resident spends 100 percent of the time on these property; 75 percent inside the house and 25 percent outside.

- The gamma exposure rate inside the house is one-half of that outside because of the shielding effect of the walls. This is highly conservative since the walls reduce the rate by greater than 50 percent.
- *The* gamma exposure rate decrease as a function of $1/r$, where r is the distance from the edge of the filter cake. This is highly conservative since, at this distance from the site, the exposure rate would likely decrease as a function of $\frac{1}{r^2}$.
- There is no barrier between the surface of the filter cake and the resident to reduce the dose rate.

The Indoor dose (D)i is therefore:

$$(D)i = 0.75 \times 24 \frac{hrs}{day} \times 365 \frac{days}{year} \times 9.5 \times 10^{-5} \frac{mrem}{hr} \times 0.50 = 0.31 \frac{mrem}{yr}$$

The outdoor dose (D)o is:

$$(D)o = 0.25 \times 24 \frac{hrs}{day} \times 365 \frac{days}{year} \times 9.5 \times 10^{-5} \frac{mrem}{hr} = 0.21 \frac{mrem}{year}$$

The total dose to the closest resident is $0.31 + 0.21 = 0.52 \frac{mrem}{year}$

AI .2 Transport of Filter Cake to Monofill Facility

AI .2.1 Occupational Gamma Dose

The total annual dose (D) to truck drivers transporting *the* filter cake to the Monofill facility is determined from:

$$D = 0.100 \frac{mrem}{hr} \times \frac{labor\ \ hrs}{year}$$

(see Section A1.1)

The assumptions used to calculate the drivers' exposure are:

- Dose rates in the cab and in the vicinity of the truck are the same as standing 3 feet from the fitter cake. No reduction in dose is assumed for the shielding effect of the truck or cab.
- The travel distance to the Monofill facility is 25 miles.
- The driver will make 1 trip day at an average speed of 40 mph, thus spending 0.53 hrs in the cab. It is further assumed that the driver stands in the vicinity of the loaded truck for 1 additional hour (during loading and decontamination) giving a total of 1.63 hrs/day of exposure.
- Each truck driver will work a maximum of 300 days/year.

Based on these assumptions, the maximally exposed truck drivers at each facility would receive an annual dose (D) of:

$$D = 0.100 \frac{mrem}{hr} \times 1.63\text{-\&} \times 300 \frac{\&V}{yr} = 48.9 \frac{mrem}{yr}$$

The total annual dose to all truck drivers at each facility is:

$$D = 0.100 \frac{mrem}{hr} \times 1.63 \frac{hr}{day} \times 365 \frac{days}{yr} = 59.5 \frac{mrem}{yr}$$

Al .2.2 Population Dose During Transport

The population exposure (gamma dose) resulting from transport of the contaminated soil is assumed to consist of the doses to onlookers who are bystanders standing at a distance of approximately 30 feet (10 meters) from the center line of the shipment route while the truck passes.

The exposure rate to the onlookers during transport is calculated using the following equation:

$$D(d)=\frac{2K}{v}I(d)$$ Where D(d) = total integrated dose at a distance (mrem)

and $$I(d)=\int_d^\infty \frac{\exp(-ur)B(r)}{r(r^2-d^2)^{1/2}}dr$$

K= dose rate factor $\left(\frac{mrem-ft^2}{hr}\right)$

V= shipment speed (ft/hr)

d= perpendicular distance of an individual from shipment (ft)

u= linear absorption coefficient for air = 0.00118 ft^{-1}

B(r)= dimensionless factor = 1 + 0.0006 r

The dose rate factor (K) was calculated as 0.9 $\frac{mrem\text{-}ft^2}{hr}$ based on a gamma exposure rate of 0.001 $\frac{mrem}{hr}$ at a distance of 30 feet from the truck.

The dose to an onlooker along the transport route was calculated to be 1.54 x 10^{-6} mrem for each shipment using a computer program to evaluate individual exposures. For the highly improbable situation of the same individual receiving this exposure for ail shipments/day for an entire year the total dose would be 0.002 mrem.

Al .3 Unloading and Emplacement of Filter Cake

Al .3.1 Occupational Gamma Dose

The workers at the Monofiii facility will be exposed to an average gamma dose rate of 0.100 $\frac{mrem}{hr}$ from the filter cake during truck unloading, emplacement in the lined ceil, maintenance of the cell, and decontamination of the truck after unloading. The dose to workers at the Monofili facility is determined from:

$$D=0.100\frac{mrem}{hr}\times\frac{labor\ hours}{year}$$

The assumptions used to calculate the workers exposure are:

- The Monofiii facility will receive 4 truck loads of filter cake/day, 7 days/week for 365 days/year.
- 5 employees will be involved in the unloading of the trucks, emplacement in the cell, washing of the trucks after unloading, and maintenance operations including grading and compacting of the material and spraying of a sealant. Each employee will work a maximum of 8 hrs/day but the facility will be in operation for 12 hrs/day.
- It is conservatively assumed that each employee works at a distance of 3 feet from the filter cake for the duration of the 8 hr shift.

- The dose rate for all the filter cake is assumed to be 0.1 00 $\frac{mrem}{yr}$, which is the maximum level measured at the Del Ranch facility.
- Each employee works a maximum of 300 days/year.

Based on these assumptions the maximally exposed individual at the Monofill facility would receive an annual dose of:

$$D = 0.100\frac{mrem}{hr}\times 8\frac{hr}{day}\times 300\frac{day}{yr} = 240\frac{mrem}{yr}$$

The total annual dose to all workers handling the filter cake at the Monofill facility is:

$$D = 0.100\frac{mrem}{hr}\times 12\frac{hr}{day}\times 365\frac{days}{yr}\times 5\ workers = 2190\frac{mrem}{yr}$$

Al .3.2 Offsite Non-Occupational Gamma Dose

The predicted gamma dose rate (DR) to an occupant of the nearest residence, *the* Elmore Desert Ranch located 2 miles (10560 feet) to the east - northeast of the site, is determined from:

$$DR = \frac{3\,ft}{10560\,ft}\times 0.100\frac{mrem}{hr} = 2.8\times 10^{-5}\frac{mrem}{hr}$$

Using the same conservative assumptions as to resident exposure rate and time as in Section Al .1.2 gives the following individual indoor dose (D)i:

$$(D)i = 0.75\times 24\frac{hrs}{day}\times 365\frac{days}{yr}\times 2.8x10^{-5}\frac{mrem}{hr}\times 0.5 = 0.09\frac{mrem}{year}$$

The outdoor dose (Djo is:

$$(D)o = 0.25\times 24\frac{hrs}{day}\times 365\frac{days}{yr}\times 2.8x10^{-5}\frac{mrem}{hr} = 0.06\frac{mrem}{year}$$

The total dose to the closest resident is 0.09 x 0.06 = 0.15 $\frac{mrem}{year}$

A2.0 AIR PARTICULATE DOSE

A2.1 Discussion of Calculations

There will be some low level dispersion of **particulates** from the filter cake during the truck loading operation. In this section the inhalation dose from the airborne release Is determined. The concentration of **particulates** in the air (Ca) is estimated by the following methodology:

(1) The Filter Cake radiological Constituents are listed in Table 2-1. Del Ranch First Clarifier data are used in the calculations since they would result in the most conservative estimates.

(2) The airborne dust burden is conservatively taken as 512 $\frac{\mu g}{m^3}$ corresponding to the maximum 1 hr concentration at the location of maximum concentration (page 3-55 of **FEIS** on **Monofill** Facility). (This value is quite comparable to the 425 $\frac{\mu g}{m^3}$ value for earth moving activities from the draft of **EIS** for **UMTRA** tailings movement in Grand Junction).

(3) Based on the distance from the filter cake a "% Dust Applicable" weighing factor is considered. For example for Individuals considered at 3ft distance from the filter cake "% Dust Applicable" is 100%. At 0.1 miles away from the filter cake or at the site boundary, the "% Dust Applicable" is 5%[1]. At 0.6 miles away from the filter cake or at the resident's property (during truck loading operations) the "% Dust Applicable" is $\left[\frac{0.1\,mile}{0.6\,mile} \times 5\% = 0.83\%\right]^{(2)}$ 1.43%. Similarly at 2 miles away from the filter cake or at the closest resident's property (during **truck** unloading and emplacement operations) the "% Dust Applicable" is $\left[\frac{0.1\,mile}{2\,mile} \times 5\% = 0.25\%\right]$ 0.25%.

(4) The specific activity of dust is determined from the ratio:

$$\frac{\textit{Specific Activity of Dust}}{\textit{Specific Activity of Contaminated Soil}} = 2.4$$

From final Generic EIS on Uranium Milling

(5) The **air** particulate concentration for a particular isotope considered is:

For Ra-226 with a concentration of 254 $\frac{pCi}{g}$[3]

$$254\frac{pCi}{g} \times 512\frac{\mu g}{m^3} \times 2.4E-06\frac{g}{\mu g} \times \left[\frac{100}{100}\right] = 3.1E-01\frac{pCi}{m^3}$$

note: that at this stage we also account for the "% Dust Applicable."

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(1) **Based** on data from UMTRA Vicinity Properties program in Grand Junction, CO.

(2) **The** direct burden decreases as a function **of** $\frac{1}{r}$ where r is the distance from the edge of the filter cake. This is highly conservative since, at considerable distances from the site the exposure rate would likely decrease as a function of $\frac{1}{r^2}$.

(3) **For** all of the sample calculations shown Ra-226 at a concentration of 254 $\frac{pCi}{g}$ for the Truck Loading Operation is considered.

(6) Next the inhaled activity of the isotope is calculated. For the calculation it is assumed that all individuals are working at a light pace, which requires an average air intake of 1.2 $\frac{m^3}{hr}$. This calculation also requires the number of hours a day and the number of days a year that the individual is exposed to the filter cake to be specified, (in this case 2 hours per day, 300 days per year).

$$3.1E-01\frac{pCi}{m^3}\times 2\frac{hrs}{day}\times 300\frac{days}{yr}\times 1.2\frac{m^3}{hr}=2.2E+02\frac{pCi}{yr}$$

We can manipulate the hours of exposure to avoid multiple calculations for one individual. For example for an individual exposed for 8 hours at 100% total exposure level, and an additional 16 hours at 20% of the total exposure level. He/She has been exposed for a total of 11.2 hours at 100% total exposure level:

$$8+\{\frac{[16hrs\times 20\%]\times 8hrs}{(8hrs\times 100\%)}\}=11.2hrs$$

(7) For each isotope listed in Table 2-1 using the "DOE Internal Dose Conversion Factors," we estimate the **50-Year** Committed Dose equivalent to the organs affected, and the Committed Effective Dose Equivalent (C.E.D.E.).
The following set of data are the isotopes in Table 2-1 and their associated **50-Year** Committed Dose Equivalent Factors.

(Table 2-1 listing)		50-YEAR COMMITTED DOSE EQUIVALENT FACTORS $\frac{Rem}{\mu Ci}$ INTAKE							
		LUNGS	GONADS	R MARROW	BONE SURF	KIDNEYS	LIVER	SPLEEN	C.E.D.E.
ISOTOPE	$\frac{pCi}{g}$	$\frac{Rem}{\mu Ci}$	$\frac{Rem}{\mu Ci}$	$\frac{Rem}{\mu Ci}$	$\frac{Rem}{\mu Ci}$	$\frac{Rem}{\mu Ci}$	$\frac{Rem}{\mu Ci}$	$\frac{Rem}{\mu Ci}$	$\frac{Rem}{\mu Ci}$
Ra-226	254	5.9E+01	-	-	2.8E+01	-	-	-	7.9E+00
Rn-222	254	-	-	-	-	-	-	-	-
Po-218	254	-	-	-	-	-	-	-	-
Pb-214	206	5.6E-02	-	-	-	-	-	-	6.7E-03
Bi-214	173	4.8E-02	-	-	-	1.6E-02	-	-	6.3E-03
Po-214	173	-	-	-	-	-	-	-	-
Pb-210	173	-	-	1.4E+01	2.0E+02	2.6E+01	5.6E+01	-	1.3E+01
Bi-210	173	1.6E+00	-	-	-	2.1E-01	-	-	1.9E-01
Po-210	173	4.8E+01	-	-	-	2.4E+01	4.4E+01	8.1E+00	8.1E+00
Ra-228	183	2.7E+01	-	2.7E+00	-	-	-	-	4.2E+00
Ac-228	183	9.3E-01	-	4.1E-01	5.2E+00	-	1.4E+00	-	2.9E-01
Th-228	no data	3.5E+02		4.1E+02	5.2E+03				3.1E+02
Ra-224	44	2.4E+00	-	-	-	-	-	-	2.9E+00
Rn-220	44	-	-	-	-	-	-	-	-
Po-216	44	-	-	-	-	-	-	-	-
Pb-212	42	7.4E-01	-	1.2E-01	1.4E+00		1.8E-01	-	1.6E-01
Bi-212	41	1.4E-01	-			1.0E-01		-	2.1E-02
Po-212	27	-	-	-	-	-	-	-	-
Tl-208	16	-	-	-	-	-	-	-	-

(8) To estimate **50-Year** Committed Dose Equivalent, multiply the air particulate concentration for a particular isotope by the inhaled activity of the isotope:

$$2.2E+02\frac{pCi}{yr}\times 5.9E+01\frac{rem}{\mu Ci}\times\left[0.001\frac{mrem}{yr}\right]=1.3E+01\frac{mrem}{yr}$$

(9) The following table shows the concentration in air (**CONC.AIR** column), and the inhaled activity of the isotope (CONC.IN column), also the estimated **50-Year** Committed Dose Equivalent for the affected organs and the Committed Effective Dose Equivalent as a result of the particular isotope. The last row of the Table is the sum of all the **50-Year** Committed Dose for the organs and the Committed Effective Dose Equivalent.

COMPUTED VALUES $\frac{mrem}{yr}$

ISOTOPE	CONC.AIR $\frac{pCi}{m^3}$	CONC.IN $\frac{pCi}{yr}$	LUNGS $\frac{mrem}{yr}$	GONADS $\frac{mrem}{yr}$	R MARROW $\frac{mrem}{yr}$	BONE SURF $\frac{mrem}{yr}$	KIDNEYS $\frac{mrem}{yr}$	LIVER $\frac{mrem}{yr}$	SPLEEN $\frac{mrem}{yr}$	C.E.D.E. $\frac{mrem}{yr}$
Ra-226	3.1E-01	2.2E+02	1.3E+01	0.0E+00	0.0E+00	6.3E+00	0.0E+00	0.0E+00	0.0E+00	1.8E+00
Rn-222	3.1E-01	2.2E+02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Po-218	3.1E-01	2.2E+02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Pb-214	2.5E-01	1.8E+02	1.0E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.2E-03
Bi-214	2.1E-01	1.5E+02	7.3E-03	0.0E+00	0.0E+00	0.0E+00	2.4E-03	0.0E+00	0.0E+00	9.6E-04
Po-214	2.1E-01	1.5E+02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Pb-210	2.1E-01	1.5E+02	0.0E+00	0.0E+00	2.1E+00	3.1E+01	4.0E+00	8.6E+00	0.0E+00	2.0E+00
Bi-210	2.1E-01	1.5E+02	2.4E-01	0.0E+00	0.0E+00	0.0E+00	3.2E-02	0.0E+00	0.0E+00	2.9E-02
Po-210	2.1E-01	1.5E+02	7.3E+00	0.0E+00	0.0E+00	0.0E+00	3.7E+00	6.7E+00	1.2E+00	1.2E+00
Ra-228	2.2E-01	1.6E+02	4.4E+00	0.0E+00	4.4E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.8E-01
Ac-228	2.2E-01	1.6E+02	1.5E-01	0.0E+00	6.6E-02	8.4E-01	0.0E+00	2.3E-01	0.0E+00	4.7E-02
Th-228	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Ra-224	5.4E-02	3.9E+01	9.3E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.1E-01
Rn-220	5.4E-02	3.9E+01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Po-216	5.4E-02	3.9E+01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Pb-212	5.2E-02	3.7E+01	2.7E-02	0.0E+00	4.5E-03	5.2E-02	0.0E+00	6.7E-03	0.0E+00	5.9E-03
Bi-212	5.0E-02	3.6E+01	5.1E-03	0.0E+00	0.0E+00	0.0E+00	3.6E-03	0.0E+00	0.0E+00	7.6E-04
Po-212	3.3E-02	2.4E+01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Tl-208	2.0E-02	1.4E+01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
		SUM=	2.6E+01	0.0E+00	2.7E+00	3.8E+01	7.7E+00	1.6E+01	1.2E+00	5.9E+00

A2.2 Use of a Spread Sheet For Calculations & Results

A2.2.1 Input Parameters

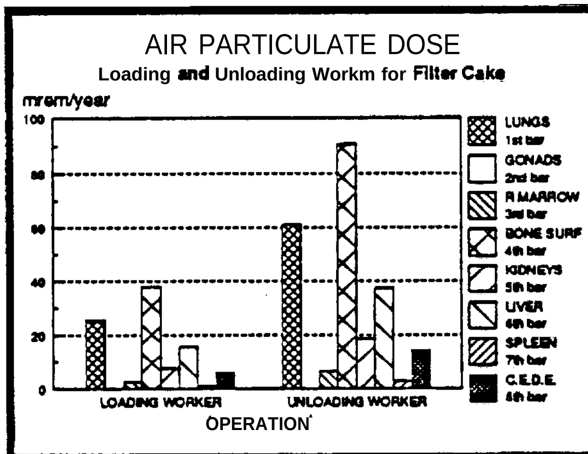
A spread sheet was utilized to calculate the 50-YEAR Committed Dose Equivalent and the Committed Effective Dose Equivalents. The methodology of which was explained above. The input variables to the spread sheet are:

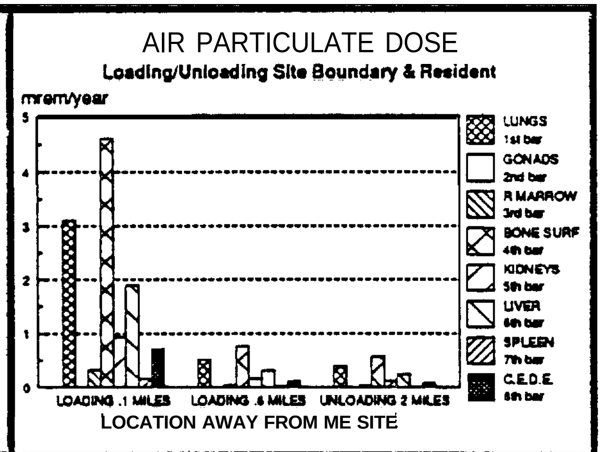
Ratio sp Activity=	2.4E-06	$\frac{g}{\mu g}$	From final Generic EIS on Uranium Milling
Airborne Dust=	512	$\frac{\mu g}{m^3}$	
% Dust Applicable=	variable	*percent*	Based on the location of exposure
# hrs Exposed=	variable	$\frac{hrs}{day}$	
# People Exposed=	variable		
# Days Yr Exposed=	variable	$\frac{days}{yr}$	
Air Intake Rate=	1.2	$\frac{m^3}{hr}$	Based on STANDARD MAN working light

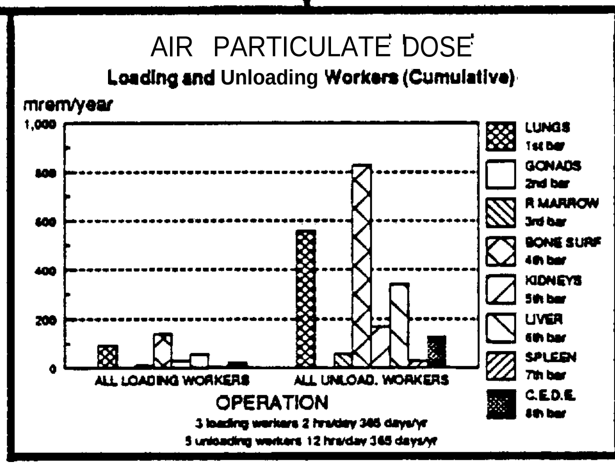
A2.2.2 Results

By inputting the appropriate values for different operations the following results were obtained:

	LUNGS	GONADS	R MARROW	BONE SURF	KIDNEYS	LIVER	SPLEEN	C.E.D.E.
	mrem/yr	mrem/yr	mrem/yr	mrem/yr	mrem/yr	mrem/yr	mrem/yr	mrem/yr
LOADING WORKER	2.6E+01	0.0E+00	2.7E+00	3.8E+01	7.7E+00	1.6E+01	1.2E+00	5.9E+00
UNLOADING WORKER	6.1E+01	0.0E+00	6.4E+00	9.1E+01	1.8E+01	3.7E+01	3.0E+00	1.4E+01
LOADING .1 MILES	3.1E+00	0.0E+00	3.2E-01	4.6E+00	9.4E-01	1.9E+00	1.5E-01	7.2E-01
LOADING .6 MILES	8.9E-01	0.0E+00	9.2E-02	1.3E+00	2.7E-01	5.4E-01	4.3E-02	2.0E-01
UNLOADING 2 MILES	4.3E-01	0.0E+00	4.5E-02	6.4E-01	1.3E-01	2.6E-01	2.1E-02	1.0E-01
ALL LOADING WORKERS	9.3E+01	0.0E+00	9.7E+00	1.4E+02	2.8E+01	5.7E+01	4.5E+00	2.1E+01
ALLUNLOAO. WORKERS	5.6E+02	0.0E+00	5.8E+01	8.3E+02	1.7E+02	3.4E+02	2.7E+01	1.3E+02







A2.2.3 Discussion of Input Variables for Each Filter Cake Operation

- Ratio sp Activity will remain **constant** — **2.4E-06** $\frac{g}{\mu g}$
- Airborne Dust will **remain constant** — 512 $\frac{\mu g}{m^3}$
- Air Intake Rate will remain **constant** — **1.2** $\frac{m^3}{hr}$

A2.2.3.1 Truck Loading Operation

- (4)**Each** of the four power plants will on average ship one truck load of filter cake per day, 365 days per year. This is based on using 25 yd^3 capacity truck to haul 18 yd^3 of filter cake per day.
- 3 employees will be involved in the loading process for a period of 2 hours **per** day per employee. This is based on the used of excavating equipment capable of moving 18 yd^3 of material at the rate of 12 yd^3 per hr.
- Each employee will work at a distance of 3 feet from the filter cake.
- Each employee works a maximum of 300 days per year.

Maximally exposed Indlvldual at each facllity:

At a distance of 3 feet the **%** Dust Applicable 100%
hrs Exposed 2 $\frac{hrs}{day}$
People Expose is **1**
Days Yr Exposed 300 $\frac{days}{yr}$

The detailed results are in the back **of** this appendix under the heading "TRUCK LOADING WORKER ANNUAL AIR PARTICULATE DOSE.

RESULTS:

	LUNGS	GONADS	R MARROW	BONE SURF	KIDNEYS	LIVER	SPLEEN	C.E.D.E.
	$\frac{mrem}{yr}$	$\frac{mrem}{yr}$	$\frac{mrem}{yr}$	$\frac{mrem}{yr}$	$\frac{mrem}{yr}$	$\frac{mrem}{yr}$	$\frac{mrem}{yr}$	$\frac{mrem}{yr}$
LOADING WORKER	2.6E+01	0.0E+00	2.7E+00	3.8E+01	7.7E+00	1.6E+01	1.2E+00	5.9E+00

Total annual dose to **all workers at each facility:**

At a distance of 3 feet the **%** Dust Applicable **100 %**
hrs Exposed 2 $\frac{hrs}{day}$
People Expose is 3
Days Yr Exposed 365 $\frac{days}{yr}$

*(4)***Refer** to Section **B1.1** for more details.

The detailed results **are in the back of this appendix under the heading** “ALL TRUCK LOADING **WORKERS TOTAL ANNUAL** AIR PARTICULATE **DOSE.**

RESULTS:

	LUNGS	GONADS	A MARROW	BONE SURF	KIDNEYS	LIVER	SPLEEN	C.E.D.E.
	$\frac{mrem}{yr}$	$\frac{mrem}{yr}$	$\frac{mrem}{yr}$	$\frac{mrem}{yr}$	$\frac{mrem}{yr}$	$\frac{mrem}{yr}$	$\frac{mrem}{yr}$	$\frac{mrem}{yr}$
ALL LOADING WORKERS	9.3E+01	0.0E+00	9.7E+00	1.4E+02	2.8E+01	5.7E+01	4.5E+00	2.1E+01

A2.2.3.2 Off-Site Non Occupational Gamma Dose (Loading)

- Nearest permanent resident to each loading facility is no closer than 0.5 miles from the site boundary (@ 0.1 miles), or a total of **0.6** miles from the filter cake.
- Filter cake operations occur 2 hours per day, 365 days per year. **Particulates** are assumed **to be in** the air no more than 4 hours per day.
- **An observer at** the site boundary and a resident are assumed to be standing at the 0.1 mile and 0.6 miles locations from the filter cake during the same 4 hours (365 days per year) when filter cake operation occur.

At the site boundary (0.1 mites from filter cake):

At a distance of 0.1 miles the % Dust Applicable 5 %

\# hrs Exposed 4 $\frac{hrs}{day}$

\# People Expose is 1

\# Days **Yr** Exposed 365 $\frac{days}{yr}$

The detailed results are in the back of this appendix under the heading "OFF TRUCK LOADING SITE ANNUAL AIR PARTICULATE DOSE AT 0.1 MILE BOUNDARY."

RESULTS:

	LUNGS	GONADS	R MARROW	BONE SURF	KIDNEYS	LIVER	SPLEEN	C.E.D.E.
	$\frac{mrem}{yr}$	$\frac{mrem}{yr}$	$\frac{mrem}{yr}$	$\frac{mrem}{yr}$	$\frac{mrem}{yr}$	$\frac{mrem}{yr}$	$\frac{mrem}{yr}$	$\frac{mrem}{yr}$
LOADING .1 MILES	3.1E+00	0.0E+00	3.2E-01	4.6E+00	9.4E-01	1.9E+00	1.5E-01	7.2E-01

At the resident boundary (0.6 miles from filter cake):

At a distance of 0.6 miles the % Dust Applicable 0.63 %

\# hrs Exposed 4 $\frac{hrs}{day}$

\# People Expose is, 1

\# Days Yr Exposed 365 $\frac{days}{yr}$

The detailed results are in the back of this appendix under the heading "OFF TRUCK LOADING SITE ANNUAL AIR PARTICULATE DOSE AT 0.6 MILE RESIDENT."

RESULTS:

	LUNGS	GONADS	R MARROW	BONE SURF	KIDNEYS	LIVER	SPLEEN	C.E.D.E.
	$\frac{mrem}{yr}$	$\frac{mrem}{yr}$	$\frac{mrem}{yr}$	$\frac{mrem}{yr}$	$\frac{mrem}{yr}$	$\frac{mrem}{yr}$	$\frac{mrem}{yr}$	$\frac{mrem}{yr}$
LOADING .6 MILES	5.2E-01	0.0E+00	5.4E-02	7.6E-01	1.6E-01	3.1E-01	2.5E-02	1.2E-01

A2.2.3.3 Transportation of Filter Cake to Monofill Facility

Air particulates doses during the transport of the filter cake to Monofill facility will be negligible because of the use of a tarpaulincoveroverthe filter cake and because any fugitive dust released **will rapidly disperse and be diluted:**

A2.2.3.4 Unloading and Emplacement Operation

- The Monofill facility will receive **4** truck loads of filter cake per day, 365 days per year.
- 5 employees will be involved in the unloading of the trucks, emplacement in the cell. washing of the trucks after unloading, and maintenance operations including grading and compacting **of** the material and spraying of a sealant. Each employee will work a maximum of 6 hours per day but the facility will be in operation for 12 hours per day.
- 100% total exposure air particulate dose is assumed for 4 hours per day and, 20% total exposure of air particulate dose is assumed for the remainder of the 6 hour work day per employee.
- Each employee works a maximum of 300 days per year.

Maximally exposed Individual at Monofill facility:

At **a** distance of 3 feet the **%** Dust Applicable 100%

hrs Exposed **4.8** $\frac{hrs}{day}$

\# People Expose is 1

\# Days Yr Exposed 300 $\frac{days}{yr}$

The detailed results are in the back of this appendix under the heading "UNLOADING AND EMPLACEMENT WORKER ANNUAL AIR PARTICULATE DOSE."

RESULTS:

	LUNGS	GONADS	A MARROW	BONE SURF	KIDNEYS	LIVER	SPLEEN	C.E.D.E.
	$\frac{mrem}{yr}$	$\frac{mrem}{yr}$	$\frac{mrem}{yr}$	$\frac{mrem}{yr}$	$\frac{mrem}{yr}$	$\frac{mrem}{yr}$	$\frac{mrem}{yr}$	$\frac{mrem}{yr}$
UNLOADING WORKER	6.1E+01	0.0E+00	6.4E+00	9.1E+01	1.8E+01	3.7E+01	3.0E+00	1.4E+01

Total annual dose to all workers at **Monofill facility:**

At a distance of 3 feet the % Dust Applicable 100%

\# hrs Exposed 7.2 $\frac{hrs}{day}$

\# People Expose is 5

\# Days Yr Exposed 365 $\frac{days}{yr}$

The detailed results are in the back of this appendix under the heading "ALL UNLOADING AND EMPLACEMENT WORKERS TOTAL ANNUAL AIR PARTICULATE DOSE."

RESULTS:

	LUNGS	GONADS	R MARROW	BONE SURF	KIDNEYS	LIVER	SPLEEN	C.E.O.E.
	mrem/yr	mrem/yr	mrem/yr	mrem/yr	mrem/yr	mrem/yr	mrem/yr	mrem/yr
ALL UNLOAD. WORKERS	5.6E+02	0.0E+00	5.8E+01	8.3E+02	1.7E+02	3.4E+02	2.7E+01	1.3E+02

A2.2.3.5 Off-Site Non Occupational Gamma Dose (Unloading)

- Nearest permanent resident to the Monofill facility is at a distance of 2 miles.
- Filter cake operations occur 12 hours per day, 365 days per year. Particulates are assumed to be in the air no more than 8 hours per day at 100% total exposure air particulate dose, and 16 hours per day at 20% total exposure of air particulate dose.
- An observer is very conservatively assumed to be at the resident location and is to be standing "out doors" for the duration of the entire daily Monofill operations, 365 days per year.

At the resident location (2 **miles** from the **Monofill** operations):

At a distance of 2 miles the % Dust Applicable 0.25 %

\# hrs Exposed 11.2 $\frac{hrs}{day}$

\# People Exposed 1

\# Days Yr Exposed 365 $\frac{days}{yr}$

The detailed results are in the back of this appendix under the heading "OFF UNLOADING AND EMPLACEMENT SITE ANNUAL AIR PARTICULATE DOSE AT 2 MILE RESIDENT."

RESULTS:

	LUNGS	GONADS	A MARROW	BONE SURF	KIDNEYS	LIVER	SPLEEN	C.E.D.E.
	mrem/yr	mrem/yr	mrem/yr	mrem/yr	mrem/yr	mrem/yr	mrem/yr	mrem/yr
UNLOADING 2 MILES	4.3E-01	0.0E+00	4.5E-02	6.4E-01	1.3E-01	2.6E-01	2.1E-02	1.0E-01

TRUCK LOADING WORKER
ANNUAL AIR PARTICULATE DOSE

Ratio sp Activity=	2.4E-06	g/µg	From final Generic EIS on Uranium Milling
Airborne Dust=	512	µg/m^3	
% Dust Applicable=	100	percent	Based on the location of exposure
# hrs Exposed=	2	hrs/day	
# People Exposed=	1		
# Days Yr Exposed=	300	days/yr	
Air Intake Rate=	1.2	m^3/hr	Based on STANDARD MAN working light

		50-YEAR COMMITTED DOSE EQUIVALENT FACTORS -- rem/µCi INTAKE							
ISOTOPE	pCi/g	LUNGS Rem/µCi	GONADS Rem/µCi	R MARROW Rem/µCi	BONE SURF Rem/µCi	KIDNEYS Rem/µCi	LIVER Rem/µCi	SPLEEN Rem/µCi	C.E.D.E. Rem/µCi
Ra-226	254	5.9E+01	–	–	2.8E+01	–	–	–	7.9E+00
Rn-222	254	–	–	–	–	–	–	–	–
Po-218	254	–	–	–	–	–	–	–	–
Pb-214	206	5.6E-02	–	–	–	–	–	–	6.7E-03
Bi-214	173	4.8E-02	–	–	–	1.6E-02	–	–	6.3E-03
Po-214	173	–	–	–	–	–	–	–	–
Pb-210	173	–	–	1.4E+01	2.0E+02	2.6E+01	5.6E+01	–	1.3E+01
Bi-210	173	1.6E+00	–	–	–	2.1E-01	–	–	1.9E-01
Po-210	173	4.8E+01	–	–	–	2.4E+01	4.4E+01	8.1E+00	8.1E+00
Ra-228	183	2.7E+01	–	2.7E+00	–	–	–	–	4.2E+00
Ac-228	183	9.3E-01	–	4.1E-01	5.2E+00	–	1.4E+00	–	2.9E-01
Th-228	NO DATA	3.5E+02		4.1E+02	5.2E to3				3.1E+02
Th-224	44	2.4E+00	–						2.9E+00
Rn-220	44	–							
Po-216	44	–							
Pb-212	42	7.4E-01	–	1.2E-01	1.4E+00		1.8E-01	–	1.6E-01
Bi-212	41	1.4E-01	–			1.0E-01			2.1E-02
Po-212	27	–	–	–	–	–	–	–	–
Tl-208	16	–	–	–		–	–	–	–

			COMPUTED VALUES mrem/yr							
ISOTOPE	CONC.AIR Pci/m^3	CONC.IN Pci/yr	LUNGS mrem/yr	GONADS mrem/yr	R MARROW mrem/yr	BONE SURF mrem/yr	KIDNEYS mrem/yr	LIVER mrem/yr	SPLEEN mrem/yr	C.E.D.E. mrem/yr
Ra-226	3.1E-01	2.2E+02	1.3E+01	0.0E+00	0.0E+00	6.3E+00	0.0E+00	0.0E+00	0.0E+00	1.8E+00
Rn-222	3.1E-01	2.2E+02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Po-218	3.1E-01	2.2E+02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E +oo	0.0E+00	0.0E+00
Pb-214	2.5E-01	1.8E+02	1.0E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.2E -03
Bi-214	2.1E-01	1.5E+02	7.3E-03	0.0E+00	0.0E+00	0.0E+00	2.4E-03	0.0E+00	0.0E+00	9.6E-04
Po-214	2.1E-01	1.5E+02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Pb-210	2.1E-01	I 5E+02	0.0E+00	0.0E+00	2.1E+00	3.1E+01	4 0E+00	8.6E+00	0.0E+00	2.0E+00
Bi-210	2.1E-01	1 5E+02	2 4E-01	0.0E+00	0.0E+00	0.0E+00	3.2E-02	0.0E+00	0.0E+00	2.9E -02
Po-210	2.1E-01	1.5E+02	7.3E+00	0.0E+00	0.0E+00	0.0E+00	3.7E+00	6.7E+00	1.2E+00	1 .2E+00
Ra-228	2 2E-01	1 6E+02	4.4E+00	0.0E+00	4.4E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.8E-01
Ac-228	2.2E-01	1.6E t02	1.5E-01	0.0E+00	6.6E-02	8.4E-01	0.0E+00	2.3E-01	0.0E+00	4.7E-02
Th-228	ooftoo	0.0E too	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Th-224	5 4E-02	3 9E+01	9.x-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.1E-01
Rn-220	5.4E-02	3.9E to1	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Po-216	5.4E-02	3.9E to1	ooftoo	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Pb-212	5.2E-02	3 7E+01	2.7E-02	0.0E+00	4.5E-03	5.2E-02	0.0E+00	6.7E-03	0.0E+00	5.9E-03
Bi-212	5.0E-02	3.6E+01	5.1E-03	0.0E+00	0.0E+00	0.0E +oo	3.6E-03	0.0E+00	0.0E+00	7.6E-04
Po-212	3.3E -02	2 4E+01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E +oo	0.0E+00	0.0E+00
Tl-208	2 of-02	1 4E+01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
		SUM-	2.6E+01	0.0E+00	2.7E+00	3.8E+01	7.7E+00	1.6E+01	1.2E+00	5.9E+00

ALL TRUCK LOADING WORKERS
TOTAL ANNUAL AIR PARTICULATEDOSE

Ratio sp Activity=	2.4E-06	g/µg	From final Generic EIS on Uranium Milling
Airborne Dust=	512	µg/m^3	
% Dust Applicable=	100	percent	Based on the location of exposure
# hrs Exposed=	2	hrs/day	
# People Exposed=	3		
# Days Yr Exposed=	365	days/yr	
Air Intake Rate=	1.2	m^3/hr	Based on STANDARD MAN working light

			50-YEAR COMMITTED DOSE EQUIVALENT FACTORS -- rem/µCi INTAKE								
ISOTOPE	pCi/g	LUNGS Rem/µCi	GONADS Rem/µCi	R MARROW Rem/µCi	BONE SURF Rem/µCi	KIDNEYS Rem/µCi	LIVER Rem/µCi	SPLEEN Rem/µCi	C.E.D.E. Rem/µCi	CONC.AIR Pci/m^3	CONC.IN Pci/yr
Ra-226	254	5.9E+01			2.8E+01				7.9E+00	3.1E-01	8.2E+02
Rn-222	254	–	–	–	–	–	–	–	–	3.1E-01	8.2E+02
Po-218	254	–	–	–	–	–	–	–	–	3.1E-01	8.2E+02
Pb-214	206	5.6E-02	–	–	–	–	–	–	6.7E-03	2.5E-01	6.7E+02
Bi-214	173	4.8E-02	–	–	–	1.6E-02	–	–	6.3E-03	2.1E-01	5.6E+02
Po-214	173	–	–	–	–	–	–	–	–	2.1E-01	5.6E+02
Pb-210	173	–	–	1.4E+01	2.0E+02	2.6E+01	5.6E+01	–	1.3E+01	2.1E-01	5.6E+02
Bi-210	173	1.6E+00	–	–	–	2.1E-01	–	–	1.9E-01	2.1E-01	5.6E+02
Po-210	173	4.8E+01	–	–	–	2.4E+01	4.4E+01	8.1E+00	8.1E+00	2.1E-01	5.6E+02
Ra-228	183	2.7E+01	–	2.7E+00	–	–	–	–	4.2E+00	2.2E-01	5.9E+02
Ac-228	183	9.3E-01	–	4.1E-01	5.2E+00	–	1.4E+00	–	2.9E-01	2.2E-01	5.9E+02
Th-228	NO DATA	3.5E+02		4.1E+02	5.2E+03				3.1E+02	0.0E+00	0.0E+00
Ra-224	44	2.4E+00	–	–	–	–	–	–	2.9E+00	5.4E-02	1.4E+02
Rn-220	44	–	–	–	–	–	–	–	–	5.4E-02	1.4E+02
Po-216	44	–	–	–	–	–	–	–	–	5.4E-02	1.4E+02
Pb-212	42	7.4E-01	–	1.2E-01	1.4E+00		1.8E-01	–	1.6E-01	5.2E-02	1.4E+02
Bi-212	41	1.4E-01	–			1.0E-01		–	2.1E-02	5.0E-02	1.3E+02
Po-212	27	–	–	–	–	–	–	–	–	3.3E-02	8.7E+01
Tl-208	16	–	–	–	–	–	–	–	–	2.0E-02	5.2E+01

	COMPUTED VALUES mrem/yr							
ISOTOPE	LUNGS mrem/yr	GONADS mrem/yr	R MARROW mrem/yr	BONE SURF mrem/yr	KIDNEYS mrem/yr	LIVER mrem/yr	SPLEEN mrem/yr	C.E.D.E. mrem/yr
Ra-226	4.8E+01	0.0E+00	0.0E+00	2.3E+01	0.0E+00	0.0E+00	0.0E+00	6.5E+00
Rn-222	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Po-218	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Pb-214	3.7E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.5E-03
Bi-214	2.7E-02	0.0E+00	0.0E+00	0.0E+00	8.9E-03	0.0E+00	0.0E+00	3.5E-03
Po-214	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Pb-210	0.0E+00	0.0E+00	7.8E+00	1.1E+02	1.5E+01	3.1E+01	0.0E+00	7.3E+00
Bi-210	8.9E-01	0.0E+00	0.0E+00	0.0E+00	1.2E-01	0.0E+00	0.0E+00	1.1E-01
Po-210	2.7E+01	0.0E+00	0.0E+00	0.0E+00	1.3E+01	2.5E+01	4.5E+00	4.5E+00
Ra-228	1.6E+01	0.0E+00	1.6E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.5E+00
Ac-228	5.5E-01	0.0E+00	2.4E-01	3.1E+00	0.0E+00	8.3E-01	0.0E+00	1.7E-01
Th-228	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Ra-224	3.4E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.1E-01
Rn-220	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Po-216	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Pb-212	1.0E-01	0.0E+00	1.6E-02	1.9E-01	0.0E+00	2.4E-02	0.0E+00	2.2E-02
Bi-212	1.9E-02	0.0E+00	0.0E+00	0.0E+00	1.3E-02	0.0E+00	0.0E+00	2.8E-03
Po-212	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Tl-208	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SUM=	9.3E+01	0.0E+00	9.7E+00	1.4E+02	2.8E+01	5.7E+01	4.5E+00	2.1E+01

OFF TRUCK LOADING SITE
ANNUAL AIR PARTICULATE DOSE
AT 0.1 MILE BOUNDARY

Ratio sp Activity=	2.4E-06	g/µg	From final Generic EIS on Uranium Milling
Airborne Dust=	512	µg/m^3	
% Dust Applicable=	5	percent	Based on the location of exposure
# hrs Exposed=	4	hrs/day	
# People Exposed=	1		
# Days Yr Exposed=	365	days/yr	
Air Intake Rate=	1.2	m^3/hr	Based on STANDARD MAN working light

		50-YEAR COMMITTED DOSE EQUIVALENT FACTORS -- rem/µCi INTAKE									
ISOTOPE	pCi/g	LUNGS Rem/µCi	GONADS Rem/µCi	R MARROW Rem/µCi	BONE SURF Rem/µCi	KIDNEYS Rem/µCi	LIVER Rem/µCi	SPLEEN Rem/µCi	C.E.D.E. Rem/µCi	CONC.AIR Pci/m^3	CONC.IN Pci/yr
Ra-226	254	5.9E+01			2.8E+01				7.9E+00	1.6E-02	2.7E+01
Rn-222	254	–	–	–	–	–	–	–	–	1.6E-02	2.7E+01
Po-218	254	–	–	–	–	–	–	–	–	1.6E-02	2.7E+01
Pb-214	206	5.6E-02	–	–	–	–	–	–	6.7E-03	1.3E-02	2.2E+01
Bi-214	173	4.8E-02	–	–	–	1.6E-02	–	–	6.3E-03	1.1E-02	1.9E+01
Po-214	173	–	–	–	–	–	–	–	–	1.1E-02	1.9E+01
Pb-210	173	–	–	1.4E+01	2.0E+02	2.6E+01	5.6E+01	–	1.3E+01	1.1E-02	1.9E+01
Bi-210	173	1.6E+00	–	–	–	2.1E-01	–	–	1.9E-01	1.1E-02	1.9E+01
Po-210	173	4.8E+01	–	–	–	2.4E+01	4.4E+01	8.1E+00	8.1E+00	1.1E-02	1.9E+01
Ra-228	183	2.7E+01	–	2.7E+00	–	–	–	–	4.2E+00	1.1E-02	2.0E+01
Ac-228	183	9.3E-01	–	4.1E-01	5.2E+00	–	1.4E+00	–	2.9E-01	1.1E-02	2.0E+01
Th-228	NO DATA	3.5E+02		4.1E+02	5.2E+03				3.1E+02	0.0E+00	0.0E+00
Ra-224	44	2.4E+00	–	–	–	–	–	–	2.9E+00	2.7E-03	4.7E+00
Rn-220	44	–	–	–	–	–	–	–	–	2.7E-03	4.7E+00
Po-216	44	–	–	–	–	–	–	–	–	2.7E-03	4.7E+00
Pb-212	42	7.4E-01	–	1.2E-01	1.4E+00		1.8E-01	–	1.6E-01	2.6E-03	4.5E+00
Bi-212	41	1.4E-01	–			1.0E-01		–	2.1E-02	2.5E-03	4.4E+00
Po-212	27	–	–	–	–	–	–	–	–	1.7E-03	2.9E+00
Tl-208	16	–	–	–	–	–	–	–	–	9.8E-04	1.7E+00

			COMPUTED VALUES mrem/yr					
ISOTOPE	LUNGS mrem/yr	GONADS mrem/yr	R MARROW mrem/yr	BONE SURF mrem/yr	KIDNEYS mrem/yr	LIVER mrem/yr	SPLEEN mrem/yr	C.E.D.E. mrem/yr
Ra-226	1.6E+00	0.0E+00	0.0E+00	7.7E-01	0.0E+00	0.0E+00	0.0E+00	2.2E-01
Rn-222	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Po-218	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Pb-214	1.2E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.5E-04
Bi-214	8.9E-04	0.0E+00	0.0E+00	0.0E+00	3.0E-04	0.0E+00	0.0E+00	1.2E-04
Po-214	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Pb-210	0.0E+00	0.0E+00	2.6E-01	3.7E+00	4.8E-01	1.0E+00	0.0E+00	2.4E-01
Bi-210	3.0E-02	0.0E+00	0.0E+00	0.0E+00	3.9E-03	0.0E+00	0.0E+00	3.5E-03
Po-210	8.9E-01	0.0E+00	0.0E+00	0.0E+00	4.5E-01	8.2E-01	1.5E-01	1.5E-01
Ra-228	5.3E-01	0.0E+00	5.3E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	8.3E-02
Ac-228	1.8E-02	0.0E+00	8.1E-03	1.0E-01	0.0E+00	2.8E-02	0.0E+00	5.7E-03
Th-228	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Ra-224	1.1E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.4E-02
Rn-220	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Po-216	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Pb-212	3.3E-03	0.0E+00	5.4E-04	6.3E-03	0.0E+00	8.1E-04	0.0E+00	7.2E-04
Bi-212	6.2E-04	0.0E+00	0.0E+00	0.0E+00	4.4E-04	0.0E+00	0.0E+00	9.3E-05
Po-212	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Tl-208	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SUM-	3.1E+00	0.0E+00	3.2E-01	4.6E+00	9.4E-01	1.9E+00	1.5E-01	7.2E-01

OFF TRUCK LOADING SITE
ANNUAL AIR PARTICULATE DOSE
AT 0.6 MILE RESIDENT

Ratio sp Activity=	2.4E-06	g/µg	From final Generic EIS on Uranium Milling
Airborne Dust=	512	µg/m^3	
% Dust Applicable=	0.83	percent	Based on the location of exposure (5%*.1/.6)
# hrs Exposed=	4	hrs/day	
# People Exposed=	1		
# Days Yr Exposed=	365	days/yr	
Air Intake Rate=	1.2	m^3/hr	Based on STANDARD MAN working light

			50-YEAR COMMITTED DOSE EQUIVALENT FACTORS -- rem/µCi INTAKE						
		LUNGS	GONADS	R MARROW	BONE SURF	KIDNEYS	LIVER	SPLEEN	C.E.D.E.
ISOTOPE	pCi/g	Rem/µCi	Rem/µCi	Rem/µCi	Rem/µCi	Rem/µCi	Rem/µCi	Rem/µCi	Rem/µCi
Ra-226	254	5.9E+01			2.8E+01				7.9E+00
Rn-222	254	-	-	-	-	-	-	-	-
Po-218	254	-	-	-	-	-	-	-	-
Pb-214	206	5.6E-02	-	-	-	-	-	-	6.7E-03
Bi-214	173	4.8E-02	-	-	-	1.6E-02	-	-	6.3E-03
Po-214	173	-	-	-	-	-	-	-	-
Pb-210	173	-	-	1.4E+01	2.0E+02	2.6E+01	5.6E+01	-	1.3E+01
Bi-210	173	1.6E+00	-	-	-	2.1E-01	-	-	1.9E-01
Po-210	173	4.8E+01	-	-	-	2.4E+01	4.4E+01	8.1E+00	8.1E+00
Ra-228	183	2.7E+01	-	2.7E+00	-	-	-	-	4.2E+00
Ac-228	183	9.3E-01	-	4.1E-01	5.2E+00	-	1.4E+00	-	2.9E-01
Th-228	NO DATA	3.5E+02		4.1E+02	5.2E+03				3.1E+02
Ra-224	44	2.4E+00	-	-	-	-	-	-	2.9E+00
Rn-220	44	-	-	-	-	-	-	-	-
Po-216	44	-	-	-	-	-	-	-	-
Pb-212	42	7.4E-01	-	1.2E-01	1.4E+00		1.8E-01	-	1.6E-01
Bi-212	41	1.4E-01	-			1.0E-01		-	2.1E-02
Po-212	27	-	-	-	-	-	-	-	-
Tl-208	16	-	-	-	-	-	-	-	-

			COMPUTED VALUES mrem/yr							
	CONC.AIR	CONC.IN	LUNGS	GONADS	R MARROW	BONE SURF	KIDNEYS	LIVER	SPLEEN	C.E.D.E.
ISOTOPE	Pci/m^3	Pci/yr	mrem/yr	mrem/yr	mrem/yr	mrem/yr	mrem/yr	mrem/yr	mrem/yr	mrem/yr
Ra-226	2.6E-03	4.5E+00	2.7E-01	0.0E+00	0.0E+00	1.3E-01	0.0E+00	0.0E+00	0.0E+00	3.6E-02
Rn-222	2.6E-03	4.5E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Po-218	2.6E-03	4.5E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Pb-214	2.1E-03	3.7E+00	2.1E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.5E-05
Bi-214	1.8E-03	3.1E+00	1.5E-04	0.0E+00	0.0E+00	0.0E+00	4.9E-05	0.0E+00	0.0E+00	1.9E-05
Po-214	1.8E-03	3.1E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Pb-210	1.8E-03	3.1E+00	0.0E+00	0.0E+00	4.3E-02	6.2E-01	8.0E-02	1.7E-01	0.0E+00	4.0E-02
Bi-210	1.8E-03	3.1E+00	4.9E-03	0.0E+00	0.0E+00	0.0E+00	6.5E-04	0.0E+00	0.0E+00	5.9E-04
Po-210	1.8E-03	3.1E+00	1.5E-01	0.0E+00	0.0E+00	0.0E+00	7.4E-02	1.4E-01	2.5E-02	2.5E-02
Ra-228	1.9E-03	3.3E+00	8.8E-02	0.0E+00	8.8E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.4E-02
Ac-228	1.9E-03	3.3E+00	3.0E-03	0.0E+00	1.3E-03	1.7E-02	0.0E+00	4.6E-03	0.0E+00	9.5E-04
Th-228	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Ra-224	4.5E-04	7.9E-01	1.9E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.3E-03
Rn-220	4.5E-04	7.9E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Po-216	4.5E-04	7.9E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Pb-212	4.3E-04	7.5E-01	5.6E-04	0.0E+00	9.0E-05	1.1E-03	0.0E+00	1.4E-04	0.0E+00	1.2E-04
Bi-212	4.2E-04	7.3E-01	1.0E-04	0.0E+00	0.0E+00	0.0E+00	7.3E-05	0.0E+00	0.0E+00	1.5E-05
Po-212	2.8E-04	4.8E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Tl-208	1.6E-04	2.9E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
		SUM=	5.2E-01	0.0E+00	5.4E-02	7.6E-01	1.6E-01	3.1E-01	2.5E-02	1.2E-01

UNLOADING AND EMPLACEMENT WORKER
ANNUAL AIR PARTICULATE DOSE

Ratio sp Activity=	2.4E-06	g/μg	From final Generic EIS on Uranium Milling
Airborne Dust=	512	μg/m^3	
% Dust Applicable=	100	percent	Based on the location of exposure
# hrs Exposed=	4.8	hrs/day	4+(4*80/400)
# People Exposed=	1		
# Days Yr Exposed=	300	days/yr	
Air Intake Rate=	1.2	m^3/hr	Based on STANDARD MAN working light

		50-YEAR COMMITTED DOSE EQUIVALENT FACTORS -- rem/μCi INTAKE										COMPUTED VALUES mrem/yr							
		LUNGS	GONADS	R MARROW	BONE SURF	KIDNEYS	LIVER	SPLEEN	C.E.D.E.	CONC.AIR	CONC.IN	LUNGS	GONADS	R MARROW	BONE SURF	KIDNEYS	LIVER	SPLEEN	C.E.D.E.
ISOTOPE	pCi/g	Rem/μCi	Rem/μCi	Rem/μCi	Rem/μCi	Rem/μCi	Rem/μCi	Rem/μCi	Rem/μCi	Pci/m^3	Pci/yr	mrem/yr	mrem/yr	mrem/yr	mrem/yr	mrem/yr	mrem/yr	mrem/yr	mrem/yr
Ra-226	254	5.9E+01			2.8E+01				7.9E+00	3.1E-01	5.4E+02	3.2E+01	0.0E+00	0.0E+00	1.5E+01	0.0E+00	0.0E+00	0.0E+00	4.3E+00
Rn-222	254	–	–	–	–	–	–	–	–	3.1E-01	5.4E+02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Po-218	254	–	–	–	–	–	–	–	–	3.1E-01	5.4E+02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Pb-214	206	5.6E-02	–	–	–	–	–	–	6.7E-03	2.5E-01	4.4E+02	2.4E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.9E-03
Bi-214	173	4.8E-02	–	–	–	1.6E-02	–	–	6.3E-03	2.1E-01	3.7E+02	1.8E-02	0.0E+00	0.0E+00	0.0E+00	5.9E-03	0.0E+00	0.0E+00	2.3E-03
Po-214	173	–	–	–	–	–	–	–	–	2.1E-01	3.7E+02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Pb-210	173	–	–	1.4E+01	2.0E+02	2.6E+01	5.6E+01	–	1.3E+01	2.1E-01	3.7E+02	0.0E+00	0.0E+00	5.1E+00	7.3E+01	9.6E+00	2.1E+01	0.0E+00	4.8E+00
Bi-210	173	1.6E+00	–	–	–	2.1E-01	–	–	1.9E-01	2.1E-01	3.7E+02	5.9E-01	0.0E+00	0.0E+00	0.0E+00	7.7E-02	0.0E+00	0.0E+00	7.0E-02
Po-210	173	4.8E+01	–	–	–	2.4E+01	4.4E+01	8.1E+00	8.1E+00	2.1E-01	3.7E+02	1.8E+01	0.0E+00	0.0E+00	0.0E+00	8.8E+00	1.6E+01	3.0E+00	3.0E+00
.										0.0E+00	0.0E+00								
Ra-228	183	2.7E+01	–	2.7E+00	–	–	–	–	4.2E+00	2.2E-01	3.9E+02	1.0E+01	0.0E+00	1.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.6E+00
AC-225	183	9.3E-01	–	4.1E-01	5.2E+00	–	1.4E+00	–	2.9E-01	2.2E-01	3.9E+02	3.6E-01	0.0E+00	1.6E-01	2.0E+00	0.0E+00	5.4E-01	0.0E+00	1.1E-01
Ih-225	No DATA	3.5E+02		4.1E+02	5.2E+03				3.1E+02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Ro-224	44	2.4E+00	–			–			2.9E+00	5.4E-02	9.3E+01	2.2E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.7E-01
an-220	44									5.4E-02	9.3E+01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Po-216	44	–								5.4E-02	9.3E+01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0Et00
Pb-212	42	7.4E-01	–	1.x-01	1.4E+00		1.8E-01	–	1.6E-01	5.2E-02	8.9E+01	6.6E-02	0.0E+00	1.X-02	1.2E-01	0.0E+00	1.6E-02	0.0E+00	1.4E-02
Bi-212	41	1.4E-01	–			1.0E-01			2.1E-02	5.0E-02	8.7E+01	1.2E-02	0.0E+00	0.0E+00	0.0E+00	8.7E-03	0.0E+00	0.0E+00	1.8E-03
Po-212	27	–	–	– –	–	–	–	–	3.X-02		5.7E+01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Tl-208	16	–		–	–	–	–	–	–	2.0E-02	3.4E+01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
											SUM=	6.1E+01	0.0E+00	6.4E+00	9.1E+01	1.8E+01	3.7E+01	3.0E+00	1.4E+01

ALL UNLOADING AND EMPLACEMENT WORKERS
TOTAL ANNUAL AIR PARTICULATE DOSE

Ratio sp Activity=	2.4E-06	g/µg	From final Generic EIS on Uranium Milling
Airborne Dust=	512	µg/m^3	
% Dust Applicable=	100	percent	Based on the location of exposure
# hrs Exposed=	7.2	hrs/day	6+(6*120/600)
# People Exposed=	5		
# Days Yr Exposed=	365	days/yr	
Air Intake Rate=	1.2	m^3/hr	Based on STANDARD MAN working light

ISOTOPE	pCi/g	50-YEAR COMMITTED DOSE EQUIVALENT FACTORS -- rem/µCi INTAKE: LUNGS Rem/µCi	GONADS Rem/µCi	R MARROW Rem/µCi	BONE SURF Rem/µCi	KIDNEYS Rem/µCi	LIVER Rem/µCi	SPLEEN Rem/µCi	C.E.D.E. Rem/µCi
Us-226	254	5.9E+01			2.8E+01				7.9E+00
Rn-222	254	–	–	–	–	–	–	–	–
Po-218	254	–	–	–	–	–	–	–	–
Pb-214	206	5.6E-02	–	–	–	–	–	–	6.7E-03
Bi-214	173	4.8E-02	–	–	–	1.6E-02	–	–	6.3E-03
Po-214	173	–	–	–	–	–	–	–	–
Pb-210	173	–	–	1.4E+01	2.0E+02	2.6E+01	5.6E+01	–	1.3E+01
Bi-210	173	1.6E+00	–	–	–	2.1E-01	–	–	1.9E-01
Po-210	173	4.8E+01	–	–	–	2.4E+01	4.4E+01	8.1E+00	8.1E+00
Ra-228	183	2.7E+01	–	2.7E+00	–	–	–	–	4.2E+00
Ac-228	183	9.3E-01	–	4.1E-01	5.2E+00	–	1.4E+00	–	2.9E-01
Th-228	NO DATA	3.5E+02		4.1E+02	5.2E+03				3.1E+02
Ra-224	44	2.4E+00	–	–	–	–	–	–	2.9E+00
Rn-220	44	–	–	–	–	–	–	–	–
Po-216	44	–	–	–	–	–	–	–	–
Pb-212	42	7.4E-01	–	1.2E-01	1.4E+00		1.8E-01	–	1.6E-01
Bi-212	41	1.4E-01	–			1.0E-01		–	2.1E-02
Po-212	27	–	–	–	–	–	–	–	–
Tl-208	16	–	–	–	–	–	–	–	–

ISOTOPE	CONC.AIR Pci/m^3	CONC.IN Pci/yr	LUNGS mrem/yr	GONADS mrem/yr	COMPUTED VALUES mrem/yr: R MARROW mrem/yr	BONE SURF mrem/yr	KIDNEYS mrem/yr	LIVER mrem/yr	SPLEEN mrem/yr	C.E.D.E. mrem/yr
Us-226	3.1E-01	4.9E+03	2.9E+02	0.0E+00	0.0E+00	1.4E+02	0.0E+00	0.0E+00	0.0E+00	3.9E+01
Rn-222	3.1E-01	4.9E+03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Po-218	3.1E-01	4.9E+03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Pb-214	2.5E-01	4.0E+03	2.2E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.7E-02
Bi-214	2.1E-01	3.4E+03	1.6E-01	0.0E+00	0.0E+00	0.0E+00	5.4E-02	0.0E+00	0.0E+00	2.1E-02
Po-214	2.1E-01	3.4E+03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Pb-210	2.1E-01	3.4E+03	0.0E+00	0.0E+00	4.7E+01	6.7E+02	8.7E+01	1.9E+02	0.0E+00	4.4E+01
Bi-210	2.1E-01	3.4E+03	5.4E+00	0.0E+00	0.0E+00	0.0E+00	7.0E-01	0.0E+00	0.0E+00	6.4E-01
Po-210	2.1E-01	3.4E+03	1.6E+02	0.0E+00	0.0E+00	0.0E+00	8.0E+01	1.5E+02	2.7E+01	2.7E+01
	0.0E+00	0.0E+00								
Ra-228	2.2E-01	3.5E+03	9.6E+01	0.0E+00	9.6E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.5E+01
Ac-228	2.2E-01	3.5E+03	3.3E+00	0.0E+00	1.5E+00	1.8E+01	0.0E+00	5.0E+00	0.0E+00	1.0E+00
Th-228	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Ra-224	5.4E-02	8.5E+02	2.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.5E+00
Rn-220	5.4E-02	8.5E+02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Po-216	5.4E-02	8.5E+02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Pb-212	5.2E-02	8.1E+02	6.0E-01	0.0E+00	9.8E-02	1.1E+00	0.0E+00	1.5E-01	0.0E+00	1.3E-01
Bi-212	5.0E-02	7.9E+02	1.1E-01	0.0E+00	0.0E+00	0.0E+00	7.9E-02	0.0E+00	0.0E+00	1.7E-02
Po-212	3.3E-02	5.2E+02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Tl-208	2.0E-02	3.1E+02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
		SUM=	5.6E+02	0.0E+00	5.8E+01	8.3E+02	1.7E+02	3.4E+02	2.7E+01	1.3E+02

OFF UNLOADING AND EMPLACEMENT SITE ANNUAL AIR PARTICULATE DOSE AT 0.1 MILE BOUNDARY

Ratio sp Activity=	2.4E-06	g/μg	From final Generic EIS on Uranium Milling
Airborne Dust=	512	μg/m^3	
% Dust Applicable=	5	percent	Based on the location of exposure
# hrs Exposed=	11.2	hrs/day	8+(8*320/800)
# People Exposed=	1		
# Days Yr Exposed=	365	days/yr	
Air Intake Rate=	1.2	m^3/hr	Based on STANDARD MAN working light

		50-YEAR COMMITTED DOSE EQUIVALENT FACTORS -- rem/μCi INTAKE										COMPUTED VALUES mrem/yr							
		LUNGS	GONADS	R MARROW	BONE SURF	KIDNEYS	LIVER	SPLEEN	C.E.D.E.	CONC.AIR	CONC.IN	LUNGS	GONADS	R MARROW	BONE SURF	KIDNEYS	LIVER	SPLEEN	C.E.D.E.
ISOTOPE	pCi/g	Rem/μCi	Rem/μCi	Rem/μCi	Rem/μCi	Rem/μCi	Rem/μCi	Rem/μCi	Rem/μCi	Pci/m^3	Pci/yr	mrem/yr	mrem/yr	mrem/yr	mrem/yr	mrem/yr	mrem/yr	mrem/yr	mrem/yr
Ra-226	254	5.9E+01			2.8E+01				7.9E+00	1.6E-02	7.7E+01	4.5E+00	0.0E+00	0.0E+00	2.1E+00	0.0E+00	0.0E+00	0.0E+00	6.0E-01
Rn-222	254	–	–	–	–	–	–	–	–	1.6E-02	7.7E+01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Po-218	254	–	–	–	–	–	–	–	–	1.6E-02	7.7E+01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Pb-214	206	5.6E-02	–	–	–	–	–	–	6.7E-03	1.3E-02	6.2E+01	3.5E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.2E-04
Bi-214	173	4.8E-02	–	–	–	1.6E-02	–	–	6.3E-03	1.1E-02	5.2E+01	2.5E-03	0.0E+00	0.0E+00	0.0E+00	8.3E-04	0.0E+00	0.0E+00	3.3E-04
Po-214	173	–	–	–	–	–	–		–	1.1E-02	5.2E+01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Pb-210	173	–	–	1.4E+01	2.0E+02	2.6E+01	5.6E+01	–	1.3E+01	1.1E-02	5.2E+01	0.0E+00	0.0E+00	7.3E-01	1.0E+01	1.4E+00	2.9E+00	0.0E+00	6.8E-01
Bi-210	173	1.6E+00	–	–	–	2.1E-01	–	–	1.9E-01	1.1E-02	5.2E+01	8.3E-02	0.0E+00	0.0E+00	0.0E+00	1.1E-02	0.0E+00	0.0E+00	9.9E-03
Po-210	173	4.8E+01	–	–	–	2.4E+01	4.4E+01	8.1E+00	8.1E+00	1.1E-02	5.2E+01	2.5E+00	0.0E+00	0.0E+00	0.0E+00	1.3E+00	2.3E+00	4.2E-01	4.2E-01
Ra-228	183	2.7E+01	–	2.7E+00	–	–	–	–	4.2E+00	1.1E-02	5.5E+01	1.5E+00	0.0E+00	1.5E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.3E-01
Ac-228	183	9.3E-01	–	4.1E-01	5.2E+00	–	1.4E+00	–	2.9E-01	1.1E-02	5.5E+01	5.1E-02	0.0E+00	2.3E-02	2.9E-01	0.0E+00	7.7E-02	0.0E+00	1.6E-02
Th-228	NO DATA	3.5E+02		4.1E+02	5.2E+03				3.1E+02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Ra-224	44	2.4E+00	–	–	–	–	–	–	2.9E+00	2.7E-03	1.3E+01	3.2E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.8E-02
Rn-220	44	–	–	–	–	–	–	–	–	2.7E-03	1.3E+01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Po-216	44	–	–	–	–	–	–	–	–	2.7E-03	1.3E+01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Pb-212	42	7.4E-01	–	1.2E-01	1.4E+00		1.8E-01	–	1.6E-01	2.6E-03	1.3E+01	9.4E-03	0.0E+00	1.5E-03	1.8E-02	0.0E+00	2.3E-03	0.0E+00	2.0E-03
Bi-212	41	1.4E-01	–			1.0E-01		–	2.1E-02	2.5E-03	1.2E+01	1.7E-03	0.0E+00	0.0E+00	0.0E+00	1.2E-03	0.0E+00	0.0E+00	2.6E-04
Po-212	27	–	–	–	–	–	–	–	–	1.7E-03	8.1E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Tl-208	16	–	–	–	–	–	–	–	–	9.8E-04	4.8E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
											SUM=	8.7E+00	0.0E+00	9.0E-01	1.3E+01	2.6E+00	5.3E+00	4.2E-01	2.0E+00

A3.0 RADON-222 AND RADON-220 (THORON) DOSE TO THE LUNG

The dose from inhalation of radon and thoron gases was estimated using the following approach:

(1) A specific flux ratio of $1 \frac{pCi\ Rn-222}{m^2-sec}$ per $\frac{pCi\ Ra-226}{g}$ was tested and $1 \frac{pCi\ Rn-222}{m^2-sec}$ per $\frac{pCi\ Ra-226}{g}$ was used

(2) All the filter cake is assumed to be exposed at the same time

(3) Theconservative ratio $\frac{Radon\ concentrations}{Radon\ flux} = 0.03 \frac{pCi/l}{pCi/m^2}$ for both radon and thoron (from Grand Junction Project)

(4) Thus the average estimated radon and thoron concentrations from the filter cake are:

$$C_{RN} = 254 \frac{pCi}{g} \times 1 \frac{\frac{pCi}{m^2 sec}}{pCi/g} \times 0.03 \frac{pCi/l}{\frac{pCi}{m^2 sec}} = 7.6 \frac{pCi}{l}$$

$$C_{RN} = 44 \frac{pCi}{g} \times 1 \frac{\frac{pCi}{m^2 sec}}{pCi/g} \times 0.03 \frac{pCi/l}{\frac{pCi}{m^2 sec}} = 1.3 \frac{pCi}{l}$$

where the maximum measured concentration of Ra-224 in the filter cake is 44 $\frac{pCi}{g}$

A3.1 Truck Loading Operation

A3.1.1 Occupational Radon and Thoron Doses

The combined radon.and thoron dose rate to the lung (DR) is:

$$DR = \left[\frac{(7.6+1.3)\frac{pCi}{l} \times \frac{0.06}{100\frac{pCi}{l}} \times 0.7 \frac{rad}{WLM} \times 20 \frac{rem}{rad} \times \frac{labor\ hrs}{year}}{170 \frac{hr}{WLM} \times 10^3 \frac{rem}{mrem}} \right] = 0.440 \frac{mrem}{hr} \times \frac{labor\ hrs}{year}$$

where: $\frac{0.06}{100\frac{pCi}{l}}$ daughter equilibrium factor (assume radon & thoron remain for 3 minutes)

20 = Quality factor to translate from rad to rem for alphas
170 = hours/working level month

The individual maximum annual lung dose for the truck loading operation is:

$$D = 0.440 \frac{mrem}{hr} \times 600 \frac{hr}{yr} = 264 \frac{mrem}{yr}$$

$$[C.E.D.E. = 31.7\ mrem]$$

and the total annual occupational dose to all workers at each power plant facility is:

$$D = 0.440 \frac{mrem}{hr} \times 730 \frac{hr}{yr} \times 3 = 963.6 \frac{mrem}{yr}$$

$$[C.E.D.E. = 112.4\ mrem]$$

A3.1.2 Offsite Non-Occupational Radon and Thoron Doses

The radon and thoron doses to the lungs of an occupant of the nearest residence, at 0.6 miles from the filter cake, is determined from:

$$DR = 0.440\frac{mrem}{hr}x\left[\frac{3ft}{3168ft}\right]^2 = 3.9\times10^{-7}\frac{mrem}{hr}$$

The assumptions used to calculate the residents' exposure are:

- Resident spends 100 percent of the time on their property; 75 percent inside the house and 25 percent outside
- Radon and thoron levels inside the house are one-half of those outside
- The radon and thoron levels decrease as a function of $\frac{1}{r^2}$ where r is the distance from the filter cake.

The indoor dose (D)i is therefore:

$$(D)i = 18\frac{hr}{day}\times365\frac{days}{yr}\times3.9\times10^{-7}\frac{mrem}{hr}\times0.5 = 0.0013\frac{mrem}{year}$$

the outdoor dose (D)o is:

$$(D)i = 6\frac{hr}{day}\times365\frac{days}{yr}\times3.9\times10^{-7}\frac{mrem}{hr} = 0.00085\frac{mrem}{year}$$

The total radon and thoron dose to the lungs of the closest resident to the power plant site is 0.002 $\frac{mrem}{year}$ $[C.E.D.E. = 0.0003\ mrem]$.

A3.2 Transport of Filter Cake to Monofill Facility

Radon and thoron doses during the transport of the filter cake to the Monofill facility will be negligible because any gaseous releases from the truck will be rapidly dispersed and deleted.

A3.3 Unloading and Emplacement of the Filter Cake

A3.3.1 Occupational Radon and Thoron Doses

Using dose rate of:

$$DR = 0.440\frac{mrem}{hr}\times\frac{Labor\ hrs}{year}$$ for the 4 hr/day period of truck unloading

and a dose rate of:

$$DR = 0.2\times\left[0.440\frac{mrem}{hr}\right]\times\frac{Labor\ hrs}{year}$$ for the remainder of the day,

based on the conservative assumption that crusting of the surface of the emplaced fitter cake and other dust suppression methods reduce emanation by 80%, gives an individual occupational lung dose of:

$$D = 0.440\frac{mrem}{hr}X\ 1200\frac{hr}{yr} + 0.2\left[0.440\frac{mrem}{hr}\times1200\frac{hr}{yr}\right]$$

$$D = 634\frac{mrem}{yr} \qquad [C.E.D.E. = 76\ mrem]$$

and the total annual occupational dose to all workers at the Monofill facility is:

$$D = 0.440\frac{mrem}{hr} \times 4 \times 365\frac{hr}{yr} \times 5 + 0.2\left[0.440\frac{mrem}{hr} \times 8 \times 365\frac{hr}{yr}\right] \times 5$$

$$D = 4496.8\frac{mrem}{yr} \qquad [C.E.D.E. = 540\ mrem]$$

A3.3.2 Offsite Non-Occupational Radon and Thoron Doses

Since the concentrations of radon and thoron in the air will be reduced to essentially background as a result of dispersion and dilution in the 2.0 mile distance to the Elmore Desert Ranch, lung doses from this source at this nearest residence are negligible.

APPENDIX F

PRELIMINARY DRAINAGE CALCULATIONS

SUBJECT MONOFILL - DESERT VALLEY COMPANY - CA.					SHEET 1 OF 7
PRELIM. DRAINAGE CALC'S					
JOB NO. 2017	CHARGE NO.	BY K J Stoyer	DATE 5/12/89	CHECKED BY C Oliver	DATE 5/15/89

PURPOSE:

1. DETERMINE PEAK FLOWS (Q_{100}) to ACCESS Rdwy.
2. SIZE DRAINAGE CROSSINGS @ Rdwy. FOR Q_{100}
3. SIZE DIVERSION BERM SYSTEM @ LANDFILL SITE FOR Q_{100}

BASIC DATA:

1. CALTRANS HIGHWAY DESIGN MANUAL NOMOGRAPH FOR "DESIGN DISCHARGE FOR SMALL BASINS" FIG. 7-811.2 FOR Q_{100} FLOWS
2. RUNOFF COEFFICIANT = 0.60 - ROLLING BARRENS
3. GEOGRAPHICAL CLASSIFICATION = G
4. MAX. VELOCITY 6 fps FOR UNLINED CHANNEL
5. N = 0.014 for ASPHALT Rdwy. N = 0.016 FOR ~~EARTH~~ CHANNEL
6. USGS 7.5' QUAD KANE SPRING, CALIF 1956

ASSUMPTIONS: AS GIVEN IN BODY of CALCULATIONS

SKETCHES: INCLUDED IN BODY of CALCULATIONS

CALCULATIONS:

A. DRAINAGE AREAS to PROPOSED ACCESS Rdwy. SEE SKETCH SHEET 7 OF 7

1. AREA #1 = 58.9 ACRES (by PLANIMETER)
$\Delta H = 35'$
$L = 4,000'$
$S = 0.88\%$
$TC = 28$ MIN.
$Q_{100} = \underline{85 cfs}$

SUBJECT MONOFILL - DESERT VALLEY COMPANY - G.					SHEET 2 OF 7
PRELIM. DRAINAGE CALC'S.					
JOB NO. 2017	CHARGE NO.	BY KJS.	DATE 5/12/89	CHECKED BY C Olu	DATE 5/15/89

2. AREA #2 = 391.4 ACRES
ΔH = 80'
L = 7,500'
S = 1.07%
TC = 40 MIN.
Q_{100} = 500 cfs

3. AREA #3 = 440.9 ACRES
ΔH = 240'
L = 16,000'
S = 1.50%
TC = 1.05 hrs.
Q_{100} = 550 cfs

4. AREA #4 = 229.6 ACRES
ΔH = 160'
L = 12,000'
S = 1.33%
TC = 55 MIN.
Q_{100} = 275 cfs

5. AREA #5 = 239.0 ACRES
ΔH = 230'
L = 14,500'
S = 1.59%
TC = 52 MIN.
Q_{100} = 290 cfs

6. AREA #6 = 135.6 ACRES
ΔH = 120'
L = 8,000'
S = 1.50%
TC = 40 MIN.
Q_{100} = 175 cfs

7. AREA #7 = 23.8 ACRES
ΔH = 35'
L = 2,000'
S = 1.75%
TC = 15 MIN.
Q_{100} = 50 cfs

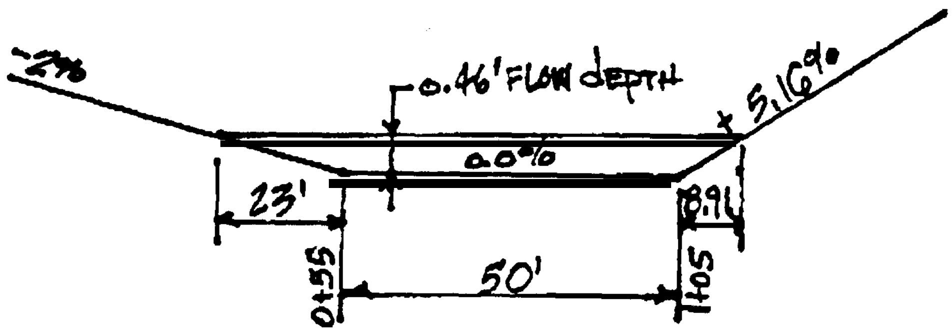
HDC-9009
REV. A

THE DOW CHEMICAL COMPANY
ENGINEERING AND CONSTRUCTION SERVICES

SUBJECT: MONOFILL - DESERT VALLEY COMPANY - CA.					SHEET 3 OF 7
PRELIM. DRAINAGE CALC'S.					
JOB NO. 2017	CHARGE NO.	BY K.J.S.	DATE 5/12/89	CHECKED BY C. Olivier	DATE 5/15/89

B. DEPTH of FLOW & VELOCITY @ PROP. CROSSINGS

1. CROSSING #1   REQ'D Q_{100} FLOW 85 cfs



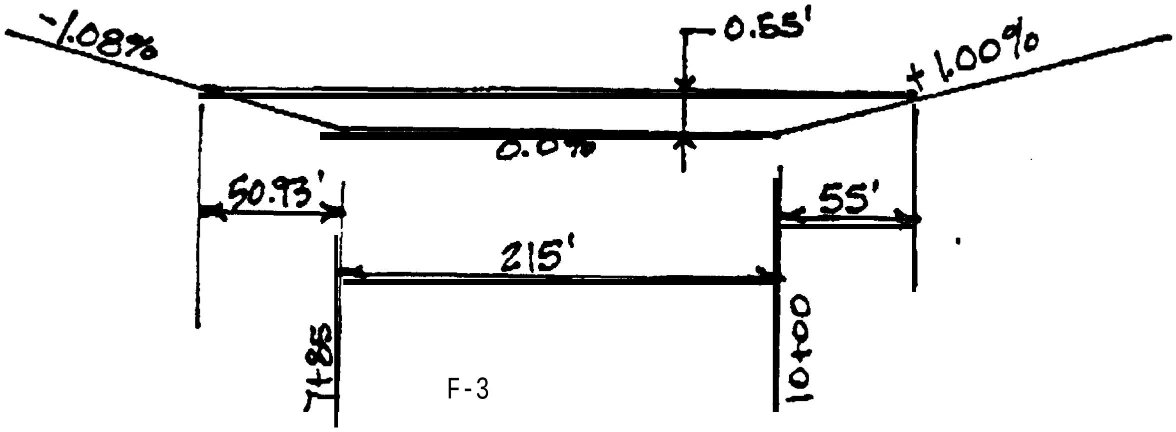
AREA @ 0.55' depth = 30.34 ft²
WETTED PERIMETER P = 81.91 ft
HYDRAULIC RADIUS R = 0.37 ft
HYDRAULIC GRADIENT S = 0.005 ft/ft (TYPICAL ALL CROSSINGS)

$$VELOCITY = \left(\frac{1.1486}{0.014}\right) 0.37^{2/3}\, 0.005^{1/2}$$

= 3.01 fps

3.01 ft² × 30.34 = 91.32 cfs

2. CROSSING #2 REQ'D Q_{100} FLOW = 500 cfs

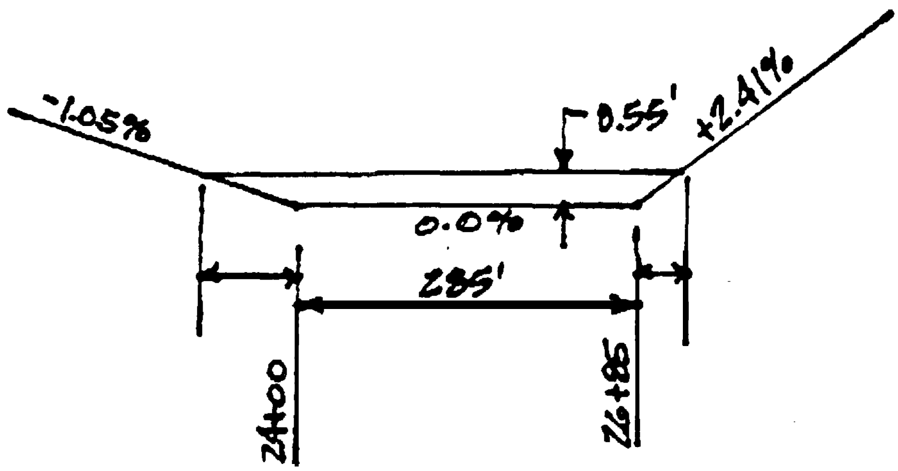


AREA = 147.38 ft^2
P = 320.93 ft
R = 0.46 ft
S = 0.005 ft/ft

∴ V = 3.47 fps

147.38 ft^2 × 3.47 = 512.14 cfs

3. CROSSING #3 REQ'D Q_{100} = 550 cfs



AREA = 177.43 ft^2
P = 360.20
R = 0.49
S = 0.005 ft/ft (TYPICAL ALL CROSSINGS)

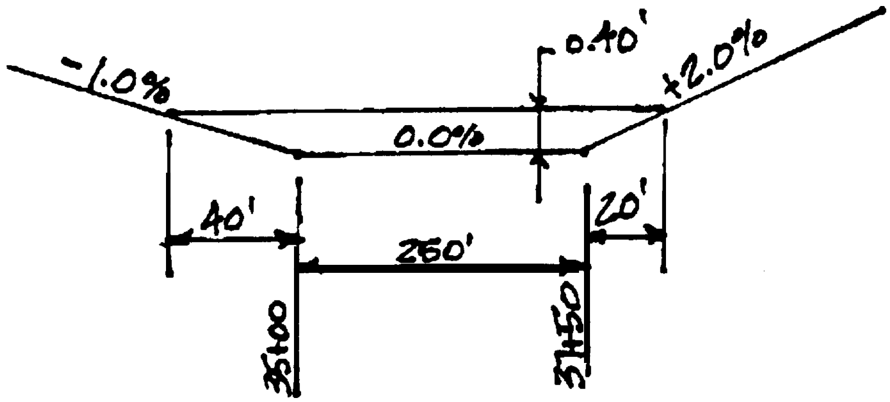
∴ V = 3.62 fps

177.43 × 3.62 = 642.81 cfs

THE DOW CHEMICAL COMPANY
ENGINEERING AND CONSTRUCTION SERVICES

SUBJECT					SHEET
MONOFILL - DESERT VALLEY COMPANY - CA.					5 OF 7
PRELIM. DRAINAGE CALC'S.					
JOB NO. 2017	CHARGE NO.	BY K.S.	DATE 5/12/89	CHECKED BY C Olm	DATE 5/15/89

4. CROSSING #4 REQ'D Q_{100} = 275 cfs

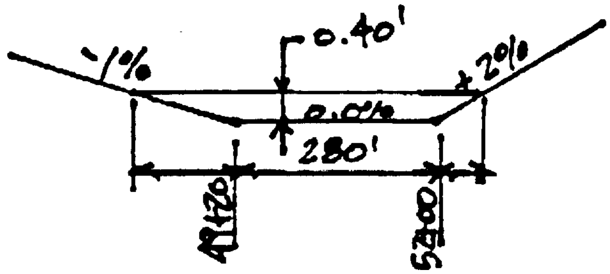


AREA = 112.00 ft^2
P = 310 ft
R = 0.36

∴ V = 2.96 fps

112.00 × 2.96 = 331.06 cfs

5. CROSSING #5 REQ'D Q_{100} = 340 cfs (AREAS #5 + #7)



AREA = 124.00 ft^2
P = 340 ft
R = 0.36
∴ V = 2.96 fps

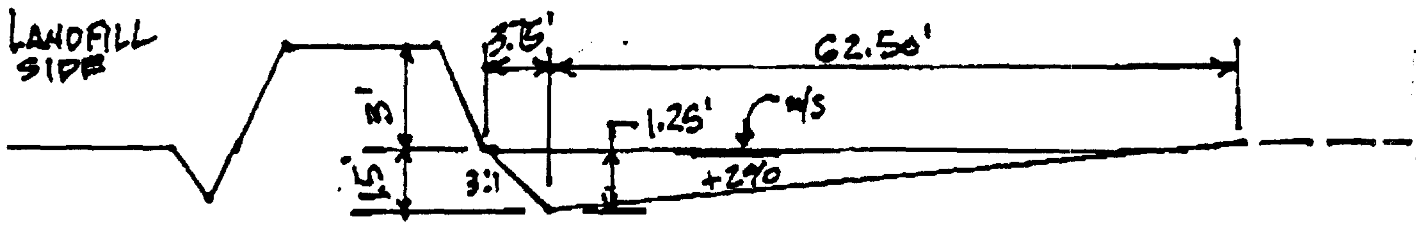
2.96 × 124.00 = 366.53 cfs

NDC - 9009
REV. A

THE DOW CHEMICAL COMPANY
ENGINEERING AND CONSTRUCTION SERVICES

SUBJECT					SHEET
MONOFILL - DESERT VALLEY COMPANY - CA.					6 OF 7
PRELIM. DRAINAGE CALC'S					
JOB NO. 2017	CHARGE NO.	BY KJS	DATE 5/12/89	CHECKED BY C Oliver	DATE 5/15/89

6. AREA #6 Q_{100} FLOW to DIVERSION BERM = 175 cfs



1.25' DEPTH | FULL 1.5' DEPTH

AREA @ W/S = 41.41 ft² | 59.63 ft²

P = 66.47 ft | 79.76 ft

R = 0.62 ft | 0.75 ft

S = 0.008 ft/ft | 0.008

∴ V = 4.68 fps | 5.50 fps

= 327.75 cfs

41.41 × 4.68 = 193.94 cfs

CONCLUSION:

1. Q_{100} FLOWS @ CROSSINGS #1 THRU #3 WILL BE LESS THAN 0.55' IN DEPTH @ ROAD SURFACE.
2. Q_{100} FLOWS @ CROSSINGS #4 & #5 WILL BE LESS THAN 0.40' IN DEPTH @ ROAD SURFACE.
3. FLOW VELOCITY ACCROSS #1 THRU #5 WILL BE LESS THAN 4.0 fps @ Q_{100}
4. DIVERSION BERM & DITCH AS SHOWN ABOVE @ MAXIMUM 1.5 FLOW DEPTH CAPACITY EQUALS @ 4.03"/hr RAINFALL OVER CONTRIBUTING DRAINAGE AREA

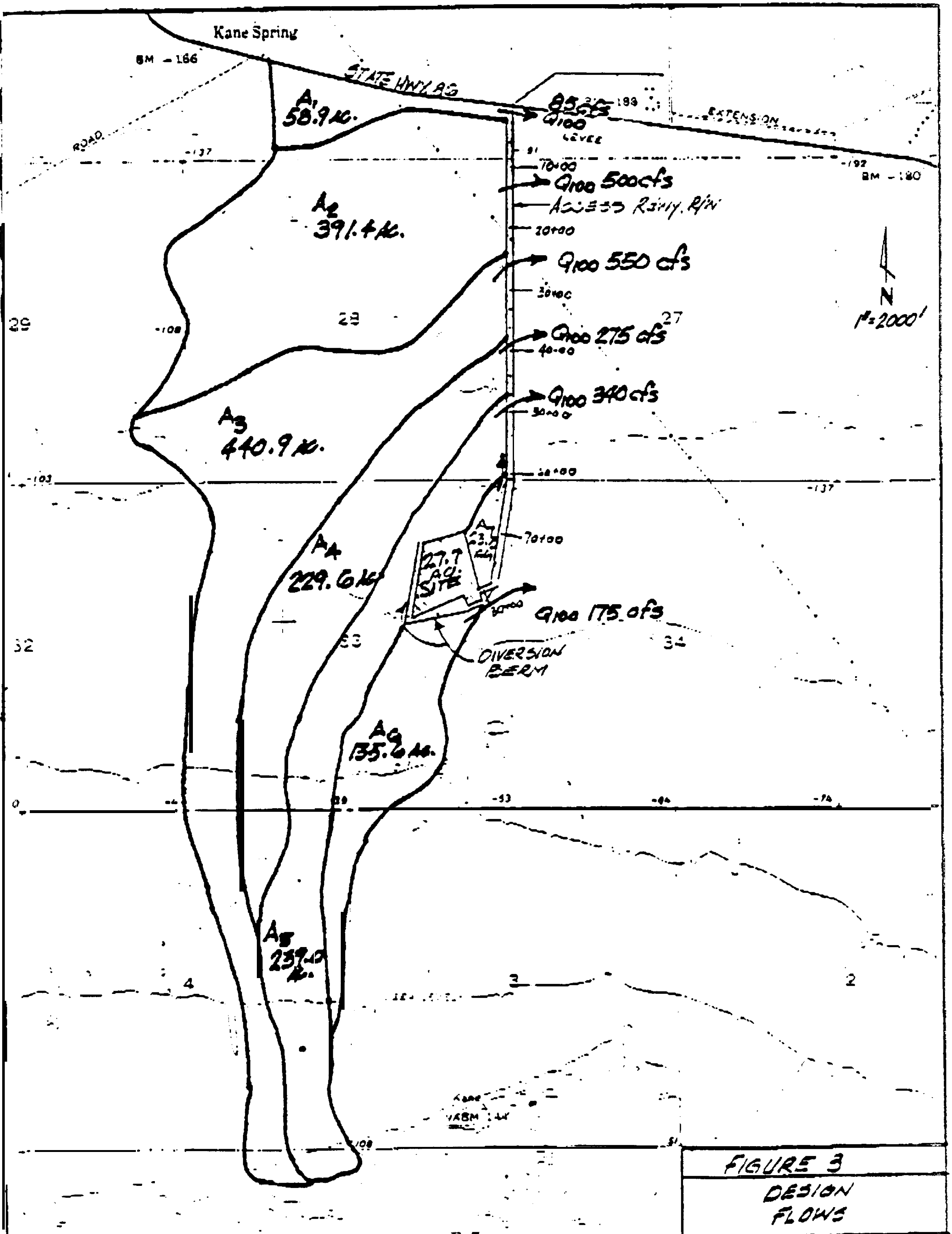


FIGURE 3
DESIGN FLOWS

SHEET 7 of 7

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APPENDIX G

ACOUSTICAL DEFINITIONS

APPENDIX G
ACOUSTICAL DEFINITIONS

Term	Definition
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
A-Weighted Sound Level, dB(A)	The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter deemphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise. All sound levels in this report are A-weighted.
Community Noise Equivalent Level, CNEL	CNEL is the average sound level during a 24-hour day and it is calculated by adding 5 decibels (dB) to sound levels in the evening (7 p.m. to 10 p.m.) and adding 10 dB to sound levels in the night (10 p.m. to 7 a.m.).
Decibel, dB	A unit describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure, which is 20 micropascals (20 micronewtons per square meter).
Equivalent Noise Level, L_{eq}	The average A-weighted noise levels during the measurement period.

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APPENDIX H

BIOLOGICAL RESOURCES

BIOLOGICAL SURVEY REPORT FOR THE MONOFILL PROJECT IMPERIAL COUNTY, CALIFORNIA

Prepared *for:*

Desert Valley Company
480 West Sinclair Road
Calipatria, California 92233

Prepared by:

ERC Environmental and Energy Services Co.
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July 1989

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INTRODUCTION

ERC Environmental (ERCE) Biological Services group surveyed the Monofill project site to determine the area's biological resources and to evaluate the impact of the proposed landfill. The study addressed the presence or absence of significant biological features on the site and the degree to which the proposed project would affect those resources. Significant biological features are defined here as plant or animal species of rare and/or endangered status, depleted or declining species, and species or habitat types of limited distribution. Nomenclature used throughout this report conforms to Munz (1974) for plants, AOU (1983) for birds, Jennings (1983) for reptiles and amphibians, and Jones et al. (1982) for mammals.

GENERAL SURVEY METHODS

A general reconnaissance of the Monofill project area was made by ERCE biologists Elyssa Robertson and Philip Unitt from 6:30 am to 1:45 pm on 23 March 1989. The biologists surveyed the site on foot, by walking in and out along the proposed access route and by transecting the north half of Section 33 in four approximately equally spaced east-west transects. All plant species observed were noted, and the one sensitive species found was plotted on a copy of an aerial photograph of the project area. Vertebrates were noted and counted.

Consultation with the staff biologists of the Bureau of Land Management (BLM) El Centro area office was conducted prior to field sampling efforts. The need for additional site-specific field data was identified for the flat-tailed homed lizard (*Phrynosoma mcallii*) (BLM 1989). Focused surveys for sensitive plants were not considered necessary given site location, characteristics, and the general habitat quality onsite. The flat-tailed homed lizard surveys were conducted in accordance with BLM and California Department of Fish and Game (CDFG) approved methodologies and surveys did not proceed until BLM staff judged lizard activity levels to be suitable for study purposes.

The basic technique employed for the flat-tailed homed lizard survey was the section search referenced here as the triangular transect (CDFG 1989). The methodology required includes walking a triangular route for 1 hour through a 2.59 kM^2 area (section). The triangular transect consisted of 0.9 mi on one side and 0.8 mi on the remaining two sides for a total of 2.5 mi of transect. All transects were oriented 0.1 mi in from a section comer using a Silva pocket compass, and measured with a 50 m tape. The purpose of the triangular search is to provide a comparable index of relative abundance by section over time and throughout the Colorado Desert. Triangular transects for the Monofill project were conducted by Vincent N. Scheidt on June 28 for Sections 27 and 28 from 7:20 am - 10:03 am and June 29 for Section 33 from 7:54 am - 8:54 am.

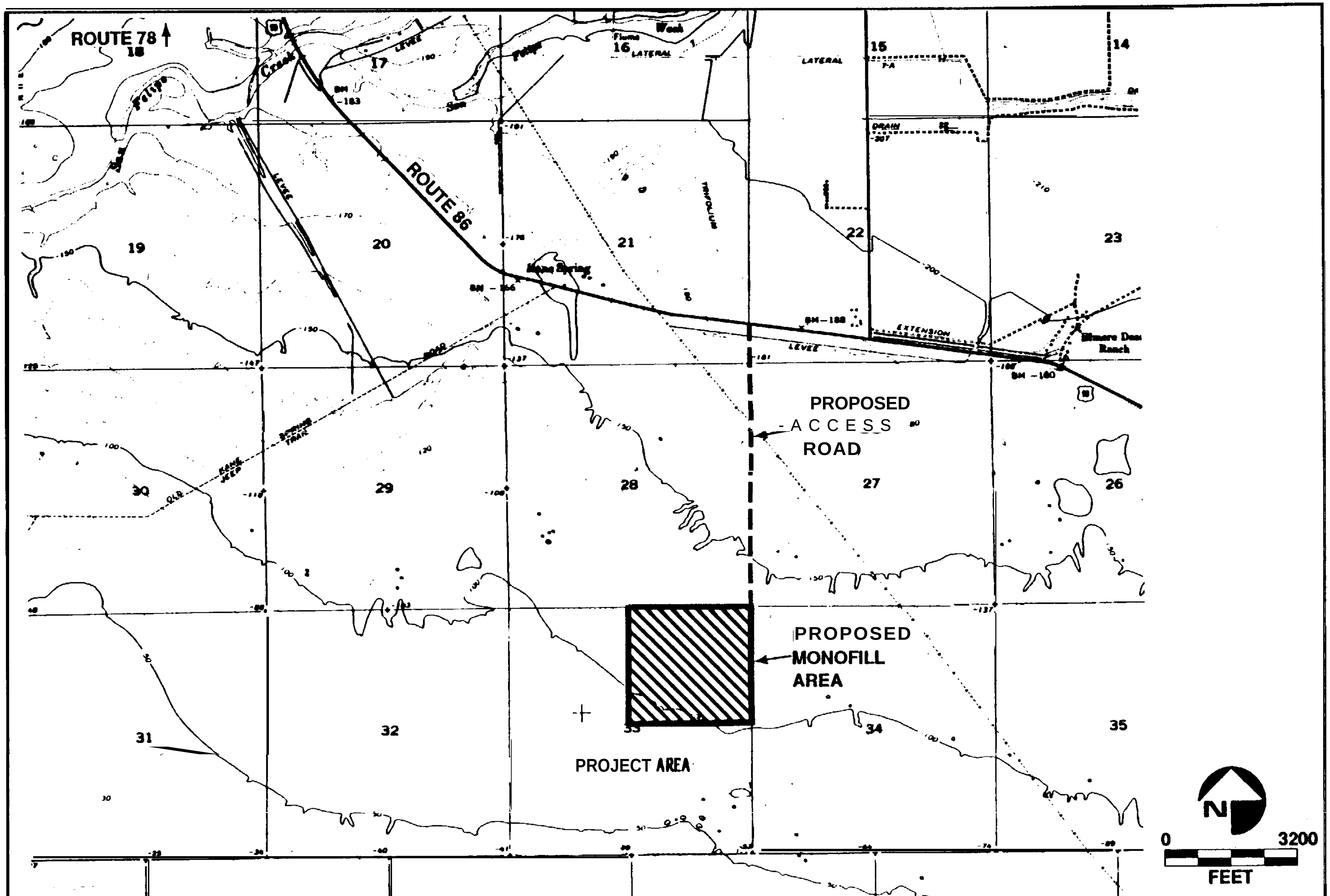
GEOGRAPHICAL LIMITS OF THE STUDY AREA

The Monofill project site is located approximately 12 miles (19.3 km) west of the City of Westmorland and 4 miles (6.4 km) south of the Salton Sea in the County of Imperial. The proposed project would develop 160 gross acres of privately owned land in the northeast quarter of Section 33, Township 12 South, Range 11 East. The proposed site is currently vacant, unirrigated desert land that is sparsely vegetated and slopes gently toward the northeast. State Route (SR) 86 is 1.25 miles (2km) to the north. The area north and east of SR-86 is irrigated cropland. This survey covered the entire northern half of Section 33, however the project is only in the north-eastern quarter of Section 33 (Figure 1).

VEGETATION

The project area supports an open creosote bush scrub (Holland 1986) (Figure 2). Creosote bush (***Larrea tridentutu)*** is the dominant shrub; the smaller burrobush ***(Ambrosia dumosa***) and all-scale saltbush (***Atriplex polycarpa***) ***are also*** common and dispersed among the creosote bushes. Mormon tea ***(Ephedru trifurca***) and dalea ***(Psorothamnus*** sp.) are present but are less frequent. Honey mesquite ***(Prosopis glandulosa***) ***occurs*** onsite on approximately 12 to 15 poorly formed or disturbed mesquite hummocks. There are numerous well-developed mesquite hummocks approximately .5 - 1 mile south of the project site near the south-east comer of Section 33.

Several washes cross the project area and generally drain to the northeast. The margins of these washes support additional plant species such as desert mat (***Coldenia plicata),*** alkali goldenbush ***(Haplopappus acradenius*** ssp. ***eremophilus***) and Salton milkvetch (***Astragalus crotalariae***)***.*** Approximately 20 percent of the north half of Section 33 consists of stony ground devoid of vegetation, with a scattering of rigid spineflowers ***(Chorizunthe rigida***). Nonnative forbs and grasses (canary grass, ***Phalaris minor***; woolly plantain, ***Plantago insularis;*** London rocket, ***Sisymbrium irio***; yellow sweet clover, ***Melilotus indicus***) ***are***



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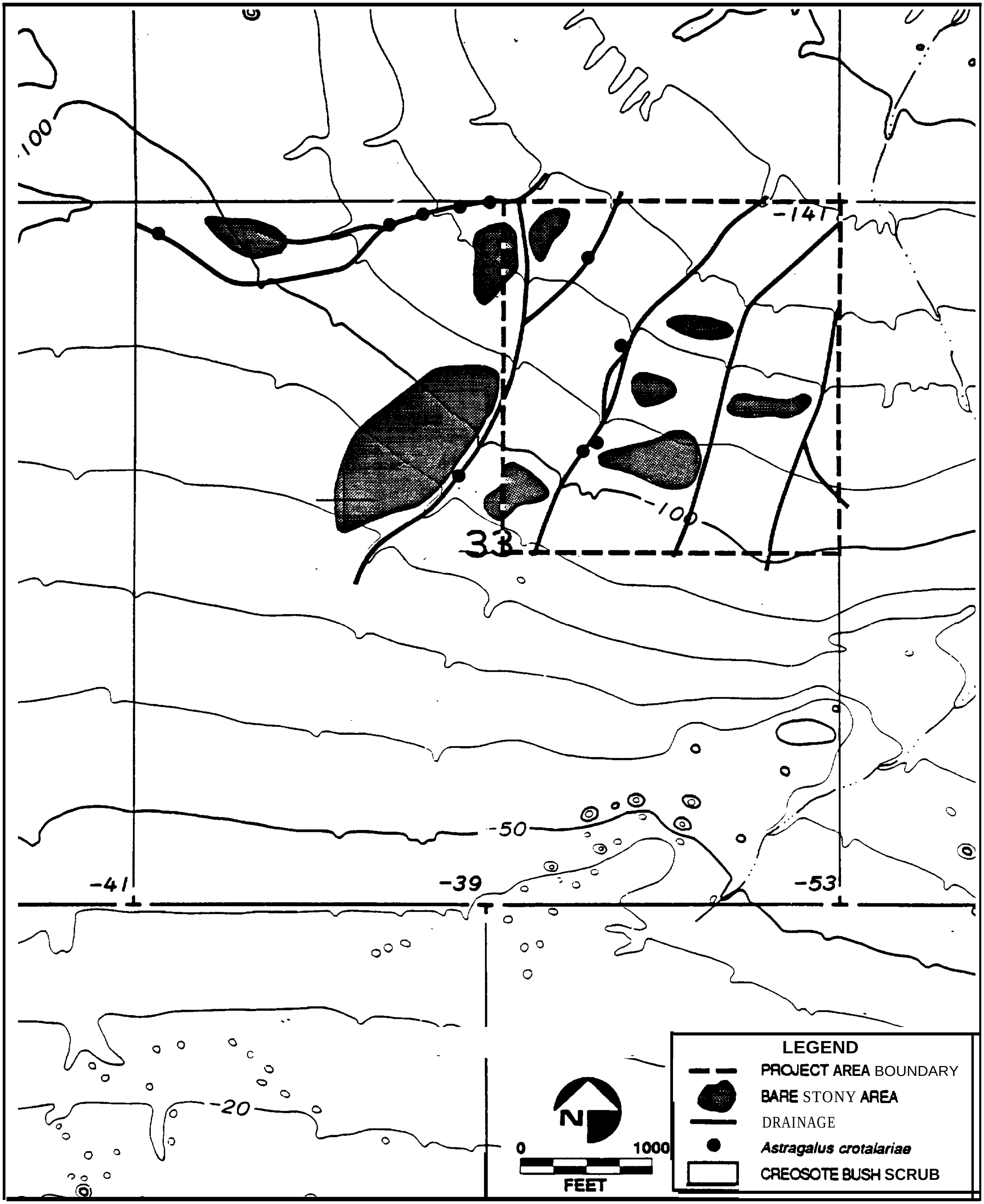
Project Site Location

FIGURE

1



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Biological Resources of Monofill Site

FIGURE 2

sparsely distributed throughout the project area. The paucity of annuals or herbaceous perennials seen (e.g., desert lily, ***Hesperocallis undulata;*** desert sunflower, ***Geraea canescens; Cryptantha*** sp.) may be due in part to the dryness of the preceding winter.

The vegetation along the access route does not differ from that in the north half of Section ***33*** except within 0.1 mile of Highway 86. There the alkali goldenbush and nonnative grasses and forbs grow somewhat more densely as a result of water occasionally accumulating behind the levee protecting the highway. Shrubby tamarisks (*Tamarix* sp.) are also growing in this area. Attachment A lists all plant species observed on the proposed site and along the access road

WILDLIFE

The density of populations of most animals in creosote bush scrub, especially in scrub as sparse as that of the project area, is very low. Also, many of the animals of desert scrub, particularly the mammals, are nocturnal. Therefore, only a fraction of the species occurring in that habitat can be detected on any given diurnal biological survey.

Birds

Five bird species were seen during the survey. Four of these were migrants or winter visitors; only the mourning dove ***(Zenaida macroura),*** of which one was seen along the access route near Highway 86, probably nests in or near the study area. Also, three of the distinctive globular nests of the verdin (***Auriparus jlaviceps acaciarum)*** were found in a mesquite near the access route; therefore, it is presumed that the species breeds in the project area. Additional resident species that may occur in the project area sporadically or in very low densities (the entire project area may be only part of the territory of a single pair) are the greater roadrunner (Geococcyx ***californianus),*** homed lark ***(Eremophila alpestris leucansiptila),*** black-tailed gnatcatcher ***(Polioptila melanura lucida***), Leconte's thrasher ***(Toxostoma leconteii leconteii),*** house finch ***(Carpodacus mexicanus frontalis),*** and Costa's hummingbird ***(Calypte costae***). The lesser nighthawk (***Chordeiles acutipennis),*** a summer visitor that arrives usually about the end of March, probably nests in the study area, as it lays its eggs on bare ground in creosote bush scrub. Though there is no suitable habitat for their nesting in the study area, the red-tailed hawk ***(Buteo jamaicensis),*** Say's phoebe ***(Sayornis saya***), and common raven (***Corvus corax***) nest in the region and presumably forage in the study area regularly. Many additional species of birds undoubtedly visit the site occasionally during migration or winter.

Mammals

A detailed determination of the mammals inhabiting the project area would require nocturnal survey. Only the desert cottontail (*Sylvilagus auduboni*) was seen during the survey, along the proposed access route near Highway 86. Tracks and scat of the coyote (*Canis latrans*) and kit fox (*Vulpus macrotis*) were also noted in the study area. Burrows of small mammals such as the little pocket mouse (*Perognathus longimembris*), desert pocket mouse (P. *penicillatus*), desert kangaroo rat (*Dipodomys deserti*), Merriam's kangaroo rat (*D. merriami*), cactus mouse (*Peromyscus eremicus*), and deer mouse (*P. maniculatus*) were noted onsite. The round-tailed ground squirrel (*Spermophilus tereticaudus*) and white-tailed antelope squirrel (*Ammospermophilus leucurus*) occur in the region and possibly in small numbers in the study area. A large hole seen at the base of a mesquite near the access route may be the entrance to a den of the coyote.

Reptiles

Four species of lizards were noted during the survey: flat-tailed horned lizard (*Phrynosoma mcallii*), western whiptail (*Cnemidophorus tigris*), the zebra-tailed lizard (*Callisaurus draconoides*), and the desert iguana (*Dipsosaurus dorsalis*). Additional reptiles that may occur in the project area include the sidewinder (*Crotalus cerastes*), the side-blotched lizard (*Uta stansburiana*), long-tailed brush lizard (*Urosaurus graciosus*), leopard lizard (*Crotaphytus wislizenii*), common kingsnake (*Lampropeltis getulus*), night snake (*Hypsiglena torquata*), and shovel-nosed snake (*Chionactis occipitalis*). The variety of reptiles that may occur on the site is limited by the lack of rock outcrops and significant sandy areas. Because of the lack of water, no amphibians are expected.

HIGH-INTEREST SPECIES/ HABITATS

Habitats

None of the habitat types represented in the study area (open creosote bush scrub, dry washes, bare stony ground) is regarded as sensitive. Mesquite hummocks, considered important by the California Department of Fish and Game (CDFG), are well represented in the southeast comer of Section 33 but not in the north half or along the proposed access route. San Felipe Creek and San Sebastian Marsh, sensitive wetlands and home of the endangered desert pupfish ***(Cyprinodon mucularius),*** lie 3 to 6 miles northwest to west of the study area and would not be affected by the proposed project. Drainage from Section 33 runs northeast where it is blocked by the levee protecting Highway 86 or through culverts under the highway and into the Trifolium Canal. The site does not drain toward or into the San Sabastian Marsh to the west.

Plants

High-interest plants include those listed by the U.S. Fish and Wildlife Service (USFWS 1985), California Department of Fish and Game (CDFG 1985), and California Native Plant Society (Smith and Berg 1988). The CNPS listing is sanctioned by the California Department of Fish and Game and essentially serves as its list of "candidate" species for threatened or endangered status.

None of the plant species observed or expected to occur on the proposed site is currently listed as endangered, threatened, or sensitive by the U.S. Fish and Wildlife Service (USFWS 1985), the California Department of Fish and Game (CDFG 1985), or the California Native Plant Society (Smith and Berg 1988). There are, however, a number of sensitive species that occur in the region surrounding the project site which have potential to occur on site. These species include three federal candidates for listing, one of which is state-listed as an endangered plant species. The status of these species along with comments on the species' range, distribution in the region, and probability of occurring onsite is listed below (see Attachment B for an explanation of CNPS listings and codes and USFWS designations). Table 1 summarizes other sensitive plants known from the region.

Ammobroma sonorae
Sand Food
USFWS: Candidate (Category C3c)
CNPS rating: List 1, 2-2-2
This purple flowered root-parasite is found primarily within the Algodones Dunes and adjacent sandy areas of the East Mesa of Imperial Valley. It is also found at a single location on West Mesa in the northeastern comer of Imperial County. The host species for

Table 1

SENSITIVE PLANT TAXA KNOWN FROM VICINITY OF MONOFILL PROJECT SITE

Scientific Name	CNPS List	Code	State/Federal status	Habitat
Astragalus insularis var. harwoodii	2	2-2-1		Dunes
Astragalus magdalenae var. peirsonii	1B	2-2-2	CE/C2	Dunes
Astragalus nutans	4	1-1-3	-	SD Scrub
Calliandra eriophylla	2	3-1-1	-	SD Scrub
Cassia covesii	2	2-1-1	-	SD Scrub
Chamuesyce arizonica	2	2-1-1	-	SD Scrub
Cryptantha costata	4	1-1-2	-	SD Scrub
Cryptantha holoptera	4	1-1-2	-	SD Scrub
Cynanchum utahense	4	1-1-1	-	SD Scrub
Delphinium parishii ssp. subglobosum	4	1-1-2	-	SD Scrub
Eucnide rupestris	2	3-2-1	-	SD Scrub
Lyrocarpa coulteri var. palmeri	4	1-1-1	-	SD Scrub
Mirabilis tenuiloba	4	1-1-1	-	SD Scrub
Penstemon thurberi	3	?-?-1	-	SD Scrub
Pholisma sonorae	1B	2-2-2	/C3c	Dunes
Pilostyles thurberi	4	1-1-1	/C3c	SD Scrub
Proboscidea althaeifolia	4	1-1-1	-	SD Scrub
Xylorhiza orcuttii	4	2-1-2	/C2	SD Scrub

this parasite include several perennial shrubs: ***Coldenia palmeri, C. plicata, Eriogonum deserticola,*** and possibly ***Pluchea sericea*** (WESTEC Services 1977) and appears on the surface of sand dunes as a tarnish-gray form resembling the top of a mushroom. This species was not detected onsite and would not be expected based on the lack of sandy habitats.

Astragalus crotdariae
Salton Milkvetch
CNPS rating: List 4, l-l-2
This coarse and malodorous annual or short-lived perennial occurs on sandy flats and desert fans. This species has been recorded at a number of locations on the West Mesa of Imperial County and in particular was found south of Yuha Wash (WESTEC 198 1 b). It is also found in Baja California and adjacent Arizona. This species is associated with high selenium content in the soil, and heavy concentrations of this element within the plant makes this species highly toxic. Approximately 50- 100 individuals were detected onsite in the numerous dry washes.

Astragalus lentiginosus* var. *borreganus
Borrego Milkvetch
CNPS rating: List 4, l-l-l
This purple-flowered perennial occurs on dunes and sandy valleys below 1000 feet elevation in association with creosote bush scrub. Borrego milkvetch flowers from February to May. This species would be expected based on the habitat onsite but was not detected.

Pilostyles thurberi
Thurber's Pilostyles
USFWS: Candidate (Category C3c)
CNPS: List 4,1-1-1
This fleshy minute herb is parasitic on the branches of ***Psorothamnus emoryi*** in San Diego and Imperial counties, southwest Arizona and Baja California. Only the small brown flowers and overlapping bracts are visible on the host plant. This species was not observed onsite.

Opuntia wigginsii
Wiggins Cholla
USFWS: Candidate (Category C2)
CNPS: List 1, 3-1-2
This shrubby (l-3 foot dm) cactus is associated with sandy soils in creosote bush scrub habitat from eastern San Diego County to Arizona. This species was not detected onsite.

Animals

Tracks and scat of a kit fox (*Vulpes macrotis*) was identified in the north-eastern quarter of Section 33. This species probably utilizes the site for foraging and presumably resides in the dense mesquite hummocks to the south. This species is not listed by either state or federal agencies, but is declining regionally (CDFG 1988), however, Williams (1986) does not list the species as a species of special concern. Other sensitive species known from Imperial County occur in other habitats, either rocky hills (e.g., the desert bighorn sheep, ***Ovis canadensis cremnobates***) or more humid areas (e.g., the badger, ***Taxidea taxus***, and the Yuma cotton rat, ***Sigmodon hispidus eremicus***). Certain scarce bats may occasionally forage or migrate over the study area, but there are no suitable roosting sites (caves, mine shafts, etc.), the resource critical to these species.

Of the many sensitive species of birds occurring in Imperial County, all but five are restricted to riparian or wetland habitats. None of the five that occurs in desert scrub was observed during the field survey and the habitat in the project area is unsuitable or marginal for all of them. None is listed as threatened or endangered by the CDFG or USFWS. The prairie falcon (***Falco mexicanus***), a third-priority species of special concern to the CDFG (Remsen 1978) nests in rocky hills and forages in creosote bush scrub, among other habitats. The nearest suitable nest sites are at least 5 miles from Section 33, so the area undoubtedly receives no more than very occasional visits by prairie falcons. The burrowing owl (***Athene cunicularia hypugaea***), a second-priority species of special concern, occurs sparsely in open creosote bush scrub in Anza-Borrego Desert State Park but is far more numerous in the agricultural areas of the Imperial Valley. No burrows or squirrel colonies constituting habitat for the species were noted during the field survey, and the area is either poor or unsuitable habitat for burrowing owls. The black-tailed gnatcatcher (***Polioptila melanura lucida***), a second-priority species of special concern, is common and widespread in the Anza-Borrego Desert and uncommon and localized to mesquite thickets in the Imperial Valley. It inhabits creosote bush scrub but usually scrub containing a higher density of large shrubs than is found in the project area. Probably black-tailed gnatcatchers occur in very low density in Section 33, as the habitat can be regarded as only marginal for them. The Crissal thrasher *(Toxostoma crissale coloradense),* a third-priority species of special concern, requires dense mesquite thickets, so there is no habitat suitable for it near Section 33. Western Imperial County constitutes a hiatus in the species' range between the Imperial Valley and the westernmost colony in the Borrego Valley. The LeConte's thrasher *(Toxostoma leconteii Zeconteii)* is regarded as a third-priority species of special concern by the CDFG but probably should be ranked higher, as it occurs in very low density (five pairs or less per square mile) even in prime habitat, and much of its range is subject to degradation by off-road vehicles.. LeConte's thrasher occurs near the project area both to the north (near Salton City) and to the south (south side of Superstition Mountain, P. Unitt, pers. obs.). It is the sensitive bird most likely to occur in Section 33. For nesting, however, it uses either cacti (for protection) or shrubs densely foliaged enough to conceal the nest. As both of these types of vegetation are absent from the study area, the project area is unlikely to constitute more than a peripheral portion of the territory of a pair of LeConte's thrashers.

Two species of sensitive reptiles may occur on the site: the Colorado desert fringe-toed lizard *(Uma notata)* and the flat-tailed homed lizard *(Phrynosoma mcallii*). Both are regarded as species of special concern by the CDFG and as candidates for listing as threatened or endangered by the USFWS. The Colorado desert fringe-toed lizard generally prefers dunes and other habitats sandier than are found in the study area, but may occur sparsely along the washes. This species was not observed onsite. The flat-tailed homed lizard is an uncommon resident of the Coachella and Imperial valleys in southeastern California; southwestern Yuma County, Arizona, and south to the desert plains around the Colorado River delta in northern Mexico (Stebbins 1954; Turner et al 1980). These areas have received increasing levels of urban and agricultural development as well as increased off-road vehicle traffic. Consequently, *P. mcallii* has been given state protected status and is a candidate for state listing as endangered and classified as a Candidate 2 Category species for the federal list of threatened and endangered species (CDFG 1988).

The flat-tailed homed lizard is a particularly secretive and cryptic animal. Individuals are rarely seen. Therefore, detection of the animals relies on indirect means, namely presence of scat. *Phrynosoma* scat is easily distinguished from other lizard scat in size, shape, texture, and contents (almost exclusively ants).

The habitat preferred by the flat-tailed horned lizard is "areas of low relief with surface soils of fme packed sand, or [desert] pavement, overlain with loose, fine sand. The vegetation is usually a simple association of creosote bush and bur-sage ["burrobush"] (Turner et al. 1980). The project area thus appears suitable for the flat-tailed horned lizard. Turner et al. reported, however, that the habitat above the old shoreline of **Lake** Cahuilla (elevation 40 feet above sea level) is more favorable for the flat-tailed homed lizard than lower areas. As the study area lies at or below 50 feet below sea level, it is not anticipated to constitute prime habitat. Turner et al. (1980) found flat-tailed homed lizard scat in Section 27, immediately northeast of Section 33 and observed the lizards themselves near Highway 78, just west of Highway 86. No flat-tailed homed lizard scat was reported by Turner in the project site.

Within the project area three triangular transects were walked (Sections 27, 28, and 33). The transects resulted in one P. ***mcallii*** scat per section (Figure 3). In addition to scat identified, one individual ***P. mcallii*** was observed off the transects near the northeast comer of Section 33. An index of relative abundance utilized by the BLM in assessing and comparing homed lizard utilization of an area is as follows:

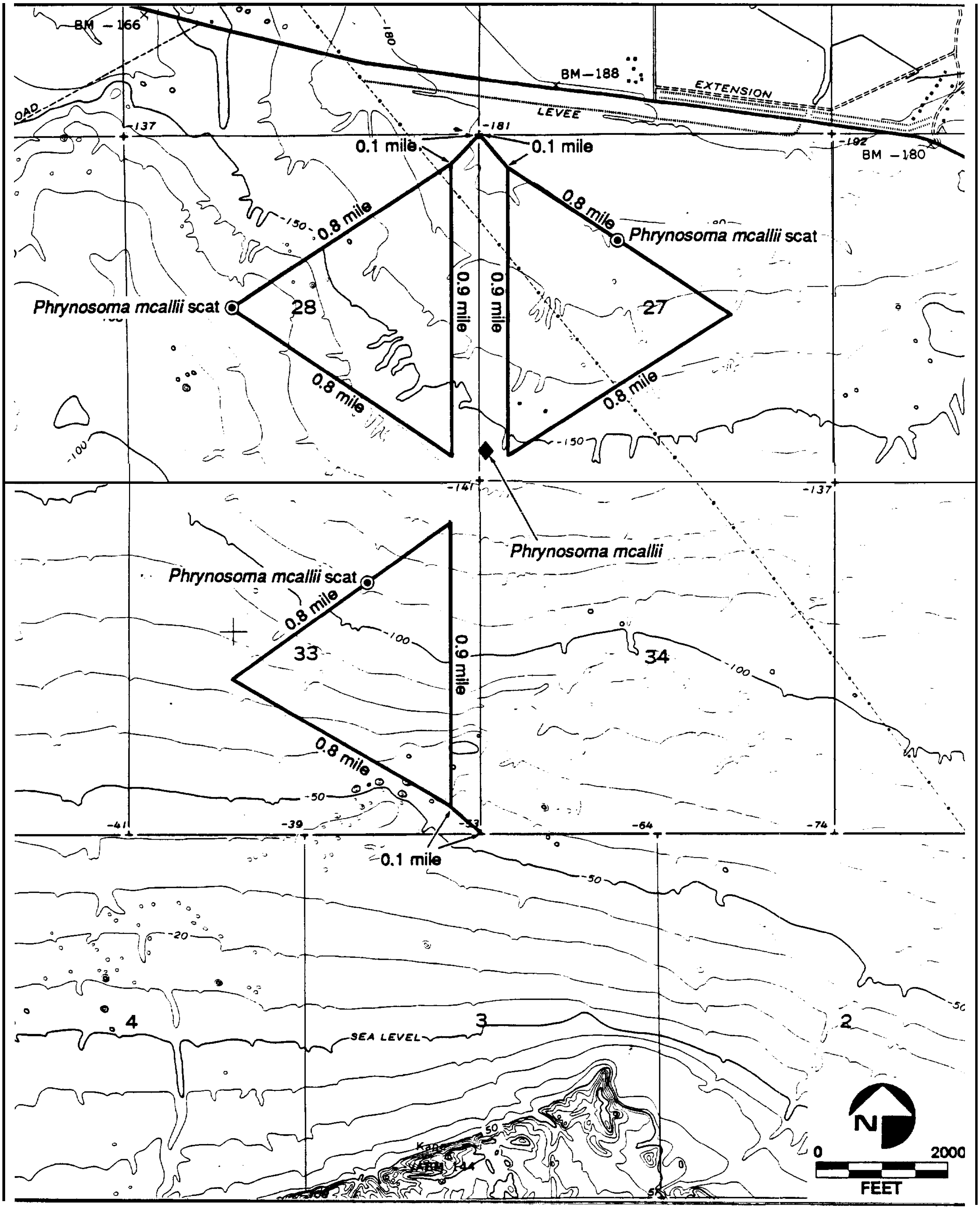
RELATIVE ABUNDANCE INDEX

Low	1 to < 5	scat/person/hour
Medium	5 to 9	scat/person /hour
High	> 9	scat/person/hour

Using this index the sensitivity level of the project site overall is low with only one scat per hour per transect.

IMPACTS

Construction of the Monofill facility would result in the loss of approximately 35 acres of creosote bush scrub (area of access road plus developed portion of Section 33). Minor additional acreage may be lost upon implementation of final grading design. The biological significance of this loss may be judged by its effect on the habitat as a whole and by its effect on the component species within the habitat. The project's impact on the habitat as a whole is not considered significant because creosote bush scrub is not regarded as a sensitive habitat due to the abundance of creosote bush scrub in the surrounding region,



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Triangle Transect Data for the *Phrynosoma mcallii*

FIGURE 3

also because of the small proportion of the habitat in the vicinity to be eliminated by the project, and because of the public (BLM) ownership of the surrounding land (possibly affording some additional degree of protection).

The site is at best only marginally suitable for sensitive animals such as the Colorado desert fringe-toed lizard or LeConte's thrasher, and because these species are not recognized as highly sensitive by government agencies, any minor effects would not be considered significant.

The project's impact on the flat-tailed homed lizard is insignificant due to its relatively low abundance index. Also, similar habitat providing suitable refuge for the flat-tailed horned lizard exists on the adjacent BLM property.

The only sensitive plant species in the project area is the Salton milkvetch. Even though some Salton milkvetch and suitable wash habitat would be eliminated by the project, this loss is not considered significant because of the species' low ranking in the California Native Plant Society's hierarchy and the abundance of suitable habitat nearby.

MITIGATION

No significant biological impacts were identified for the proposed project. Therefore, no specific mitigation measures are developed. However, recommendations are made to curtail or reduce the potential for indirect effects to species degradation of surrounding natural habitat:

- All vehicles should remain on roads. No offroad vehicle travel should be authorized without prior approval by BLM or CDFG.
- Access to the project area should be controlled by gating.
- Access roads should be paved to eliminate the amount of time the flat-tailed homed lizards spend on roads and potentially reduce lizard mortality.
- Screening should be put in the fence around the project site to reduce flat-tailed homed lizard entering the landfill area and potentially reducing lizard mortality.

- All construction work should be confined to the designated project area. Construction staging areas should coincide with the project area.

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ATTACHMENT 1

FLORAL LIST FOR THE MONOFILL PROJECT

ATTACHMENT 1

FLORAL LIST FOR THE MONOFILL PROJECT

Family Ephedraceae	
Ephedra trifurca	Mormon tea
Family Asteraceae	
Ambrosia dumosa	Burrobush
Geraea canescens	Desert sunflower
Haplopappus acradenius	Alkali goldenbush
Psathyrotes ramosissima	Velvet rosette
Stephanomeria sp.	Stephanomeria
Family Boraginaceae	
Coldenia plicata	Desert mat
Cryptantha sp.	Cryptantha
Family Brassicaceae	
Sisymbrium irio	London rocket
Family Chenopodiaceae	
A triplex polycarpa	All-scale saltbush
Family Fabaceae	
Astragalus crotalariae	Salton milkvetch
Melilotus indicus	Yellow sweet clover
Prosopis glandulosa	Honey mesquite
Psorothamnus sp.	Dalea
Family Plantaginaceae	
Plantago insularis	Woolly plantain
Family Polygonaceae	
Chorizanthe rigida	Rigid spineflower
Family Solanaceae	
Lycium brevipes	
Family Tamaricaceae	
Tamarix sp.	Tamarisk
Family Zygophyllaceae	
Larrea tridentata	Creosote bush
Family Liliaceae	
Hesperocallis undulata	Desert lily
Family Poaceae	
Phalaris caroliniana	Canary grass

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ATTACHMENT 2

CALIFORNIA NATIVE PLANT SOCIETY LISTINGS AND SENSITIVITY CODE AND FEDERAL CANDIDATE SPECIES DESIGNATIONS

ATTACHMENT 2

CALIFORNIA NATIVE PLANT SOCIETY LISTING AND SENSITIVITY CODE AND FEDERAL CANDIDATE SPECIES DESIGNATIONS

California Native Plant Society (1988)

List 1 = Plants of highest priority
1A = Plants presumed extinct in California
1B = Plants rare and endangered in California and elsewhere
List 2 = Plants rare and endangered in California, but common elsewhere
List 3 = Plants about which we need more information
List 4 = Plants of limited distribution (A watch list)

CNPS R-E-D ode

R (Rarity)

1 = Rare, but found in sufficient numbers and distributed widely enough that the potential for extinction or extirpation is low at this time.
2 = Occurrence confined to several populations or to one extended population.
3 = Occurrence limited to one or a few highly restricted populations, or present in such numbers that it is seldom reported.

E (Endangerment)

1 = Not endangered
2 = Endangered in a portion of its range
3 = Endangered throughout its range

D (Distribution)

1 = More or less widespread outside California
2 = Rare outside California
3 = Endemic to California

FEDERAL CANDIDATE SPECIES DESIGNATIONS*

Cla = Enough data are on file to support the federal listing.
Clb = Enough data are on file to support federal listing, but the plant is presumed extinct.

C2a = Threat and/or distribution data are insufficient to support federal listing.
C2b = Threat and/or distribution data are insufficient to support federal listing; plant presumed extinct.

C3a = Extinct
C3b = Taxonomically invalid
C3c = Too widespread and/or not threatened

Source: Smith and Berg (1988)

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APPENDIX I

RADIOLOGICAL CALCULATIONS

APPENDIX I

SUPPORT INFORMATION
RADIATION DOSE ASSESSMENT FOR DISPOSAL OF GEOTHERMAL WASTES

This appendix provides support information for the assessment of the radiation impacts associated with disposal of the geothermal waste materials. Assessments were performed for external gamma exposure, for inhalation of suspended dust from the geothermal wastes, and for the release of radon from uncovered waste and for the site after closure. Doses were estimated for the following categories of personnel:

- Truck drivers transporting material to the Monofill Site.
- On-site workers at geothermai plants and the Monofill Site.
- Closest off-site resident at geothermal plant and Monofill Site, and site boundary at Monofill Site.

The assessments were performed using dosimetry parameters, and meteorological and radon diffusion computer codes published and used by federal regulatory agencies. The Federal Guidance Report No. 11 (EPA 1988) dosimetry parameters were used for the inhalation dose assessments. The atmospheric dispersion of dust was estimated using the EPA PATHRAE performance assessment code (U.S. Environmental Protection Agency, PATHRAE: A Performance Assessment Code for the Land Disposal of Radioactive Waste, EPA 520/11-85-006). The assessments for release of radon were performed using the RAECOM Computer Code (Rogers 1984). The analytical results used to characterize the materials for this assessment are based on the data in Appendix E.

I.1 RADON EMISSIONS

The projected emission of radon from the waste materials was determined using the RAECOM computer code (Rogers 1984). This code was developed for the NRC and is used by the NRC and the U.S. Department of Energy for designing the cover for uranium mill tailings piles. The code uses input parameters of the radium concentration, the thickness of the cover (can use several materials), the thickness and characteristics of the waste or source material, and the moisture content of the various layers of materials. An example calculation is given as Table I-l. Table I-l indicates a flux of about 20 pCi/sq. m-sec, for a cover of2 ft of clay and 8 ft of soil. The assessments are based on a conservative Ra-226 concentration of 250 pCi/g, a Ra-226 emanating power of 25 percent, and representative material densities and moisture contents. The material densities are based on measurements by Desert Valley Company. The moisture contents are based on the moisture of the material and assessments of drainage curves for arid environments. Table I-2 provides a summary of the assessments.

The relatable regulatory criteria specify the radon flux from facilities. Although the 1989 EPA Clean Air Act regulations (EPA 1989) do not specifically cover this facility the regulations are used as guides for developing the design and assessing releases.

1.1.1 Exposure to Radon

The radon fluxes from Table I-2 were used to calculate atmospheric radon concentrations for on-site workers and for off-site residents. Radiation exposure from radon is primarily from its short half-life radioactive decay products, which are particulates and are retained in the lung.

The concentration of the decay products may be given in units of "working level" (WL), a measure of the potential radioactive decay energy from the decay products in a unit volume of air. One WL is equal to 1.3 x 10^5 MeV/liter of potential alpha decay energy from the short half-life decay products of radon. If the radon and decay products are contained such that the decay products reach radioactive equilibrium, 1 WL is equal to 100 pCi/l of Rn-222. The working level may be integrated over time to provide a unit of exposure, the working-level month **(WLM).** This is defined as exposure to 1 WL for an occupational exposure time of one month, about 168 hours.

Table I-1
Radon Flux Calculation (RAECOM Code)

INPUT PARAMETERS

Location:	Imperial Valley
Material Description:	Density: 1.4 g/cm^3 Moisture: 5% (Dry) Cover: 2 ft 0' clay, soil Ra-226: 250 pCi/g
Number of Layers:	3
Radon Flux Into Layer 1:	0.000E+00 pCi/m^2-sec
Surface Radon Concentration:	0.000E+00 pCi/liter
Layer 3 Adjusted to Meet Jcrir:	20 ± 0.01 pCi/m^2-sec
Bare Source Flux (Jo) From Layer 1:	259 pCi/m^2-sec

Laver	Thickness (cm)	Diff. Coeff. (cm^2/sec)	Porosi ty	Source (pCi/cm^3/sec)	Moisture (dry wt. percent)
1	300	0.0447	0.48 10	3.8200E-04	5.00
2	61	0.0230	0.4000	0.0000E+00	7.00
3	10	0.0369	0.4000	0.0000E+00	2.00

RESULTS OF RADON DIFFUSION CALCULATION

Laver	Thickness (cm)	Exit Flux (pCi/m^2-sec)
1	300	100
2	61	64
3	243	20

Table I-2
Summary of Radon Flux Calculations

Site	Material Density (g/cc)	Moisture in Waste (% dry wt.)	Cover Material Clay (ft)	Cover Material Soil (ft)	Radon Flux (pCi/m^2-sec)
GEOTHERMAL PLANT SITES					
Normal Op	0.9	20	None	None	158
MONOFILL SITE					
Operations					
Normal	1.4	6.5	None	None	245
Mitigated	1.4	20	Kone	None	120
After Closure					
Design	1.4	5	2	2	76
Mitigated	1.4	5	2	8	20
Mitigated	1.4	5	2	11	10

The exposures to radon were based on the product (i.e., multiplication) of the following values and parameters:

- Radon fluxes from Table I-2.
- Conversion of flux to atmospheric radon concentration:
  - On-site in area of waste: 0.03 pCi/l per pCi/m^2-s: based on airborne concentration over a large plane source (see Appendix E).

  Off-site:

  - Convert flux to an area source by multiplying the flux times the area (10 acres is 40,470 m^2). For example, the flux of 245 pCi/sq. m-sec times the 10 acre area would give a source term of about 10 million pCi/sec.

    Atmospheric transport and diffusion, based on PATHRAE model[a], for virtual sources (corrects for an area versus a point source), for Monofill Site and Turner 1969 for geothermal plant site. The Chi/Q values for selected calculations were:

    - Monofill (10 acre site):

      Resident at 2.2 mi--3.66 x 10^{-7} s/m”
      Boundary at 450 m--3.86 x 10^{-6} s/m^3

      Monofill (20 acre site):

      - Resident at 2.2 mi--3.39 x 10^{-7} s/m”

    - Geothermal site; resident at 0.5 miles:

      - 4.70 x 10^{-5} s/m^3.

  The radon concentrations (pCi/m^3) were converted to working level based on the ingrowth of the decay products. The parameters were:

    On-site workers 0.0006 WL per pCi/l, based on 6 percent ingrowth of the decay products.

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[a] PATHRAE Performance Assessment Code, U.S. Environmental Protection Agency, EPA 520/11-85-006, 1985.

Off-site residents, etc; 51 WLM per exposure to 1 WL continuously for a year (e.g., hours per year divided by occupational hours in a month).

Table I-3 provides a summary of the parameters and the WLM exposures.

I.2 INHALATION OF SUSPENDED DUST

The inhalation dose assessment is based on the product or multiplication of the following parameters:

- Source term for airborne concentration.
- Atmospheric Transport to man.
- Inhalation Rate for subject person.
- Time of exposure per year.
- Dose parameter for determining radiation dose, based on the amount of material inhaled.

I.2.1 Inhalation Exposure at Monofill Site

The estimates for the source term were taken from Table 3.11 in Chapter 3. The concentration for the on-site workers was based on a weighting of the 1-hr and 24-hour maximum concentrations. The source terms for the site boundary and the nearest off-site resident were based on estimating the rate of resuspension of dust, based on the 24-hr maximum concentration in Table 3-11 (205 micrograms per cubic meter), an average wind speed of 3.3 miles per hour (Chapter 3), and a mixing height of 10 meters (30 ft). The estimated source term is 1.46 grams per second from the 10 acre site. The concentration of radioactivity was then estimated based on the concentrations of radionuclides in the geothermal waste material, Table 2.1 from Chapter 2, and an enrichment factor of 2.4, based on resuspension of relatively fine grained material (Appendix E).

Table I-3
Radon Exposures

Location	Flux pCi/m2-s	Radon Concentration pCi/l	Decay Product Equilibrium (Percent)	Exposure (WLM)
Monofill On-Site	245[a]	7.35	6	0.053
Off-Site Resident (2.2 Mi)				
Operational	245[a]	0.0036	50	0.00093
After Closure (20 Acre Site, 4 ft Cover)[b]	76	0.0020	50	0.00053
Site Boundary Operational	245[a]	0.038	50	0.0098
Geothermal Plant				
Off-Site Resident (0.5 miles)	158	0.00069	50	0.00018

a Based on low soil moisture. Exposures can be reduced by mitigation measures.

b Cover of 2 ft clay and 2 ft of soil. An additional 6 ft of soil will reduce the flux to 20 pCi/m^2-sec and the exposure to 0.00014 WLM.

The following items illustrate the calculation for the person projected to receive the maximum on-site exposure:

- Airborne dust based **on** 1-hr max and 24-hr max concentrations.
- 250 pCi/g of Ra-226 in the waste material
- 3.4 enrichment *factor for* concentration in dust versus waste material
- E-6 micrograms/gram; unit conversion factor

= 0.215 pCi/cubic meter

The atmospheric transport factor is one (1) for this example since the person is assumed to be present where the dust is suspended. The time of exposure and inhalation **rate are** combined for occupational exposure into *a single* parameter of2400 cubic meters per year.

The above **concentration** (0.215 **pCi/ cubic meter)** is multiplied by the combination of time and inhalation rate (cubic meters of air per year for occupational conditions) and the dose factor for the specific organ of concern (0.0596 mrem per pCi inhaled) to give a dose from Ra-226 of about 31 mrem per year to the lung.

The dose calculations for both on-site exposures and the off-site resident expected to receive the highest exposure are summarized in the spread sheet in Table I-4. Doses are given for the different radionuciides, for the lung, the surface of the bone, and the whole-body committed effective dose equivalent (CEDE). The CEDE is conventionally referred to as EDE. The abbreviation EDE is used in the tables.

The CEDE is the effective whole-body dose due to the exposure of the whole-body and the various organs of the body where radionuclides are deposited. EPA dose factors (EPA 1988) are listed in Table I-4 and were used for the calculations. The rows identify the individual radionuclides and the doses for lung, bone, or CEDE (EDE).

The following items describe the columns in Table I-4. The columns are identified across the top for referencing to the comments.

Table I-4
Inhalation Dose Calculations

A	B		D	E	F	G	H	I	J	K	L	M
									Inhalation Dose (mrem/yr)			
Nuclide	Pathway	(mrem/pCi)	2000 HR mrem/yr (pCi/m³)	8760 HR mrem/yr (pCi/m³)	Concentration in Waste (pCi/g)	Source Term (g/sec)	Onsite Exposure (pCi/m³)	Resident CHI/Q (sec/m³)	Onsite Exposure (mrem/yr)	Offsite Resident (mrem/yr)	Total Worker (mrem/yr)	Total Resident (mrem/yr)
Ra-226												
	LUNG	5.96E-02	143.04	487.3	250	1.46	2.15E-01	3.66E-07	30.76	0.0651		
	BONE SF	2.81E-02	67.44	229.1	250	1.46	2.15E-01	3.66E-07	14.50	0.0307		
	EDE	8.58E-03	20.59	70.2	250	1.46	2.15E-01	3.66E-07	4.43	0.0094		
Pb-210												
	LUNG	1.18E-03	2.83	9.6	170	1.46	1.46E-01	3.66E-07	0.41	0.0009		
	BONE SF	2.02E-01	484.80	1651.6	170	1.46	1.46E-01	3.66E-07	70.90	0.1500		
	EDE	1.36E-02	32.64	111.2	170	1.46	1.46E-01	3.66E-07	4.77	0.0101		
PO-210												
	LUNG	2.70E-03	6.48	22.1	170	1.46	1.46E-01	3.66E-07	0.95	0.0020		
	BONE SF	1.49E-03	3.58	12.2	170	1.46	1.46E-01	3.66E-07	0.52	0.0011		
	EDE	9.40E-03	22.56	16.9	170	1.46	1.46E-01	3.66E-07	3.30	0.0070		
TOTAL RADIUM-226												
	LUNG	6.50E-02	155.93	531.2		1.46					32.65	0.07
	BONE SF	2.41E-01	578.38	1970.3		1.46						
	EDE	3.16E-02	75.19	258.2		1.46					12.50	0.03
Ra-228												
	LUNG	2.67E-02	64.08	218.3	180	1.46	1.55E-01	3.66E-07	9.92	0.0210		
	BONE SF	2.41E-02	57.84	197.0	180	1.46	1.55E-01	3.66E-07	8.96	0.0190		
	EDE	4.77E-03	11.45	39.0	180	1.46	1.55E-01	3.66E-07	1.77	0.0038		
Th-228												
	LUNG	2.56E+00	6144.00	20930.6	50	1.46	4.30E-02	3.66E-07	264.28	0.5592		
	BONE SF	8.47E-01	2032.80	6925.1	50	1.46	4.30E-02	3.66E-07	87.44	0.1850		
	EDE	3.42E-01	820.80	2796.2	50	1.46	4.30E-02	3.66E-07	35.31	0.0747		
Ra-224												
	LUNG	2.43E-02	58.32	198.7	50	1.46	4.30E-02	3.66E-07	2.51	0.0053		
	BONE SF	4.33E-03	10.39	35.4	50	1.46	4.30E-02	3.66E-07	0.45	0.0009		
	EDE	3.16E-03	7.58	25.8	50	1.46	4.30E-02	3.66E-07	0.33	0.0007		
Pb-212												
	LUNG	7.29E-04	1.75	6.0	50	1.46	4.30E-02	3.66E-07	0.08	0.0002		
	BONE SF	1.37E-03	3.29	11.2	50	1.46	4.30E-02	3.66E-07	0.14	0.0003		
	EDE	1.69E-04	0.41	1.4	50	1.46	4.30E-02	3.66E-07	0.02	0.0000		
TOTAL RADIUM 228												
	LUNG	2.61	6271.44	21364.7		1.46					276.91	0.59
	BONE SF	0.88	2101.73	7170.1		1.46						
	EDE	0.35	840.24	2862.4		1.46					37.42	0.08
									TOTAL LUNG		309.58	0.66
									TOTAL EDE		49.93	0.106

- **Col.A&B:** These columns list the radionuclide and the organ of the body for which the dose is calculated.

- **Col.C:** The dose factor for the specific radionuclide and body organ is given in mrem/yr CEDE per picocurie of activity taken into the body.

- **Col.D&E:** These columns indicate the dose factors based on the yearly inhalation rate for occupational conditions and the general public. Column D is the respective value in Column C times an inhalation rate of 2400 cubic meters per year for occupational conditions (8 hour day, 300 days per year). Column D incorporates an inhalation rate of 8176 cubic meters per year for the general population.

- **Col.F:** This column gives the concentration for the subject radionuclide for the source terms.

- **Col.G:** This column is one or' the source term parameters for the calculation of the off-site doses. The value of 1.46 is the resuspension source term times the particle size enrichment factor.

- **Col.H:** This column gives the projected airborne concentration of the subject radionuclide for on-site exposure.

- **Col.I:** This column gives the Chi/Q value (sec/cu. m) for atmospheric transport to the nearest off-site resident, located about 2.2 miles from the site. The Chi/Q for the site boundary is a factor of 10.55 higher.

- **Col.J&K:** These columns give the annual doses from inhalation for on-site workers and the off-site resident for the respective radionuclides.

- **Col.L&M:** The doses for all of the pertinent radionuclides in the Ra-226 and Ra-228 decay chains are given. The rows at the bottom of the table indicate summations for Ra-226 plus Ra-228 doses.

I.2.2 Inhalation Exposure at Geothermal Facility

Inhalation exposures for personnel associated with the geothermal plant sites were performed using techniques similar to those given in Section 1.2.1. The calculation for the dose for personnel on site and for the closest off-site resident are given in Table I-5. The source terms in Table I-5 are based on an airborne dust loading of 425 micrograms per cubic

Table I-5
Truck Loading Operations
Inhalation Dose Calculations

A	B	C	D	E	F	G	H	I	J	K	L	M
									Inhalation Dose (mrem/yr)			
Nuclide	Pathway	(mrem/pCi)	2000 HR mrem/yr (pCi/m³)	8760 HR mrem/yr (pCi/m³)	Concentration in Waste (pCi/g)	Source Term (g/sec)	Onsite Exposure (pCi/m³)	Resident CHI/Q (sec/m³)	Onsite Exposure (mrem/yr)	Offsite Resident (mrem/yr)	Total Worker (mrem/yr)	Total Resident (mrem/yr)
Ra-226												
	LUNG	5.96E-02	143.04	487.3	250	0.01	6.37E-02	4.70E-05	9.12	0.0573		
	BONE SF	2.81E-02	67.44	229.7	250	0.01	6.37E-02	4.70E-05	4.30	0.0270		
	EDE	8.58E-03	20.59	70.2	250	001	6.37E-02	4.70E-05	1.31	0.0082		
Pb-210												
	LUNG	1.18E-03	2.83	9.6	170	0.01	4.33E-02	4.70E-05	0.12	0.0008		
	BONE SF	2.02E-01	484.80	1651.6	170	0.01	4.33E-02	4.70E-05	21.02	0.1320		
	EDE	1.36E-02	32.64	111.2	170	0.01	4.33E-02	4.70E-05	1.41	0.0089		
Po-210												
	LUNG	2.70E-03	6.48	22.1	170	0.01	4.33E-02	4.70E-05	0.28	0.0018		
	BONE SF	1.49E-03	3.58	12.2	170	0.01	4.33E-02	4.70E-05	0.16	0.0010		
	EDE	9.40E-03	22.56	76.9	170	0.01	4.33E-02	4.70E-05	0.98	0.0061		
TOTAL RADIUM-226												
	LUNG	6.50E-02	155.93	531.2							9.52	0.06
	BONE SF	2.41E-01	578.38	1970.3								
	EDE	3.16E-02	75.79	258.2							3.71	0.02
Ra-228												
	LUNG	2.67E-02	64.08	218.3	180	0.01	4.59E-02	4.70E-05	2.94	0.0185		
	BONE SF	2.41E-02	57.84	197.0	180	0.01	4.59E-02	4.70E-05	2.65	0.0167		
	EDE	4.77E-03	11.45	39.0	180	0.01	4.59E-02	4.70E-05	053	0.0033		
Th-228												
	LUNG	2.56E+00	614400	20930.6	50	0.01	1.27E-02	4.70E-05	71.34	0.4917		
	BONE SF	8.47E-01	2032.80	69Z.J	50	0.01	1.27E-02	4.70E-05	25.92	0.1627		
	EDE	3.42E-01	820.80	2796.2	50	0.01	1.27E-02	4.70E-05	10.47	0.0657		
Ra-224												
	LUNG	2.43E-02	58.32	198.7	50	0.01	1.27E-02	4.70E-05	0.74	0.0047		
	BONE SF	4.33E-03	10.39	35.4	50	0.01	1.27E-12	4.70E-05	0.13	0.0008		
	EDE	3.16E-03	7.58	25.8	50	0.01	1.27E-02	4.70E-05	0.10	0.0006		
Pb-212												
	LUNG	7.29E-04	1.75	6.0	50	0.01	4.30E-02	4.70E-05	0.08	0.0001		
	BONE SF	1.37E-03	3.29	11.2	50	0.01	4.30E-02	4.70E-05	0.14	0.0003		
	EDE	1.69E-04	0.41	1.4	50	0.01	4.30E-02	4.70E-05	0.02	0.0000		
TOTAL RADIUM-228												
	LUNG	2.61	6271.44	21364.7							82.10	0.52
	BONE SF	0.88	2104.73	7170.1								
	EDE	0.35	840.24	2862.4							11.10	0.07
									TOTAL LUNG		91.62	0.57
									TOTAL EDE		14.81	0.03

meter (Appendix E) for 2 hours per day. The source term for the off-site area is based on the dust being suspended from a 15 m long source, with the dust mixing to a height of 5 meters. The atmospheric transport (Chi/Q) is taken from Turner 1969, based on a wind speed of about 3 mph and a distance to the location of the residence of 0.5 miles. The general descriptions of the columns in Table I-3 are the same as those given in Section I.2.1 for Table I-4.

1.3 EXTERNAL GAMMA DOSES

The external gamma dose is calculated for the truck driver transporting materials to the disposal site, and workers at the site who are unloading, placing, and compacting the waste materials. The gamma doses are based on the emission of gamma photons by the Ra-226 and associated radionuclicies (NCRP 1975), self-absorption of the radiation in the materials, and the relative geometry of the waste material and the persons being exposed. The gamma emission factors (NCRP 1975) are for sources of infinite thickness and lateral extent. The waste materials at the power plant sites and in trucks are in more restrictive geometries and the exposure rates will be lower. A gamma dose factor of 0.00167 mrem/hr per pCi/g was used. This gives a factor for the wastes of 0.4 mrem/hr.

The highest exposure rate that has been measured for the geothermal materials at the facilities is 0.1 mremihr (Appendix E). The theoretical factor of 0.4 mrem/hr is based on a large slab source of effective infinite lateral extent and thickness. Based on the limited extent of the deposits of waste in the facility and distance and materials shielding factors for the vehicles, it is assumed that the average exposure rate is 0.11 mrem/hr.

The projected maximum exposure time for truck drivers transporting the waste to the Monofill Site is assumed to be 490 hours per year. This is based on 1 hour for loading and unloading the material and a 0.63 hour travel time per trip (Appendix E). The individual is projected to work 300 days per year. The projected dose is about 51 mrem/yr. It is assumed that the personnel loading the waste at the geothermal facility may receive similar doses.

The bulldozer operator off-loading, placing, and compacting the material at the Monofill Site is assumed to be exposed for about 6 hours per day for 300 days per year. The projected dose is about 180 mrem per year. It is projected that proper placement of shielding on the bulldozer could reduce this dose, by mitigation, by about a factor of three.

I.4 SUMMARY AND PROJECTED MITIGATION OF DOSES

Table I-6 provides a summary of the doses for the various exposure scenarios. in addition to the previous estimates, general estimates are also given for the gamma doses to people in the off-site areas. Based on the distance from the sources, the gamma doses to residents in the off-site areas are estimated to be insignificant. Estimates of the doses, based on various mitigation efforts are also given. The mitigation efforts include shielding on the bulldozer used to place material, dust control, using air conditioned cabs for vehicles, using water to maintain the moisture content of the waste material, and increasing the thickness of the cover for final closure of the site.

I.5 Risk Assessment

The impact of radiation exposure may be expressed in terms of fatal cancers resulting from the exposure. This may be presented as potential cancers per million rems of exposure; where "million rems" can represent 1 rem to 1 million persons, or a similar combination of dose and number of people. The EPA in Federal Register 54/43:9612 (March 7, 1989) provided an estimate of 400 per 10^6 person-rem (proposed regulations for the Clean Air Act). This can also be interpreted on the basis of risk per rem per year. It should be recognized that the health effects of radiation exposures are based on extrapolations of effects that have been observed at very high doses. This extrapolation is performed based on the assumptions of "no threshold" and "linear effects." This means that the effect is directly proportional to the dose, and that there is no threshold below which there is no effect. There is some evidence that both of these assumptions are conservative. The actual effects from low doses (e.g., those projected for this project) may be zero, or it is possible that they may be higher than the estimates.

Health risks for the estimated radiation exposures given are provided in Table I-6.

The worker risk, about 30 per million per year, can be compared to the "safe industry" level of 100 per million per year (NCRP 1987b). This indicates that the increment from radiological risks is similar to common industrial practice.

The risk from radiation exposure due to Monofill activities to the closest resident to the Monofill would represent an increment of about 1 percent over the risk associated with average background radiation (500 mrem/year, risk of about 100 per million per year). This is an insignificant increase, comparable to the dose from a 2-hour plane flight (NCRP 1987a). The risk of smoking 1.6 cigarettes is about 1 per million and the risk of driving 30 miles in a car is about 1 per million (Bemhardt et al. 1990).

The methodology used in quantifying risk for this project assumes that radiation exposures pose risk proportional to the dose, no matter how small (the non-threshold theory). The variation in natural background radiation as well as doses from human activities (medicine, smoke detectors, eating barbecued meat, etc.) would mask this level of risk.

Table I-6

RISK ASSESSMENT, MITIGATED DOSES FOR MONOFILL ACTIVITIES

Activity	Gamma Dose (mrem/year)	Inhalation Particulate Dose (mrem/year)	Radon Exposure (WLM)	Total Dose Commitments (mrem/year)	Non-Radon Risk (risk/year)	RAE Value Radon Risk (risk/year)
MONOFILL SITE						
Workers	60[a]	10[b,d]	0.01[c,d]	70	28/million	3.6/million
Offsite Resident @ 2.2 miles						
During operation	<0.01	0.05[b]	0.00045[c]	0.05	0.02/million	0.16/million
After Closure	<0.01	—	0.00014[f]	—	—	0.05/million
Site **Boundary**						
During Operation	co.1	0.60[b]	0.0047[c]	0.60	0.24/million	1.7/million
GEOTHERMAL FACILITY						
Loading Trucks	51[e]	15[e]		66	26/million	—
Offsite Resident @ 0.5 miles	<0.01	0.093[e]	0.00045	0.103	0.041/million	0.16/million
TRUCK DRIVER	51[e]	—	—	51	20/million	—

(a) Mitigation based on shielding on off-loading and compaction equipment.
(b) Mitigation based on dust control to reduce airborne dust to 100 micrograms per cubic meter.
(c) Mitigation based on spraying uncovered areas of pile to reduce radon flux and control dust.
(d) Mitigation based on using air conditioned cabs with filtered makeup air.
(e) No mitigation assumed.
(f) Based on a cover of 2 feet of compacted clay and 8 feet of soil.
— Not calculated, insignificant compared to other values.

APPENDIX II
ANALYSIS OF FILTER CAKE MATERIALS
FOR THE LEATHER'S FACILITY

EXPERIMENTAL

Gamma spectroscopy identifies individual gamma transitions which occur following either beta or alpha decay. These transitions are discrete and detection of different energy transitions can be made using high resolution HPGe semi-conductor detectors.

For the analysis of samples which have low levels of radioactivity, it is necessary to use long acquisition times. For these analyses, acquisition times of 5 hours were used. Identification of isotopes is performed by measuring the energies of the transitions and correlating them to known transition energies of individual isotopes. Table I lists the major transitions identified in the acquired spectra.

TABLE I

Gamma-Ray Emission Lines Identified

Isotope	Gamma-Ray Energy
^{208}Tl	583
	160
^{212}Pb	238
^{214}Bi	609
	934
	1120
	1238
	1378
	1764
^{214}Pb	242
	352
	786
^{224}Ra	241
^{226}Ra	186
^{228}Ac	129
	209
	328
	911
	969

Once identification of the isotopes is made, quantification is possible. In order to perform quantification, The detector efficiency must be known. Since the efficiency is a function of energy, calibration of the detector system is necessary. This is done by comparing detector responses to a known radiation source. National Institute for Standards and Technology, NIST (formerly NBS) supplies these standards. The standard used for our measurements was SRM 4276B, which is 8 mixture of three long lived isotopes covering the energy range necessary to quantify all identified isotopes in the filtercake.

Knowing the detector efficiency for each energy transition, the branching ratio to the individual transitions and the weight of the sample which was analysed, quantification of the individual isotopes can be made. The following equation is used for these calculations.

$$\text{Activity/gram} = \text{cps}/(\epsilon \times \text{b.r.})/\text{weight}$$

where:

Activity/gram - activity units are becquerels (3.7×10^{10} bq = 1 Curie)

cps - counts per second for the measured transition

ϵ - detector efficiency

b.r. - branching ratio for the measured transition

RESULTS

Table II lists the results for the individual isotopes analysed by gamma spectroscopy.

TABLE II

Isotopic Composition by Gamma Spectroscopy

Isotope	Leathers 504 Clarifier	Leathers 524 Clarifier
^{226}Ra	187 ± 10	50 ± 5
^{214}Pb	148 ± 7	33 ± 1
^{214}Bi	140 ± 7	33 ± 1
^{228}Ac	90 ± 5	23 ± 1
^{224}Ra	26 ± 5	6 ± 1
^{212}Bi	9 ± 2	n.d.<2
^{212}Pb	9 ± 2	4 ± 1
^{208}Tl	4 ± 1	n.d.<1
^{212}Po	6 ± 2	n.d.< 1
TOTAL[1]	619 ± 23	149 ± 16

1- Total Activity in pCi/gram identified by gamma spectroscopy

It is known that radium will by trapped in barium crystals preventing the escape of all the daughters of the radioactive radium isotopes. Knowing the daughters are present, activities of the daughters can be calculated using standard decay/buildup formula. Table III lists the isotopes present from these calculations and total activities from calculated plus measured isotopes.

TABLE III

Calculated Activities From Radioactive Daughters of Measured Isotopes

	Leathers 504 Clarifier	Leathers 524 Clarifier
^{222}Rn	187 ± 10	50 ± 5
^{218}Po	187 ± 10	50 ± 5
^{214}Po	140 ± 7	33 ± 2
^{210}Pb	140 ± 7	33 ± 2
^{210}Bi	140 ± 7	33 ± 2
^{210}Po	140 ± 7	33 ± 2
^{220}Rn	26 ± 8	6 ± 1
^{216}Po	26 ± 8	6 ± 1
^{228}Ra	90 ± 5	23 ± 1
TOTAL[1]	1076 ± 54	267 ± 14
TOTAL[2]	1695 ± 85	416 ± 21

1- Total activity from calculations of Radium Daughters
2- Total Activity from Measurements (Table III) and Calculations