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ADDENDUM

PHASE II - TITLE I ENGINEERING ASSESSMENT OF INACTIVE URANIUM MILL TAILINGS RIVERTON SITE, RIVERTON, WYOMING

AUGUST 1978

PREPARED FOR

UNITED STATES DEPARTMENT OF ENERGY
GRAND JUNCTION, COLORADO, CONTRACT NO. E(05-1)-1658

BY

Ford, Bacon & Davis Utah Inc.

Department of Energy
P. O. Box 2567
Grand Junction, CO 81501

August 31, 1978

ADDENDUM TO THE RIVERTON SITE PHASE II - TITLE I ENGINEERING ASSESSMENT OF INACTIVE URANIUM MILL TAILINGS REPORT

A copy of the subject addendum is enclosed to complement the original Riverton report (either full or summary) which you received from this office.

Sincerely,

John G. Themelis

John G. Themelis, Director
Engineering & Safety Division

GJT-19A

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RIVERTON SITE

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CONTENTS

Paragraph	Title	Page
	List of Figures.	iv
	List of Tables	v
	RIVERTON LONG-TERM STORAGE SITE SELECTION	
1	Introduction	1
2	Materials to be Stored	1
3	Removal of the Materials from the Existing Site	1
4	Criteria for Long-Term Storage	2
5	Preparation of Storage Sites	3
6	General Description of Disposal Site Areas . .	4
7	Descriptions of Specific Storage Sites and Cost Estimates	5
	7.1 Site 7, North Section 36, Alkali Butte Quadrangle, Township 35 North, Range 94 West	5
	7.1.1 Costs.	6
	7.2 Site 8, Center, Section 10, Arapahoe Northeast Quadrangle, Township 1 South, Range 5 East.	6
	7.2.1 Costs.	7
	7.3 Site 11, Southeast Section 26, Arapahoe Northeast Quadrangle, Township 34 North, Range 96 West	8
	7.3.1 Costs.	8
	7.4 Site 13, Southwest Section 15, Arapahoe Quadrangle, Township 1 South, Range 4 East.	9
	7.4.1 Costs.	9
	7.5 Site 14, South Section 22, Arapahoe Quadrangle, Township 1 South, Range 4 East.	10

CONTENTS (Cont)

Paragraph	Title	Page
	7.5.1 Costs.	11
7.6	Site 16, North Section 6, Lander Southeast Quadrangle, Township 33 North, Range 99 West	11
	7.6.1 Costs.	12
7.7	Site 17, Northeast Section 8, Lander Southeast Quadrangle, Township 33 North, Range 98 West.	12
	7.7.1 Costs.	13
	REFERENCES	18

LIST OF FIGURES

Number	Title	Page
1	Location of Alternative Storage Sites.	14
2	Schematic of Typical Long-Term Tailings Storage Site	15

LIST OF TABLES

Number	Title	Page
1	Sites Considered for Long-Term Storage	16
2	Cost Estimate Summary to Decontaminate Riverton Site and Haul Materials to Storage Sites.	17

RIVERTON LONG-TERM STORAGE SITE SELECTION

1. INTRODUCTION

In December 1977, Ford, Bacon & Davis Utah Inc. (FB&DU) issued a document entitled "Phase II - Title I Engineering Assessment of Inactive Uranium Mill Tailings, Riverton Site, Riverton, Wyoming".

Paragraph 9.3, Chapter 9, of that assessment stated:

> "Although specific long-term storage sites have not been identified, the costs for relocating the tailings and contaminated material to sites at distances 5 and 10 mi from the present location have been estimated as $6,000,000 and $6,400,000, respectively. These costs include the remedial action, engineering, EIS, contingency, and perpetual care costs."

In February 1978 DOE requested that FB&DU identify specific locations in the vicinity of the Riverton pile which would serve as suitable long-term (greater than 50 yr) storage sites for the tailings and contaminated materials on the site. This report contains the description of specific long-term storage sites based on office and field studies and cost estimates for relocating the tailings and contaminated materials at these storage sites.

2. MATERIALS TO BE STORED

The tailings, which are stabilized with an 18-in. earth cover, occupy approximately 72 acres. The tailings, the stabilization cover, and an estimated average 3 ft of contaminated soil beneath the tailings would need to be removed to a long-term storage site. This material totals approximately 1,129,000 yd^3 or 1,700,000 tons. In addition, there are an estimated 500 tons of building materials and miscellaneous rubble that are contaminated and would also be removed to the storage site. This material would require a storage site of 30 acres for an average depth of approximately 25 ft, or 40 acres for a depth of 20 ft.

3. REMOVAL OF THE MATERIALS FROM THE EXISTING SITE

The old mill building and other contaminated structures and rubble would be demolished and hauled to the selected storage site. The area would be monitored during cleanup to assure that the total site would be completely cleaned to no more than twice background levels.

Based upon site examination and a review of the physical properties of the tailings, it appears that no difficulties

should be encountered in loading the tailings for removal purposes. The contractor performing this work will be able to use any number of conventional loading methods, i.e., front-end tractor loaders, conveyor belt feed to overhead loading, etc. To eliminate further tailings dispersion during loading and transportation operations, site and road dust control equipment would be used and washdown facilities and heavy rubber covers for the trucks would be provided. Rapid drying of the tailings and lack of moisture in the native earth during certain seasons of the year would require the use of dust preventive methods during the excavation process.

The debris on the site, as well as building material rubble, will be loaded by cranes onto flat-bed or high-side boarded dump trucks so that it can be transported to the disposal site without spillage of contaminated material enroute. There is ample room on the tailings site for fast loading and easy truck access.

Considering the distances and routes required, truck transportation appears to be the most economical means to haul materials to all storage areas. Trucks could move the materials at a rate of about 4,800 tons/day, based upon loading systems used and traffic capacities on the road to the disposal site. At this rate, on a 5-days-per-week, 10-months-per-year basis, all materials could be removed in approximately 1.5 yr. This method assumes the use of conventional truck and/or truck-trailer combinations. Where dirt roads would be traversed by trucks carrying tailings, the estimates involve the construction of a gravel-based surface sufficient to handle the heavy loads and traffic. No costs are included for repair and maintenance of public roads.

After removal of all contaminated materials the existing site would be restored to its original grade by adding clean imported borrow. None of the storage sites would require transporting contaminated materials through any heavily populated areas of Riverton.

4. CRITERIA FOR LONG-TERM STORAGE

Possible alternative sites were identified that could meet the objectives for long-term storage of radioactive tailings. Eighteen disposal sites were considered and each was visited and examined closely. Of these, seven sites were selected for cost estimate studies; they are presented herein as alternatives. Table 1 contains the name of each alternate disposal site studied and its distance from the Riverton site. Figure 1 shows the locations of the proposed disposal sites which were selected for cost studies.

Eleven of the 18 sites were omitted as alternatives primar-

ily because of inadequate site configuration, distance from the Riverton site, cost to develop the site, the possibility of encroachment on the site, the value of the site for other purposes, the adverse surface hydrology (too much upslope drainage), and the scarcity of suitable earth for use as stabilization cover.

Sites near populated areas or areas where population growth appears likely were eliminated from consideration. Also eliminated were lands used for farming or with farming or irrigation potential.

Each of the seven alternative sites was evaluated on the basis of hydrology, meteorology, geology, ecology, and economics. The evaluations consisted of literature surveys and limited on-site investigations. Assessments of the hydrologic and meteorologic conditions were centered on such factors as visible wind and water erosion, orientation to weathering by the prevailing winds, possible water contamination, flooding, drainage basin configuration, subsurface and surface drainage, and natural storage basin features. The geologic examination addressed stability problems and soil characteristics, such as evidence of slides and faults, and types of unconsolidated and bedrock materials. The availability of suitable stabilization cover and storage dike or dam materials also was evaluated. The ecological study included evaluation of land use potential, consideration of animal habitats, proximity to population centers, and aesthetic considerations. Economic considerations included preliminary estimates of support facilities such as highways, distance from the site, and the extent of site preparation and long-term maintenance required at the disposal sites. Rail haulage of tailings was not considered. Private, state, tribal, and federal lands were included in searching for acceptable alternate sites.

5. PREPARATION OF STORAGE SITES

The cost estimate summary given in Table 2 includes a brief description of each of the storage sites and the required costs estimated to implement each.

Several remedial measures are common to all the sites costed; these measures were considered in estimating the total cost of each. For example, standard 6-ft chainlink fence with three strands of barbed wire along the top would be required around the tailings at all sites. Also, radiation warning signs would be displayed prominently on fences, gates, and in other appropriate areas and facilities.

Long-term maintenance also would be required for the storage site selected. The maintenance would generally include periodic inspection and repair of fences, signs, and stabilizing cover, and radiometric monitoring.

Provision for the annual maintenance costs for an extended period of time is included in the form of a perpetual care fund which, at 7% annual interest, would provide the funds necessary for projected inspection and maintenance functions. The perpetual care fund is a mechanism to indicate the long-range control and financing needed to maintain the integrity of the inactive, relocated piles. No acquisition costs for alternative long-term storage areas are included in the cost estimates.

At each site the configuration of the resulting tailings storage area would be different because of the topography of the sites. In all cases, however, the first step in site preparation would be to excavate enough material from the bottom of the area to provide material for containment dike or dam construction and for covering the relocated pile with at least 2 ft of stabilization cover. In the two locations which are natural depressions, the sides of the depressions would need to be raised slightly by diking all around in order to contain the tailings. The tailings and contaminated rubble and earth would then be deposited into the storage area.

After all the contaminated materials have been deposited, the stockpiled earth would be placed over the tailings to a thickness of 2 ft. In some cases, rock would be imported and mixed into the final earthen surface of the pile and riprap would be added to the face of the dikes. The final shape of the pile would be a gentle slope, contour-graded to minimize water erosion and to encourage the vegetative process. Upslope from the pile, permanent diversion ditches would be constructed, as necessary, to divert water around the pile.

The final step in the process would be the planting of all disturbed areas with grasses and plants, native to the area, which could survive without seasonal irrigation. Figure 2 is a schematic representation of how these storage sites would be developed.

6. GENERAL DESCRIPTION OF DISPOSAL SITE AREAS

There are innumerable areas within a 20-mi haul distance from the Riverton tailings pile which would be acceptable as long-term disosal locations. Some locations would be more acceptable than others because of items such as: haul route, exposure, configuration, and ownership. The most suitable areas for a possible tailings disposal site are located south of the newly aligned State Highway 789, along either side of Sand Draw Road (State Highway 135), and on either side of the Gas Hills Road (State Highway 136). In these general areas, the lower elevations of the Beaver Creek drainage basin were avoided. Over 1 ft of snow at the time of the field reconnaissance prevented a detailed, thorough inspection of the entire area. However, the seven sites selected for cost analysis are excellent locations.

The topography of the area was characterized by numerous sharp drainage divides where upslope drainage was limited or nonexistent. Some potential storage sites were steep and others were more gradual.

The suggested disposal sites were all somewhat similar. They are located at the head of drainage areas in naturally formed horseshoe-shaped depressions or ravines, or in naturally formed depressions. The sites have little or no evidence of heavy recent wind or water erosion and none are situated close to any major faults. Access to the sites would be primarily over dirt, paved, or gravelled public roads. At some sites, haul roads would need to be constructed. There are no trees on any of the sites, and the vegetation cover is about 80%, consisting of sagebrush and native seasonal grasses.

7. DESCRIPTIONS OF SPECIFIC STORAGE SITES AND COST ESTIMATES

Site names are based upon their locations in a certain section of the USGS Quadrant Map in which the site is located.

7.1 Site 7, North Section 36, Alkali Butte Quandrangle, Township 35 North, Range 94 West:

This site is located in the extreme north end of Section 36, 14.1 mi from the Riverton site, 1.5 mi south of the Gas Hills Road, and immediately east of the Wind River Indian Reservation boundary. There are two dirt roads leading to the site which head south from the Gas Hills Road. About 45 acres would be required, as well as a long U-shaped containment dike on the northeast corner of the site. The site would have a favorable northeast exposure. It is now being used as seasonal grazing land.

Site 7 is near the edge of the Wind River Basin and therefore is in an area where the coarse-grained sequence of the Wind River Formation predominates. This sequence is characterized by green and gray, largely arkosic sandstone and conglomerate beds which are very well sorted, loosely cemented, and very porous. The coarse-grained sequence intertongues with a finer-grained sequence. In general, the bedrock does not outcrop well in this area as it is easily weathered and covered with more recent deposits.(1,2)

The Wind River Formation, a major aquifer in other areas, is not tapped in the immediate vicinity of site 7. The water table in this area is very deep, 220 ft in an industrial well

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(1)See end of report for references.

about 2.5 mi to the southwest.[1] The site is in an area which has a mean annual precipitation of only 5 to 10 in.[1] High evapotranspiration rates preclude the percolation of the limited precipitation or limited flow onto the site from the southwest to this deep water table. The site, located near the head of an intermittent drainage basin, would not be susceptible to flooding or extensive erosion from an upstream direction. Very limited flows from the southwest might be expected to cross the site during severe rainstorms but would be diverted around the storage area by a drainage ditch.

Advantages of this site are its isolation--the closest residence being at least 4 mi away; its locations on an unused and apparently undesirable portion of state-owned land; and the very unlikely possibility of encroachment by anyone. Disadvantages are the haul distance from the existing site, the necessity to construct 1.5 mi of haul road and the extensive grading required to construct the dike and storage basin.

7.1.1 Costs

As shown in Table 2, the estimated cost is $8,490,000. The major cost components are as follows:

(a)	Engineering (2.2% of item b)	$ 149,600
(b)	Remedial action	6,800,000
(c)	Environmental assessment and EIS preparation	300,000
(d)	Contingency (15% of items a, b, and c)	1,090,000
(e)	Perpetual care fund	150,000
	Total Cost	$ 8,490,000

This cost includes all of the decontamination work, removal of tailings and contaminated material from the site to this storage site, fencing, and inspection and maintenance. A perpetual care fund for the inspection and physical maintenance of the fencing and stabilized pile is included in an amount which will provide approximately $10,500/yr for the projected work.

7.2 Site 8, Center, Section 10, Arapahoe Northeast Quadrangle, Township 1 South, Range 5 East

This site is located about 300 ft north of the Gas Hills Road, 8.1 mi east of the Riverton site, and 1 mi west of Kirby Draw on the Wind River Indian Reservation. It is about 4 mi from the nearest residence and is well away from growth or infringement areas. Apparent usage is for seasonal grazing. In

configuration, orientation, acreage required, and dike size, this location is very similar to site 7.

Site 8 also is in the Wind River Basin but is not as close to the margins of the basin as is site 7. Therefore, there are likely to be more finer-grained lenses of siltstones and fine-grained sandstones and less of the coarser facies of the Wind River Formation. The bedrock does not outcrop well in this area either as it is easily weathered and covered with more recent deposits. The site is on the southwest flank of a northwest-southeast trending syncline; therefore, the beds in this area are probably dipping slightly to the northeast.[1,2]

The Wind River Formation is not tapped for water in the immediate vicinity of site 8. The water in this area is fairly deep, as indicated by the water table depth of 21.2 ft in Kirby Draw demonstrating that this depth would be even greater at the site as it is at higher elevations. The site is in an area which has a mean annual precipitation of only 5 to 10 in.[1] High evapotranspiration rates preclude the percolation of the limited precipitation and limited flows onto the site from the southwest to this water table. The site is located on nearly flat-lying land not far from the land of an intermittent drainage basin and would not be susceptible to flooding or excessive erosion from an upstream direction. The site is protected from off-site surface water flows from the south by the road grade. A drainage ditch would protect the site from very limited flows from the southwest during severe rainstorms.

Advantages of this site are its accessibility to the paved haul route without the need to construct haul roads, and the closeness to the Riverton site. Disadvantages are the high site preparation costs and its location on the Wind River Indian Reservation.

7.2.1 Costs

As shown in Table 2, the estimated cost is $7,570,000. The major cost components are as follows:

(a)	Engineering (2.5% of item b)	$ 150,000
(b)	Remedial action	6,000,000
(c)	Environmental assessment and EIS preparation	300,000
(d)	Contingency (15% of items a, b, and c)	970,000
(e)	Perpetual care fund	150,000
	Total Cost	$ 7,570,000

The perpetual care fund for annual maintenance is the same as that of site 7.

7.3 Site 11, Southeast Section 26, Arapahoe Northeast Quadrangle, Township 34 North, Range 96 West

This site is located in a natural depression, adjacent to and west of the old Sand Draw Road, 0.4 mi northwest of the Beaver Creek Oil and Gas Field Road. It is 1 mi south of the southern boundary of the Wind River Indian Reservation and 13.1 mi from the Riverton tailings pile. The closest occupied area is the Beaver Creek oil and gas operation, 3.6 mi to the southwest.

The natural configuration of this BLM-administered site makes site preparation easy and thus less costly than the other sites. No dikes, dams, and no upslope drainage would be required. The site is being used as an intermittent grazing area, but because of the depression, plant and vegetative growth is at a minimum on the site (about 40%).

Site 11 is located in the Wind River Basin and is underlain by the Wind River Formation. The Wind River Formation in this area is characterized by the coarse-grained sequence of green and gray, largely arkosic sandstone and conglomerate beds. Outcrops of these beds can be seen just west of the site where there is a sharp drop off to an intermittent tributary of Beaver Creek.

The Wind River Formation is not tapped for water in the immediate vicinity of the site. High evapotranspiration rates preclude the percolation of the limited precipitation on the site to the water table. The site is located on nearly flat-lying land. While some waters may pond in the depression, causing poor plant cover in the center of the depression, once the pile is built this will not occur. There would be very little if any flow of off-site waters on site once the pile is constructed.

Advantages of this site are its natural formation as a storage area, its easy paved access requiring no haul road, its isolation, and minimal site preparation costs. The disadvantage is the 13.1-mi haul distance from the tailings site.

7.3.1 Costs

As shown in Table 2, the estimated cost is $8,260,000. The major cost components are as follows:

(a)	Engineering (2.3% of item b)	$ 150,000
(b)	Remedial action	6,600,000

(c)	Environmental assessment and EIS preparation	300,000
(d)	Contingency (15% of items a, b, and c)	1,060,000
(e)	Perpetual care fund	150,000
	Total Cost	$ 8,260,000

The perpetual care fund, at 7% interest, would provide approximately $10,500/yr for inspection and maintenance.

7.4 Site 13, Southwest Section 15, Arapahoe Quadrangle, Township 1 South, Range 4 East

This site is located 0.5 mi east of the recently aligned State Highway 789, and about 2 mi northeast of the bridge where that new road crosses over Beaver Creek. The site is 2 air-miles southeast of the Riverton tailings pile and 6.2 mi by road access. The orientation and site development problems on this site are the same as those for sites 7 and 8.

Site 13 also is underlain by the Wind River Formation. Coarse- and fine-grained sequences of the formation alternate in this area with a predominance of the finer-grained sequences. The bedrock does not outcrop well in this area as it is easily weathered and covered with more recent deposits.[1,2]

The Wind River Formation is not tapped for water in the immediate vicinity of the site. There are some wells to the north but these are all more than 1 mi away from the site.[1] Percolation of the limited precipitation to the water table is negligible. The roads which surround the site prevent flow of surface water from reaching the site from the south. During severe rainstorms some flows might cross the road but not in appreciable amounts. Proper grading could eliminate this problem.

Advantages are that this site is the closest to the Riverton tailings pile and its location is away from any major drainage basin. Disadvantages are its closeness to residences (1.4 mi) and that it is in an area used by recreational vehicle enthusiasts and is therefore visited more frequently than any other site. Also, it is within the Wind River Indian Reservation.

7.4.1 Costs

As shown in Table 2, the estimated cost is $7,110,000. The major cost components are as follows:

(a)	Engineering (2.67% of item b)	$ 150,000
(b)	Remedial action	5,600,000
(c)	Environmental assessment and EIS preparation	300,000
(d)	Contingency (15% of items a, b, and c)	910,000
(e)	Perpetual care fund	150,000
	Total Cost	$ 7,110,000

The perpetual care fund will provide approximately $10,500/yr, which is the same as for the other sites, because of the similar maintenance requirements.

7.5 Site 14, South Section 22, Arapahoe Quadrangle, Township 1 South, Range 4 East

This site is located 1 mi south of site 13 on the north side of a ridge which separates drainage between Beaver Creek and the Little Wind River. It is about 120 ft higher in elevation than site 13, but is in a more natural storage basin configuration. Access would be by the same route as for site 13, except the last 1.5 mi would be over a haul road with grades of 6 to 8%. No upslope drainage problems would be present, and a dike of about 200 ft long and 30 ft high would be required. The terrain at this site is rougher than at any of the other sites, but would present no grading problems. The site is on the Wind River Indian Reservation, 7.7 road mi from the tailings; the nearest residence is 2.4 mi away.

Site 14 is underlain by coarse and fine-grained sequences of the Wind River Formation.[1,2] Outcrops are visible along the nearby ridge.

There are no water wells in the Wind River Formation in the immediate vicinity of the site. The low precipitation rates and high evapotranspiration rates combine to prevent the percolation of water to the water table. The site location at the head of a drainage basin eliminates practically all upslope drainage onto the site. Present erosion rates due to the steep slopes in this area would be greatly reduced by the reshaping of the site as the result of the placement of the tailings in the basin.

Advantages of this site are its relatively short haul distance, existing and continued isolation, and location on land that has little if any use. Disadvantages are the haul distance required over specially built haul roads with steep grades for loaded trucks, and the location on the Wind River Indian Reservation.

7.5.1 Costs

As shown in Table 2, the estimated cost is $7,680,000. The major cost components are as follows:

(a)	Engineering (2.45% of item b)	$ 150,000
(b)	Remedial action	6,100,000
(c)	Environmental assessment and EIS preparation	300,000
(d)	Contingency (15% of items a, b, and c)	980,000
(e)	Perpetual care fund	150,000
	Total Cost	$ 7,680,000

The perpetual care fund will provide approximately $10,500/yr for monitoring and maintenance.

7.6 Site 16, North Section 6, Lander Southeast Quandrangle, Township 33 North, Range 99 West

This site is located on private property which is being used as seasonal grazing land. It is on the east side of a ridge in a horseshoe-shaped basin 1 mi west of the Little Popo Agie River near the intersection of State Highway 789 and the Lyons Valley road. Access from the Riverton tailings pile would be via State Highway 789, through the community of Hudson. The site is 14.1 mi from the tailings site. About 40 acres would be required.

Site 16 is located on the margins of the Wind River Basin and is underlain by the Cody shale of upper Cretaceous age. The Cody shale dips to the northeast and is characterized by gray to buff, very fine-grained, thin-bedded sandstone and siltstone interbedded with gray-to-black shale. Yields as high as 20 gpm of water are possible from the sandstone beds but most of the formation is not an aquifer.[1,2] Therefore, it is not likely that deep ground water aquifers would be affected in this area. However, if water were perched on this formation, shallow ground water flows might reach the Lyons irrigation ditch to the southeast of the site. The possibility for this to occur is slight because the site is at the head of a drainage basin in a region which has only 10 to 15 in. of mean annual precipitation and high evapotranspiration rates.[1] The site would not be susceptible to flooding or erosion problems.

Advantages of this site are the availability of excellent stabilization cover, the ease of hauling the tailings over a paved road with little grade problems, and its eastern exposure.

Disadvantages are the relatively long haul distance, the proximity of the site to residences (about 0.75 mi), and the need to haul the material through the town of Hudson.

7.6.1 Costs

As shown in Table 2, the estimated cost is $8,300,000. The major cost components are as follows:

(a)	Engineering (2.2% of item b)	$ 150,000
(b)	Remedial action	6,900,000
(c)	Environmental assessment and EIS preparation	300,000
(d)	Contingency (15% of items a, b, and c)	1,100,000
(e)	Perpetual care fund	150,000
	Total Cost	$ 8,300,000

The perpetual care fund will provide approximately $10,500/yr for monitoring and maintenance.

7.7 Site 17, Northeast Section 8, Lander Southeast Quadrangle, Township 33 North, Range 98 West

This site is on the north side of Coal Mine Draw Road, less than 0.5 mi east of the Little Popo Agie River in a natural depression. It is similar to the depression of site 11, except that at the southeast end, a dike would need to be constructed of approximately 15 ft in height because of the shallowness of the ridge which forms the depression in that area. The property is under BLM jurisdiction.

Access for trucks from the Riverton tailings would be via State Highway 789 to the east edge of Hudson where the Coal Mine Draw Road would be utilized. A special haul road would be built near the intersection of an old railroad grade, southwest approximately 1.8 mi to the storage site.

Site 17 also is underlain by the Cody shale. Outcrops of the Cody are rare as it is easily weathered and covered with more recent deposits.[1,2]

The location of the site at the top of a drainage basin in a shallow depression eliminates problems of upslope drainage. The shallow slopes, low mean annual precipitation of 10 to 15 in.,[1] and high evapotranspiration rates will act to prevent the formation of appreciable shallow surface water bodies. The Cody shale is not tapped downdip from the site and shallow

ground and surface waters are not used immediately down gradient from the site.

Advantages of the site are the ease and thus minor cost involved in preparing the storage site. Disadvantages are its haul distance (16.5 mi) from the site, the need to haul through Hudson, a steep grade out of Hudson and the need to construct a haul road. Although the site is in a generally isolated area, the closest residence is about 0.5 mi away.

7.7.1 Costs

As shown in Table 2, the estimated cost is $9,180,000. The major cost components are as follows:

(a)	Engineering (2.1% of item b)	$ 150,000
(b)	Remedial action	7,400,000
(c)	Environmental assessment and EIS preparation	300,000
(d)	Contingency (15% of items a, b, and c)	1,180,000
(e)	Perpetual care fund	150,000
	Total Cost	$ 9,180,000

The perpetual care fund will provide approximately $10,500/yr for monitoring and maintenance.

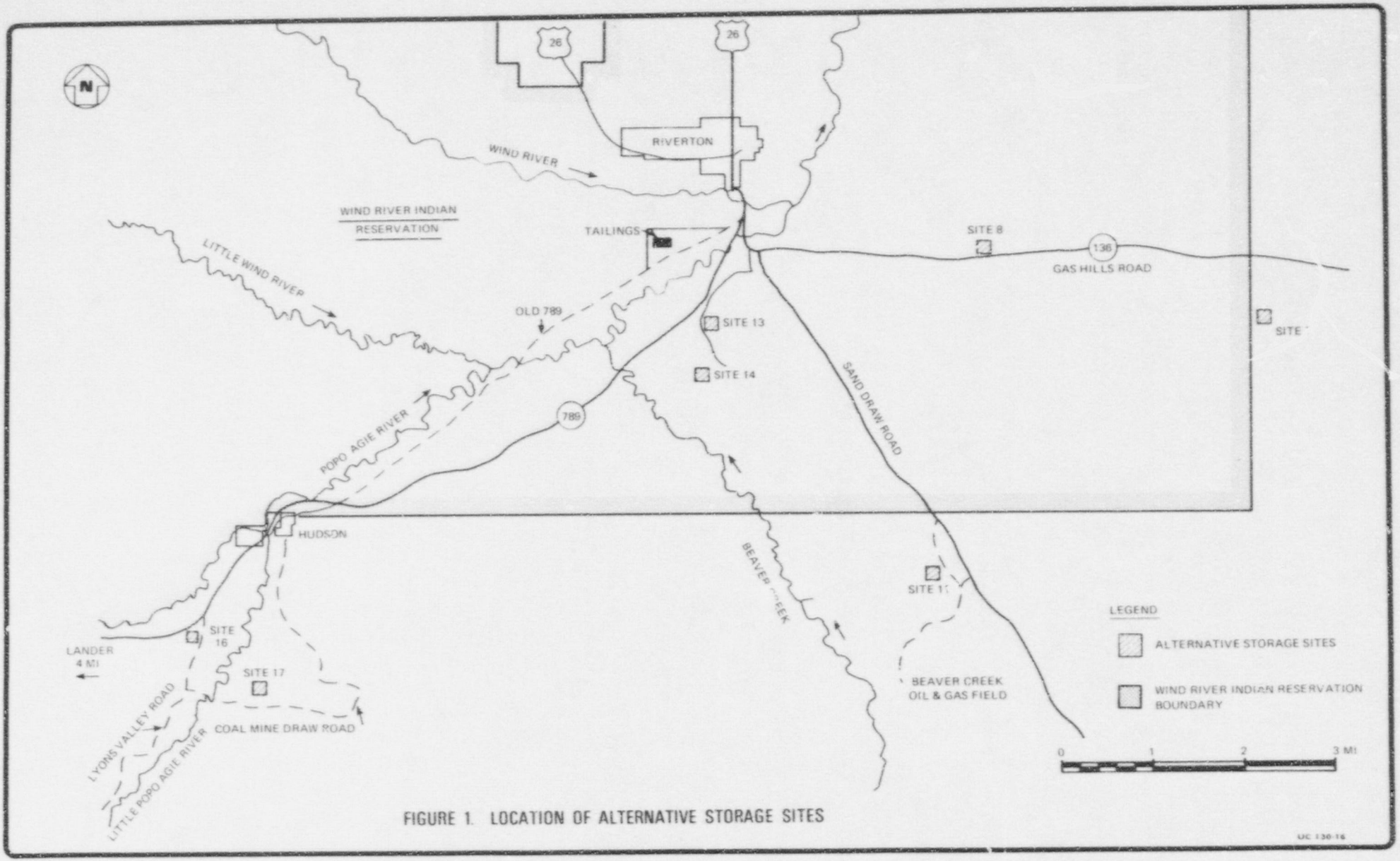

FIGURE 1. LOCATION OF ALTERNATIVE STORAGE SITES

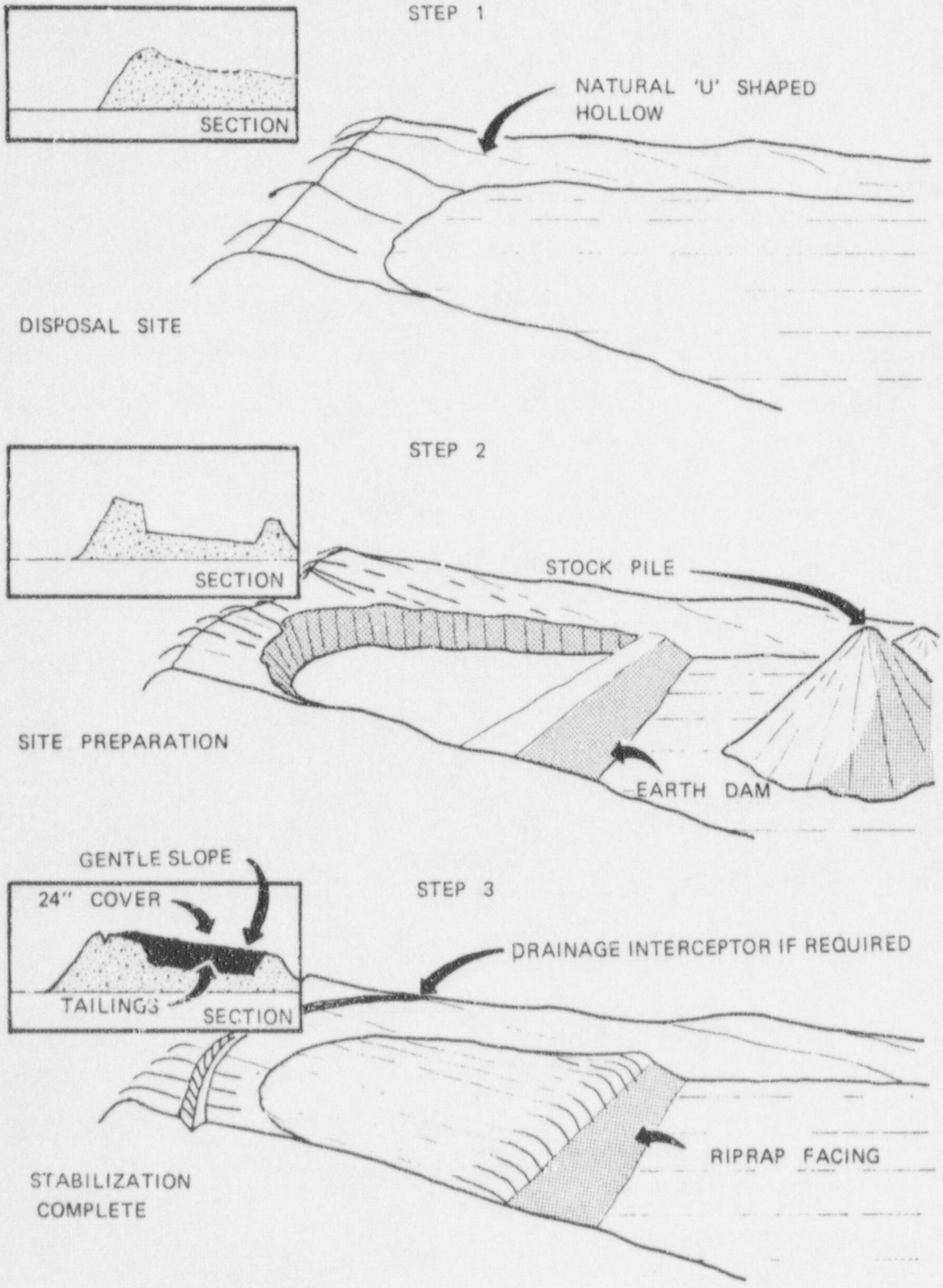

FIGURE 2. SCHEMATIC OF TYPICAL LONG-TERM TAILINGS STORAGE SITE

TABLE 1

SITES CONSIDERED FOR LONG-TERM STORAGE

Site	Description	Road mi From Riverton Tailings Pile	Ownership
1	SE Sec 22, Lander T33N R99W	28.0	BLM
2	Center Sec 10, Lander T33N R99W	20.2	BLM
3	SE Sec 27, Weiser Poss T33N R98W	36.5	BLM
4	SW Sec 30, Weiser Poss T33N R98W	31.5	BLM
5	SW Sec 20, Riverton W T1N R4E	9.5	Reservation
6	NW Sec 32, Riverton E T1N R5E	9.3	Reservation
7*	N Sec 36, Alkali Butte T35N R94W	14.1	State
8*	CTR Sec 10, Arapahoe NE T1S R5E	8.1	Reservation
9	SW Sec 29, Arapahoe NE T1S R5E	9.8	Reservation
10	Sec 4 & 9, Arapahoe NE T2S R5E	11.8	Reservation
11*	SE Sec 26, Arapahoe NE T34N R96W	13.1	BLM
12	NW Sec 35, Arapahoe NE T1S R4E	13.8	BLM
13*	SW Sec 15, Arapahoe T1S R4E	6.2	Reservation
14*	S Sec 22, Arapahoe T1S R4E	7.7	Reservation
15	E Sec 25, Arapahoe T1S R3E	6.4	Private on Reservation
16*	N Sec 6, Lander SE T33N R99W	14.1	Private
17*	NE Sec 8, Lander SE T33N R98W	16.5	BLM
18	NE Sec 10, Lander SE T33N R98W	16.5	BLM

Note: Description is the site's location by section, or portion of section on a USGS Quadrangle Map, and its Township and Range.

*Denotes the sites which were selected for cost alternatives, see Figure 1.

TAELE 2

COST ESTIMATE SUMMARY
TO DECONTAMINATE RIVERTON SITE AND HAUL MATERIALS TO STORAGE SITES

Site	Mi from Riverton	Description	Total Cost	Additional Costs/ft For Removal
7	14.1	N Sec 36 Alkali Butte	$8,490	$700
8	8.1	Ctr Sec 10 Arapahoe NE	7,570	610
11	13.1	SE Sec 26 Arapahoe NE	8,260	680
13	6.2	SW Sec 15 Arapahoe	7,110	590
14	7.7	S Sec 22 Arapahoe	7,680	630
16	14.1	N Sec 6 Lander SE	8,300	700
17	16.5	NE Sec 8 Lander SE	9,180	750

Notes:
1. Costs are in 1978 thousands of dollars.
2. Total costs are for the removal of all tailings, stabilization cover, building rubble, and contaminated soil up to 3 ft below the interface of tailings with soil.
3. Additional cost is for removal from the existing tailings area of any contaminated soil greater than 3 ft below the interface on a per foot basis.

REFERENCES

1. L.J. McGreevy, W.G. Hodson, and S.J. Rucker, IV; "Ground Water Resources of the Wind River Indian Reservation, Wyoming"; USGS Water Supply Paper 1576-I; 1969.

2. W.R. Keefer; "Structural Geology of the Wind River Basin, Wyoming"; USGS Professional Paper 495-D; 1970.