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ALTERNATE SITE SELECTION PROCESS
FOR UMTRA PROJECT SITES

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MASTER

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TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
1.0 INTRODUCTION	1
2.0 ALTERNATE SITE SELECTION PROCESS	3
2.1 Phase I - designation of a search region	3
2.2 Phase II - preliminary screening of search region	4
2.3 Phase III - identification and evaluation of sites	7
3.0 REPORTING	18
REFERENCES	19

LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
1.1 Alternate site selection process	2

LIST OF TABLES

<u>Table</u>	<u>Page</u>
2.1 Regional screening guidelines	5
2.2 Selected desirable characteristics for alternate areas	9
2.3 Geotechnical, hydrological, environmental, and economic rating matrix	11

1.0 INTRODUCTION

The purpose of this document is to describe the guidelines and processes to be used by the DOE with input from the affected states and tribes to select alternate disposal sites in compliance with each established cooperative agreement. This document supersedes two previous DOE documents, Criteria for Evaluating Disposal Sites (DOE, 1982) and Alternate Site Selection Process (ASSP) for UMTRA Project Sites (DOE, 1986).

This revision of the ASSP was prepared in response to the proposed groundwater protection standards that amend 40 CFR 192. The principal modifications are to the ASSP screening criteria for hydrological and geological conditions at candidate disposal sites. The revised screening and selection criteria will assist the project in selecting disposal sites where the probability of compliance with the proposed groundwater standards is high.

The ASSP described in Section 2.0 consists of three phases (Figure 1.1): Phase I - designation of a search region; Phase II - preliminary screening of the designated search region; and Phase III - identification and evaluation of candidate sites. Section 3.0 discusses how the results of the ASSP will be reported. This process provides a technically sound and publicly defensible approach for identifying potentially suitable disposal sites.

FIGURE 1.1
ALTERNATE SITE SELECTION PROCESS

2.0 ALTERNATE SITE SELECTION PROCESS

2.1 PHASE I - DESIGNATION OF A SEARCH REGION

The initial phase in the ASSP is the designation of a search region. The search region is selected in consultation with the affected state or tribe. Factors to be considered include local, state, or tribal preferences; political boundaries (e.g., within the county of the processing site); the likelihood of finding suitable sites (e.g., underlying strata may not be suitable); and other factors appropriate to the site in question (e.g., including specific locations).

Typically, a search region includes the lands within a five-mile radius of the processing site. The search region is then plotted on USGS topographic maps.

In other cases, the factors listed above may modify the search region. For example, at the Lakeview, Oregon, site, the former mines from which the ore was extracted were included in the search region.

It also should be recognized that the ASSP (see Figure 1.1) can consist of several iterations, as necessary. For example, should it be determined that there are no suitable sites within the search region, the region would be modified and the evaluation process repeated.

2.2 PHASE II - PRELIMINARY SCREENING OF SEARCH REGION

Phase II involves the use of regional screening guidelines based on geotechnical, hydrological, and environmental factors. The guidelines are applied to the area within the search region to eliminate areas that are unsuitable for tailings disposal.

A team of specialists with expertise in the fields of geotechnical and design engineering, geology, hydrology, seismology, and the environmental sciences will develop and apply the guidelines in consultation, as necessary, with the affected state or tribe. Each guideline will be identified by the team from existing information. Geotechnical, hydrological, environmental, and economic information may be obtained from Federal, state, and local sources including, but not limited to, the U.S. Geological Survey, Bureau of Land Management, state regulatory agencies, state geological surveys, state engineer's office, health departments, municipalities, university and state libraries, and the Bureau of Mines and Mineral Resources.

Table 2.1 provides the basic list of regional screening guidelines. These guidelines were selected as a means of avoiding areas for potential disposal which may have regulatory or legislative constraints (e.g., wetlands, parks), engineering constraints (e.g., erosive soils), or significant negative environmental impacts. Certain aspects of the regional screening guidelines will vary from site to site; therefore, certain factors may require additional investigations on a site-specific basis. For example, a guideline for geothermal resources may require

Table 2.1 Regional screening guidelines

Characteristic	Definition
Geologic faults	Areas within 3000 feet of capable faulting as defined by 10 CFR Part 100, Appendix A.
Liquefaction potential	Within 0.25 mile of areas having saturated loose sands or visible surface indications of disrupted drainage or broken ground.
Landslides	Areas within 0.25 mile of visible indications of slope instability.
Erosive soils	Areas of known highly erosive soils, including fluvial environments subject to flash flooding or mainstream river flooding.
Slopes and escarpments	Slopes steeper than 33 percent or areas from the top of an escarpment in excess of 10 measured feet in height to a distance established by the intersection of the ground surface with a plane inclined at a 20° angle from a horizontal plane passing through the toe of the escarpment, or 100 feet, whichever is greater.
Water bodies	Lakes, ponds, reservoirs, rivers, or perennial streams.
Wetlands	Wetlands as defined by the U.S. Fish & Wildlife Service or U.S. Army Corps of Engineers.
Floodplains	100-year floodplains as defined by the U.S. Department of Housing & Urban Development, or within 0.125 mile of a stream centerline.
Aquifers	Any area underlain by Class I groundwater.
Surface drinking water supplies	Areas within one mile of surface waters that are sources of domestic water for either individual households or communities.

Table 2.1 Regional screening guidelines (Concluded)

Characteristic	Definition
Communities	Areas within one mile of community limits (legal boundary).
Mineral resources	Significant known recoverable resources of oil, gas, coal, and other minerals (except uranium and gravel).
Subsidence areas	Within 0.25 mile of areas susceptible to subsidence by natural or man-made causes.
Transportation and communication corridors	Areas within the rights-of-way of state, Federal, and county roads.
Archaeological & historical resources	Within 100 feet of archaeological or historical districts and sites listed or eligible for listing on the National Register of Historic Places.
Prime farmlands	Areas designated by the Soil Conservation Service as being within the Class II soil capability classification.
State & National Parks	Within 0.25 mile of parks and monuments under Federal, state, or local jurisdiction.
Wilderness & natural areas	Within 0.25 mile of Wilderness Areas, Wilderness Study Areas, Natural Areas, areas of critical environmental concern, and roadless areas as identified by the U.S. Forest Service, or Bureau of Land Management.
Wildlife refuges	Within 0.25 mile of wildlife refuges and designated migratory bird feeding areas.
Critical habitat	Within 0.25 mile of designated critical habitat for threatened or endangered species, fishery resource areas, and botanically sensitive areas.

additional attention, or definitions of a guideline may be altered to account for state regulations (e.g., state endangered species).

The guidelines are not weighted or ranked by their relative importance but are used to eliminate broad areas from consideration that, if included, would require a more complex design (e.g., steep slopes) or pose problems of a regulatory nature (e.g., presence of endangered species).

Each guideline will be used to identify unsuitable lands within the search region. These lands will be plotted on topographic maps and will not be considered further in the ASSP.

2.3 PHASE III - IDENTIFICATION AND EVALUATION OF SITES

Phase III requires that the selection team examine the lands not eliminated after the Phase II screening and select no more than three areas for further evaluation (an area is defined as a location ranging in size from 40 to 600 acres). The team will reexamine the literature and select areas having characteristics that are conducive to disposal of tailings in a manner that will meet the standards without overly complex design features. Characteristics considered for design include area accessibility and terrain, nearby structures, potential borrow sites for cover material, and constructibility. Hydrologists will evaluate the presence or absence of complex watersheds, flooding potential, geomorphic stability, potential surface water quality impacts, aquifer parameters, depth to groundwater,

direction of groundwater flow, volume flux beneath the disposal site, aquifer and subsoil geochemical properties, background water quality and classification of groundwater (EPA, 1986), and potential impacts of tailings seepage on groundwater quality including compliance with EPA groundwater standards. Geotechnical engineers will consider nearby faults and fault zones, latest seismic activity and extent, erosion potential, liquefaction potential, slope stability, and other considerations. The environmental science department will evaluate distances to parks, monuments, critical habitats, prime farmlands, cultural resources, and the like.

Table 2.2 presents examples of desirable characteristics used in the selection of alternate disposal sites. Suitable alternate areas are delineated on composite maps that incorporate geotechnical, hydrological, engineering, and environmental factors.

Once the areas have been selected, the evaluation team will conduct a field inspection to select no more than three sites (a site ranges from 40 to 100 acres in size) from within the areas. The criteria in Table 2.2 will form the basis for site selection.

Each site selected by the team may be drilled or have test pits dug to provide information regarding depth to groundwater, lithology, relative contaminant attenuation capacity, soils thicknesses, and other hydrological and geological features. The minimum number of holes needed to provide this information will be used. Each site will be drilled or have test pits dug only if the information needed is not available for the specific site or immediately adjacent areas.

Table 2.2 Selected desirable characteristics for alternate areas

<p>o GEOTECHNICAL</p> <ul style="list-style-type: none"> - Distant from active faults. - Low potential for liquefaction. - Highly stable slopes. - Low erosion potential. 	<p>o ENGINEERING</p> <ul style="list-style-type: none"> - Close to existing tailings. - Close to borrow materials. - Existing transportation network. - Favorable topography. - Few existing structures.
<p>o HYDROLOGICAL</p> <ul style="list-style-type: none"> - Minimal upstream surface-water drainage area. - No flooding potential. - Favorable geochemical properties; high cation exchange capacity and the presence of iron and manganese oxide adsorbents, high acid neutralization capacity for disposal of acid tailings and the presence of organic carbon or other chemical reducing agents. - Class III groundwater. - Upgradient groundwater contamination. - Upward vertical hydraulic gradients beneath a low-hydraulic conductivity strata. 	<p>o ENVIRONMENTAL</p> <ul style="list-style-type: none"> - Distant from critical habitats. - Distant from state and national parks. - Distant from wildlife refuges. - Distant from wilderness and natural areas. - Distant from populated areas.

After drilling and test excavations are complete, the alternate site selection team will rank each site using the geotechnical, hydrological, and environmental criteria shown in Table 2.3. The criteria were based on modifications to Criteria for Evaluating Disposal Sites (DOE, 1982), and the geotechnical ranking matrix used by the Colorado Geological Survey in the Preliminary Disposal Site Screening Report (CGS, 1982); the hydrological ranking criteria were established to take into account the groundwater protection standards set forth in 40 CFR 192. These criteria rank each alternate site for 32 site-specific characteristics. Each characteristic is weighted and a total of 432 points is possible.

Table 2.3 Geotechnical, hydrological, environmental, and economic rating matrix

FACTOR	RANK					FACTOR ^a SCORE
	0	1	2	3	4	
GEOTECHNICAL						
1. Land slope	>10%		<2% or 5 to 10%		2 to 5%	1
2. Surficial materials lithology	Gravel or sand	Very fine sand or sandy silt	Silt	Silty clay	Clay	2
3. Surficial materials thickness	0 to 2 ft	2 to 5 ft	5 to 10 ft	10 to 20 ft	>20 ft	1
4. Distance to nearest seismic risk cap- able fault ^b	0.5 to 1.0 mi	1 to 5 mi	5 to 10 mi	10 to 20 mi	>20 mi	4
5. Susceptibility to slope failures, subsidence, or hydroconsolidation ^c	Moderate to high		Low		Very low	4
6. Present erosion	Intense gully	Moderate gully	Minor gully	Sheet or rill wash	No erosion	4
7. Geomorphic stability	Very poor (fluvial environment)	Poor	Moderate	Good	Excellent (non-fluvial environment)	4
8. Conflict with mineral resources	Serious conflicts		Moderate conflicts		No or minor conflicts	1
9. Relative strength & compressibility of foundation soil & rock (if rock is -4 only)	Very soft or very loose	Soft or loose	Medium stiff to stiff or medium dense	Very stiff or dense	Hard or very dense	4

Table 2.3 Geotechnical, hydrological, environmental, and economic rating matrix (Continued)

FACTOR	RANK					WEIGHT	FACTOR ^a SCORE
	0	1	2	3	4		
HYDROLOGICAL							
10. Well yields are less than 150 gpd (Class III groundwater)	No	---	---	---	Yes	10	
11. Background water quality (TDS in mg/l) and aquifer classification	<1000	1000-2999	3000-4999	5000-9999	Class >10,000	10	
12. Widespread ambient contamination, not due to activities at the processing site, that cannot be treated by public water supply systems	No	---	---	---	Exceed EPA MCL's	5	
13. Upgradient groundwater contamination above EPA MCL's, which affects local background	No	---	---	---	Yes	3	
14. Geologic strata where there is no existing groundwater and the strata is underlain by lithologies of relatively lower hydraulic conductivity	No				Yes	2	
15. Volumetric flux of uppermost aquifer through cross-sectional area under disposal site (gpm). Applies only if Item 10 is "no"	<1	1-10	10-100	100-1000	>1000	5	

Table 2.3 Geotechnical, hydrological, environmental, and economic rating matrix (Continued)

FACTOR	RANK					FACTOR ^a WEIGHT SCORE
	0	1	2	3	4	
HYDROLOGICAL						
16. Geochemical properties of aquifer and subsoils: cation exchange capacity (CEC), acid neutralization capacity (ANC), iron and manganese oxide absorbents (IMOA), and chemical reducing agents	None	Low	Moderate	Medium	High	7
17. Potential for upward hydraulic gradients below a low hydraulic conductivity stratum	Downward	Neutral	Low	Medium	High	4
18. Proximity to point of groundwater discharge (ft)	None	<500	500-300	300-100	Top of pile	4
19. Depth to groundwater in shallowest aquifer	<20	20-50	50-200	>200	No ground-water underlain by low hydraulic conductivity strata.	3

Table 2.3 Geotechnical, hydrological, environmental, and economic rating matrix (Continued)

FACTOR	RANK				FACTOR ^a WEIGHT SCORE	
	0	1	2	3		
ENVIRONMENTAL						
20. Distance to nearest point of groundwater withdrawal from potentially affected aquifer (miles)	On site	0-0.5	0.5-1.0	1.0-2.0	>2	8
21. Precipitation frequency (events per year of more than 1/8 inch)	>100	100-75	75-50	50-25	<25	2
22. Total annual precipitation (inches)	>40	40-30	30-20	20-10	<10	3
23. Annual pan evaporation (inches)	<40	40-50	50-60	60-70	>70	3
24. Population density ^d	Site is within one mile of any size city or town boundary.	Site is within one mile of a subdivision.	Site is within one mile of a proposed subdivision or projected residential growth area.	Site is within one mile of scattered private residences.	Site is in an uninhabited area; no residences are within two miles.	4
25. Transportation network ^d	Traffic congestion very likely, accident potential enhanced.	Traffic congestion likely, accident potential moderate.	Traffic congestion unlikely, accident potential low.			3

Table 2.3 Geotechnical, hydrological, environmental, and economic rating matrix (Continued)

FACTOR	RANK					FACTOR ^a SCORE
	0	1	2	3	4	
ENVIRONMENTAL						WEIGHT
26. Presence of cultural ^d or historical sites	Nationally significant cultural sites are known to be present within a two-mile radius.	Cultural sites of minor importance have been found within a one-mile radius.	The area was known to be inhabited in prehistoric times.	The area may have the characteristics for finding cultural sites but none are known to exist within a one-mile radius.	There are no known cultural sites within a two-mile radius, nor is it likely that nationally significant sites would be found.	3
27. Threatened, endangered, or economically important species ^d	Threatened, endangered, or economically important species are known to inhabit currently the area during any part of the year.	Prior use of the area by threatened, endangered, or economically important species is established although no recent (within five years) sightings within a two-mile radius have been made.	The area contains suitable habitat for threatened, endangered, or economically important species.	The area contains suitable habitat for threatened, endangered, or economically important species; however, similar habitat is abundant throughout the area.	There are no known threatened, endangered, or economically important species within a two-mile radius; nor is the habitat suitable for listed threatened or endangered species.	4
28. Scenic values ^d	Site has high recreational use or is along the travel corridor to areas frequented by tourists.	Site is clearly visible to the majority of town residents or is visible from area scenic viewpoints.	Site is visible to residents of existing or planned subdivisions.	Site is not visible from high use areas, viewpoints, or populated areas.	Site is not visible to any residents within the city limits, surrounding unincorporated areas, or planned growth areas.	3

Table 2.3 Geotechnical, hydrological, environmental, and economic rating matrix (Continued)

FACTOR	RANK					FACTOR'S WEIGHT SCORE
	0	1	2	3	4	
ENVIRONMENTAL						
29. Land used - current	A change in land use would directly affect the livelihood of the owner or surrounding owners.	A change in land use would impact surrounding land-owners.	The site would disrupt existing use but suitable, adjacent land could be traded satisfactorily so as not to impact negatively the landowner's economic base.	Current use of the site is considered low in productivity/quality relative to other areas.	A change in land use would have an insignificant effect on the existing or adjacent landowner or user.	4
30. Land used - potential	The area has potential for higher uses.	Adjacent land is suitable for development; presence of tailings would preclude desireability of other future adjacent land areas.	Land may have potential for development but similarly suitable land is abundantly available in the area.	The area does not have potential for productive use without stimulation or change by man.	Land has no recognized inherent value or potential.	5
31. Land ownership	Surface and subsurface rights are owned by multiple, and different, parties.		Surface rights are owned by multiple parties; subsurface rights are owned by a single party.		Surface and subsurface rights are owned by a single party.	6

Table 2.3 Geotechnical, hydrological, environmental, and economic rating matrix (Concluded)

ECONOMIC	FACTOR	RANK				WEIGHT	FACTOR ^a SCORE
		0	1	2	3	4	
32.	Distance from existing site	Longest		Moderate		Lowest	7
33.	Distance to potential borrow sites: fine materials/coarse materials	Longest		Moderate		Lowest	2.5/2.5
34.	Existing road network	Poor condition, extensive improvements required.		Moderate condition, some improvements required.		Good condition, no or few improvements required.	3
35.	Road has spots with positive grade from mill site and tailings to disposal site	>10%		8 to 10%		0 to <8%	3

^aFactor score = rank x weight.
 Refers to a capable fault as defined by 10 CFR Part 100, Appendix A.
 Determination of susceptibility is based on evidence of recent slope failures, subsurface materials, and subsurface conditions.
 If more than one ranking definition applies, site would be ranked for the lowest point value.

3.0 REPORTING

The results of the ASSP are reported principally in the Comparative Analysis of Disposal Site Alternatives Report, Environmental Assessment, or Environmental Impact Statement for each site. Each phase is described and the results are noted. Data gathered from the drilling program will be reported in these documents as well as in the Disposal Site Characterization Report (if required). The topographic maps, which will depict the search region, areas eliminated from consideration, and the areas/sites selected, will be retained in the UMTRA Project Document Control Center, Albuquerque, New Mexico.

REFERENCES

- CGS (Colorado Geological Survey), 1982. "Preliminary Disposal Site Screening Report for the Grand Junction and Rifle Mill Tailings Piles," Department of Natural Resources, Denver, Colorado.
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- EPA (U.S. Environmental Protection Agency), 1986. "Guidelines for Ground-Water Classification Under the EPA Ground-Water Protection Strategy," final draft, EPA Office of Ground-Water Protection, Office of Water.

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