UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

MAY 1 8 1998

May 12, 1998

Mr. Jack Tillman
U.S. Department of Energy
Grand Junction Office
2597 B 3/4 Road
Grand Junction, CO 81503

SUBJECT: GRAND JUNCTION STEEL PROPERTY CLEANUP

Dear Mr. Tillman:

The U.S. Nuclear Regulatory Commission (NRC) has received a copy of a letter (copy enclosed) from Mr. Jeffery Deckler, Colorado Department of Public Health and Environment (CDPHE), to Ms. Sharon Kercher, U.S. Environmental Protection Agency (EPA), dated March 3, 1998, in which Mr. Deckler seeks EPA approval for disposal of polychlorinated biphenyls (PCBs)-contaminated radioactive material to be placed in the Grand Junction, Colorado, Cheney uranium mill tailings disposal cell. The PCBs-contaminated material was discovered during the cleanup efforts at the Grand Junction Steel property. The CDPHE letter, final paragraph, also requests that NRC concur with the option of placing the PCBs-contaminated material in the Cheney cell, and states that CDPHE will begin discussions with the U.S. Department of Energy (DOE) following approval from EPA and NRC.

Under Title I of the Uranium Mill Tailings Radiation Control Act (UMTRCA), NRC must concur that DOE's actions for cleanup and remediation of inactive tailings sites meet standards set by EPA for the disposal of residual radioactive material. In addition, UMTRCA requires that the tailings disposal sites be licensed under the general NRC license for long-term care with DOE as the NRC licensee and long-term care custodian. Because NRC's licensee for the Cheney disposal site is DOE, the request for NRC concurrence to place PCBs-contaminated radioactive material in the Cheney cell must come from DOE.

In a letter of December 11,1995, NRC agreed with the placement of 61 cubic yards of PCBs-contaminated material from the former Grand Junction processing site in the Cheney cell. NRC's decision was based on information provided by DOE in its letter of July 8, 1992, and documentation in Project Interface Document 05-S-61 for the Cheney site. In addition, DOE provided documentation of approval by EPA (letter of May 13, 1992, from Michael F. Wood, Office of Compliance Monitoring, EPA, to Michael K. Tucker, DOE Grand Junction Projects Office) to place PCBs-contaminated material in the Cheney cell. EPA's approval was conditioned with the statement that its decision was "based on the specific circumstances of the case and may not be applied to any other situation or waste."

Therefore, if DOE proposes to allow disposal of PCBs-contaminated material from the Grand Junction Steel property in the Cheney cell, DOE should notify NRC that it proposes to take such action and request NRC concurrence. Any such proposal should include information related to the type, quantity, and concentration of material (including the maximum and average specific

activity). In view of the EPA's conditioned approval in its letter of May 13, 1992, the DOE request should be accompanied by EPA's approval to dispose of the contaminated material in the Cheney cell.

Thank you for your attention in this matter. If you have any questions concerning this letter, please contact Ms. Charlotte Abrams, of my staff, at (301) 415-5808.

Sincerely,

Joseph J. Holonich, Chief
Uranium Recovery Branch
Division of Waste Management
Office of Nuclear Material Safety
and Safeguards

Enclosure: As stated

cc: J. Deckler, CDPHE
D. Simpson, CDPHE
J. Hams, CDPHE
G. Rael, DOE Alb.
S. Kercher, EPA/Den

STATE OF COLORADO

Roy Romer, Governor
Patti Shwayder, Executive Director

Dedicated to protecting and improving the health and environment of the people of Colorado

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Colorado Department
of Public Health
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March 3, 1998

Sharon Kercher, Director
Technical Enforcement Program (8-ENF-T)
Environmental Protection Agency
999 18th Street, Ste 500
Denver, Colorado 80202-2466

Re: PCB Mixed Waste

Dear Ms. Kercher:

In 1992, EPA headquarters, in conjunction with Region VIII, issued a letter (dated May 13, 1992) which allowed the disposal of 61 cubic yards of PCB-contaminated radioactive material in the Uranium Mill Tailings Remedial Action (UMTRA) Program Cheney Disposal Cell in Mesa County, Colorado. The letter asserted EPA's jurisdiction over this material, and stated that enforcement action would not be appropriate should the material be disposed of at Cheney. The determination was based on the PCB concentration of the material, the design of the disposal cell, and the fact that there is no disposal facility authorized to take PCB-contaminated radioactive material.

We are seeking similar approval and enforcement discretion for some additional material which has been discovered in our cleanup efforts at the Grand Junction Steel property. The material in question is uranium mill tailings located in a steel fabrication yard. The PCBs in this material are believed to originate from a transformer on a power pole outside the facility, however, there is no definitive proof regarding origination of the PCBs. Results of the original sampling, which occurred several years ago, showed PCBs ranging from 61 to 1500 ppm. While the UMTRA Program was trying to decide what, if anything, could be done with this material, operations at the business continued. These operations resulted in further disturbance and dilution of this material.

In consultation with Dan Bench of Region VIII, it was determined that the material should be containerized pending final disposal. Additional sampling was performed to determine the excavation boundaries, which were set by Region VIII as requiring excavation of any material with greater than 2 ppm PCB. This sampling, which was conducted in 1997, indicated a PCB range of 2 to 93 ppm. Approximately 200 yards of material was excavated and containerized on site, and verification sampling was performed to insure all material was excavated as necessary. Although the material within the containers has not been resampled, a simple area averaging would indicate an average concentration of approximately 15 ppm PCB.

Enclosure

As with the previous material, the initial PCB concentrations clearly show that the material is regulated under TSCA, and that its disposal is subject to the antidilution and disposal provisions of the PCB Rule. However, as with the previous material, there is no TSCA disposal facility which can accept the material due to the radioactive contamination. We believe that it is in the best interests of public health and safety to provide permanent disposal of this material in the Cheney disposal cell. Since this cell is limited by Federal statute (P.L. 95-604 Sec.112(a)(1)(B)) to accept only UMTRA waste, we do not believe that this opens the door for any widespread disposal of PCB materials in the cell, nor would we expect multiple future requests for special dispensation for UMTRA materials. There is only one other property where we suspect PCB waste containing radioactive contamination exists. Further, based on the disposal cell design, the immobility of PCBs in soil, and the fact that this is material constitutes a thousandth of a percent of the total cell volume (over 5 million cubic yards), we believe that this is a technically sound alternative.

Dan Bench may already have most of the information regarding this site. His assistance to this point has been invaluable ... isolating and containerizing the contamination, so that it does not continue to pose an immediate threat to workers at the facility. Grand Junction Steel has been very cooperative in implementing Dan's recommendations. We are now asking for EPA's approval of a permanent solution to this problem. We would be happy to forward more detailed information if required for you to make a determination.

By this letter we are also asking the NRC to concur with this option. Should we receive approvals from EPA, and NRC, we will begin discussions with Mesa County and DOE to accept this material in the Cheney Disposal Cell.

If you have any questions, please contact me at (303) 692-3387.

Sincerely,

Jeffrey Deckler
Remedial Programs Manager

cc: Dan Bench, EPA/Den
Kim Lee, EPA/Den
Jack Tillman DOE/GJ
Dave Mathes, DOE/D.C.
Joseph Holonich, NRC/D.C.
Doralyn Genova, Mesa County
Wes Harpole, Grand Junction Steel

Application for Risk-Based Disposal of PCB/Radioactive Waste

Appendix to Application

Submitted by U.S. Department of Energy
Grand Junction Office
Grand Junction, Colorado
February 2000

Application for Risk-Based Disposal of PCB/Radioactive Waste

Introduction

The U.S. Department of Energy (DOE) requests approval from the U.S. Environmental Protection Agency (EPA) for risk-based disposal of approximately 29 cubic yards of PCB/radioactive remediation waste and PCB/radioactive bulk product waste. The wastes were generated during remedial action conducted under the Uranium Mill Tailings Remedial Action (UMTRA) Program and the DOE-sponsored remediation of the DOE Grand Junction, Colorado, Office (GJO) facility. The wastes have been managed in storage since as early as 1994 because disposal has not been possible for these dual regulated materials.

DOE proposes to dispose of these wastes at the Grand Junction (a.k.a. Cheney) Disposal Cell. This facility complies with EPA design requirements specified in 40 CFR 192. The U.S. Nuclear Regulatory Commission (NRC) and the Colorado Department of Public Health and Environment have concurred that the DOE remedial action plan complies with EPA standards. DOE will provide stewardship services in perpetuity under a license to be issued by NRC at 10 CFR 40.27.

This application for approval of risk-based disposal, as provided for under 40 CFR 761.61(c) and 761.62(c), will demonstrate that this disposal action complies with EPA requirements and that approval of this action will not result in unreasonable risk of injury to health or the environment.

Background

DOE remediated over 4,000 properties in the Grand Junction area under the UMTRA Program between 1986 and 1998. These activities were conducted to mitigate the health effects of uranium mill tailings. Concurrently, DOE remediated uranium mill tailings from the GJO facility. The tailings and residual radioactive material from these programs were codisposed in the Grand Junction Disposal Cell (Appendix A).

During the course of UMTRA remediation, residual radioactive materials were encountered on the Grand Junction Steel, the former Public Service Company of Colorado, and the Lewco Steel properties that were contaminated also with PCBs. These "commingled" materials could not be disposed of because neither commercial nor government-owned landfills were permitted to accept both radioactive and PCB-contaminated materials. Incineration options were unavailable or not economically feasible. Consequently, because DOE was not responsible for the nonradiological component of these wastes, the department could not remediate these commingled materials. However, hazardous waste screening analyses conducted at these properties resulted in generation of investigation-derived waste (IDW) and excess soil sample material that requires disposal.

The owners of Grand Junction Steel conducted remediation of PCB/radioactive waste (Appendix B) at their expense to facilitate certification that their facility complied with the UMTRA cleanup standards prescribed in 40 CFR 192. The regulated PCB commingled material has been stored in steel bins since its removal in 1997.

EPA determined that the PCB/radioactive material from the Lewco Steel property was not regulated under TSCA and the material was disposed of in the Grand Junction Disposal Cell. However, "hotspot" samples were collected for hazardous waste screening, and are now the responsibility of and stored by DOE.

The PCB commingled waste at the former Public Service Company of Colorado (Public Service) property, now owned by the city of Grand Junction, remains in place as discovered. The waste deposit was exempted from remediation by the UMTRA Program because of low risk and lack of an economically feasible disposal option, as described in the NRC-approved application for supplemental radiological standards (Appendix C). Although this waste is of small quantity and low PCB concentration, it is included in this application for disposal in the Grand Junction Disposal Cell because its continued presence on a city-owned property impedes unrestricted redevelopment of the property and imposes perpetual control requirements on a public entity.

Other PCB/radioactive waste (small electrical equipment and fluorescent light ballasts) has accumulated on the GJO facility since 1994 as a result of facility remediation.

Some PCB/radioactive waste has been approved for disposal at the Grand Junction Disposal Cell. During remediation of the GJO facility, approximately one cubic yard of uranium mill tailings were found to be

contaminated with PCBs. This material was inadvertently diluted to approximately 61 cubic yards of PCB/radioactive waste with an average PCB concentration of < 1 ppm. EPA approved disposal of this PCB/radioactive waste at the Grand Junction Disposal Cell. Subsequently, EPA determined that the waste was not regulated. The waste was removed from the GJO facility and disposed in the Grand Junction Disposal Cell in August 1998.

Notification and Certification

This section addressed notification and certification requirements set forth in 40 CFR 761.61(a)(3)(A). This information is required for an application for approval of risk-based disposal of PCB remediation waste at 761.61(c).

Nature of the Contamination, including Kinds of Materials Contaminated

The contaminated materials consist of PCB/radioactive remediation waste and PCB/radioactive bulk product waste from multiple waste streams. The radioactive component of the wastes can be accepted for disposal in the Grand Junction UMTRCA Title I Disposal Cell as either UMTRA residual radioactive material or GJO facility radioactive waste material. No free liquids are present in the waste. The PCB/radioactive remediation wastes consist of contaminated soil and gravel and investigation-derived waste (IDW). The PCB/radioactive bulk product waste consists of small electrical equipment and fluorescent light ballasts. The following table describes the individual waste streams. Additional information describing the source of these waste streams is presented in Appendix D.

Waste Stream	Waste Description	Quantity	PCB Concentration	Status
Grand Junction Steel (GJS)	PCB-contaminated soil	8 cubic yards	22 ppm (> 50 ppm as found)	In steel bins at GJS site
	Excess soil samples[a]	22.24 kg	51 to 1600 ppm	Managed at GJO facility
	Broken sample containers in 5-gallon pail	1.83 kg	Contacted 410 ppm waste	Managed at GJO facility
	Cardboard, wipes, and PPE in plastic rad. bag	1.25 kg	Contacted 410 ppm waste	Managed at GJO facility
	IDW: PPE, containers, loose soil, disposable samplers, plastic, etc.	1 55-gallon drum	51 to 93 ppm	Managed at GJO facility
Lewco Steel	Excess soil samples	1.12 kg	579 to 1273 ppm	Managed at GJO facility
Public Service (PS)	PCB-contaminated soil[b]	16 cubic yards (estimated)	Non-detectable to 680 ppm	In place at PS site
	Excess soil samples[b]	1.44 kg	150 to 290 ppm	Managed at GJO facility
	Excess soil samples	1.73 kg	150 to 290 ppm	Managed at GJO facility
	IDW: PPE, containers, loose soil, disposable samplers, plastic, etc.	1 55-gallon drum	> 50 ppm	Managed at PSC site
DOE Grand Junction Office	PCB light ballasts and rusted parts in one 5-gallon bucket	12.80 kg	> 50 ppm	Managed at GJO facility
	PCB light ballasts (some leaking) and fixture parts in one 55-gallon drum	58.00 kg	> 50 ppm	Managed at GJO facility
	One empty 55-gallon drum historically used to contain GJS soil samples	23.02 kg	> 50 ppm	Managed at GJO facility
	One rusted empty 55-gallon drum contaminated with radioactivity and PCBs	22.68 kg	> 50 ppm	Managed at GJO facility

[a]Material will be treated to stabilize toxicity-characteristic lead before disposal.
[b]Material will be treated to remove RCRA-listed volatile organic compounds before disposal.

Sampling Procedures and Results

The PCB/radioactive waste materials were characterized in accordance with approved plans and procedures, which are archived in project records at the GJO facility. These records will be preserved in perpetuity as part of the long-term stewardship collection.

Location of Contaminated Area

The wastes managed at the GJO facility are located in a waste management facility. The Grand Junction Steel waste is contained in steel bins on site at its facility. Waste at the Public Service property remains in place, as described in the application for supplemental standards (Appendix C)

Cleanup Plan

PCB/radioactive soils will be excavated from the Public Service property in accordance with a plan to be developed by the city of Grand Junction and approved by the Colorado Department of Public Health and Environment. Because NRC has approved leaving the PCB/radioactive material in place through application of supplemental standards to the radiological component and the spill predates enactment of TSCA, the city may choose to leave the contaminated soil in place. Approval of this application for risk-based disposal will provide the city with the option to dispose of the material at the Grand Junction Disposal Cell.

Certification of Records Availability

DOE maintains all pertinent sampling plans, sample collection procedures, sample preparation procedures, extraction procedures, and instrumental/chemical analysis procedures at the DOE-GJO facility. These records are available for EPA inspection.

Disposal Plan

DOE will handle waste materials shipped from the GJO facility in accordance with existing procedures that result in compliance with applicable U.S. Department of Transportation, EPA, and DOE regulations, guidance, and policy. The city of Grand Junction and Grand Junction Steel will also follow all applicable waste handling procedures for loading and transporting these materials to the Grand Junction Disposal Site. DOE will not oversee their cleanup. Disposal will take place during September or October 2000, when the disposal cell is opened to receive waste, if this request is approved.

Equipment will be wipe-tested for PCB contamination and decontaminated, as necessary, before release from the Grand Junction Disposal Site.

Environmental Protectiveness

The following information is offered in accordance with the preamble to 761.62(c) found at Federal Register Volume 63 Number 124, page 35411.

Disposal of PCB/radioactive waste in the Grand Junction Disposal Cell will not result in unreasonable risk of injury to health or the environment. The Grand Junction Disposal Cell was designed to comply with the requirements of 40 CFR 192. These requirements specify that the cell will effectively isolate the contained wastes from the environment for "up to 1,000 years, to the extent reasonably achievable, and in any case for at least 200 years." Isolation is achieved by selecting an appropriate site, designing the cell to isolate the contaminants from the environment, and providing long-term stewardship to maintain the effectiveness of the impoundment and necessary institutional controls. NRC license provisions stipulate perpetual stewardship.

Hydrogeological Setting—The cell is situated on a broad outslope pediment west of the Grand Mesa. Surface alluvium overlies more than 700 feet of Mancos Shale, below which is the Dakota Sandstone. Groundwater has been identified in the alluvium, the Mancos Shale, and the Dakota Sandstone.

Groundwater in the alluvium occurs in thin, laterally- and vertically-discontinuous paleochannels. These consist of stream channels incised into the ancestral Mancos surface and subsequently filled with low-permeability granular material. Groundwater in the Mancos Shale occurs in discrete fracture zones between 50 and 500 feet beneath the cell. The remainder of the Mancos Shale is unsaturated. The uppermost aquifer is in the Dakota Sandstone.

Groundwater in the alluvium does not occur in sufficient quantity to qualify as a drinking water source. The saturated zones in the Mancos Shale produce less than 150 gallons per day of brackish water that is high in selenium. Groundwater in the Dakota Sandstone aquifer is not a current or potential source of drinking or livestock water because concentrations of total dissolved solids exceed water quality standards. (The groundwater in the Dakota Sandstone is classified as limited use Class III water in accordance with 40 CFR 192.11(e)).

There is no apparent hydraulic connection between these three saturated zones as evidenced by radioisotope age dating and compositional differences (Appendix E, pg. 2-9). Unsaturated Mancos Shale mudstones and shales form an effective aquitard that separates the waste materials in the cell from the uppermost aquifer in the Dakota Sandstone.

The cell footprint was adjusted prior to construction when trench explorations delineated a paleochannel within the proposed cell footprint.

The Grand Junction Disposal Cell is located in a semiarid climate. The average annual precipitation measured at the Grand Junction airport is approximately 8.5 inches.

Cell Design and Performance—The cell cover is designed to promote precipitation runoff and to minimize infiltration. Contaminated materials will be covered with a 2-feet-thick soil radon barrier compacted to a design saturated hydraulic conductivity (k_{sat}) of 2 x 10E-7 cm/sec (Appendix H). This layer is covered by a 2-feet-thick compacted soil frost protection layer, a 0.5-feet-thick granular bedding/drainage layer, and a 1-foot-thick rock erosion-protection layer. Cover surfaces are sloped to direct precipitation off the cell and into armored channels.

The cell is excavated into competent (unweathered) bedrock (k_{sat} = approximately 1 x 10E-5 to 1 x 10E-7 cm/sec). The cell floor slopes to the southwest and is approximately 35 feet below grade and 25 feet below the alluvium/shale contact at the deepest point. The sides of the excavation are lined with compacted shale (k_{sat} = 2.8 x 10E-7 cm/sec from Appendix G)

A paleochannel was delineated near the northwest side of the disposal cell footprint (Appendix F). The channel was reconstructed to ensure lateral containment of groundwater and to prevent any possible leachate from entering the paleochannel system. Reconstruction included excavating the paleochannel to bedrock, filling the channel with compacted clay, excavating a 6-feet-deep watercourse through the clay, and filling it with washed rock. The top of the channel was capped with 2 feet of compacted clay. The floor of the channel remained on existing bedrock, which contains groundwater in the undisturbed channel system.

Some seepage from the bottom of the disposal cell is anticipated. The residual radioactive material included slimes from the milling process and water that was used sparingly during construction for compaction and dust control. Modeling indicates that, at most, 2 to 3 meters of expelled tailings pore water might temporarily accumulate above the cell floor (Appendix G); the remainder of the cell should remain unsaturated.

As shown in the modeling results, the surface of the ponded water does not rise to the level of the alluvial paleochannels. The paleochannels adjacent to the southwest side of the cell are isolated from the granular cell contents by a 2-feet-thick compacted shale liner (k_{sat} = 2.8 x 10 E-8 cm/sec) and the 50-feet wide zone of native material and compacted clayey material used to reconstruct the paleochannel.

Additional infiltration will occur in the open portion of the cell. The model did not account for infiltration that might occur through the uncovered portion of the cell. However, infiltration in the open cell is controlled by maintaining positive drainage to a lined storm water retention pond and stabilizing the exposed surface with a copolymer for dust suppression; the copolymer promotes sheet flow and controls erosion during periods of intense rainfall.

Design of the Grand Junction Disposal Site is substantially equivalent to the design requirements specified in 761.75(b), as shown in the table on the following page (Appendix H).

Required Cell Properties (per 761.75(b)(1))	Grand Junction Disposal Cell Design
Minimum cover thickness: 10 inches	24 inches
Permeability: ≤1 x 10E-7 cm/sec	2 x 10E-7 to 8 x 10E-8 cm/sec
% passing #200 Screen :>30	86
Liquid Limit: >30	37
Plasticity Index: >15	20

In accordance with 761.61(b)(2), a synthetic liner is not required because the compacted soil layer meets the permeability requirement, as shown above. The site is isolated from the uppermost aquifer by a 700-feet-thick section of Mancos Shale, and there is no standing or surface water in the region, so the site conforms to the requirements of 761.75(b)(3). Flood protection has been provided that satisfies the requirements of 761.75(b)(4).

Groundwater monitoring, as required in 761.75(b)(5), will be conducted, but well placement has been optimized for the local hydrological setting; such placement will adequately indicate seepage of leachate (see discussion in "Long-Term Stewardship" below). DOE monitors groundwater semi-annually for PCBs but does not monitor groundwater for other chlorinated organic compounds. Other elements of the monitoring program are consistent with the requirements of this section. One of the analytes is uranium, which is more mobile than PCBs and is, therefore, an effective early indicator that the cell may not be limiting water infiltration as designed.

The Grand Junction Disposal Cell does not incorporate a leachate collection system. Such a system will not enhance protection of health and the environment because infiltration is controlled and seepage of PCB-contaminated leachate from the disposal cell is unlikely.

PCB Disposal Plan— PCB waste placement will be photographically documented. The location of the PCB wastes will be surveyed and recorded in the disposal cell records.

The empty drums will be crushed to eliminate void space. Void space in the remaining containers will be filled with non-compressible absorbent material.

PCB waste will be buried within a geomembrane fabric to differentiate the PCB-contaminated material from the remainder of the impounded waste. The PCB waste will be placed on existing residual radioactive material, which will be recompacted, if necessary, prior to PCB waste disposal. A 2-feet-thick layer of compacted clayey soil having a characteristic k_{sat} of less than 1 x 10E-7 will cover the wastes (weathered Mancos Shale will be used from existing radon barrier material stockpiles). This interim soil cover will be placed to prevent water infiltration and to retard movement of any leachate or drainage. All void space between containers will be filled with compacted clayey soil. The soil will be free of debris and large rocks. Positive surface drainage will be maintained over the top of the waste materials.

The PCB wastes will be placed at an elevation of approximately 5230 feet above sea level, which will provide a 50-feet-thick buffer of unsaturated compacted waste between the PCB wastes and the cell floor (Appendix I).

Transport and Fate— The total volume of PCB wastes will be approximately 29 cubic yards, which will represent approximately 0.001 percent of the 4,600,000 cubic yard capacity of the disposal cell. The weighted average concentration of the waste is less than 500 ppm.

Protection of two groundwater systems must be considered: the shallow paleochannel system and the Dakota Sandstone aquifer.

Any infiltration within the cell will move predominantly downward. Subgrade cell walls are lined with low-permeability compacted shale. The paleochannels are laterally isolated from the disposal cell and are located above the anticipated zone of saturation within the cell, as explained previously.

Recently, elevated uranium, sulfate, and nitrate concentrations were detected in the groundwater intercepted by the paleochannel monitor wells. Water levels in these wells has been 20 to 30 feet higher than the water level in the monitor well inside the cell; therefore, water can not enter the paleochannel wells from within the cell. Water levels in the paleochannel wells have been rising. DOE concluded that the paleochannel is being recharged by runoff from the disposal cell, and that the elevated constituent concentrations are caused by the rising water levels leaching the soils. NRC concurred in this finding (Appendix J).

PCB migration into the Dakota Sandstone aquifer is highly unlikely. To reach this system, the PCBs would have to migrate through 50 feet of unsaturated soil-like waste and 700 feet of mostly unsaturated Mancos Shale. These earth materials are relatively impermeable. Water infiltration is controlled; therefore, there is no driving force to cause this migration. Owing to the low solubility of PCBs, the high affinity of PCBs for soil particles, the likelihood that disposal cell contents are high in organic carbon, and the long residence time and consequent opportunity for biodegradation, the possibility for PCBs to leach into the Dakota Sandstone aquifer is remote. (Approximately 50 percent of the disposal cell contents derived from vicinity properties. The typical vicinity property waste was near-surface topsoil, which typically would be high in organic carbon). The vertical isolation between the waste and the uppermost aquifer is more than 10 times the 50-feet minimum distance to the water table required for PCB disposal at 7621.75(b)(3).

Disposal Cell Operations—A 13-acre portion of the disposal cell is not covered to allow ongoing waste disposal. As the cell is filled, all surfaces within the open cell will be sloped towards a lined stormwater retention basin. Exposed waste materials are sealed with a copolymer coating to prevent wind dispersal and reduce infiltration. DOE is required by the 1998 UMTRCA amendment to close the cell no later than 2023, at which time the water-shedding cover will be completed and infiltration through the contaminated materials will be controlled.

Long-Term Stewardship—The NRC license for the Grand Junction Disposal Cell will not expire. Custody of the site has been assigned to the Long-Term Surveillance and Maintenance (LTSM) Program at GJO. The LTSM Program conducts stewardship activities at the Grand Junction Disposal Site in accordance with an NRC-approved Long-Term Surveillance Plan (LTSP) (Appendix E). This plan prescribes routine inspections and environmental monitoring and constitutes an operating plan for this disposal facility. DOE stewardship will be provided in perpetuity.

As specified in the Grand Junction Disposal Site LTSP, the groundwater monitoring network at the site consists of three monitor wells. Two wells are completed in nearby paleochannels and the third well is completed in the low point of the disposal cell above the cell floor. Samples are collected from the wells semi-annually and analyzed for a suite of constituents that indicate cell performance, including PCBs. Routine sampling will continue for 10 years after the cell is closed, at which time DOE will evaluate the need for continued groundwater monitoring.

The site is permanently withdrawn from public use and has been assigned to DOE (see Attachment 2 of the LTSP, which is attached to this application as Appendix E). Access controls for the cell (gates and signs) will be maintained in perpetuity.

Community Acceptance—Disposal of local PCB/radioactive wastes is supported by the Mesa County Commissioners and the Colorado Department of Public Health and Environment (Appendix K).

Conclusions

PCB wastes will be isolated within the Grand Junction Disposal Cell by placing a layer of low-permeability soil over the waste. The waste will be placed near the top of the disposal cell, and approximately 50 feet of unsaturated compacted residual radioactive materials will be situated beneath the PCB wastes. The disposal cell is designed to EPA standards that require effective isolation of residual radioactive materials for up to 1,000 years, and at least 200 years.

PCB migration is unlikely because water infiltration is controlled and the PCB waste will remain unsaturated. Cell contents will not become saturated because regional annual precipitation is less than 10 inches per year and because saturated hydraulic conductivities in the cover system are lower than in the cell contents or the cell foundation. PCBs exhibit a strong tendency to adhere to soil particles, resulting in low mobility. A 700-feet-thick section of Mancos Shale will isolate the cell from the Dakota Sandstone aquifer. DOE will conduct regular groundwater monitoring.

DOE will provide perpetual custody and care of the Grand Junction Disposal Site in accordance with the NRC license issued to DOE. The Grand Junction Disposal Cell will come under the general license upon cell closure.

In consideration of the above information, disposal of these PCB/radioactive wastes will not result in unreasonable risk of injury to health or the environment. Therefore, DOE requests approval from EPA to dispose of 29 cubic yards of PCB/radioactive waste at the Grand Junction Disposal Cell.

Appendix A

Fact Sheet and Disposal Site Aerial Photo

Grand Junction, Colorado, Disposal Site

Long-Term Surveillance and Maintenance Program

U.S. Department of Energy
Grand Junction Office

F A C T S H E E T

The Grand Junction Office has provided cost-effective and efficient stewardship for more than 10 years

Overview

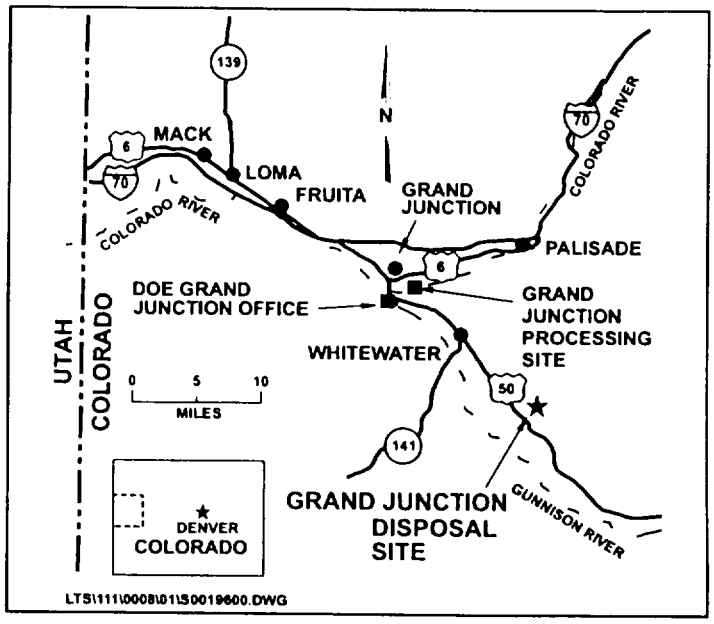
Uranium ore was processed at the Climax millsite at Grand Junction, Colorado, between 1951 and 1970. The milling operations created process-related waste and tailings, a sandlike material containing radioactive materials and other contaminants. The tailings were an ideal and inexpensive construction material suitable for concrete, mortar, and fill. Accordingly, the tailings were widely used in the Grand Junction area for these purposes. The U.S. Department of Energy (DOE) encapsulated the tailings and other contaminated materials from the millsite and more than 4,000 vicinity properties in the Grand Junction area in an engineered disposal cell. Part of the disposal cell was completed in 1994; the remainder of the cell remains open until it is filled or until 2023, whichever comes first, to receive additional contaminated materials.

The U.S. Nuclear Regulatory Commission has condi-
tionally approved the closed portion of the disposal cell,
ut the Grand Junction site will not be fully licensed
until the open part of the disposal cell is closed. Until that time, the Long-Term Surveillance and Maintenance (LTSM) Program will be responsible for the closed part of the cell under provisions of the long-term surveillance plan (LTSP) for the Grand Junction site. The open part of the cell will be operated by the Long-Term Radon Management (LTRM) Project, which is part of the LTSM Program.

Under provisions of the LTSP, the LTSM Program conducts annual inspections of the site and maintains the site, as necessary. The open cell is managed according to an LTRM operations plan. Groundwater monitoring is not required at the Grand Junction site but is being performed as a best management practice.

DOE established the LTSM Program in 1988 to provide stewardship of disposal cells that contain low-level radioactive material. The mission of the LTSM Program is to ensure that the disposal cells continue to prevent release of contaminated materials to the environment. This material will remain potentially hazardous for thousands of years. As long as the cells function as designed, risks to human health and the environment
e negligible.

The LTSM Program maintains the safety and integrity of the disposal cell through periodic monitoring,



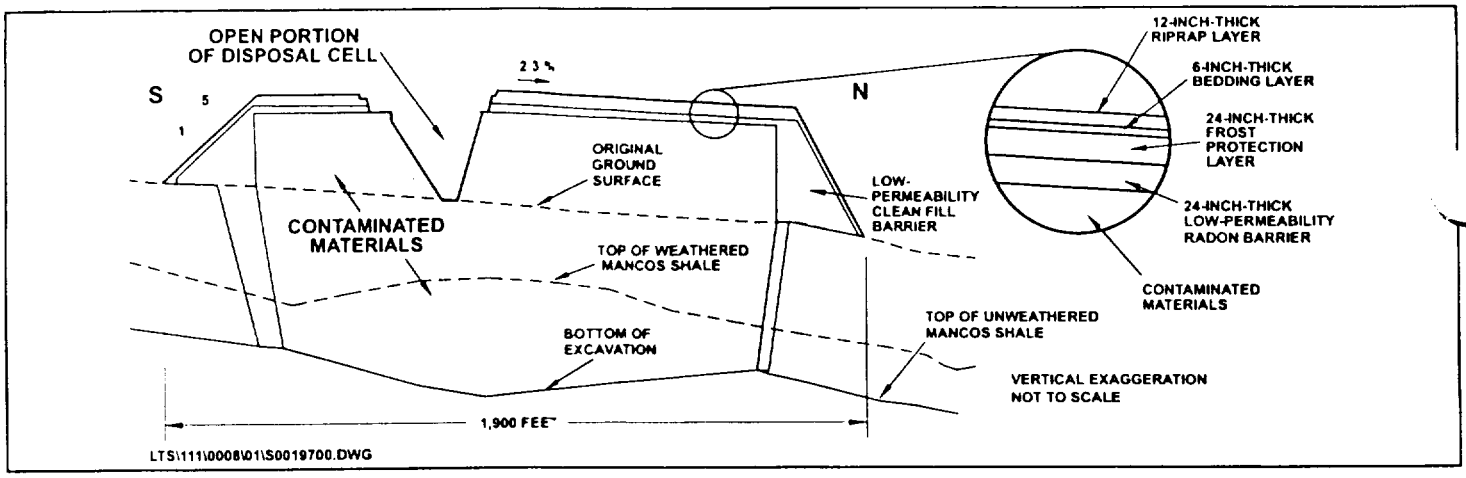
inspections, and maintenance; serves as a point of contact for stakeholders; and maintains an information repository at the DOE Grand Junction Office for all sites in the LTSM Program.

Regulatory Setting

Congress passed the Uranium Mill Tailings Radiation Control Act in 1978 (Public Law 95–604) that specified remedial action for 24 inactive millsites where uranium was produced for the Federal Government. DOE remediated these sites under the Uranium Mill Tailings Remedial Action Project and encapsulated the radioactive material in U.S. Nuclear Regulatory Commission-approved disposal cells. Cleanup standards were promulgated by the U.S. Environmental Protection Agency in Title 40 *Code of Federal Regulations* (CFR) Part 192. The U.S. Nuclear Regulatory Commission license for long-term custody and care will be issued in accordance with 10 CFR 40.

Grand Junction Disposal Site

The Grand Junction Disposal Site is located in Mesa County, Colorado, 18 miles south of Grand Junction. U.S. Bureau of Land Management property surrounding the 360-acre site is used seasonally for grazing. The nearest residence is approximately 2 miles north of the site.



South-North Cross Section of Grand Junction Disposal Cell

The 60-acre cell is located on a westward-sloping pediment surface at an elevation of about 5,200 feet. The surface consists of about 40 feet of alluvium, colluvium, and terrace gravels underlain by a 700-foot-thick sequence of Mancos Shale. Groundwater beneath the disposal site area occurs transiently in thin, isolated paleochannels within the lower portion of the alluvium and in fractures in the Mancos Shale. Groundwater in the Mancos Shale is in discontinuous zones that yield less than 150 gallons per day. In general, water quality is good in the alluvium and poor in the Mancos Shale.

DOE chose the Grand Junction Disposal Site location on the basis of remoteness, lack of significant groundwater, and the thick impermeable layer of Mancos Shale underlying the site.

Cell Design

The disposal cell is 1,700 feet by 2,300 feet and contains 4.03 million cubic yards of tailings and vicinity property materials. Tailings were placed in compacted layers to a height 30 feet above the original ground surface. The cell is covered with a multicomponent cap constructed of materials removed from the excavation. Radon emissions and precipitation infiltration are minimized by the low-permeability radon barrier. Three additional layers—a soil frost barrier; a sand-and-gravel bedding layer, and a rock (riprap) layer—protect the radon barrier from the weather and plant and animal intrusion. The cell design promotes rapid runoff of precipitation to minimize leachate. Precipitation runoff is collected and directed away from the disposal cell by riprap-armored aprons that surround the cell.

Disposal Activities

The open portion of the disposal cell will accept contaminated materials until 2023 or until the design capacity is reached. These will include tailings and contaminated materials removed from underground utility lines beneath Grand Junction streets; the Monticello, Utah, site; and other sites; and sludge from groundwater treatment plants at the Tuba City, Arizona, and Monticello, Utah, sites. The cell will be open for short durations to accept contaminated materials.

The open portion of the disposal cell is located at the crest of the cell and can accommodate as much as 250,000 cubic yards of additional material. This open cell measures 1,200 feet by 750 feet and is approximately 30 feet in depth.

LTSM Program Activities

In addition to operating the open cell every summer, the LTSM Program conducts annual inspections of the closed portion of the site and weekly inspections of the open portion of the disposal cell. Inspectors evaluate the condition of the disposal site and determine if maintenance is necessary to protect the integrity of the site. Water levels in two monitor wells located in paleochannels near the cell and a monitor well within the cell will be monitored continually. Groundwater in these three wells is monitored to detect seepage from the cell should seepage occur.

The disposal cell at Grand Junction is designed and constructed to last for 200 to 1,000 years. However, the general license has no expiration date, and DOE understands that its responsibility for the safety and integrity of the Grand Junction site will last indefinitely.

Contacts

For more information about the LTSM Program or about the Grand Junction Disposal Site, contact

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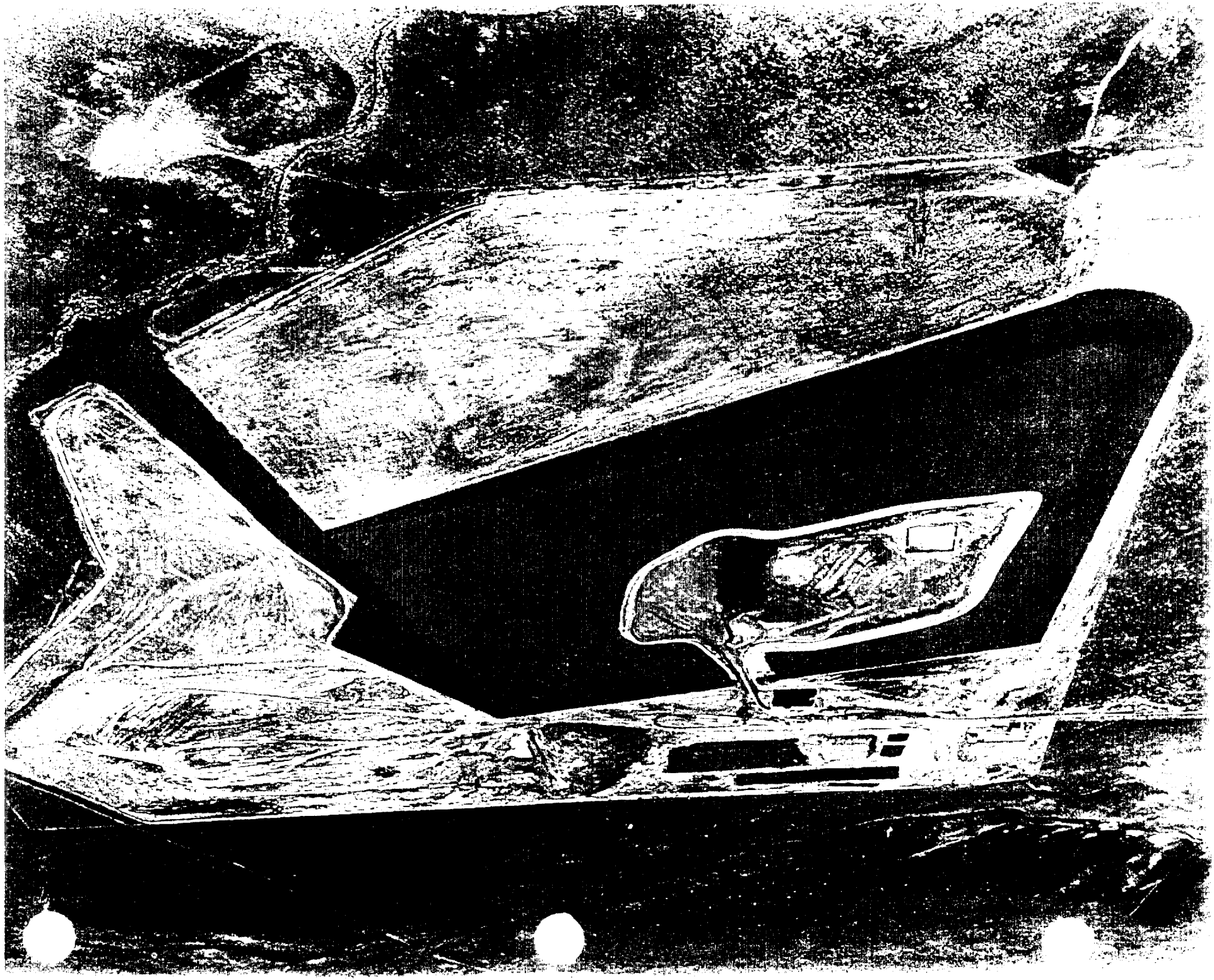
or visit the Internet site at
http://www.doegjpo.com/projects/propage1.htm



Appendix B

Commingled Waste Investigation Report for the Grand Junction Steel Property

Commingled Waste Investigation Project

APPENDIX B
COMMINGLED WASTE INVESTIGATION REPORT

for

GRAND JUNCTION STEEL
DOE ID NO. GJ-90094-CC

August 1997

Work Performed Under Contract No. DE–AC13–96GJ87335

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The information provided herein was collected in support of the Uranium Mill Tailings Remedial Action (UMTRA) Program to facilitate engineering designs, health and safety plans, constructibility determinations, and the identification of constituents regulated under the Resource Conservation and Recovery Act (RCRA) and the Toxic Substances Control Act (TSCA). The U.S. Department of Energy (DOE) disclaims any use of this information except for the purposes for which it was collected and assumes no liability for its use for any purpose other than the UMTRA Program.

INVESTIGATION SUMMARY

1.0 INTRODUCTION

The property discussed in this report is Grand Junction Steel (GJS), DOE Identification Number (DOE ID No.) GJ-90094-CC, located at 1101 Third Avenue, Grand Junction, Colorado. Many Grand Junction UMTRA vicinity properties such as GJS have been contaminated with residual radioactive material (RRM) originating from a uranium processing (milling) site formally located in Grand Junction. Radiological assessments of GJS, conducted under the UMTRA Program, confirmed the presence of RRM in the form of uranium mill tailings. Because historical conditions at GJS suggested the potential existence of hazardous constituents within RRM-contaminated areas, commingled (mixed) waste investigations were conducted under the direction of the Commingled Waste Investigation Project (CWIP) in 1989 and 1997. The results of the 1989 commingled waste investigation were documented in a previous Appendix B report. This report documents the results of the commingled waste investigation conducted at GJS in 1997.

The primary purpose of a commingled waste investigation is to identify any hazardous waste that might be commingled with RRM (Section 1.1 of this report defines hazardous and commingled waste). RRM remediated from Grand Junction UMTRA vicinity properties is typically disposed of at the UMTRA Cheney Disposal Site; however, the disposal of hazardous waste at the Cheney Disposal Site is prohibited. Data derived from a commingled waste investigation also can be used in determining the health and safety requirements for personnel involved in remediation activities on a property. The investigation of material that may be contaminated with hazardous waste but that is not contaminated with RRM is outside the scope of the UMTRA Program.

1.1 Definitions

RRM - The Uranium Mill Tailings Radiation Control Act (UMTRCA), as amended (42 U.S.C. Sections 7901-7925), defines RRM in Title 1, Section 101, **Definitions (7)(A)**, as "Waste... in the form of tailings resulting from the processing of ores for the extraction of uranium and other valuable constituents of the ores...". Uranium mill tailings also are known by a similar definition, found in the Atomic Energy Act, Section 11, **Definitions (c)(2)**, as "byproduct material". For the purpose of this report, the term RRM, as defined by UMTRCA, will be used in reference to uranium mill tailings.

RCRA Hazardous Waste - For the purpose of this report and pursuant to the Federal and Colorado Hazardous Waste Regulations, RCRA hazardous waste is defined as a solid waste (or a material such as RRM) that either exhibits a hazardous characteristic or contains a listed hazardous waste. The following hazardous characteristics are defined in 40 CFR Part 261 Subpart C or 6 CCR 1007-3 Part 261 Subpart C: toxicity, ignitability, reactivity, and corrosivity.

Listed hazardous wastes are those constituents that are listed in 40 CFR Part 261 Subpart D or 6 CCR 1007-3 Part 261 Subpart D. **Note:** Solid waste is defined in 40 CFR Part 261.2 or 6 CCR 1007-3 Part 261.2. RRM is excluded from the RCRA definition of a solid waste in 40 CFR Part 261.4, **Exclusions.**

TSCA-Regulated Substance - Substances regulated under TSCA are addressed in 40 CFR Part 761. Polychlorinated biphenyls (PCBs) are generally the only TSCA-regulated substance of concern with respect to commingled waste investigations.

Flammable Solid - For the purpose of this report, flammable solid refers to a material defined as such in 16 CFR Part 1500.3. **Note:** Though flammability does not technically fit into any standard RCRA hazardous waste category, a solid material may be investigated for flammability to determine if it would present a hazard during transportation.

Commingled Waste - For the purpose of this report, commingled waste is defined as material composed of RRM, or RRM and a solid waste, that is mixed with (1) a RCRA hazardous waste, (2) a TSCA-regulated substance (specifically PCBs), or (3) a flammable solid. The subsequent use of the term "hazardous waste" in this report may broadly refer to any of these three categories.

2.0 SITE DESCRIPTION AND BACKGROUND

GJS is a currently operational steel fabricating, warehousing, and distributing business located on approximately 21 acres in an industrial area of south Grand Junction. Its primary products are steel structures used in bridges. An assessment of GJS for radiological contamination in the 1980's indicated the presence of RRM in the form of uranium mill tailings. Commingled waste investigations at GJS in 1989 indicated that RRM was commingled with (1) RCRA toxicity characteristic hazardous waste (Toxicity Characteristic Lead [TC-Lead]) and (2) TSCA-regulated concentrations of PCBs. No sources for the TC-Lead or PCBs were positively identified, however it was suspected the TC-Lead was associated with historical painting activities at GJS, and the PCBs were associated with an electrical transformer that sometime in the past leaked its contents onto soils located on the perimeter of GJS.

Partial remediation of RRM was performed at GJS in the early 1990's. The RRM that had previously been determined or was suspected to be commingled with TC-Lead and PCBs was excluded from remediation because of difficulties associated with managing this material. The RRM excluded from remediation, located on the east side of GJS in Deposits A through F, is illustrated on Figure 1.

GJS continued to operate in the usual manner after partial remediation of RRM occurred in the early 1990's. Due to the following factors, it was suspected that some of the boundaries and/or concentrations of TC-Lead and PCB contamination commingled with RRM may have changed in the area encompassing Deposits A through F between the early 1990's and 1997:

1. Normal business activities disturbed surface soils on the property. These activities included the (1) driving of heavy equipment back and forth across the suspect areas, and (2) occasional scraping and grading of the surface of the main workyard to manage sand-blasting sands that accumulated on the ground after being used in steel fabricating operations.

2. Recurring breakage of a water main in a street adjacent to GJS resulted in flooding, water erosion, and redistribution of soils in the GJS workyard area.

Because the boundaries and/or concentrations of TC-Lead and PCB contamination commingled with RRM in the area encompassing Deposits A through F could have changed from that assessed in 1989, an additional commingled waste investigation was performed at GJS in May 1997. The remainder of this report presents the details and results of the May 1997 commingled waste investigation.

3.0 SITE INVESTIGATION

The RRM remaining at GJS in Deposits A through F was targeted for an additional commingled waste investigation in May 1997 because the extent of commingled waste associated with these deposits was in question. Following are the factors that guided the performance of the May 1997 commingled waste investigation.

3.1 Investigation Objectives

The primary objective of the May 1997 commingled waste investigation was to determine the existence and extent of commingled waste associated with Deposits A through F. The following steps were used to achieve this objective:

1. Assume all RRM in Deposits A through F had the potential to be commingled with the same hazardous wastes that were previously found to be mixed with RRM at GJS: TC-Lead and PCBs. Identify any other potential hazardous wastes commingled with RRM in Deposits A through F by performing a walkthrough of these areas and interviewing GJS personnel to determine what materials may have been historically used in these areas.

2. Characterize RRM in Deposits A through F for any suspected hazardous wastes through soil sampling and laboratory analysis.

3. Evaluate analytical results to determine whether any potentially hazardous constituents found to be mixed with RRM in Deposits A through F could be defined as a RCRA hazardous waste, a TSCA-regulated substance (i.e., PCBs), or a flammable solid, thereby creating a commingled waste.

3.2 Investigation Decisions

The commingled waste investigation was designed to enable the following decisions to be made:

1. If commingled waste was not identified in Deposits A through F, then remediation of RRM in these deposits could proceed without restrictions.

2. If commingled waste was identified in Deposits A through F, then restrictions would be placed on the remediation of RRM in these deposits.

3.3 Summary of Sampling and Analytical Strategy

Sampling - RRM in Deposits A through F was characterized for hazardous waste by performing laboratory analysis of representative soil samples collected from these deposits. A site-specific sampling and analysis plan was developed to guide this characterization. The potential existence of PCB contamination in these deposits prompted sample collection to be performed through use of a systematic gridded sampling scheme. Guidance found in the Environmental Protection Agency's (EPA) *Field Manual for Grid Sampling of PCB Spill Sites to Verify Cleanup* (EPA-560/5-86-017, May 1986) and *Verification of PCB Spill Cleanup by Sampling and Analysis* (EPA-560/5-85-026, August 1985) was used to develop this gridded sampling scheme.

A total of 49 sample locations (GJS-1 through GJS-49) made up the sample grid covering Deposits A through F (see Figures 2 and 3). Because RRM exists in Deposits A through F at depths varying from 0-27 inches, samples were collected from each location at distinct depth intervals, with no samples representing more than 12 inches of RRM. Multiple sample sets were collected at some sample locations because multiple depth intervals had to be investigated. The assessed depth of RRM nearest a particular sample location dictated the depth intervals sampled (0-6 inches, 0-12 inches, 12-24 inches, etc.).

Analysis - Because PCBs previously had been identified in the area encompassing Deposits A through F, samples were collected from all locations and all depth intervals in the sample grid to undergo PCB analysis. Samples also were collected from almost all locations and depth intervals to undergo Toxicity Characteristic Leaching Procedure (TCLP) Lead analysis (information is provided in Table 1 as to why TCLP Lead analysis was not performed on samples from Locations GJS-6, GJS-7, and GJS-18).

At those sample locations in the sample grid considered to have the potential to contain other hazardous constituents because of suspect conditions (e.g., the presence of significant staining in the soil or elevated volatile organic readings), samples were collected to undergo TCLP Volatile or Flammability analysis.

Additional composite samples also were collected representing each of Deposits B through F to undergo Total Lead analysis (information is provided in Table 1 as to why Total Lead analysis was not performed on a sample representing Deposit A). These Total Lead samples were

collected for health and safety purposes to assess potential worker exposure to lead.

4.0 SUMMARY OF ANALYTICAL RESULTS AND WASTE DETERMINATIONS

All samples were submitted to the analytical laboratory at the DOE Grand Junction Office. Samples were analyzed using standard EPA-approved methods. The analytical data were reviewed for compliance with laboratory quality control and data acceptance procedures outlined in the *Analytical Chemistry Laboratory Administrative Plan and Quality Control Procedures*. No anomalies occurred that impeded the effective evaluation of the analytical data for the presence of hazardous waste in the areas sampled.

Analytical results are compiled in Table 1. The analytical results as they relate to the definitions for hazardous waste noted in Section 1.1 of this report are summarized below.

4.1 Characteristic Hazardous Wastes (6 CCR 1007-3 Part 261, Subpart C)

Characteristic of Toxicity for Lead - Samples from all locations (except GJS-6, GJS-7, and GJS-18) and depth intervals underwent TCLP Lead analysis (information is provided in Table 1 as to why TCLP Lead analysis was not performed on samples from Locations GJS-6, GJS-7, and GJS-18). Samples from two locations in Deposit A, GJS-2 (0-6 inches) and GJS-20 (0-12 inches), had TCLP Lead concentrations exceeding the regulatory level (RL) for TC-Lead of 5.0 mg/L (per 6 CCR 1007-3 Part 261.24). Because samples from Locations GJS-6, GJS-7, and GJS-18 were not analyzed for TCLP Lead, it is unknown whether leachable lead at these locations exceeds the RL for TC-Lead. Leachable lead was detected at many other locations and depth intervals but not at concentrations equal to or exceeding the RL for TC-Lead.

Characteristic of Toxicity for Volatile Constituents - Samples from the following locations underwent TCLP Volatile analysis because suspect conditions existed at the locations: GJS-25 (Deposit B, 0-12 inches; elevated volatile organic readings, paint), GJS-35 (Deposit C, 0-12 inches; elevated volatile organic readings, oily staining), and GJS-38 (Deposit C, 0-6 inches; elevated volatile organic readings, oily staining). Chloroform and 2-butanone were detected in all these samples but in concentrations below the RLs for these constituents (per 6 CCR 1007-3 Part 261.24).

Characteristics of Reactivity and Corrosivity - The RRM in Deposits A through F was not investigated for the hazardous waste characteristics of reactivity or corrosivity as there was no reason to suspect that this material was reactive or corrosive.

Characteristic of Ignitability - The RRM in Deposits A through F was not investigated for the hazardous waste characteristic of ignitability because of the absence of potentially ignitable free liquids.

4.2 Listed Hazardous Wastes (6 CCR 1007-3 Part 261, Subpart D)

The RRM in Deposits A through F was not investigated for listed hazardous wastes. Process knowledge, observable site conditions, and analytical data from the 1989 commingled waste investigation did not provide convincing evidence of the presence of any listed hazardous wastes in these areas.

4.3 Toxic Substances (40 CFR Part 761)

Samples from all locations and depth intervals underwent PCB analysis. Analytical results indicated that PCB concentrations in these samples ranged from undetected to 93.0 parts per million (ppm). In a video conference meeting in April 1997 among EPA Region VIII, the DOE-Grand Junction Office, the Colorado Department of Public Health and Environment (CDPHE), MACTEC-ERS, and a representative of GJS concerning potential PCB contamination at GJS, the EPA determined that 2.0 ppm was the concentration at which PCBs at GJS would become TSCA-regulated (i.e., requiring cleanup). Samples from the following locations had PCB concentrations exceeding the 2.0 ppm action level (Table 1 provides more details concerning the specific depth intervals at which 2.0 ppm was exceeded):

Deposit A - All locations (GJS-1 through GJS-23). Note: Three locations (GJS-6, GJS-7 and GJS-18) had PCB concentrations exceeding 50.0 ppm.

Deposit B - All locations (GJS-24 through GJS-28).

Deposit C - Locations GJS-29 through GJS-32, GJS-39, and GJS-40.

Deposit D - Locations GJS-42 through GJS-44.

Deposit E - None.

Deposit F - None.

4.4 Flammability

One sample was collected from Location GJS-34 (Deposit C) and analyzed for flammability because of the presence of a significant spill of diesel fuel on the ground at that sample location. Analytical results indicate this material does not pose a flammability hazard.

5.0 EXTENT OF COMMINGLED WASTE

Based on the analytical results and applicable RLs, commingled waste is present in a significant portion of Deposits A through D; no commingled waste exists in Deposits E or F. Figures 2 and 3 illustrate the lateral extent of commingled waste associated with Deposits A through F. Figures 2 and 3 also illustrate all sample locations and designate locations which have PCB

concentrations of ≥2.0 ppm and ≥50.0 ppm, locations which have TCLP Lead concentrations of ≥5.0 mg/L, and locations where neither RL is exceeded. Boundary lines separating commingled waste areas from RRM that is not commingled waste were established by placing the boundary lines approximately halfway between locations whose analytical results exceeded RLs and adjacent locations whose analytical results were below RLs.

Analytical results indicate commingled waste exists in Deposits A through D at depth intervals varying from 0-27 inches. Other than the information provided in Table 1 that associates analytical results with specific depth intervals, this report will not attempt to distinguish specific layers of commingled waste. The vertical extent of commingled waste in Deposits A through D will be correlated with the various depths of RRM contamination associated with these deposits.

A summary of the extent of commingled waste associated with Deposits A through F is provided below. Volume estimates are based on the depths of RRM contamination in the commingled waste areas and the boundary lines previously discussed.

Deposit A - All of Deposit A is commingled waste. All of Deposit A is contaminated with PCBs in concentrations exceeding 2.0 ppm. Additionally, at least two separate areas in Deposit A also are contaminated with RCRA hazardous waste; these areas have TC-Lead, with leachable lead concentrations exceeding 5.0 mg/L. The volume of PCB-contaminated commingled waste is approximately 65 cubic yards. The two areas of TC-Lead-contaminated commingled waste (which also are PCB-contaminated) have a total volume of approximately 6 cubic yards. **Note:** It is unknown whether TC-Lead exists at Locations GJS-6, GJS-7, and GJS-18 because samples from these locations were not analyzed for TCLP Lead.

Deposit B - All of Deposit B is commingled waste because it is contaminated with PCBs in concentrations exceeding 2.0 ppm. The volume of PCB-contaminated commingled waste is approximately 11 cubic yards.

Deposit C - Commingled waste exists in two separate areas of Deposit C; these areas are contaminated with PCBs in concentrations exceeding 2.0 ppm. The two areas of PCB-contaminated commingled waste have a total volume of approximately 11 cubic yards. The volume of remaining RRM that is not commingled waste is approximately 20 cubic yards.

Deposit D - Most of Deposit D is commingled waste because it is contaminated with PCBs in concentrations exceeding 2.0 ppm. The volume of PCB-contaminated commingled waste is approximately 5 cubic yards. The volume of remaining RRM that is not commingled waste is approximately 1 cubic yard.

Deposit E - None of Deposit E is commingled waste. The volume of RRM in Deposit E is approximately 1 cubic yard.

Deposit F - None of Deposit F is commingled waste. The volume of RRM in Deposit F is approximately 3 cubic yards.

In summary: Commingled waste exists in all of Deposits A and B; commingled waste exists in parts of Deposits C and D; no commingled waste exists in Deposits E or F. The total volume of commingled waste in Deposits A through D is approximately 92 cubic yards. All of the commingled waste in Deposits A through D is PCB-contaminated; approximately 6 cubic yards of this PCB-contaminated commingled waste also is TC-Lead-contaminated.

6.0 CONCLUSIONS AND RECOMMENDATIONS

The results of the commingled waste investigation conducted at GJS in May 1997 indicate that commingled waste resulting from the mixture of RRM with TSCA-regulated concentrations (≥2.0 ppm) of PCBs and RCRA hazardous waste (TC-Lead) exists in all or parts of Deposits A through D; no commingled waste exists in Deposits E or F. Because commingled waste exists, the following restrictions are recommended relative to the remediation of Deposits A through F:

Deposit A - Deposit A should be excluded from remediation because PCB-contaminated commingled waste exists throughout the deposit, including the two areas contaminated with TC-Lead hazardous waste. There currently are no acceptable alternatives for treating and/or disposing materials that consist of both RRM and PCB contamination.

Deposit B - Deposit B should be excluded from remediation because PCB-contaminated commingled waste exists throughout the deposit. There currently are no acceptable alternatives for treating and/or disposing materials that consist of both RRM and PCB contamination.

Deposit C - PCB-contaminated commingled waste exists in two areas of Deposit C. Although RRM exists in Deposit C that does not qualify as commingled waste, the boundary lines separating PCB-contaminated commingled waste from RRM that is not commingled waste are only approximations. Therefore, it is recommended that all materials comprising Deposit C be excluded from remediation because (1) there currently are no acceptable alternatives for treating and/or disposing materials that consist of both RRM and PCB contamination, and (2) there would be a significant risk of mismanaging PCB-contaminated RRM if partial remediation was attempted of RRM that is not commingled waste.

Deposit D - PCB-contaminated commingled waste exists in most of Deposit D. Although RRM exists in Deposit D that does not qualify as commingled waste, the boundary line separating PCB-contaminated commingled waste from RRM that is not commingled waste is only an approximation. Therefore, it is recommended that all materials comprising Deposit D be excluded from remediation because (1) there currently are no acceptable alternatives for treating and/or disposing materials that consist of both RRM and PCB contamination, and (2) there would be a significant risk of mismanaging PCB-contaminated RRM if partial remediation was attempted of RRM that is not commingled waste.

Deposit E - Because no commingled waste exists in Deposit E, there are no restrictions with respect to the remediation of RRM located in this deposit. If suspected hazardous waste materials are encountered during future remediation activities, further characterization of this deposit may be required.

Deposit F - Because no commingled waste exists in Deposit F, there are no restrictions with respect to the remediation of RRM located in this deposit. If suspected hazardous waste materials are encountered during future remediation activities, further characterization of this deposit may be required.

Table 1
Commingled Waste Investigation Analytical Results

Sample Location Number Deposit	Depth Interval (in.)	Sample Ticket Number	Analyte	Result	Regulatory Level
GJS-1 Deposit A	0-12	NDA 601	PCBs [1] TCLP Lead	27.0 mg/kg [2] 1.66 mg/L	2.0 ppm [3] 5.0 mg/L [4]
GJS-2 Deposit A	0-6	NDA 602	PCBs TCLP Lead	26.0 mg/kg 9.14 mg/L	2.0 ppm 5.0 mg/L
GJS-3 Deposit A	0-6	NDA 603	PCBs TCLP Lead	11.0 mg/kg 1.49 mg/L	2.0 ppm 5.0 mg/L
GJS-4 Deposit A	0-12	NDA 604	PCBs TCLP Lead	13.0 mg/kg 1.69 mg/L (N) [5]	2.0 ppm 5.0 mg/L
GJS-5 Deposit A	0-12 0-12 (duplicate)	NDA 605 NDA 606	PCBs TCLP Lead PCBs TCLP Lead	25.0 mg/kg 3.97 mg/L (N) 22.0 mg/kg 4.34 mg/L (N)	2.0 ppm 5.0 mg/L
GJS-6 Deposit A	0-6	NDA 607	PCBs TCLP Lead	51.0 mg/kg None [6]	2.0 ppm 5.0 mg/L
GJS-7 Deposit A	0-6	NDA 608	PCBs TCLP Lead	93.0 mg/kg None [6]	2.0 ppm 5.0 mg/L
GJS-8 Deposit A	0-12	NDA 609	PCBs TCLP Lead	6.6 mg/kg ~0.869 mg/L (B, N)	2.0 ppm 5.0 mg/L
GJS-9 Deposit A	0-6	NDA 610	PCBs TCLP Lead	29.0 mg/kg 1.99 mg/L (N)	2.0 ppm 5.0 mg/L
GJS-10 Deposit A	0-6	NDA 611	PCBs TCLP Lead	~3.2 mg/kg (J, P) ~0.621 mg/L (B, N)	2.0 ppm 5.0 mg/L
GJS-11 Deposit A	0-6	NDA 612	PCBs TCLP Lead	3.8 mg/kg 2.88 mg/L	2.0 ppm 5.0 mg/L
GJS-12 Deposit A	0-6	NDA 613	PCBs TCLP Lead	~3.2 mg/kg (J) ~0.411 mg/L (B, N)	2.0 ppm 5.0 mg/L
GJS-13 Deposit A	0-6	NDA 614	PCBs TCLP Lead	3.3 mg/kg ~1.07 mg/L (B, N)	2.0 ppm 5.0 mg/L
GJS-14 Deposit A	0-6	NDA 615	PCBs TCLP Lead	~3.2 mg/kg (J, P) ~0.964 mg/kg (B, N)	2.0 ppm 5.0 mg/L

Table 1
Commingled Waste Investigation Analytical Results (continued)

Sample Location Number Deposit	Depth Interval (in.)	Sample Ticket Number	Analyte	Result	Regulatory Level
GJS-15 Deposit A	0-6	NDA 616	PCBs TCLP Lead	4.8 mg/kg ~0.548 mg/L (B, N)	2.0 ppm 5.0 mg/L
	0-6 (duplicate)	NDA 617	PCBs TCLP Lead	~2.8 mg/kg (J) ~0.441 mg/L (B, N)	
GJS-16 Deposit A	0-6	NDA 618	PCBs TCLP Lead	7.9 mg/kg 1.14 mg/L (N)	2.0 ppm 5.0 mg/L
GJS-17 Deposit A	0-6	NDA 619	PCBs TCLP Lead	3.7 mg/kg ~1.06 mg/L (B)	2.0 ppm 5.0 mg/L
GJS-18 Deposit A	0-6	NDA 620	PCBs TCLP Lead	61.0 mg/kg None [6]	2.0 ppm 5.0 mg/L
GJS-19 Deposit A	0-6	NDA 621	PCBs TCLP Lead	10.0 mg/kg ~0.0622 mg/L (B)	2.0 ppm 5.0 mg/L
GJS-20 Deposit A	0-12	NDA 622	PCBs TCLP Lead	40.0 mg/kg 7.31 mg/L	2.0 ppm 5.0 mg/L
	12-24	NDA 623	PCBs TCLP Lead	0.65 mg/kg U [7]	
	24-27	NDA 624	PCBs TCLP Lead	0.040 mg/kg (P) U	
GJS-21 Deposit A	0-6	NDA 625	PCBs TCLP Lead	17.0 mg/kg ~0.398 mg/L (B)	2.0 ppm 5.0 mg/L
GJS-22 Deposit A	0-12	NDA 626	PCBs TCLP Lead	14.0 mg/kg ~0.184 mg/L (B)	2.0 ppm 5.0 mg/L
	12-24	NDA 627	PCBs TCLP Lead	35.0 mg/kg 2.12 mg/L	
	24-27	NDA 628	PCBs TCLP Lead	0.35 mg/kg U	

Table 1
Commingled Waste Investigation Analytical Results (continued)

Sample Location Number Deposit	Depth Interval (in.)	Sample Ticket Number	Analyte	Result	Regulatory Level
GJS-23 Deposit A	0-12	NDA 629	PCBs TCLP Lead	3.5 mg/kg ~0.070 mg/L (B)	2.0 ppm 5.0 mg/L
	12-24	NDA 630	PCBs TCLP Lead	0.58 mg/kg ~0.322 mg/L (B)	
	24-27	NDA 631	PCBs TCLP Lead	2.6 mg/kg ~0.0678 mg/L (B)	
GJS-24 Deposit B	0-12	NDA 632	PCBs TCLP Lead	16.0 mg/kg ~0.31 mg/L (B, N)	2.0 ppm 5.0 mg/L
	12-18	NDA 633	PCBs TCLP Lead	~2.8 mg/kg (J) ~0.307 mg/L (B, N)	
	12-18 (duplicate)	NDA 634	PCBs TCLP Lead	0.85 mg/kg ~0.116 mg/L (B, N)	
GJS-25 Deposit B	0-12	NDA 635	PCBs TCLP Lead	6.9 mg/kg ~0.0444 mg/L (B, N)	2.0 ppm 5.0 mg/L
	0-12	NDA 676	TCLP Volatiles: [8] Chloroform 2-Butanone	 0.003 mg/L (B, J) 0.027 mg/L (B)	 6.0 mg/L [9] 200.0 mg/L
	0-12 (duplicate)	NDA 677	TCLP Volatiles: Chloroform 2-Butanone	 0.003 mg/L (B, J) 0.026 mg/L (B)	
GJS-26 Deposit B	0-12	NDA 636	PCBs TCLP Lead	11.0 mg/kg 1.6 mg/L	2.0 ppm 5.0 mg/L
GJS-27 Deposit B	0-6	NDA 637	PCBs TCLP Lead	14.0 mg/kg 1.23 mg/L (N)	2.0 ppm 5.0 mg/L
GJS-28 Deposit B	0-6	NDA 638	PCBs TCLP Lead	13.0 mg/kg ~0.277 mg/L (B, N)	2.0 ppm 5.0 mg/L
GJS-29 Deposit C	0-6	NDA 639	PCBs TCLP Lead	5.8 mg/kg 3.29 mg/L (N)	2.0 ppm 5.0 mg/L
	0-6 (duplicate)	NDA 640	PCBs TCLP Lead	12.0 mg/kg 3.87 mg/L (N)	

Table 1
Commingled Waste Investigation Analytical Results (continued)

Sample Location Number Deposit	Depth Interval (in.)	Sample Ticket Number	Analyte	Result	Regulatory Level
GJS-30 Deposit C	0-12	NDA 641	PCBs TCLP Lead	4.5 mg/kg ~1.1 mg/L (B, N)	2.0 ppm 5.0 mg/L
	12-15	NDA 642	PCBs TCLP Lead	U U (N)	
GJS-31 Deposit C	0-12	NDA 643	PCBs TCLP Lead	5.6 mg/kg 1.62 mg/L (N)	2.0 ppm 5.0 mg/L
	12-15	NDA 644	PCBs TCLP Lead	0.72 mg/kg ~0.273 mg/L (B, N)	
GJS-32 Deposit C	0-6	NDA 645	PCBs TCLP Lead	4.1 mg/kg (P) ~0.671 mg/L (B, N)	2.0 ppm 5.0 mg/L
GJS-33 Deposit C	0-6	NDA 646	PCBs TCLP Lead	1.1 mg/kg ~0.462 mg/L (B, N)	2.0 ppm 5.0 mg/L
GJS-34 Deposit C	0-6 [10]	NDA 682	Flammability	<0.02 in/sec	0.1 in/sec [11]
	0-12	NDA 647	PCBs TCLP Lead	~0.031 mg/kg (J, P) U	2.0 ppm 5.0 mg/L
	12-15	NDA 648	PCBs TCLP Lead	0.064 mg/kg U (N)	
GJS-35 Deposit C	0-12	NDA 649	PCBs TCLP Lead	0.19 mg/kg ~0.351 mg/L (B, N)	2.0 ppm 5.0 mg/L
	0-12 (duplicate)	NDA 650	PCBs TCLP Lead	0.12 mg/kg (P) ~0.23 mg/L (B, N)	
	0-12	NDA 678	TCLP Volatiles: Chloroform 2-Butanone	 0.004 mg/L (B, J) 0.015 mg/L (B)	 6.0 mg/L 200.0 mg/L
	12-24	NDA 651	PCBs TCLP Lead	0.093 mg/kg ~0.142 mg/L (B, N)	
GJS-36 Deposit C	0-6	NDA 652	PCBs TCLP Lead	~0.3 mg/kg (J, P) ~0.539 mg/L (B, N)	2.0 ppm 5.0 mg/L
GJS-37 Deposit C	0-6	NDA 653	PCBs TCLP Lead	1.0 mg/kg ~0.47 mg/L (B, N)	2.0 ppm 5.0 mg/L

Table 1
Commingled Waste Investigation Analytical Results (continued)

Sample Location Number Deposit	Depth Interval (in.)	Sample Ticket Number	Analyte	Result	Regulatory Level
GJS-38 Deposit C	0-6	NDA 654	PCBs TCLP Lead	0.064 mg/kg (P) ~0.984 mg/L (B)	2.0 ppm 5.0 mg/L
	0-6	NDA 679	TCLP Volatiles: Chloroform 2-Butanone	 0.004 mg/L (B, J) 0.012 mg/L (B)	 6.0 mg/L 200.0 mg/L
GJS-39 Deposit C	0-6	NDA 655	PCBs TCLP Lead	2.8 mg/kg ~0.658 mg/L (B)	2.0 ppm 5.0 mg/L
GJS-40 Deposit C	0-6	NDA 656	PCBs TCLP Lead	2.7 mg/kg ~0.562 mg/L (B)	2.0 ppm 5.0 mg/L
GJS-41 Deposit D	0-6	NDA 657	PCBs TCLP Lead	1.9 mg/kg ~0.627 mg/L (B)	2.0 ppm 5.0 mg/L
GJS-42 Deposit D	0-6	NDA 658	PCBs TCLP Lead	2.6 mg/kg ~0.256 mg/L (B)	2.0 ppm 5.0 mg/L
GJS-43 Deposit D	0-6	NDA 659	PCBs TCLP Lead	2.9 mg/kg 1.27 mg/L	2.0 ppm 5.0 mg/L
GJS-44 Deposit D	0-6	NDA 660	PCBs TCLP Lead	2.4 mg/kg ~1.12 mg/L	2.0 ppm 5.0 mg/L
GJS-45 Deposit E	0-6	NDA 661	PCBs TCLP Lead	0.11 mg/kg ~0.207 mg/L (B)	2.0 ppm 5.0 mg/L
GJS-46 Deposit F	0-6	NDA 662	PCBs TCLP Lead	0.055 mg/kg (P) ~0.0944 mg/L (B)	2.0 ppm 5.0 mg/L
GJS-47 Deposit F	0-6	NDA 663	PCBs TCLP Lead	0.089 mg/kg ~0.2 mg/L (B)	2.0 ppm 5.0 mg/L
GJS-48 Deposit F	0-6	NDA 664	PCBs TCLP Lead	0.1 mg/kg ~0.138 mg/L (B)	2.0 ppm 5.0 mg/L
GJS-49 Deposit F	0-6	NDA 665	PCBs TCLP Lead	0.24 mg/kg ~0.302 mg/L (B)	2.0 ppm 5.0 mg/L
	0-6 (duplicate)	NDA 666	PCBs TCLP Lead	0.26 mg/kg ~0.439 mg/L (B)	
Deposit B [12]	NA [13]	NDA 670	Total Lead	1510 mg/kg	NA [14]
Deposit C	NA	NDA 669	Total Lead	453 mg/kg	NA

Table 1
Commingled Waste Investigation Analytical Results (continued)

Sample Location Number Deposit	Depth Interval (in.)	Sample Ticket Number	Analyte	Result	Regulatory Level
Deposit D	NA	NDA 668	Total Lead	712 mg/kg	NA
Deposit E	NA	NDA 672	Total Lead	114 mg/kg	NA
Deposit F	NA	NDA 667	Total Lead	172 mg/kg	NA
E1 (Equipment Blank 1 [water sample]) NA	NA	NDA 671	PCBs Total Lead	U 0.0051 mg/L	2.0 mg/kg 5.0 mg/L
E2 (Equipment Blank 2 [water sample]) NA	NA	NDA 675	PCBs Total Lead	U U	2.0 mg/kg 5.0 mg/L
E3 (Equipment Blank 3 [water sample]) NA	NA	NDA 680	TCLP Volatiles: Chloroform 2-Butanone	 0.015 mg/L (B) 0.015 mg/L (B)	 6.0 mg/L 200.0 mg/L
Decon Water NA	NA	NDA 681	PCBs Total Lead Ignitability [15]	0.013 mg/L 4.61 mg/L >160 °F	2.0 mg/kg 5.0 mg/L 140 °F [16]

Footnotes to Table 1

[1] Only Aroclor 1254 was identified at GJS.

[2] mg/kg = ppm.

[3] The EPA has stated verbally that the action level for PCBs at GJS is 2.0 ppm.

[4] Per 6 CCR 1007-3 Part 261.24.

[5] Qualifiers associated with analytical data are provided in parentheses after the analytical result. Below are the definitions for all qualifiers shown in Table 1, as presented in the "Definition of Qualifiers" section of the Grand Junction Office Analytical Laboratory Analytical Report:

Qualifiers associated with PCB analysis:

J - An estimated value. This qualifier is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed, or when the mass spectral data indicate the presence

Footnotes to Table 1 (continued)

of a compound that meets the identification criteria, but the result is less than the sample quantitation limit and greater than zero.
P - This qualifier is used for a pesticide/Aroclor target analyte when there is greater than 25% difference for detected concentrations between the two GC columns.

Qualifiers associated with TCLP Lead analysis:

N - Spiked sample recovery is not within control limits.
B - The reported value was obtained from a reading that was less than the Required Detection Limit (RDL) but greater than or equal to the actual Detection Limit (DL).

Qualifiers associated with TCLP Volatile analysis:

B - Analyte found in the associated blank as well as in the sample.
J - An estimated value. This qualifier is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed, or when the mass spectral data indicate the presence of a compound that meets the identification criteria, but the result is less than the sample quantitation limit and greater than zero.

[6] TCLP Lead analysis was not performed at this location so as to minimize any laboratory wastes associated with analyzing materials from this location. PCB concentrations at this location were >50.0 ppm; the PCB regulatory level for laboratory wastes is 50.0 ppm.

[7] Analyte was undetected.

[8] The following ten compounds are assessed when analyzing for TCLP Volatiles: vinyl chloride; 1,1-dichloroethene; chloroform; 1,2-dichloroethane; 2-butanone (also known as methyl ethyl ketone); carbon tetrachloride; trichloroethene; benzene; tetrachloroethene; chlorobenzene. Only those compounds found at detectable concentrations are provided in Table 1.

[9] Per 6 CCR 1007-3 Part 261.24.

[10] Material suspected of being a flammability problem at this location existed primarily in the 0-6 inch depth interval.

[11] Per 16 CFR Part 1500.3.

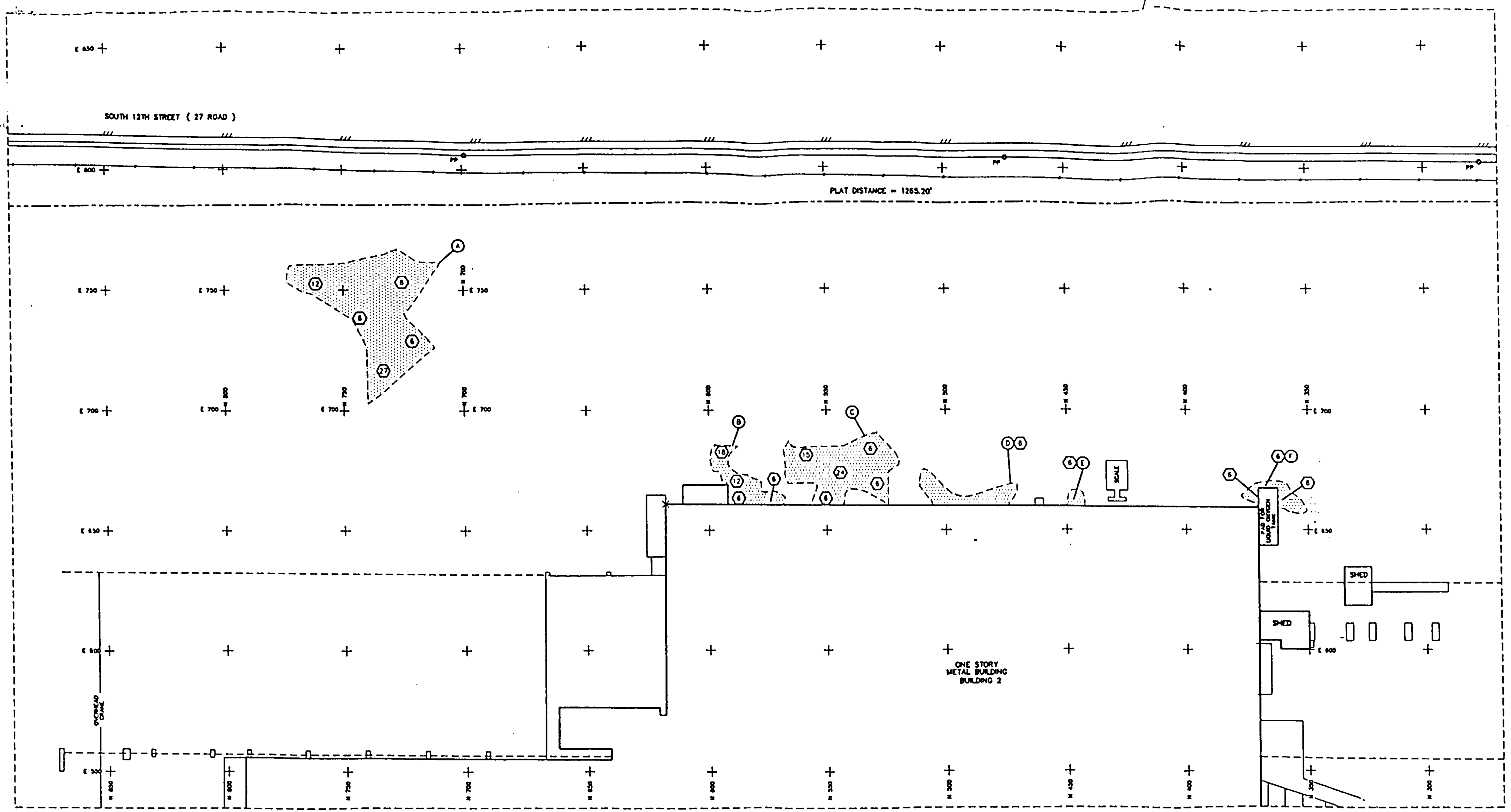
[12] Composite samples representing each of Deposits B through F were collected for health and safety reasons to assess potential worker exposure. No composite sample representing Deposit A was analyzed. This was to minimize any laboratory wastes associated with analyzing materials from Deposit A. PCB concentrations at some locations within Deposit A were >50.0 ppm; the PCB regulatory level for laboratory wastes is 50.0 ppm.

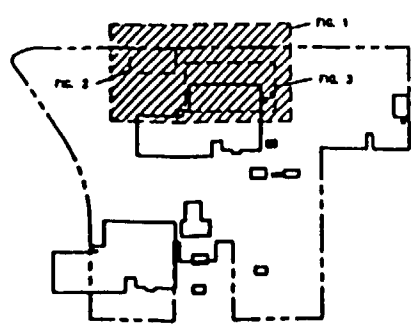
[13] Not applicable. Splits of sample material from all locations and depth intervals associated with each of Deposits B through F were combined to form each composite sample.

[14] Not applicable. Regulatory levels for making waste determinations are not relevant to health and safety samples.

[15] Ignitability was investigated in the waste rinsate remaining after the decontamination of sampling equipment because an ignitable solvent was used in the decontamination process.

[16] Per 6 CCR 1007-3 Part 261.21.





KEY MAP

LEGEND

- BOUNDARY OF RADIOLOGICAL CONTAMINATION
- (A) DESIGNATION OF RESIDUAL RADIOACTIVE DEPOSIT
- (6) DEPTH OF RADIOLOGICAL CONTAMINATION (INCHES)
- RADIOLOGICALLY CONTAMINATED AREA

NORTH

SCALE IN FEET

5 2.5 0 5 10

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GRAND JUNCTION STEEL 1101 THIRD AVENUE GRAND JUNCTION, CO	LAND SURVEY	UMTRA VICINITY PROPERTIES GJ-90094-CC FIGURE 1 ESTIMATED EXTENT OF RADIOLOGICAL CONTAMINATION DEPOSITS A THOUGH F
		TAS-011-0002-90094
		R90094W1
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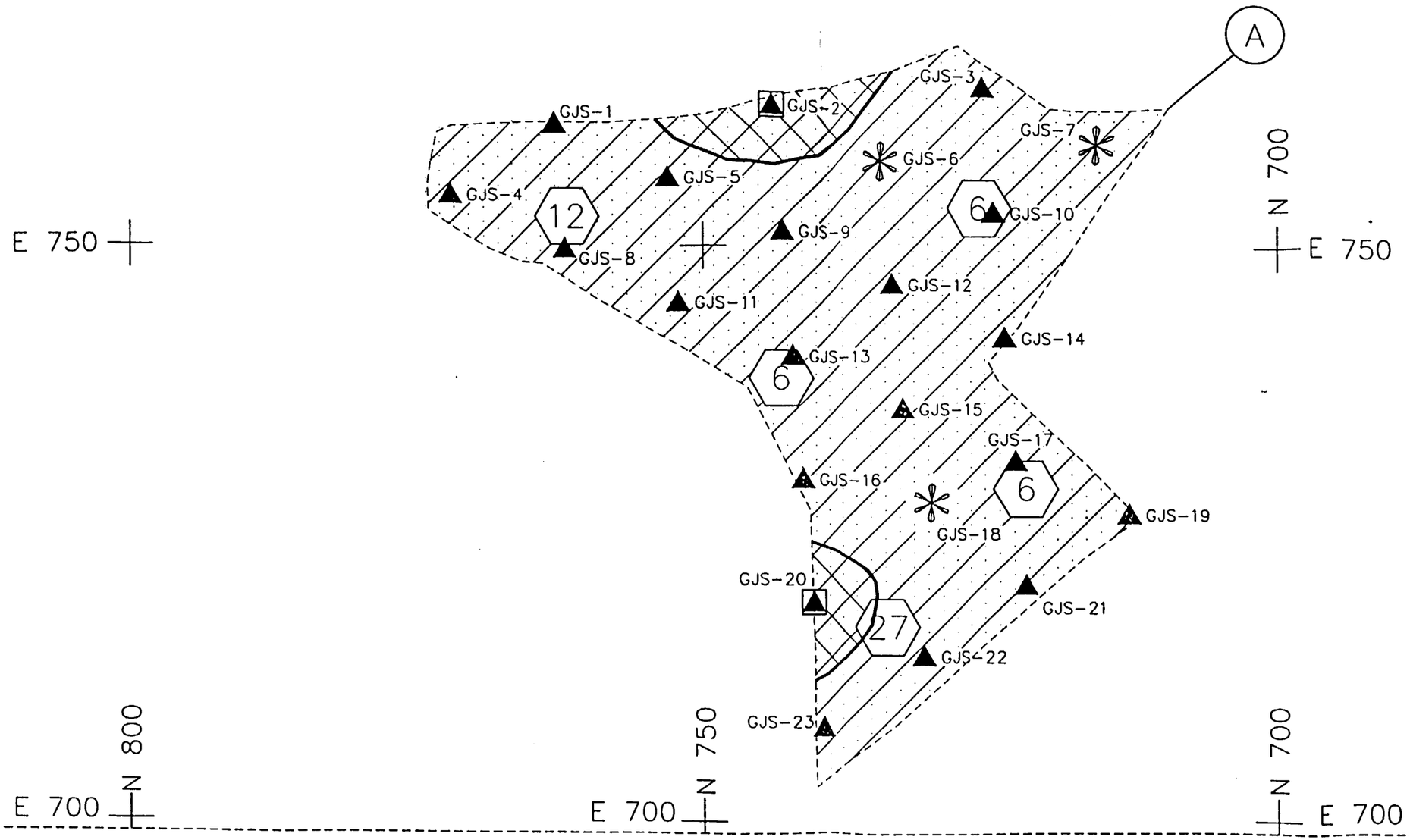

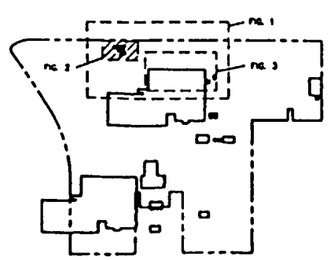

LEGEND

- BOUNDARY OF RADIOLOGICAL CONTAMINATION
- DESIGNATION OF RESIDUAL RADIOACTIVE DEPOSIT
- DEPTH OF RADIOLOGICAL CONTAMINATION (INCHES)
- RADIOLOGICALLY CONTAMINATED AREA
- GJS-11 SAMPLE LOCATION NUMBER
- SAMPLE LOCATIONS WITH PCB CONCENTRATIONS OF ≥ 2.0 ppm and < 50.0 ppm
- SAMPLE LOCATIONS WITH PCB CONCENTRATIONS OF ≥ 50.0 ppm
- SAMPLE LOCATIONS WITH TCLP LEAD CONCENTRATIONS OF ≥ 5.0 mg/L
- COMMINGLED WASTE – PCBs ≥ 2.0 ppm
- COMMINGLED WASTE – TCLP LEAD ≥ 5.0 mg/L

NORTH

SCALE IN FEET

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GRAND JUNCTION STEEL
1101 THIRD AVENUE
GRAND JUNCTION, CO

LAND SURVEY

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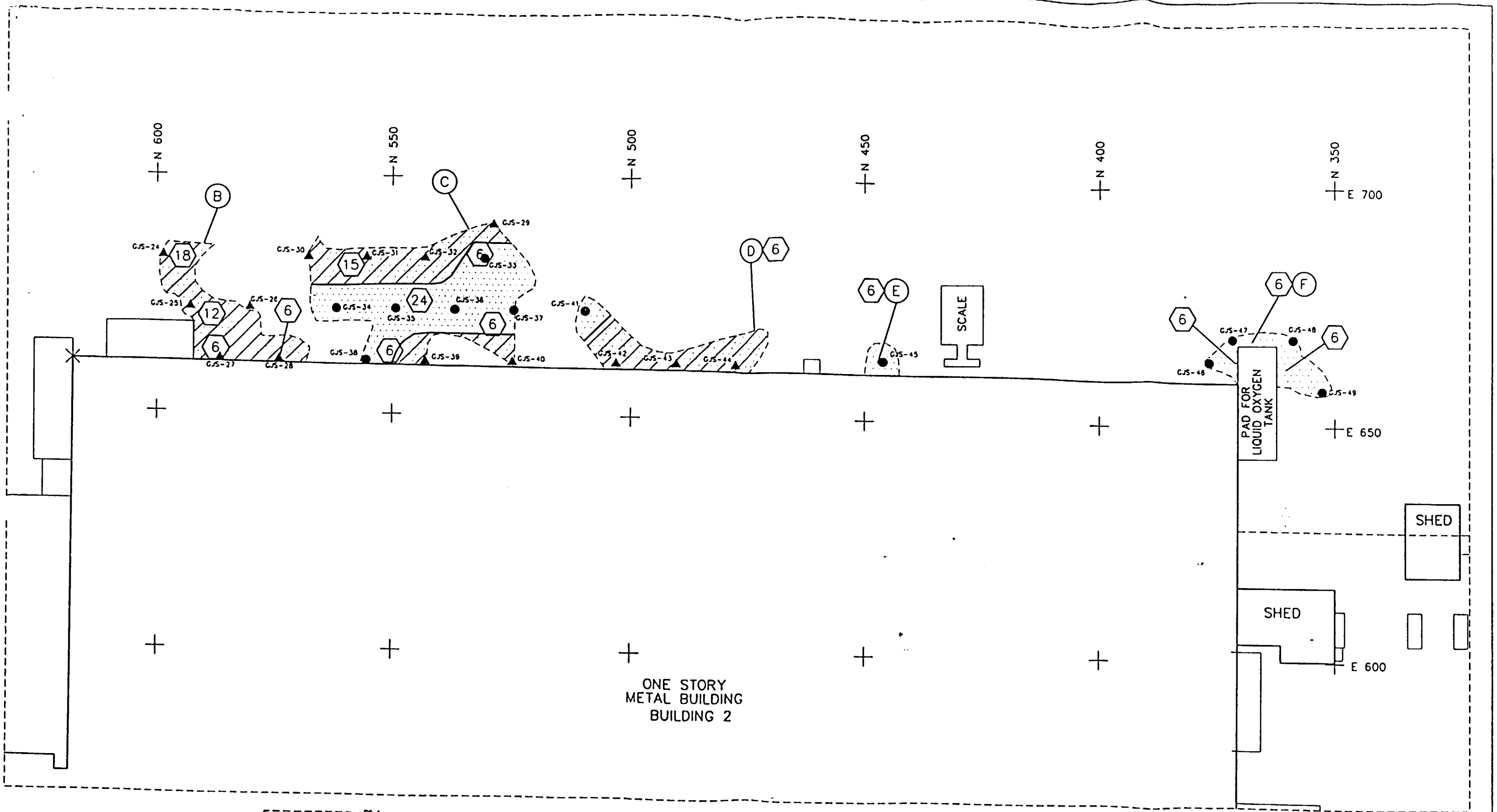
GJ-90094-CC

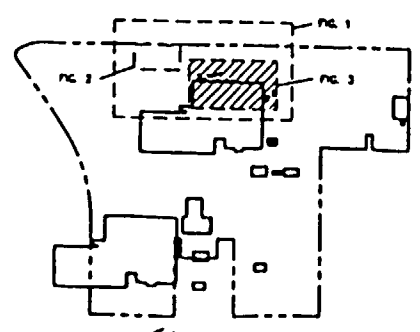
FIGURE 2
COMMINGLED WASTE INVESTIGATION
SAMPLE LOCATIONS AND
ESTIMATED EXTENT OF COMMINGLED
WASTE DEPOSIT A

TAS-011-0002-90094

R90094W1

2 of 3





KEY MAP

LEGEND

- BOUNDARY OF RADIOLOGICAL CONTAMINATION
- (A) DESIGNATION OF RESIDUAL RADIOACTIVE DEPOSIT
- (B) DEPTH OF RADIOLOGICAL CONTAMINATION (INCHES)
- RADIOLOGICALLY CONTAMINATED AREA
- SAMPLE LOCATION NUMBER
- ● SAMPLE LOCATIONS WITH PCB CONCENTRATIONS OF < 20 ppm and TCLP LEAD CONCENTRATIONS OF < 5.0 mg/L
- ▲ SAMPLE LOCATIONS WITH PCB CONCENTRATIONS OF ≥ 20 ppm and < 500 ppm
- COMMINGLED WASTE – PCBs ≥ 20 ppm

NORTH

SCALE IN FEET

5 2.5 0 5 10

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FIGURE 3
COMMINGLED WASTE INVESTIGATION
SAMPLE LOCATIONS AND
ESTIMATED EXTENT OF COMMINGLED
WASTE DEPOSITS B THROUGH F

TAS-011-0002-90094

R90094W1

3 3

Appendix C

Public Service Company Of Colorado Property Supplemental Standards Application

Radiologic and Engineering Assessment

for

DOE ID No.: GJ–00673–CS

Address: 531 South Avenue
Grand Junction, Colorado

November 1997

Prepared for
U.S. Department of Energy
Albuquerque Operations Office
Grand Junction Office

Prepared by
MACTEC Environmental Restoration Services, LLC
Grand Junction, Colorado

Work Performed Under DOE Contract Number DE–AC13–96GJ87335
Task Order Number 96–05.04.01

Approved by _____
J. E. Virgona
DOE Project Manager

Date 11/7/97

SUPPLEMENT
STANDARDS

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1.0 Introduction

The U.S. Environmental Protection Agency (EPA) "Standards for Remedial Actions at Inactive Uranium Processing Sites," Title 40, *U.S. Code of Federal Regulations*, Part 192 (40 CFR 192) specifies generic standards for radium-226 (Ra-226) in soil. Under narrowly defined circumstances when removal of residual radioactive material (RRM) contaminated with Ra-226 is unreasonable or impractical, provisions within 40 CFR 192 allow for the application of supplemental standards. The U.S. Department of Energy (DOE) requested that the Technical Assistance and Remediation Contractor (TAR)* evaluate remedial action alternatives and apply supplemental standards to a portion of DOE ID No. GJ–00673–CS. This property was purchased by the City of Grand Junction from Public Service Company of Colorado (PSCo) in 1989. The property is located at 531 South Avenue in Grand Junction, Colorado.

This supplemental standards application addresses two deposits of RRM on this property. An exterior deposit of RRM was left in place because it is commingled with polychlorinated biphenyls (PCBs). An interior deposit of RRM was left in place because it is commingled with volatile organic compounds (VOCs) and PCBs. The PCBs are regulated under the Toxic Substances Control Act (TSCA). The VOCs are regulated under the Resource Conservation and Recovery Act (RCRA) as characteristic or listed hazardous wastes.

This Radiologic and Engineering Assessment (REA) serves as an Executive Summary for the remainder of this supplemental standards application and contains a description of remedial action alternatives, an evaluation of the health risks associated with each alternative, an estimate of costs and approximate volumes of contaminated materials for each alternative, and a recommendation that no remedial action be conducted on these two deposits. Appendix A contains the radiological assessment data for the deposits of RRM. Appendix B contains the reports of the hazardous waste investigation results. Appendix C contains a detailed analysis of land use, health risks, alternative actions, construction costs, and owner input.

2.0 Evaluation

This property is the site of the former PSCo steam plant and maintenance facility, which was housed in a two story brick building with a basement. This structure is over 50 years old and meets the eligibility requirements of the National Register of Historic Places. However, the remedial action considered for this property is of the type identified in the Programmatic Memorandum of Agreement No. DE-GM04-84AL28460. Therefore, no historic data is required to accompany this REA.

This supplemental standards application addresses two deposits of RRM on this property. Appendix A describes these areas and summarizes the radiological contamination data.

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*MACTEC Environmental Restoration Services, LLC (MACTEC–ERS), was awarded the U.S. Department of Energy Grand Junction Office (DOE–GJO) Technical Assistance and Remediation (TAR) contract and commenced work on September 5, 1996. The MACTEC–ERS team consists of International Technology Corporation, Science Applications International Corporation, Roy F. Weston, Inc., and Rust Federal Services, Inc. Rust Geotech was the DOE–GJO contractor from October 1, 1986, through September 4, 1996, and implemented some of the tasks discussed in this report.

Deposit A, located outside the northwest corner of the building and consisting of three separate contaminated soil areas, contains an estimated 9 cubic yards (yd^3) of RRM, 6 inches deep, distributed over an area of 45 square meters (m^2) or 484 square feet (ft^2). The RRM is commingled with PCBs in concentrations regulated under TSCA. The maximum measured Ra-226 concentration in the assessed area is 27.8 picocuries per gram (pCi/g).

Deposit H, located in the basement of the building, contains an estimated 7 yd^3 of RRM, 8 to 11 inches deep, distributed over an area of 20 m^2 (217 ft^2). The RRM is commingled with RCRA toxicity-characteristic and listed hazardous wastes and TSCA regulated waste. The maximum measured Ra-226 concentration in the assessed area is 51.5 pCi/g.

The following alternatives are evaluated in Appendix C:

Alternative 1—No Remediation/Supplemental Standards
Health Risk: No health risk from gamma exposure, possible future risk from exposure to nonradiological contaminants
Estimated Subcontracted Construction Cost: $ 0
Approximate Volume of Contaminated Materials Removed: 0 yd^3
Approximate Volume of Contaminated Materials Remaining: 16 yd^3

Alternative 2—Complete Remediation
Health Risk: Reduced to EPA standards
Estimated Subcontract Construction Cost: $143,500
Approximate Volume of Contaminated Materials Removed: 16 yd^3
Approximate Volume of Contaminated Materials Remaining: 0 yd^3

Alternative 3—Partial Remediation/Supplemental Standards
Not applicable because all RRM is commingled with PCBs.

3.0 Conclusions and Recommendations

The results of the analysis of health risks and engineering data in Appendix C indicate that implementation of Alternative 1—No Remediation/Supplemental Standards will not result in unacceptable health risks. Also, disposal and treatment options for these commingled wastes either do not exist on a commercial scale or are inordinately and unpredictably expensive. For these reasons, the TAR recommends that no remediation be conducted on the remaining RRM. The property owner, the City of Grand Junction, opposes this alternative. Although implementation of Alternative 2—Complete Remediation would result in meeting applicable standards, there are no significant health risks at present from the RRM left in place. This property is an industrial site and future land use will not likely result in a change of occupancy patterns. Also the $143,500 subcontract cost would be inordinately expensive relative to the minor risk of leaving the radiologically contaminated material in place.

APPENDIX A

SUPPLEMENTAL STANDARDS RADIOLOGICAL ASSESSMENT for DOE No. GJ–00673–CC 531 South Avenue Grand Junction, Colorado

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Executive Summary

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Table A–2 Radium Concentrations at Exterior Locations
Table A–3 Radium Concentrations at Interior Locations

Figures

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Figure A–2. Radiological Map—Gamma Exposure Rates and Extent of Contamination
Figure A–3. Radiological Map—Radiological Sample Locations

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Executive Summary

A.1 Introduction

This appendix contains the radiological information describing the deposits of RRM for which supplemental standards are proposed. The data were gathered during the assessment and engineering design development of DOE ID No. GJ–00673–CS, located at 531 South Avenue, Grand Junction, Colorado (Figure A–1).

Following the procedures described in the *Field Services Procedures Manual*, data were collected at the property to assess the location and extent of Ra-226 contamination in concentrations in excess of the standards specified in 40 CFR 192.

A.2 Gamma Exposure Rate Surveys

A.2.1 Exterior

The area background exposure rate is 16 microroentgens per hour (μR/h). The gamma exposure rates in the supplemental standards area range from 18 to 36 μR/h, as measured in July 1994. Exterior gamma exposure rates in the supplemental standards area are shown on Figure A–2. A summary of the gamma exposure rates is presented in Table A–1.

A.2.2 Interior

The area background exposure rate is 16 microroentgens per hour (μR/h). The gamma exposure rates in the supplemental standards area range from 33 to 71 μR/h, as measured in October 1988. Interior gamma exposure rates in the supplemental standards area are shown on Figure A–2. A summary of the gamma exposure rates is presented in Table A–1.

Table A–1. Summary of Radiological Data for the Supplemental Standards Areas

Assessed Area	Maximum Gamma Exposure Rate (μR/h)		Radium-226 Concentration (pCi/g)		Depth of Contamination (Inches)	
	Bkg	Ground Surface	Bkg	Max	Min	Max
A	16	35	2	27.8	0	6
H	16	71	2	51.5	8	11

Key: bkg = background; pCi/g = picocuries per gram; RRM = residual radioactive material; μR/h = microroentgens per hour

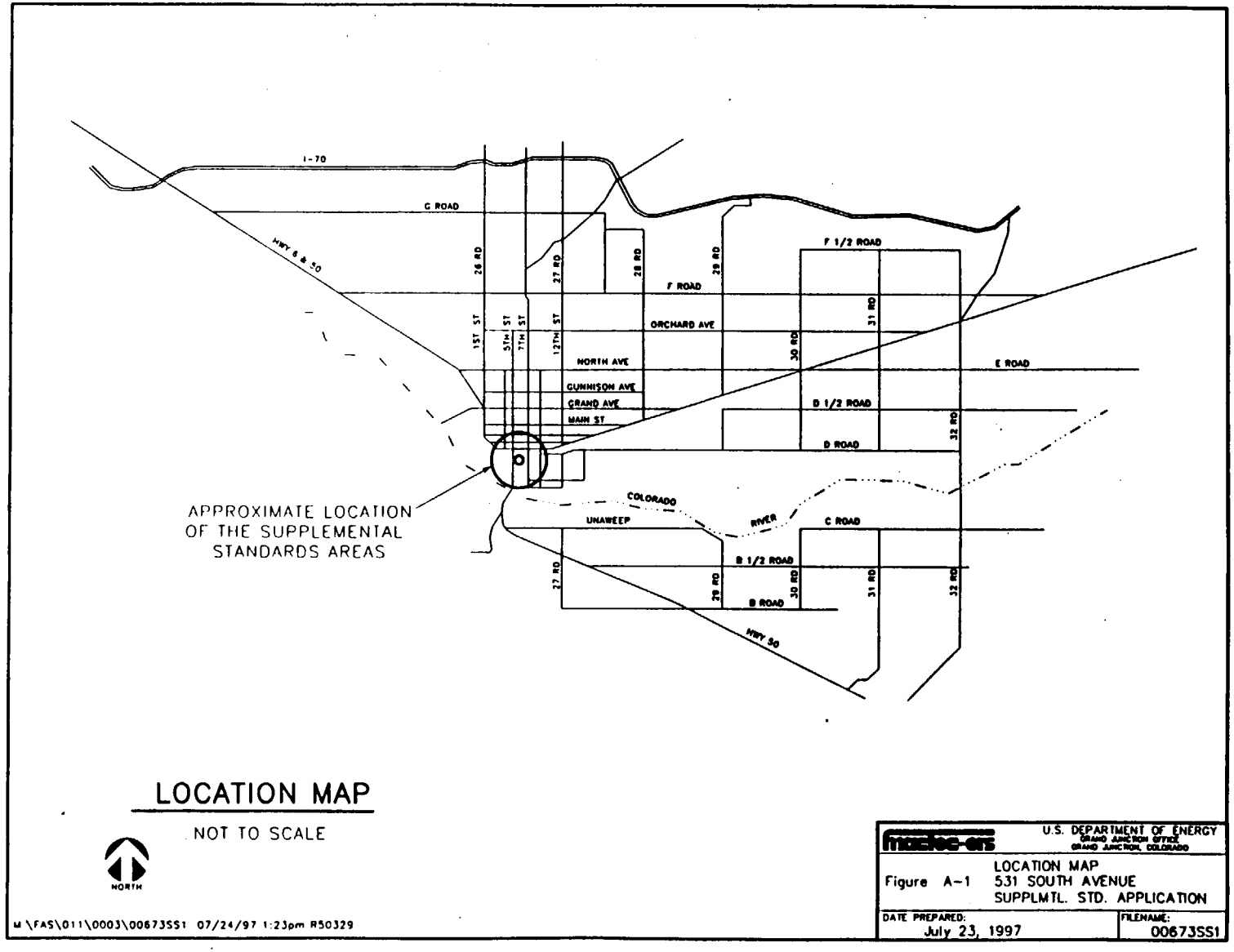


Figure A–1. Location Map

A.3 Radon/Radon Decay-Product Concentration Measurements

Valid radon decay- product concentration (RDC) measurements could not be obtained because of excessive ventilation caused by missing windows.

A.4 Radiological Extent of Contamination

The following results represent samples collected and analyzed for assessment in October 1988. The previous owner conducted removal activities after that time.

A.4.1 Exterior

The extent of contamination is presented on Figure A–2. The maximum radium concentration in the contaminated area is 27.8 pCi/g. The depth of contamination is 6 inches. Survey results are presented in Table A–2. Sample locations are shown on Figure A–3.

A.4.2 Interior

The extent of contamination is presented on Figure 2. The maximum radium concentration remaining in the contaminated area is 51.5 pCi/g. After the previous owner removed 10 inches of material from the contaminated area, the depth of remaining contamination ranges from 8 to 11 inches. Survey results are presented in Table A–3. Sample locations are shown on Figure A–3.

A.5 Remedial Action Recommendations

A.5.1 Exterior

The exterior deposit shown on Figure A–2 should not be removed and should be considered for application of supplemental standards (see Appendix C for further evaluation of the alternatives and recommendations).

A.5.2 Interior

The interior deposit shown on Figure A–2 should not be removed and should be considered for application of supplemental standards (see Appendix C for further evaluation of the alternatives and recommendations).

A.6 Commingled Waste Investigation

The results of the commingled waste investigation are presented in Appendix B.

Table A-2
Radium Concentrations at Exterior Locations
531 South Avenue

Loc #	Grid Location	Depth (in.)	Meas. Type	Ra-226 (pCi/g) Non-Deconv.	Ra-226 (pCi/g) Deconv.	Working Level	dpm/ 100 cm²	Comments
2	150450	00	DS	1.9				Gravel
3	165450	00	DS	22.9				Gravel
		03	TC	7.4	7.4			DC = 6 inches
		06	TC	6.5	6.5			
		09	TC	5.6	4.7			
		12	TC	5.2	4.8			
		15	TC	5.0	4.8			
		18	TC	4.9	5.1			
		21	TC	4.7	4.9			
		24	TC	4.4	3.9			
		27	TC	4.4	4.4			
7	170461	00	DS	<1.0				Asphalt
10	185446	00	DS	12.9				Gravel
		03	TC	5.2	5.2			Gravel
		06	TC	5.1	5.8			DC = 6 inches
		09	TC	4.6	4.2			
		12	TC	4.3	3.9			
		15	TC	4.2	4.4			
		18	TC	4.0	4.0			
		21	TC	3.8	3.4			
		24	TC	3.8	3.8			
		27	TC	3.8	4.0			
		30	TC	3.7	3.7			
13	20441	00-06	OC	2.5				MCX-481
		00	DS	2.7				Gravel
		06	DS	2.1				

Loc #	Grid Location	Depth (in.)	Meas. Type	Ra-226 (pCi/g) Non-Deconv.	Ra-226 (pCi/g) Deconv.	Working Level	dpm/ 100 cm²	Comments
15	210455	00	DS	8.1				Gravel
		03	TC	4.0	4.0			
		06	TC	4.2	4.4			DC = 6 inches
		09	TC	4.3	4.7			
		12	TC	4.2	4.4			
		15	TC	4.0	3.5			
		18	TC	4.1	4.3			
		21	TC	4.1	4.1			
		24	TC	4.1	4.1			
		27	TC	4.1	4.1			
16	215461	00	DS	<1.0				Asphalt
19	230446	00	DS	27.8				Gravel-6" deep
		06	DS	1.5				
20	230456	00-06	OC	7.7				MCZ-482
		00	DS	1.0				Concrete 5" thick
		00	DS	3.4				Gravel
		06	DS	2.0				Hz beneath concrete
		06	DS	2.5				

Measurement Types:
- AS = Alpha Sample
- DH = Downhole Survey
- DS = Delta Scintillometer
- GB = GAD-6 Borehole
- GS = GAD-6 Surface
- OC = Soil Sample by Opp. Crys. Sys.
- RP = Radon Profile
- SS = Soil Sample by Laboratory Analysis
- TC = Total Count Borehole

Notes:
- DC = Depth of Contamination
- [n] = Reading Taken n-Inches Above Floor or Ground
- Date of Survey = 10-07-88
- Team Leader = DF

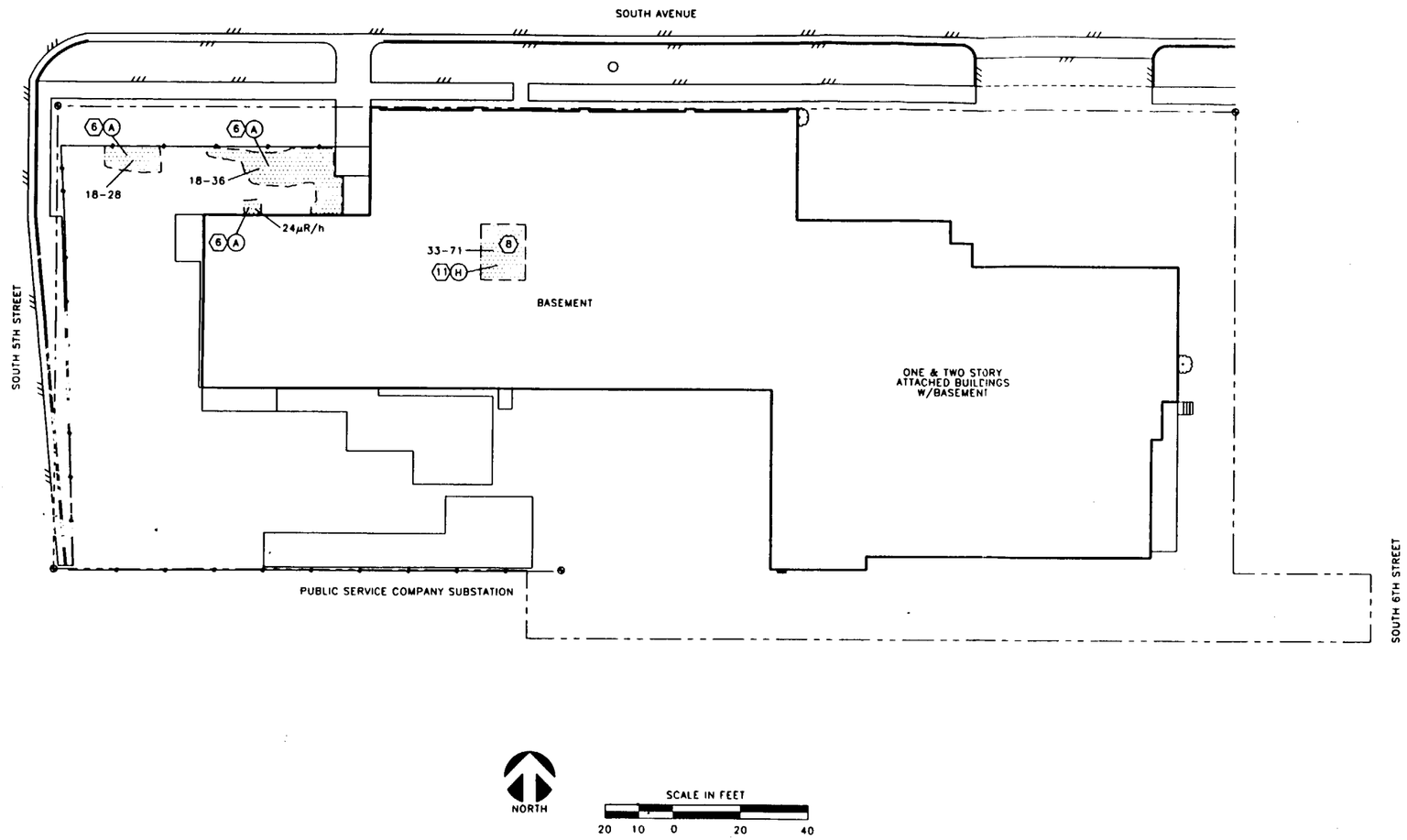
Table A-3
Radium Concentrations at Interior Locations

Ra-226 (pCi/g)

Loc #	Grid Location	Depth (in.)	Meas. Type	Non-Deconv.	Deconv.	Working Level	dpm/ 100 cm^2	Comments
42	220345	00	DS	3.1				Concrete
43	225331	00	DS	4.3				
44	225345	00-06	OC	42.4				MNP-547
		00	DS	51.5				
		03	TC	20.3	20.3			Dirt
		06	DS	36.3				Concrete bottom
		06	TC	24.3	29.0			
		09	TC	24.9	25.3			DC = 21 inches
		12	TC	25.6	24.9			
		15	TC	26.7	34.3			
		18	TC	23.5	22.6			
		21	TC	20.8	20.8			
45	238345	00	DS	12.8				Dirt
		03	TC	8.3	8.3			Concrete bottom
		06	TC	10.5	9.4			DC = 18 inches
		09	TC	13.3	13.1			
		12	TC	16.2	21.7			
		15	TC	16.0	20.4			
		18	TC	13.3	13.3			

Measurement Types:
AS = Alpha Sample
DH = Downhole Survey
DS = Delta Scintillometer
GB = GAD-6 Borehole
GS = GAD-6 Surface
OC = Soil Sample by Opp. Crys. Sys.
RP = Radon Profile
SS = Soil Sample by Laboratory Analysis
TC = Total Count Borehole

Notes:
DC = Depth of Contamination
[n] = Reading Taken n-Inches Above Floor or Ground
Date of Survey = 10-07-88
Team Leader = DF



LEGEND

ALL DEPTHS/HEIGHTS IN INCHES
ALL EXPOSURE RATES IN μR/h

(A) ASSESSED AREA IDENTIFIER

(6) AVERAGE DEPTH OF ASSESSED CONTAMINATION

[ ] AREA OF ASSESSED CONTAMINATION

12-15 GAMMA EXPOSURE-RATE RANGE

NOTE: THE DEPTHS OF CONTAMINATION SHOWN FOR ASSESSED AREA H INDICATE THE DEPTH OF REMAINING RRM AFTER 10 INCHES OF RRM WAS REMOVED.

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PROJECT LOCATION: 53 SOUTH AVENUE GRAND JUNCTION, CO	COMPLETION REPORTS		UMTRA VICINITY PROPERTIES
	CAD TECH	8/97	FIGURE A-2 GAMMA EXPOSURE RATES AND EXTENT OF CONTAMINATION
	TECHNICAL EDITOR	8/97	
			PROJECT NO. GJ-00673-CS
			DRAWING NO. FAS-011-0003-00673SS2
			SHT 1 OF 1

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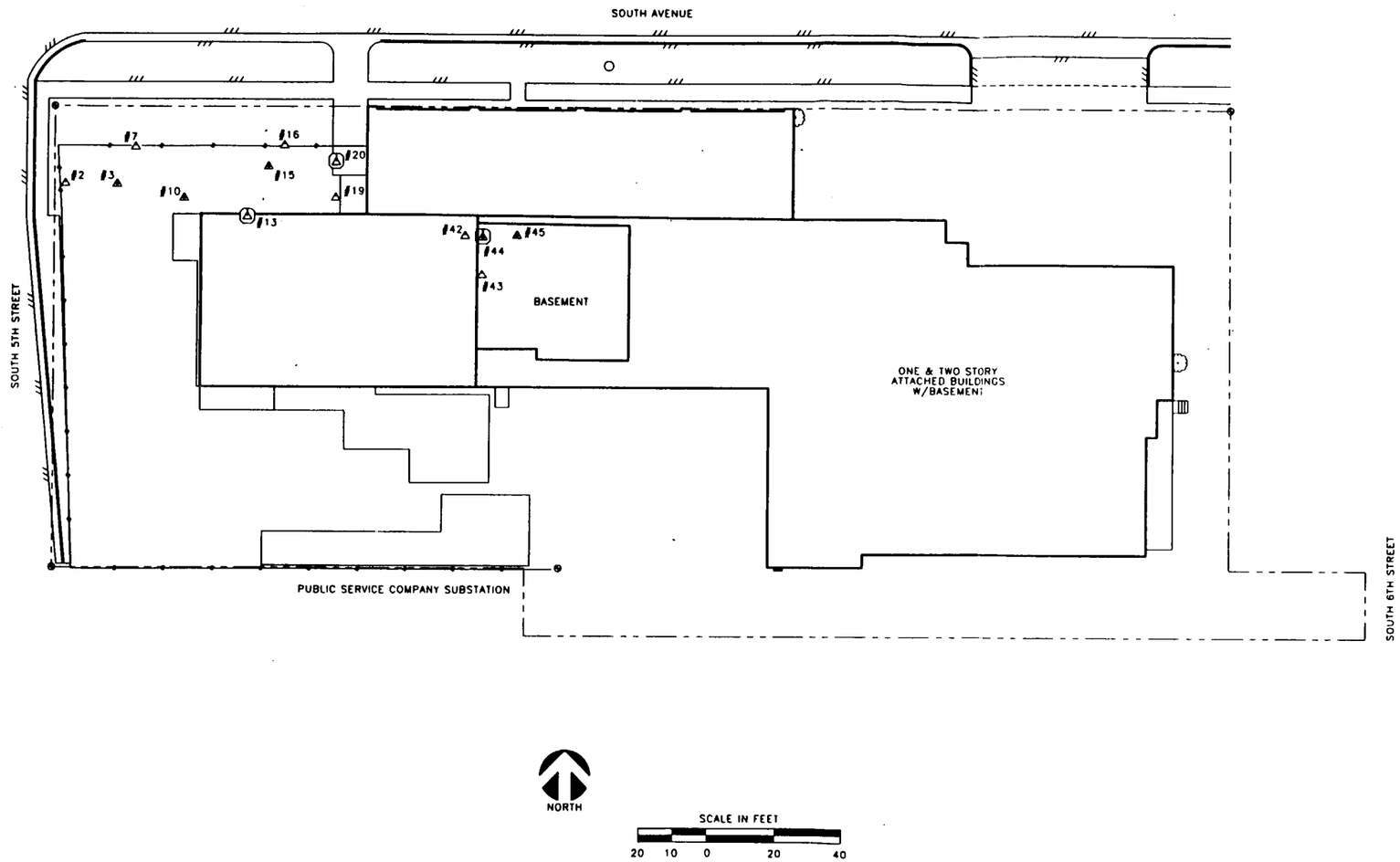

LEGEND

- #2 LOCATION NUMBER
- • BOREHOLE LOCATION
- △ DELTA SCANNER
- SOIL SAMPLE

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PROJECT LOCATION 531 SOUTH AVENUE GRAND JUNCTION, CO	COMPLETION REPORTS CAD MGR KWS 8/97 PROJECT MGR KWS 8/97	UMTRA VICINITY PROPERTIES FIGURE A-3 RADIOLOGICAL SAMPLE LOCATIONS
		PROJECT NO. GJ-00673-CS DRAWING NO. FAS-011-0003-00673SS3 SHT 1 OF 1

APPENDIX B

COMMINGLED WASTE INVESTIGATION REPORT

FOR

DOE ID NO. GJ-00673-CC
(PUBLIC SERVICE BUILDING)

NOVEMBER 1994

CONTENTS

Investigation Summary

Table 1. Analytical Results Exceeding Detection Limits
Table 2. Summary of Analytes Investigated

Figure 1. Commingled Waste Soil Sample Locations (July 1989)
Figure 2. Commingled Waste Soil Sample Locations (May 1994)

The information provided herein was collected in support of the Uranium Mill Tailings Remedial Action (UMTRA) Program to facilitate engineering designs, health and safety plans, constructibility determinations, and identification of constituents regulated under the Resource Conservation and Recovery Act and/or the Toxic Substances Control Act. The Department of Energy disclaims any use of the information except for the purposes for which it was collected and assumes no liability for the use of the information for any purpose other than for the UMTRA Program.

INVESTIGATION SUMMARY

1.0 INTRODUCTION

1.1 Site Location and Description

This property consists of the Public Service Building, Department of Energy Identification Number (DOE ID. No.) GJ-00673-CC, located at 531 South 5th Street, Grand Junction, Colorado. The building is situated in the middle of a 3.2 acre lot, which is bounded by South Avenue on the north, 5th Street on the west, 6th Street on the east, and commercial property (Lewco Iron & Metal Inc.) on the south. Presently abandoned, the Public Service Building was once a steam heat electrical generating plant. The area of concern at this vicinity property is radiologically defined Area H, which is in the basement.

1.2 Site History

Historically, half of the Public Service Building was used as a market and cold storage business (Colescotts), while the other half was occupied at various times by Public Service Company of Colorado (PSCo.) and a castings foundry. PSCo. owned the property until it was purchased by the city of Grand Junction in 1989. A radiological assessment conducted on the property by the UMTRA Program in 1989 confirmed the presence of uranium mill tailings, also known as residual radioactive material (RRM). Grand Junction UMTRA vicinity properties such as the Public Service Building were contaminated with RRM from an inactive uranium processing (milling) site. Stained soil/RRM was identified in the basement Area H during the property radiological assessment.

This Appendix B document describes a 1989 characterization of Area H (see Figure 1), and a 1994 recharacterization of Area H after soil/RRM was remediated by United States Pollution Control, Inc. (USPCI), a subcontractor for PSCo. (see Section 3.0).

1.3 Regulatory Definitions

For the purpose of this Appendix B document, commingled waste is defined as a mixture of either Resource Conservation and Recovery Act (RCRA) hazardous waste or Toxic Substances Control Act (TSCA) substances and RRM. The Uranium Mill Tailings Radiation Control Act (UMTRCA), as amended [42 United States Code (U.S.C.) Sections 7901-7925], defines RRM at Title 1 Section 101 "Definitions" (7)(A) as "Waste... in the form of tailings resulting from the processing of ores for the extraction of uranium and other valuable constituents of the ores..."[see also Federal Register (FR) 45926 Vol 48, No. 196, October 7, 1983, for a definition of active and inactive milling sites]. Uranium mill tailings are also defined in the Atomic Energy Act (AEA) Section 11 "Definitions" (e)(2) as "byproduct material" [AEA 11(e)(2) byproduct material]. In this Commingled Waste Investigation Project (CWIP) report, the term RRM as defined by UMTRCA is used in reference to uranium mill tailings. Uranium mill tailings are excluded from the RCRA definition of a solid waste at 40 CFR Part 261.4 (a), "Exclusions."

Pursuant to the Federal and Colorado Hazardous Waste Regulations, a waste is classified as hazardous if it is a solid waste (or other material such as RRM) that is mixed with a hazardous waste listed in 40 Code of Federal Regulations (CFR) Part 261 Subpart D and/or 6 Colorado Code of Regulations (CCR) 1007-3 Part 261 Subpart D. A waste material may also be characterized as hazardous under 40 CFR Part 261 Subpart C and 6 CCR 1007-3 Part 261 Subpart C if it exhibits at least one of the following characteristics: toxicity, ignitability, reactivity, or corrosivity.

Additionally, a material (either a RCRA hazardous waste and/or solid waste) found to contain substances regulated under the TSCA as defined by the Environmental Protection Agency (EPA) at 40 CFR Part 761, is subject to the RCRA land disposal prohibitions. An example is Polychlorinated biphenyls (PCBs). For the purpose of this investigation, PCB-contaminated material, if found, would be classified as a commingled waste.

The following sections discuss the 1989 and 1994 characterizations of basement Area H, the 1991 remediation of Area H by USPCI, and the hazardous waste determinations that were made on the basis of analytical results for soil/RRM samples collected during the 1994 characterization of Area H.

2.0 1989 SITE CHARACTERIZATION OF BASEMENT AREA H

Basement Area H was characterized in July 1989 because of elevated photoionization detector (PID) readings that exceeded 10 parts per million (ppm). The radiological assessment had confirmed that Area H was radiologically contaminated with RRM, and that widespread staining and/or discolored soil was present with the RRM. The sampling and analysis strategy and rationale for the investigation are detailed in the Work *Plan of Characterization of Hazardous Substances and Radiological Contaminants for Public Service Building, GJ-00673-CC* (UNC, UMTRA CWIP-12, June 1989).

Two soil/RRM samples (MGA 170 and MGA 171) were collected in Area H on July 21, 1989, for laboratory analysis. Samples were obtained with a hand-operated soil auger to a depth of 21". PID measurements at these sample locations were 20 ppm and 15 ppm, respectively.

Samples MGA 170 and MGA 171 were analyzed by International Technology Corporation (IT) Laboratory in Oak Ridge, Tennessee (Job No. UNCG 35529). The laboratory report identified PCBs at 9.8 ppm and volatile compounds in concentrations exceeding 20 times their respective Toxicity Characterization Leaching Procedure (TCLP) regulatory limits (see Table 1).

Because a 20 to 1 dilution of solids is inherent in the TCLP procedure, the constituent values can be divided by 20 to extrapolate comparable TCLP values. Since 1/20 of the constituent value for many of the identified analytes exceeded its respective TCLP regulatory limits, the soil in Area H could have been classified as characteristically hazardous waste. There was also the potential that TSCA regulated substances and listed hazardous wastes existed, however, process knowledge at the time (July, 1989) did not support this conclusion.

No waste determinations of Area H material were made by Geotech on the basis of the analytical data. Soil sample locations MGA 170 and MGA 171 are indicated on Figure 1 as #6 and #5, respectively. Analytical results exceeding detection limits are presented in Table 1.

3.0 1992 REMEDIATION ACTIVITY OF BASEMENT AREA H BY USPCI

The 1989 site characterization information compiled by Geotech was transmitted to PSCo. and the City of Grand Junction through the Department of Energy. After reviewing the information, PSCo. contracted with USPCI to conduct soil/RRM remediation on June 7, 1992. USPCI removed and drummed the top 10" of soil in Area H, and ultimately transported the material off the property on July 31, 1992. A report of the USPCI remedial action was provided to Geotech by PSCo. and can be found in the property folio, GJ-00673-CC.

A post-remedial on-site inspection of Area H performed by Geotech determined that approximately 10" of soil/RRM had been removed by PSCo. and that Area H was saturated with groundwater. The report provided by PSCo. identified no post-remediation soil sampling to confirm complete remediation of PCBs and organic constituents. Therefore, a recharacterization of Area H was conducted in May 1994 by Geotech.

4.0 1994 RECHARACTERIZATION OF BASEMENT AREA H

4.1 Rationale for Recharacterization

Because of the 1989 site characterization analytical results, an historical search was performed in May 1994 to determine if there was a potential for TSCA regulated substances, at 40 CFR Part 761 and hazardous wastes, listed at 6 CCR 1007-3 Part 261 Subpart D, to be present within Area H.

Historically, solvents had not been thought to have been used at the Public Service Building; however, further investigation showed that solvents had been used at the site to clean electrical transformers (as defined at 40 CFR Part 761.79, "Decontamination"). This information supported the potential for TSCA and listed hazardous wastes.

A radiological scan of Area H conducted in March 1993 by Geotech determined that RRM still remained. To recharacterize the soil/RRM, a sampling and analysis plan was written. Two soil samples (NBB 927 and NBB 928) were collected for this recharacterization and analyzed by the Geotech Analytical Laboratory; sampling locations were selected to replicate the sampling locations for the 1989 site characterization (refer to Figure 2).

4.2 Analytical Results

Soil samples NBB 927 and NBB 928 (locations shown on Figure 2) were analyzed for Target Compound List (TCL) volatiles, TCL semi-volatiles, TCLP volatiles, TCLP semi-volatiles, TCLP metals, and PCBs. The TCL is a list of analytes used in the EPA contract laboratory program. Geotech often uses the TCL as a starting point for volatile organic compound analysis. Analytes in samples NBB 927 and NBB 928 that exceeded detection limits are listed in Table 1. All analytical parameters and their respective laboratory detection limits are listed in Table 2.

The Geotech Analytical Laboratory results for inorganics (obtained through inductively coupled plasma-atomic emission spectrometry [ICP-AES]) indicated several reported values less than the Reported Detection Limit (RDL) but greater than or equal to the actual Detection Limit (DL). Analytical data were reviewed for compliance with analytical laboratory quality control and data acceptance procedures outlined in Geotech's *Analytical Chemistry Laboratory Administrative Plan and Quality Control Procedures*. Through a data validation process, several minor QC deviations in the laboratory analysis were identified, but the analytical results reported are considered valid because the laboratory procedural (reporting) deviations noted do not affect the chemical analysis detection capabilities for each specific chemical analysis.

4.3 Analytical Quality Control Issues

Geotech's Laboratory report includes a summary page that describes how each analysis was performed, describes laboratory data qualifiers, and provides clarification of Geotech's laboratory quality control procedures and procedural problems (also provided as a quality control requirement).

The quality control requirements are defined in EPA's *Contract Laboratory Program (CLP) 10/86 Statement of Work* (SOW) and EPA's *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (SW-846) Manual (Ref. 7). The CLP is an institutional program by which requirements for quality assurance and quality control (QA/QC) are established for EPA qualified laboratories.

5.0 HAZARDOUS WASTE DETERMINATIONS BASED ON 1994 ANALYTICAL DATA FROM BASEMENT AREA H

5.1 Evaluation of Characteristic Hazardous Wastes

If a waste contains any of the contaminants on the TCLP list in concentrations that meet or exceed the regulatory levels identified in 6 CCR 1007-3 Part 261.24, the waste is classified as exhibiting the characteristic of toxicity. The TCLP analysis for organics indicated that sample NBB 927 contained 1, 1-dichloroethene, 1, 2-dichloroethane, tetrachloroethene, 2-butanone, and trichloroethene (TCE) at concentrations above detection limits (see Table 1). Sample NBB 927 also contained TCE concentrations exceeding the established TCLP regulatory limit of 0.5 mg/L [with a detected concentration of 1.1 mg/L (see Table 1)]. Therefore, the soil area represented by NBB 927 qualifies as a characteristically hazardous waste due to the presence of trichloroethene (Waste Code D040).

The characteristic of ignitability was not suspected because Area H is saturated with groundwater. There is no evidence of free liquids (other than aqueous solutions) and no evidence that soil/RRM-contaminated materials on this vicinity property are excessively corrosive or reactive. Therefore, the characteristics of corrosivity and reactivity were not investigated.

5.2 Evaluation of Listed Hazardous Wastes

The flow chart in 40 CFR Part 260 Appendix 1 was used to evaluate Area H in terms of listed wastes. Listed hazardous wastes include material-specific and process-specific wastes, which can be further separated into wastes from specific sources (K codes), commercial chemical products (U and P codes), and wastes from nonspecific sources (F codes).

The most appropriate listed waste classification for the Public Service Building basement Area H was determined to be hazardous wastes from nonspecific sources, a category of wastes including spent solvents. Solvent wastes are designated as wastes F001 through F005 (see 40 CFR Part 261.31 *et seq*). A spent halogenated solvent is considered spent when it has been used and can no longer serve its intended purpose without processing.

The May 1994 analysis for organics indicated that sample NBB 927 contained 1, 1, 1-trichloroethane (TCA), TCE, and tetrachloroethene concentrations of 950 mg/kg, 290 mg/kg, and 290 mg/kg, respectively. The July 1989 analysis for organics indicated that soil sample MGA 170 contained 4.5% by volume TCA, 0.1% by volume TCE, and 0.1% by volume tetrachloroethene (see Table 1). These compounds are typically used for cleaning (decontaminating) metal components. It is assumed that the 1989 soil sample data would support the supposition that spent solvents have been misused or mismanaged in Area H. It also has been assumed that the spent solvents contained at least 10% (by volume) solvent before use. The listed waste classification is then a more conservative waste determination for spent solvents than the characteristic waste classification.

The 1994 analytical results for organics also indicate that samples NBB 927 and NBB 928 contained several other identified compounds (e.g. methylene chloride and acetone) at levels above detection limits (see Table 1). These identified compounds range in detection from 1.5 mg/kg to 18 mg/kg and could be classified as F003 and F005 listed wastes; however, it is not known if these compounds (identified at much lower concentrations when compared to TCA, TCE, and tetrachloroethene) contained at least 10% (by volume) solvent before use.

It is evident that a spent solvent waste stream exists in Area H that contains typical halogenated solvents (TCA, TCE, and tetrachloroethene) and possibly other solvent constituents (identified constituents exceeding detection limits in Table 1).

Because the analytical data showed high concentrations of organic compounds in the soil/RRM and historic research determined that solvents were used to clean electrical transformers in Area H, the soil area represented by NBB 927 and MGA 170 is considered a listed hazardous waste. Solvent constituents TCA, TCE, and tetrachloroethene are considered to be classified as F002 listed hazardous waste.

5.3 Evaluation of Toxic Substances

Field observations made in July 1989 suggested the presence of substances regulated under the TSCA, namely PCBs. PCB analysis was performed on four samples collected in Area H prior to and after USPCI's remediation activities. The four soil samples (MGA 170, MGA 171, NBB 927, and NBB 928) contained PCB concentrations below the regulatory limit of 50 ppm (0.0 ppm, 9.8 ppm, 28 ppm, and 0.3 ppm, respectively) . However, on the basis of 40 CFR 761.79 (*et seq*), process knowledge identified solvent use to decontaminate PCB transformers. Therefore, the spent solvent is considered to be PCB contaminated at $\geq$ 50 ppm. Area H is considered to be a PCB contaminated area. The PCB analytical results are presented in Table 1.

6.0 EXTENT OF COMMINGLED WASTE CONTAMINATION

On the basis of a review of the solid/hazardous waste definition flow chart (40 CFR Part 260 Appendix I, Figures 1 and 2), site investigations, process knowledge, and results of laboratory analyses, Area H contains characteristic, listed hazardous wastes, and TSCA regulated substances, and is considered a commingled waste area. The extent of the commingled waste includes all areas delineated on Figure 2 as RRM contaminated (Area H) in the basement of the Public Service Building.

7.0 CONCLUSIONS AND RECOMMENDATIONS

On the basis of results of the 1989 and 1994 CWIP investigations, commingled waste restrictions are required for remedial action activities on this property. It is recommended to exclude this area from the remedial design of the property until an EPA- and Colorado State-approved method for treatment and/or disposal of the regulated constituents is identified.

The material presently identified as commingled waste cannot be managed or approval given for transport until a program-specific consent agreement between the Department of Energy and the Colorado Department of Public Health and Environment is signed and a site specific work plan is written to implement the recommendations in this document.

Prepared By: Mark Gilfillan _____ **Date:** 11/15/94
Mark A. Gilfillan, Technical Specialist
Commingled Waste Investigation Project

Approved By: Gary Neff _____ **Date:** 11/15/94
Gary G. Neff, Technical Lead
Commingled Waste Investigation Project

Table 1
Analytical Results Exceeding Detection Limits
531 South 5th Street, Grand Junction, Colorado

Sample Loc. No.	Figure No.	Sample Ticket No.	Depth Interval (inches)	Analyte	Soil Result[1] (mg/kg)	Extrap-olated TCLP Conc. (mg/L)	Reg. Limit
5	1	MGA 171 (July 1989)	00-21	Acetone	4.3	N/A	N/A
				1,1-Dichloroethene	2.0	0.1	0.7 mg/L
				1,1-Dichloroethane	3.6	N/A	N/A
				1,2-Dichloroethane	0.3	0.01	0.5 mg/L
				1,1,1-Trichloroethane	5300	N/A	N/A
				Trichloroethene	480	24	0.5 mg/L
				1,1,2-Trichloroethane	0.3	N/A	N/A
				Tetrachloroethene	330	16.5	0.7 mg/L
				Toluene	0.2	N/A	N/A
				PCB (Aroclor-1260)	9.8	N/A	50 ppm
				Chlorobenzene	260	13	100mg/L
6	1	MGA 170 (July 1989)	00-21	Methylene Chloride	5.4	N/A	N/A
				1,1-Dichloroethene	170	8.5	0.7 mg/L
				1,1-Dichloroethane	220	N/A	N/A
				1,2-Dichloroethene	0.09	N/A	N/A
				Chloroform	0.1	0.005	6.0 mg/L
				1,2-Dichloroethane	5.2	0.26	0.5 mg/L

Table 1
Analytical Results Exceeding Detection Limits
531 South 5th Street, Grand Junction, Colorado

Sample Loc. No.	Figure No.	Sample Ticket No.	Depth Interval (inches)	Analyte	Soil Result[1] (mg/kg)	Extrap-olated TCLP Conc. (mg/L)	Reg. Limit
6	1	MGA 170 (July 1989)	00-21	Acetone	750	N/A	N/A
				1,1,1-Trichloroethane	45000	N/A	N/A
				Bromodichloromethane	0.09	N/A	N/A
				Trichloroethene	.920	46	0.5 mg/L
				1,1,2-Trichloroethane	1.2	N/A	N/A
				4-Methyl-2-Pentanone	0.6	N/A	N/A
				Tetrachloroethene	860	43	0.7 mg/L
				1,1,2,2-Tetrachloroethane	0.3	N/A	N/A
				Toluene	25	N/A	N/A
				Ethylbenzene	0.1	N/A	N/A
				Total Xylenes	0.3	N/A	N/A

Table 1
Analytical Results Exceeding Detection Limits
531 South 5th Street, Grand Junction, Colorado
DOE ID No. GJ-00673-CS

Sample Loc. No.	Figure No.	Sample Ticket No.	Depth Interval (inches)	Analyte	Soil Result[1,2] (mg/kg)	TCLP Conc. (mg/L)	Reg. Limit
1	2	NBB 927 (May 1994)	00-12	Methylene Chloride	1.5	N/A	N/A
				Acetone	18.0	N/A	N/A
				1,1-Dichloroethene	4.0	0.59	0.7 mg/L
				CIS-1,2-Dichloroethene	0.5	N/A	N/A
				1,2-Dichloroethane	0.9	0.097	0.5 mg/L
				2-Butanone	0.2	0.051	200 mg/L
				1,1,1-Trichloroethane	950	N/A	N/A
				Carbon Tetrachloride	3.5	N/A	N/A
				Trichloroethene	290	1.1	0.5 mg/L
				1,1,2-Trichloroethane	0.3	N/A	N/A
				Tetrachloroethene	290	0.47	0.7 mg/L
				Toluene	4.8	N/A	N/A
				PCB (Total)	28	N/A	50 ppm
2	2	NBB 928 (May 1994)	00-12	CIS-1,2,-Dichloroethene	0.021	N/A	N/A
				1,1,1-Tricloroethane	0.016	N/A	N/A
				PCB (Aroclor-1260)	0.37	N/A	50 ppm

[1] Only those results of analytes exceeding detection limits are listed.
[2] Analytes with laboratory qualifiers "B" and "J" are not listed.
N/A Indicates Not Applicable.

Table 2
Summary of Analytes Investigated
531 South 5th Street, Grand Junction, Colorado

DOE ID No. GJ-00673-CC

Chemical Compounds	Laboratory Detection Limit	Applicable to samples[1]
TCLP and EP-Toxicity Metals:		NBB 927, 928
Arsenic	1.00 mg/L	MGA 170, 171
Barium	2.00 mg/L	
Cadmium	0.20 mg/L	
Chromium	1.00 mg/L	
Lead	1.00 mg/L	
Mercury	0.002 mg/L	
Selenium	0.20 mg/L	
Silver	1.00 mg/L	
TCLP Volatile Compounds:		NBB 927, 928
Vinyl Chloride	0.010 mg/L	
1,1-Dichloroethene	0.005 mg/L	
Chloroform	0.005 mg/L	
1,2-Dichloroethane	0.005 mg/L	
2-Butanone	0.010 mg/L	
Carbon Tetrachloride	0.005 mg/L	
Trichloroethene	0.005 mg/L	
Benzene	0.005 mg/L	
Tetrachloroethene	0.005 mg/L	
Chlorobenzene	0.005 mg/L	
Pyridine	0.050 mg/L	
TCLP Semivolatile Compounds:		NBB 927, 928
Total Cresol	0.010 mg/L	
1,4-Dichlorobenzene	0.010 mg/L	
2,4-Dinitrotoluene	0.010 mg/L	
Hexachlorobenzene	0.010 mg/L	
Hexachloroethane	0.010 mg/L	
Hexachlorobutadiene	0.010 mg/L	
Nitrobenzene	0.010 mg/L	
Pentachlorophenol	0.050 mg/L	
2,4,5-Trichlorophenol	0.050 mg/L	
2,4,6-Trichlorophenol	0.010 mg/L	

Table 2
Summary of Analytes Investigated
531 South 5th Street, Grand Junction, Colorado

Chemical Compounds	Laboratory Detection Limit	Applicable to samples[1]
TCL Semivolatile Compounds:	0.330 mg/kg	NBB 927, 928
Phenol	0.330 mg/kg	
bis(2-Chloroethyl)Ether	0.330 mg/kg	
2-Chlorophenol	0.330 mg/kg	
1,3-Dichlorobenzene	0.330 mg/kg	
1,4-Dichlorobenzene	0.330 mg/kg	
Benzyl Alcohol	0.330 mg/kg	
1,2-Dichlorobenzene	0.330 mg/kg	
2-Methylphenol	0.330 mg/kg	
bis(2-Chloroisopropyl)Ether	0.330 mg/kg	
4-Methylphenol	0.330 mg/kg	
N-Nitroso-Di-n-Propylamine	0.330 mg/kg	
Hexachloroethane	0.330 mg/kg	
Nitrobenzene	0.330 mg/kg	
Isophorone	0.330 mg/kg	
2-Nitrophenol	0.330 mg/kg	
2,4-Dimethylphenol	1.600 mg/kg	
Benzoic Acid	0.330 mg/kg	
bis(2-Chloroethoxy)Methane	0.330 mg/kg	
2,4-Dichlorophenol	0.330 mg/kg	
1,2,4-Trichlorobenzene	0.330 mg/kg	
Naphthalene	0.330 mg/kg	
4-Chloroaniline	0.330 mg/kg	
Hexachlorobutadiene	0.330 mg/kg	
4-Chloro-3-Methylphenol	0.330 mg/kg	
2-Methylnaphthalene	0.330 mg/kg	
Hexachlorocyclopentadiene	0.330 mg/kg	
2,4,6-Trichlorophenol	1.600 mg/kg	
2,4,5-Trichlorophenol	0.330 mg/kg	
2-Chloronaphthalene	1.600 mg/kg	
2-Nitroaniline	0.330 mg/kg	
Dimethyl Phthalate	0.330 mg/kg	
Acenaphthylene	0.330 mg/kg	
2,6-Dinitrotoluene	1.600 mg/kg	
3-Nitroaniline	0.330 mg/kg	
Acenaphthene	1.600 mg/kg	
2,4-Dinitrophenol	1.600 mg/kg	

Table 2
Summary of Analytes Investigated
531 South 5th Street, Grand Junction, Colorado

Chemical Compounds	Laboratory Detection Limit	Applicable to samples[1]
PCBs:		NBB 927, 928
Aroclor 1016	0.080 mg/kg	MGA 170, 171
Aroclor 1221	0.080 mg/kg	
Aroclor 1232	0.080 mg/kg	
Aroclor 1242	0.080 mg/kg	
Aroclor 1248	0.080 mg/kg	
Aroclor 1254	0.080 mg/kg	
Aroclor 1260	0.080 mg/kg	

Table 2
Summary of Analytes Investigated
531 South 5th Street, Grand Junction, Colorado

DOE ID No. GJ-00673-CC

Chemical Compounds	Laboratory Detection Limit	Applicable to samples[1]
TCL Volatile Compounds:		NBB 927, 928
Chloromethane	0.010 mg/kg	MGA 170, 171
Bromomethane	0.010 mg/kg	
Vinyl Chloride	0.010 mg/kg	
Chloroethane	0.010 mg/kg	
Methylene Chloride	0.005 mg/kg	
Acetone	0.010 mg/kg	
Carbon Disulfide	0.005 mg/kg	
1,1-Dichloroethene	0.005 mg/kg	
1,1-Dichloroethane	0.005 mg/kg	
cis-1,2-Dichloroethene	0.005 mg/kg	
trans-1,2-Dichloroethene	0.005 mg/kg	
Chloroform	0.005 mg/kg	
1,2-Dichloroethane	0.005 mg/kg	
2-Butanone	0.010 mg/kg	
1,1,1-Trichloroethane	0.005 mg/kg	
Carbon Tetrachloride	0.005 mg/kg	
Vinyl Acetate	0.010 mg/kg	
Bromodichloromethane	0.005 mg/kg	
1,2-Dichloropropane	0.005 mg/kg	
cis-1,3-Dichloropropene	0.005 mg/kg	
Trichloroethene	0.005 mg/kg	
Dibromochloromethane	0.005 mg/kg	
1,1,2-Trichloroethane	0.005 mg/kg	
Benzene	0.005 mg/kg	
trans-1,3-Dichloropropene	0.005 mg/kg	
Bromoform	0.005 mg/kg	
4-Methyl-2-Pentanone	0.010 mg/kg	
2-Hexanone	0.010 mg/kg	
Tetrachloroethene	0.005 mg/kg	
1,1,2,2-Tetrachloroethane	0.005 mg/kg	
Toluene	0.005 mg/kg	
Chlorobenzene	0.005 mg/kg	
Ethylbenzene	0.005 mg/kg	
Styrene	0.005 mg/kg	
Total Xylenes	0.005 mg/kg	

[1] If a concentration for the analyte is not listed in Table 1, the concentration is undetected.

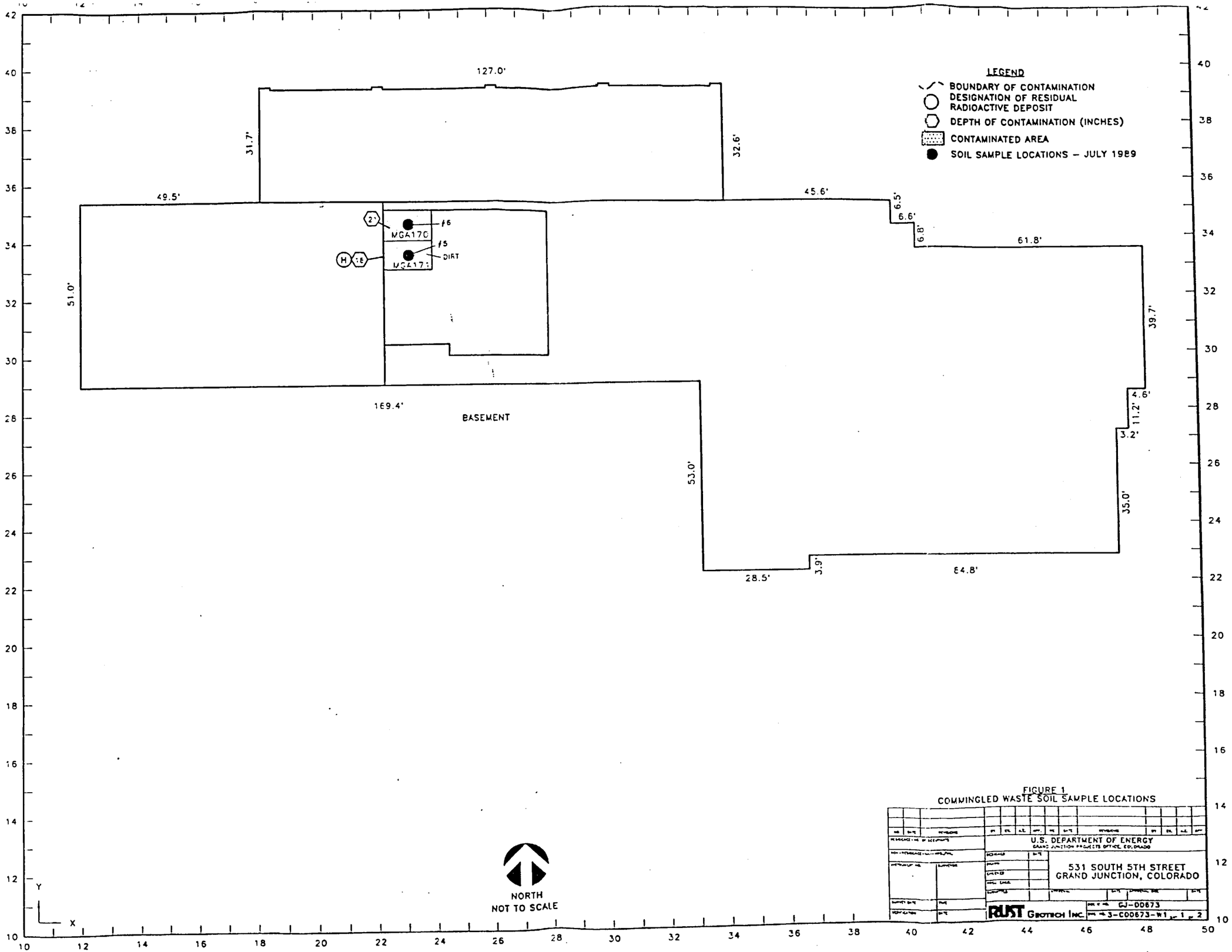

FIGURE 1
COMMINGLED WASTE SOIL SAMPLE LOCATIONS

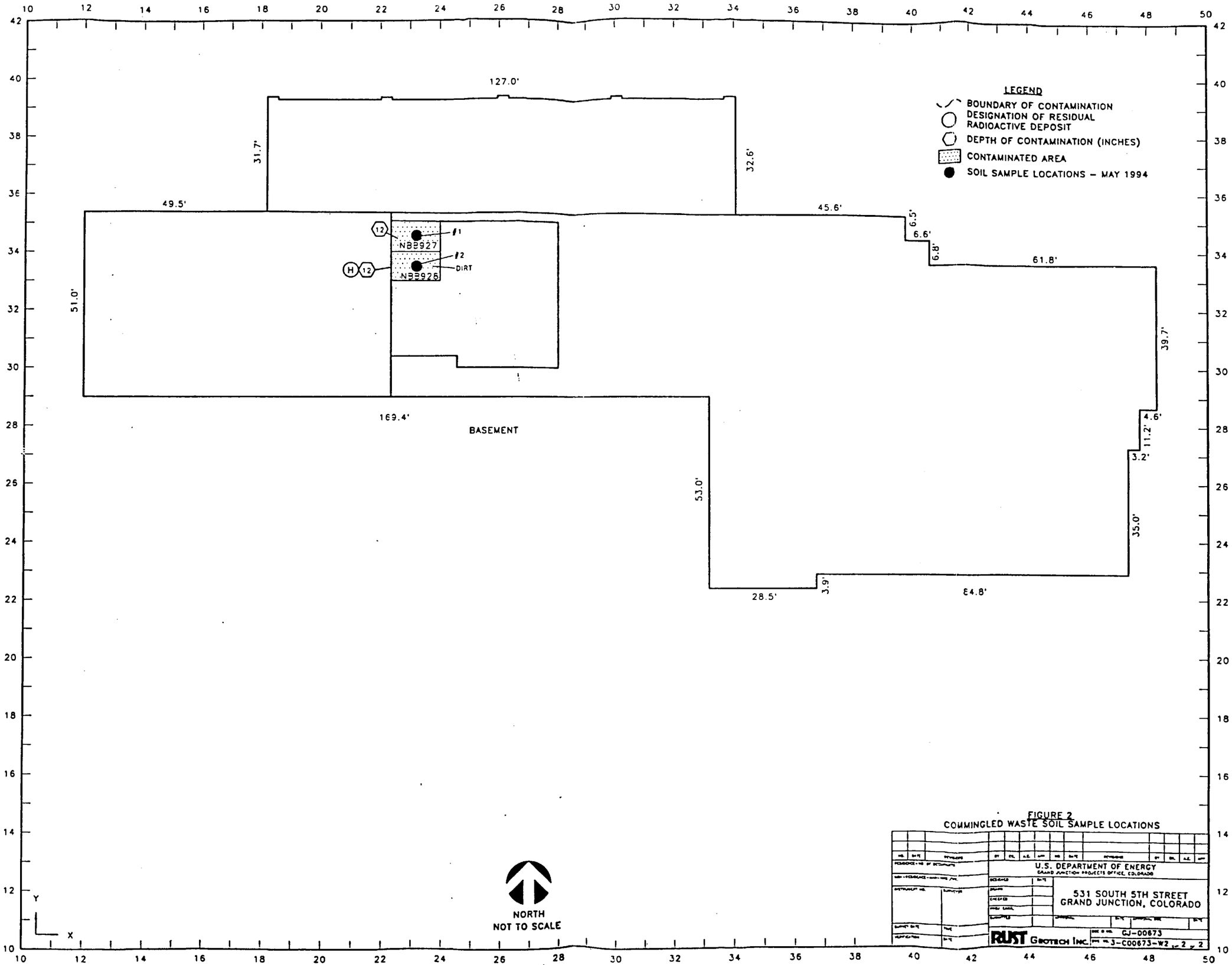

FIGURE 2
COMMINGLED WASTE SOIL SAMPLE LOCATIONS

ADDENDUM TO
APPENDIX B

COMMINGLED WASTE INVESTIGATION REPORT

FOR

DOE ID NO. GJ-00673-CC
(PUBLIC SERVICE)

FEBRUARY 1995

Prepared for the U. S. Department of Energy
Grand Junction Projects Office
contract No. DE-AC04-86ID12584

CONTENTS

Investigation Summary

Table 1 Addendum Analytical Results Exceeding Detection Limits

Figure 1 Addendum Commingled Waste Sample Investigations (July and August 1989, and August 1994)

The information provided herein was collected in support of the Uranium Mill Tailings Remedial Action (UMTRA) Program to facilitate engineering designs, health and safety plans, constructibility determinations, and identification of constituents regulated under the Resource Conservation and Recovery Act and/or the Toxic Substances Control Act. The Department of Energy disclaims any use of the information except for the purposes for which it was collected and assumes no liability for the use of the information for any purpose other than for the UMTRA Program.

INVESTIGATION SUMMARY

1.0 INTRODUCTION

1.1 Site Location and Description

This property consists of the Public Service building and lot, Department of Energy Identification Number (DOE ID. No.) GJ-00673-CC, located at 531 South 5th Street, Grand Junction, Colorado. The abandoned Public Service building is situated in the middle of a 3.2-acre lot, which is bounded by South Avenue on the north, 5th Street on the west, 6th Street on the east, and commercial property (Lewco Iron & Metal Inc.) on the south. The area of concern at this vicinity property is radiologically defined Area A, which is located at the northwest corner of the lot (near the building's loading dock).

1.2 Site History

Historically, half of the Public Service Building was used as a market and cold storage business (Colescotts), while the other half was occupied at various times by Public Service Company of Colorado (PSCo.) for steam heat electricity generation and a castings foundry. Most of the west lot was used by PSCo. for maintenance and storage. A portion of the east half of the lot is currently used as a coal yard. PSCo. owned the property until it was purchased by the city of Grand Junction in 1989. A radiological assessment conducted on the property by the UMTRA Program in 1989 confirmed the presence of uranium mill tailings, also known as residual radioactive material (RRM). Stained soil/RRM was identified in Area A to a depth of 6 inches. Grand Junction UMTRA vicinity properties such as the Public Service property were contaminated with RRM from an inactive uranium processing (milling) site.

This Addendum Appendix B document describes two 1989 sampling activities (characterizations) of exterior Area A (see Figure 1), and a 1994 recharacterization of Area A after soil/RRM was remediated by United States Pollution Control, Inc. (USPCI), a subcontractor for PSCo. (see Section 3.0). A description of previous commingled waste investigations conducted on this property is provided in the Appendix B document for interior Area H, released on November 16, 1994.

1.3 Regulatory Definitions

For the purpose of this document, commingled waste is defined as a mixture of either Resource Conservation and Recovery Act (RCRA) hazardous waste or Toxic Substances Control Act (TSCA) substances and RRM. The Uranium Mill Tailings Radiation Control Act (UMTRCA), as amended [42 United States Code (U.S.C.) Sections 7901-7925], defines RRM at Title 1 Section 101 "Definitions" (7)(A) as "Waste... in the form of tailings resulting from the processing of ores for the extraction of uranium and other valuable constituents of the ores..."[see also Federal Register (FR) 45926 Vol 48, No. 196, October 7, 1983, for a definition of active and inactive milling sites]. Uranium mill tailings are also defined in the Atomic Energy Act (AEA) Section 11 "Definitions" (e)(2) as "byproduct material" [AEA 11(e)(2) byproduct material]. In this Commingled Waste Investigation Project (CWIP) report, the term RRM as defined by UMTRCA is used in reference to uranium mill tailings. Uranium mill tailings are excluded from the RCRA definition of a solid waste in 40 CFR Part 261.4 (a), "Exclusions."

Pursuant to the Federal and Colorado Hazardous Waste Regulations, a waste is classified as hazardous if it is a solid waste (or other material such as RRM) that is mixed with a hazardous waste listed in 40 Code of Federal Regulations (CFR) Part 261 Subpart D and/or 6 Colorado Code of Regulations (CCR) 1007-3 Part 261 Subpart D. A waste also may be characterized as hazardous under 40 CFR Part 261 Subpart C and 6 CCR 1007-3 Part 261 Subpart C if it exhibits at least one of the following characteristics: toxicity, ignitability, reactivity, or corrosivity.

Additionally, a material (either a RCRA hazardous waste and/or solid waste) found to contain substances regulated under the TSCA as defined by the Environmental Protection Agency (EPA) in 40 CFR Part 761, is subject to the RCRA land disposal prohibitions. An example is Polychlorinated biphenyls (PCBs). For the purpose of this investigation, PCB-contaminated RRM, if found, would be classified as a commingled waste.

The following sections discuss the 1989 and 1994 characterizations of Area A, the 1990 remediation of Area A by USPCI, and the hazardous waste determinations that have been made on the basis of analytical results for soil/RRM samples collected during the 1989 and 1994 characterizations.

2.0 1989 SITE CHARACTERIZATIONS OF AREA A

2.1 Rationale for Characterization

Area A was characterized in July and August 1989 on the basis of visible evidence of a PCB spill in Area A. The radiological assessment had confirmed that Area A was radiologically contaminated with RRM, and that staining and/or discolored soil was present with the soil/RRM. Historically, it was observed that electrical transformers were stored on a concrete pad (northwest corner of the PSCo. building) adjacent to Area A and that oil stained soil/RRM existed in Area A prior to the July 1989 sampling activity (identified during the initial site walk-through). This information supported the potential for TSCA regulated wastes. The sampling and analysis strategy and rationale for the investigation are detailed in the *Work Plan of Characterization of Hazardous Substances and Radiological Contaminants for Public Service Building, GJ-00673-CC* (UNC, UMTRA CWIP-12, June 1989).

Three soil/RRM samples (MGA 162, MGA 195, and MGA 196) were collected in Area A on July 18 and August 31, 1989, for laboratory analysis. Soil sample locations MGA 162 (Grid location 191446), MGA 195 (200450), and MGA 196 (225445) are indicated on Figure 1. Samples were obtained with a hand-operated soil auger to a depth of 6 inches.

Sample MGA 162 was analyzed by International Technology (IT) Corporation Laboratory in Oak Ridge, Tennessee (Job No. UNCG 35529) for PCBs and volatile organics. The laboratory report identified PCBs at 680 ppm but did not detect any volatile organic constituents. Samples MGA 195 and MGA 196 were analyzed by the UNC Geotech Laboratory in Grand Junction, Colorado (Requisition 2987) for PCBs and semi-volatile organics. Geotech's laboratory identified PCBs at 150 and 290 ppm, respectively, but was not able to report semi-volatile organic concentrations due to PCB 1254 chromatographic peak interferences (see Table 1).

Waste determinations for the PCB/RRM material in Area A were not made by Geotech in 1989. Historical observations made prior to July 1989 (of transformer storage near Area A) are not supported by process knowledge obtained in May 1994 (the suspect substances had been removed). However, in 1989, Area A was excluded from the UMTRA program.

2.2 Laboratory Analytical Results for Samples Collected in 1989

Soil/RRM samples MGA 162, MGA 195, and MGA 196 were analyzed for PCBs. Analytes in these samples that exceeded detection limits are listed in Table 1. Analytical data were reviewed for compliance through a data validation process.

2.3 Laboratory Analytical Quality Control Issues

Geotech's Laboratory report includes a summary page that describes quality control problems associated with surrogate recoveries, retention times, and matrix spike recoveries. The quality control requirements are defined in EPA's *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (SW-846) Manual (Third Edition).

IT's Laboratory report also includes a summary page that describes quality control requirements for subcontract analysis as defined in EPA's *Contract Laboratory Program (CLP) 10/86 Statement of Work* (SOW) and EPA's *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (SW-846) Manual (Third Edition). The CLP is an institutional program by which requirements for quality assurance (QA) and quality control (QC) are established for EPA-qualified laboratories.

Through the data validation process, CWIP personnel identified several minor QC complications in the laboratory analysis; however, because the laboratory procedural (quality control) complications noted do not affect the chemical analysis detection capabilities for each specific chemical analysis, the analytical results are considered valid.

3.0 1990 REMEDIATION ACTIVITY IN AREA A BY USPCI

The 1989 site characterization information compiled was transmitted to PSCo. and the City of Grand Junction through the Department of Energy. After reviewing the information, PSCo. contracted with USPCI to conduct soil/RRM remediation from February 22 through April 19, 1990. USPCI excavated 6 to 18 inches of soil in Area A, and ultimately transported 77 tons of PCB/RRM contaminated soil off the property to USPCI's disposal facility in Clive, Utah. A report of the USPCI remedial action was provided to Geotech by PSCo. and can be found in the property folio, GJ-00673-CC.

A post-remedial on-site inspection of Area A performed by Geotech determined that approximately 6 to 18 inches of soil/RRM had been removed by PSCo. Not until the 1994 recharacterization for RRM was it discovered that the Geotech-delineated PCB area (Area A) had not been completely remediated. Additionally, the final report provided by PSCo. identified no post-remediation soil sampling results to verify remediation of PCBs in Area A (reference: EPA-560/5-85-026 and EPA-560/5-86-017) and did not identify a pre-established (negotiated) EPA cleanup standard as prescribed in 40 CFR 761.125. Because of this lack of information, a recharacterization of Area A was conducted by Geotech with the ENSYS Immunoassay PCB Field Test Kits (RISc™) in August 1994.

4.0 1994 RECHARACTERIZATION OF AREA A USING FIELD TEST KITS

4.1 Rationale for Recharacterization

Because of the 1989 site characterization analytical results, an historical search was performed in May 1994 to determine if there was a potential for TSCA-regulated substances, listed in 40 CFR Part 761, to be present within Area A. This search confirmed the potential for hazardous wastes, but could not substantiate a previous observation of electrical transformers stored on a concrete pad adjacent to Area A.

A radiological scan of Area A conducted in August 1994 by Geotech determined that RRM still remained in excluded Area A. To recharacterize the PCBs and soil/RRM, a sampling and analysis plan was written and an additional sampling effort was conducted.

4.2 Field Analytical Results for Samples Collected in 1994

Eight soil/RRM samples (Sample locations 1 through 8) were collected and analyzed in the field on August 17, 1994, adhering to *USEPA SW-846 Immunoassay Analytical Methods 4010, 4020, and 4030,* for the Immunoassay PCB Field Test Kits (RISc™). Aroclor 1260 concentrations in these samples that exceeded test kit detection limits (1 ppm-10 ppm) are listed in Table 1. Analytical data were reviewed for compliance through a data validation process and results reported are considered valid. Sampling locations were selected based on the basis of remaining soil/RRM identified by Field Assessments in August 1994 (see Figure 1), not to represent EPA verification protocol.

5.0 HAZARDOUS WASTE DETERMINATIONS BASED ON 1989 AND 1994 ANALYTICAL DATA FROM AREA A

Field observations made in July 1989 suggested the presence of substances regulated under the TSCA, namely PCBs. PCB analysis was performed on three soil/RRM samples collected in Area A prior to USPCI's remediation activities. The three samples (MGA 162, MGA 195, and MGA 196) contained PCB concentrations above the regulatory limit of 50 ppm (680 ppm, 150 ppm, and 290 ppm, respectively).

PCB analysis was performed in 1994 on eight soil/RRM samples (locations #1-#8) collected in Area A after USPCI's remediation activities. Four of the eight sample locations contained PCB concentrations above the field test kit detection limit of 10 ppm PCBs (Aroclor 1260). Furthermore, Figure 1 indicates sample location 225445 (with a PCB concentration of 290 ppm, collected in August 1989) was not remediated by USPCI in 1990. Therefore, Area A is considered to contain PCBs at a concentration not less than 290 ppm.

6.0 EXTENT OF COMMINGLED WASTE CONTAMINATION

On the basis of site investigations, previous observations, and results of laboratory and field test kit analyses, Area A has been determined to contain TSCA regulated substances and RRM, and is considered a commingled waste area. The extent of the commingled waste includes all areas delineated on Figure 1 as RRM contaminated (Area A) in the northwest corner of the Public Service property.

7.0 CONCLUSIONS AND RECOMMENDATIONS

Commingled waste restrictions apply to remedial activities on this property. Exclude Area A from the RRM remedial action activities.

DOE ID NO. GJ-00673-CC

Prepared By: Mark Gilfillan _____ **Date:** 2/27/95
Mark A. Gilfillan, Technical Specialist
Commingled Waste Investigation Project

Approved By: Gary Neff _____ **Date:** Feb 27, 1995
Gary G. Neff, Technical Lead
Commingled Waste Investigation Project

Table 1 Addendum
1989 & 1994 Analytical Results Exceeding Detection Limits
531 South 5th Street, Grand Junction, Colorado

DOE ID No. GJ-00673-CS

Sample Location	Figure No.	Sample Ticket No.	Depth Interval (inches)	Analyte	Soil Result[1] (mg/kg)	Reg. Limit
191446 (1989)	1	MGA 162	0-6	PCB (Aroclor 1260)	680 ppm	50 ppm
200450 (1989)	1	MGA 195	0-6	PCB (Aroclor 1254)	150 ppm	50 ppm
225445 (1989)	1	MGA 196	0-6	PCB (Aroclor 1254)	290 ppm	50 ppm
N/A (1994)	1	#5	0-6	PCB (Aroclor 1260)	>10 ppm	50 ppm
N/A (1994)	1	#6	0-6	PCB (Aroclor 1260)	>10 ppm	50 ppm
N/A (1994)	1	#7	0-6	PCB (Aroclor 1260)	>10 ppm	50 ppm
N/A (1994)	1	#8	0-6	PCB (Aroclor 1260)	>10 ppm	50 ppm

[1] Only those results of analytes exceeding detection limits are listed.
N/A Indicates Not Applicable.

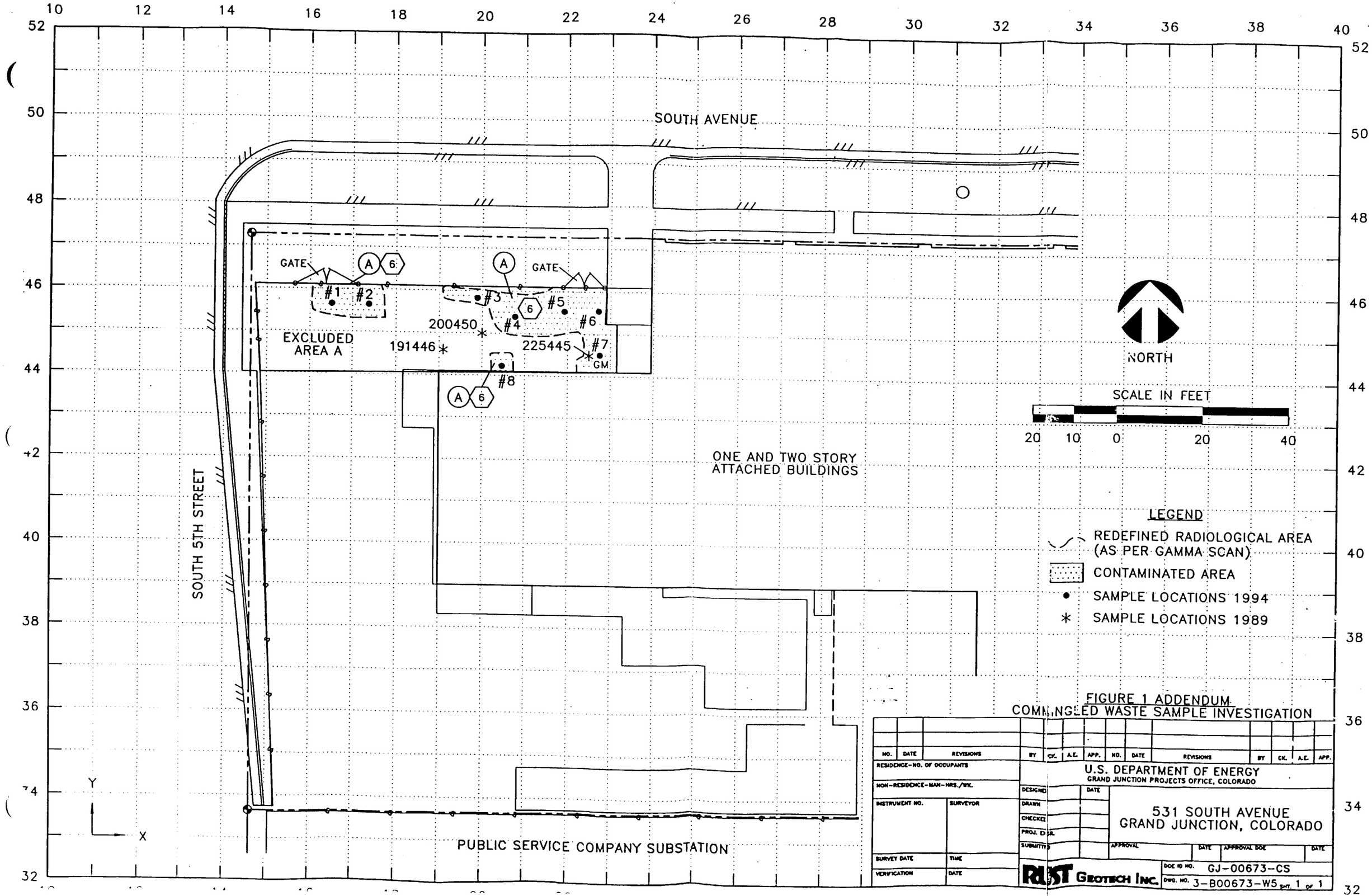

FIGURE 1 ADDENDUM
COMMINGLED WASTE SAMPLE INVESTIGATION

APPENDIX C

APPLICATION FOR SUPPLEMENTAL STANDARDS
DOE ID NO. GJ–00673–CS

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Attachments

Request for Owner Comments (Letter from the TAR to City of Grand Junction dated August 14, 1997)

C.1 Applicable EPA Criteria

This application of supplemental standards is proposed in accordance with the regulations specified by EPA in 40 CFR 192. The potentially applicable criteria identified in 40 CFR 192.21 are summarized as follows:

_____ a) Remedial action would pose a clear and present risk of injury to workers or to members of the public

_____ b) Remedial action would directly cause excessive environmental harm

___X___ c) The cost of remedial action at the vicinity site is unreasonably high relative to long-term benefits for RRM that does not pose a clear present or future hazard

___X___ d) The cost of remedial action for cleanup of a building is unreasonably high relative to benefits

_____ e) There is no known remedial action

_____ f) Radionuclides other than radium-226 and its decay products are present

An "X" indicates the criteria that are applicable to this Application.

C.2 Introduction

This Supplemental Standards Application pertains to all RRM remaining in two assessed deposits on the property, as shown on Figure A–2 of Appendix A of this Application. An exterior area of RRM is contaminated with polychlorinated biphenyls (PCBs) that were determined to be regulated under TSCA, resulting in a commingled waste. An interior area of RRM is contaminated with PCBs at concentrations regulated by TSCA and with VOCs (trichloroethane [TCA], trichloroethene [TCE], and tetrachloroethane) that were determined to be RCRA characteristic and/or listed hazardous wastes, resulting in commingled waste. The term "commingled waste," as used in this Application, is defined as "residual radioactive material mixed with hazardous wastes."

C.2.1 Common Location and Legal Description

This property is located at 531 South Avenue, Grand Junction, Colorado. The legal description of the City of Grand Junction property is:

Parcel No. 294514343921: Lots 1 through 14, inclusive, Block 161, City of Grand Junction, and also the southerly 5.27 feet of South Avenue adjoining the north line of said Lots 1 through 14, inclusive, and also beginning 150 feet east of the SW corner of said Lot 1, southerly at a right angle to the south line of said Block 161 20 feet, easterly 251.06 feet to the west line of 6th Street, north 20 feet, west 251.06 feet to the beginning; except beginning at the SW corner of said Lot 1, north 92 feet, southeasterly 92.4 feet, to a point on the south line of said Lot 1, west 9.1 feet to the beginning, City of Grand Junction, County of Mesa, State of Colorado.

C.2.2 Major Physical Features

This property lies on the southeast corner of Fifth Street and South Avenue. The building is surrounded by a chain link security fence. The building is unoccupied.

The exterior deposit being considered for supplemental standards is located within the property boundary near the northwest corner of the building. This deposit is near a loading dock in a graveled area of the property (Figure C–1). The interior deposit being considered for supplemental standards is located in a soil area in the basement of the building.

C.2.3 Inclusion Boundary

The inclusion boundaries applied to this supplemental standards application are shown on Figure A–2 of Appendix A.

C.2.4 Land Use

The areas being proposed for supplemental standards are located within the boundary of property owned by the City of Grand Junction. The surrounding area is used for commercial and light industrial purposes.

C.2.5 Owner's Input

The Owner Notification Checklist and copies of the characterization results were presented to representatives of the City of Grand Junction on August 14, 1997 (Attachment). The City responded in writing on October 31, 1997 (Attachment). The City of Grand Junction opposes the application of supplemental standards on the subject property because this property was acquired as part of the South Downtown Redevelopment Project, and the City intends to use the building for community purposes. Future uses are anticipated to result in long durations of human occupation. The City states that the RRM that will remain in place poses a health hazard because the contamination is located in surface areas without controls, and a high water table creates a potential for spreading the RRM. The City feels that application of supplemental standards might complicate or prevent the conversion of the building and property to public use, with an attendant loss of long-term social and economic benefit, and will jeopardize the South Downtown Redevelopment Project.

Response of the TAR:

The response of the City of Grand Junction does not address the nonradiological hazardous materials that are commingled with all remaining RRM. Because of the regulatory uncertainties and high cost of removing and disposing of the commingled waste on this property, DOE should not attempt to remove and dispose of the commingled waste. DOE is not the responsible party for the nonradiological component of the commingled waste and the TAR believes, on the basis of past legal advice, that DOE does not have the authority to assume the risk or liability for this waste. The RRM in the waste is shown to not present a risk to the public under reasonable use scenarios. If the City decides to redevelop the building for public use, the City has the option of either placing the commingled waste in temporary storage containers or placing a cap over the deposits of commingled waste.

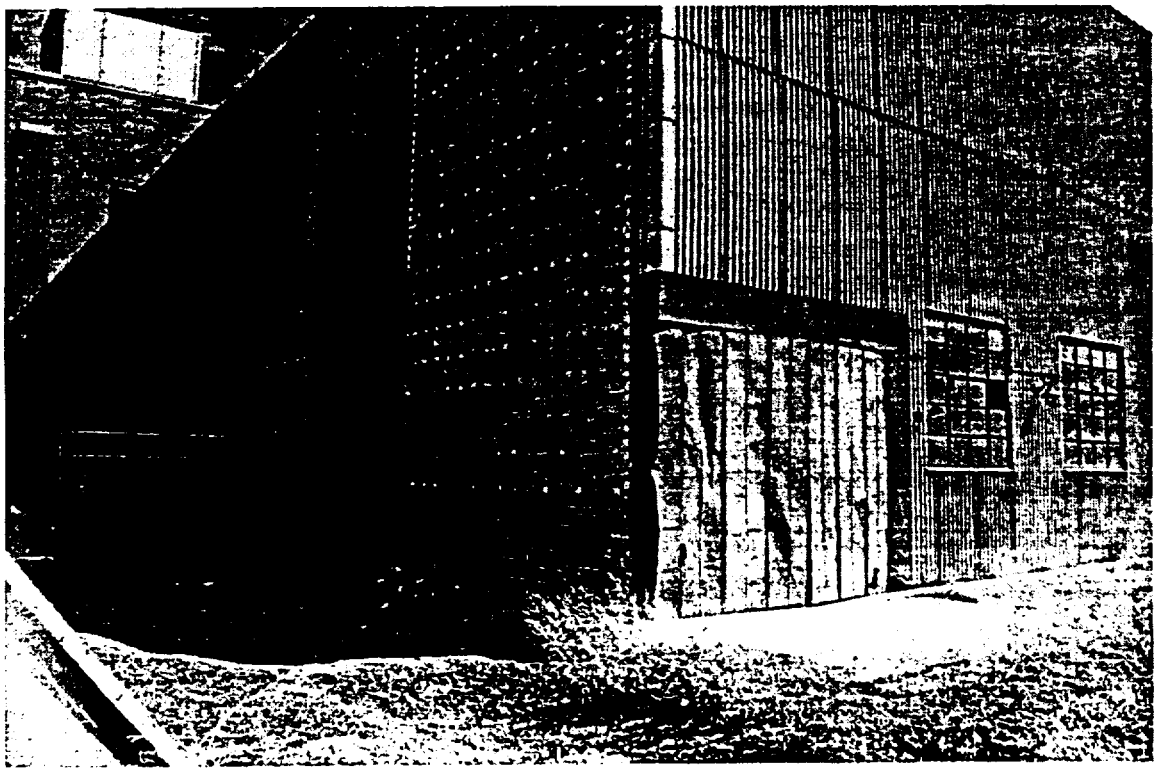

Figure C–1. Photograph of the Exterior Supplemental Standards Area

C.3 Radiological Data

Appendix A contains the radiological data that is relevant to this Application.

The radiological conditions within the supplemental standards area are summarized as follows:

> The gamma exposure rates in the supplemental standards areas range from 18 to 36 μR/h in the exterior deposit (Area A) and 33 to 77 μR/h in the interior deposit (Area H); the area background exposure rate is approximately 16 μR/h.
>
> The maximum radium concentrations in the supplemental standards areas are 27.8 pCi/g. in Area A and 51.5 pCi/g in Area H. The depth of contamination ranges from 6 inches to 11 inches.

C.3.1 Health Risk Analysis of Radiological Contamination

An analysis of current health risks is presented in Table C–1. ***This assessment is only intended to be a screening-type analysis*** that depicts how many hours an individual could be exposed to the major pathway (direct gamma exposure) and remain below the 100- or 500-millirem (mrem) limits. These limits represent allowable dose in addition to naturally occurring background. Because the 100- and 500-mrem limits are based on exposure from all pathways, a more detailed analysis, such as the dose assessment methodology associated with the RESRAD computer pathway analysis model, would be required to develop a more accurate estimate of the total future dose under a given land-use scenario. RESRAD, or a similar model, would estimate the effective dose equivalent from external gamma radiation plus the committed effective dose equivalent from internal absorbed, ingested, or inhaled radioactive source material. The dose for the individual(s) expected to receive the largest dose would be obtained by 1) determining the future land-use scenario; 2) determining which exposure pathways are plausible at the site for that land-use scenario; 3) estimating exposure durations at the site; and 4) calculating the dose based upon the estimated duration/extent of exposure to the radioactive source(s) for each pertinent pathway. The annual estimated dose to the maximally exposed individual would need to be less than the dose limits; the percentage of the dose limit allowed would depend upon many factors, including the probability of the exposure occurring.

Exposure potentials are compared with two criteria.

1. Long-term exposures are examined based on an allowable exposure rate of 100 mrem per year above background (a 100-mrem dose).

2. Short-term unusual exposures are examined based on an allowable exposure rate of 500 mrem per year above background (a 500-mrem dose). The maximum annual gamma dose at waist level recommended by the International Commission on Radiological Protection specified in DOE Order 5400.5 for an individual member of the general public is 100 mrem.

   Dose rates exceeding 100 mrem per year are acceptable when the higher exposures do not persist for long periods and the average annual dose over an individual's lifetime is expected to be less than 100 mrem. The ICRP and the DOE suggest that dose rates be reduced as low as is reasonably achievable, and state that no annual dose shall exceed 500 mrem.

Table C–1. Summary of Health Risk Analysis for Alternative 1—No Remediation/Supplemental Standards

Assessed Area	Surface Level Gamma (µR/h)			Long-Term Exposure Analysis			Short-Term "Occupational" Exposure Analysis		
	Bkg	Max	Above Bkg	Hours of Continuous Exposure To Receive 100 mrem Dose	Hours Per Day Over One Year To Receive 100 mrem Dose	Hours Per Day Over 260 Days To Receive 100 mrem Dose	Hours of Continuous Exposure to Receive 500 mrem Dose	48-Hour "Repair" Scenarios To Receive 500 mrem Dose	24-Hour "Emergency" Scenarios To Receive 500 mrem Dose
A	16	36	20	5,000	14	19	25,000	521	1,042
H	16	71	55	1,818	5	7	9,091	189	379

Key:

bkg = background
mrem = millirem
µR/h = microroentgens per hour

The health risk analysis presented in this Application has compared the dose rates measured at ground level with the recommendations of the ICRP and DOE regarding waist-level exposures. This procedure ensures a conservative evaluation. The following exposure scenarios do not create a model of likely situations, but present data that can be used to evaluate the potential for a health hazard if this Application is approved.

The long-term exposure analysis considers three scenarios:

1. The required number of hours of continuous exposure to obtain the 100 mrem dose. This scenario models the exposure received by an individual residing on the site in the extreme case where no time away from the site is considered.

2. The hours per day of exposure during a continuous one year period required to receive the 100 mrem dose. This scenario represents a maximum allowable daily time an individual may occupy the location of the highest gamma exposure rate.

3. The hours per day of exposure during a one year period, considering weekdays only (260 days), required to receive the 100 mrem dose. This scenario models the potential exposure that could be received by an individual working in the area the indicated number of hours per day for one year.

The short-term unusual exposure analysis considers three potential scenarios:

1. The required number of hours of continuous exposure to obtain the 500 mrem dose. This scenario examines the estimated time of continuous exposure required to receive the allowable dose.

2. The number of 48-hour temporary occupancy periods in one year that will result in a 500 mrem dose. This scenario represents instances when an individual occupies the site for repair work or other short-term purposes.

3. The number of 24-hour periods of exposure, in one year, that will result in a 500 mrem dose. This scenario considers emergency operations to perform repair work at the site.

The exposure scenarios for the City of Grand Junction property are based on the 20 and 55 μR/h above background *maximum* surface gamma exposure rates observed in the exterior and interior supplemental standards areas, respectively. This ensures an upper limit exposure prediction. The net gamma exposure rate in assessed Area H is probably less than 55 μR/h because the top 10 inches of contaminated material was removed by the previous owner. The maximum Ra-226 concentration identified in the RRM below 10 inches is 34.3 pCi/g, whereas the assessed maximum Ra-226 concentration near the surface was 51.5 pCi/g when this exposure rate was observed. The durations of exposure required to receive a 100 mrem or an occupational 500 mrem dose under the six identified scenarios are presented in Table C–1. These durations indicate that the maximum allowable exposure is unlikely to be received by workers at the site or the public because the RRM is located in either a limited access basement area or behind a chain link fence (neither area should be expected to be continuously occupied) and the durations exceed typical work situations or exceed available time in a year.

C.4 Nonradiological Hazardous Waste Data

Two sampling episodes were conducted within the proposed supplemental standards areas.

Stained soil was observed in assessed Area A during a property screening visit on July 18, 1989. Analyses of two samples collected from the area of assessed RRM indicated the presence of PCBs at concentrations exceeding the TSCA regulatory limit of 50 parts per million (ppm). In 1990, the previous owner of the property, PSCo, contracted with United States Pollution Control, Inc. (USPCI) to remove the PCB-contaminated material. Approximately 77 tons of material was removed at depths of 6 to 18 inches. The DOE contractor reassessed the area in 1994 because apparently no material was removed from the easternmost portion of Area A, a site-specific cleanup standard had not been negotiated with EPA, and the 1990 remedial action report did not provide sample results to verify that the PCB-contaminated material was removed. The reassessment resulted in the detection of PCBs at concentrations exceeding regulatory limits or typical cleanup levels remaining in the area containing RRM. The Commingled Waste Investigation Report (Appendix B) provides more detailed results of these characterization activities.

Stained soil was observed in assessed Area H during a property screening visit on July 18, 1989. Photoionization detector readings taken at that time exceeded 10 ppm. Analyses of two samples collected from the area of assessed RRM indicated the presence of VOCs and PCBs. In 1990, PSCo contracted with USPCI to remove the PCB- and VOC-contaminated material. Approximately 62 55-gallon drums of material were removed to a depth of 10 inches. The DOE contractor reassessed the area in 1994 because the 1990 remedial action report did not provide sample results to verify that the PCB- and VOC-contaminated material was removed. TCA, TCE, and tetrachloroethene were detected. The recharacterization effort included an historical search to determine the source of the organic contaminants. Area H was determined to be contaminated with characteristic and/or listed hazardous wastes (VOCs) and TSCA-regulated substances (PCBs). The Commingled Waste Investigation Report (Appendix B) provides more detailed results of these characterization activities.

C.4.1 Health Risk Analysis of Nonradiological Contamination

The potential exposure pathways are inhalation and ingestion of contaminated soil. Dermal absorption is another potential pathway, but is considered to be insignificant for VOCs compared to the other pathways because of the difficulty in transferring organic compounds in soil through the skin layer. Access to the site is currently restricted by fencing and locked doors. Although the groundwater may be contaminated, only a remote possibility exists that it would be ingested. No water wells exist in the immediate area because the groundwater is brackish and water is available from a municipal water system. The possibility that the groundwater will contaminate agriculture is also remote because local irrigation water is diverted from the Colorado River for most uses and the area around the property is used for industrial purposes with little need for irrigation. Therefore, no pathways are considered to be complete under the current scenario.

The future land use of this property is expected to continue to be commercial and industrial. The surrounding land use is commercial and industrial, and there is no reason to anticipate a change in land use in the foreseeable future. Under a future industrial use scenario, construction workers excavating soil in these areas could be exposed through all three identified exposure pathways. The owner should consider imposing engineering and institutional controls to prevent such exposures. These controls might include placing a cap over the affected areas, posting the areas with warnings about potential exposure when excavating, and placing notices in city records. Because this property is owned and controlled by a municipality, there is little likelihood that private contractors will inadvertently excavate the affected soils.

Risk-based concentration screening levels for soils in an industrial setting are shown in Table C–2 for the VOCs identified in assessed Area H. Only the concentration of tetrachloroethene exceeds the screening level, which indicates that additional health risk assessment work may be required to determine whether a health risk is created by the presence of this contaminant. Access controls will prevent exposure to this substance.

C.5 Remediation Alternatives

C.5.1 Alternative 1—No Remediation/Supplemental Standards

C.5.1.1 Work Description

No work is required under this alternative.

C.5.1.2 Health Risk Analysis

The health risks associated with this alternative are approximated in the screening analysis summarized in Table C–1 and discussed in Sections C.3.1 and C.4.1. Although elevated gamma exposure rates were observed, it is unlikely that the allowable gamma dose rates will be exceeded.

Because contact with the nonradiological wastes is restricted by the use of access controls, there is minimal exposure to the possible future occupants of the site from the PCBs and VOCs. Future construction workers excavating in the supplemental standards areas may be exposed to the hazardous materials primarily by ingestion or inhalation.

C.5.1.3 Construction Parameters

No construction is required under this alternative.

C.5.1.4 Alternative-Specific Issues

The RRM that would remain in place under this alternative may be disturbed by erosion and construction or repair activities at the site. The owner should consider placing a cap over assessed Areas A and H or instituting other controls to prevent accidental contact with the contamination.

C.5.1.5 Engineering Data

No cost is associated with this no-remediation alternative. The approximate volume of RRM to remain in place is 16 cubic yards (based on assessed contamination). This RRM is commingled with the hazardous waste materials identified in Appendix B.

Table C–2. Summary of Nonradiological Contamination Identified in the Supplemental Standards Areas

Area A				
Sample Location Number[a]	**Analyte**	**Depth (inches)**	**Concentration (ppm)**	**TSCA Regulatory Limit (ppm)**
1	PCB (Aroclor 1260)	00-06	680	50
2	PCB (Aroclor 1254)	00-06	150	50
3	PCB (Aroclor 1254)	00-06	290	50
4	PCB (Aroclor 1260)	00-06	> 10	50
5	PCB (Aroclor 1260)	00-06	> 10	50
6	PCB (Aroclor 1260)	00-06	> 10	50
7	PCB (Aroclor 1260)	00-06	> 10	50

[a]The results for sample locations 1, 2, and 3 are from the 1989 characterization episode. The remainder of the results are from the 1994 characterization episode.

Area H						
Sample Identification Number	**Analyte**	**Depth (inches)**	**Concentration**	**RCRA Regulatory Limit**	**TSCA Regulatory Limit**	**CERCLA RBC Level[a]**
NBB 927	trichloroethene	00 - 12[b]	1.1 mg/L	0.5 mg/L[c]		
	trichloroethene		290 mg/kg[d]			520 mg/kg
	1,1,1-trichloroethane		950 mg/kg[d]			72,000 mg/kg
	tetrachloroethene		290 mg/kg[d]			110 mg/kg
	PCB (total)		28 mg/kg		50 ppm[e]	
	other organics detected					
NBB 928	PCB (Aroclor 1260)	00 - 12	0.37 mg/kg[f]		50 ppm[e]	
	other organics detected					

[a]This risk screening tool was developed by the Superfund program to evaluate the potential risk of contaminants in various media using standard risk assessment assumptions. The values listed are for contaminants in soil in an industrial setting. Site-specific concentrations greater than the screening level indicate that additional risk assessment modeling is necessary to determine if risks are acceptable; concentrations below the screening level imply no further action would be necessary under CERCLA (from Risk-Based Concentration Table, January-June, 1996, EPA Region III, September 11, 1996).
[b]This depth was measured from the surface after the previous owner removed 10 inches of material.
[c]This constitutes a characteristic waste.
[d]This constitutes a listed waste (F002).
[e]PCBs were detected at concentrations below the TSCA regulatory limit of 50 ppm. Based on process knowledge, the soils represented by these samples is considered to be contaminated with spent PCB-laden solvents that originally exceeded the regulatory limit.
[f]The 1989 sample collected at this location exhibited a concentration of 9.8 mg/kg of Aroclor 1260.

Key:
mg/kg = milligrams per kilogram; mg/L = milligrams per liter; ppm = parts per million; RBC= risk-based concentration

C.5.2 Alternative 2—Complete Remediation of All RRM

C.5.2.1 Work Description

This alternative includes conducting additional sampling to delineate the extent of radiological contamination; obtaining EPA approval to treat the PCBs and VOCs in the RRM in accordance with EPA's "contained-in" interpretation to remove the hazardous waste components to below regulatory detection limits; removing all remaining RRM from assessed Areas A and H; hauling commingled RRM to a licensed treatment, storage, and disposal facility for treatment to remove PCBs and VOCs; hauling the treated RRM to the Cheney Disposal Cell or at another approved facility; and disposing the nonradiological waste component of the commingled material at an approved facility.

C.5.2.2 Health Risk Analysis

The health risks in the supplemental standards application areas from RRM will be reduced to the level attained by meeting EPA cleanup standards. No risks resulting from exposure to the hazardous waste component of the commingled waste will remain.

C.5.2.3 Construction Parameters

Remediation operations for this alternative will include:

a. Excavate all commingled RRM on the site.

b. Haul commingled RRM to a licensed treatment, storage, and disposal facility or treat commingled RRM on site to remove the hazardous waste contaminants to below regulated limits. Test the treated RRM to verify compliance with RCRA and/or TSCA regulatory limits.

c. Dispose of the treated-commingled RRM at the Cheney Disposal Cell or other approved facility.

d. Dispose of the nonradiological hazardous waste materials at an approved facility.

e. Backfill the site with roadbase and restore to preremedial action condition.

C.5.2.4 Alternative-Specific Issues

The regulations governing PCB remediation, 40 CFR 761, contain provisions that discourage dilution of PCB-contaminated media. Disposal requirements for materials containing PCB concentrations of 50 ppm or greater may not be circumvented by either accidental or intentional dilution—all diluted PCB-contaminated media with a concentration in excess of 2 ppm (the regulatory detection limit) must be treated as if it contained concentrations greater than 50 ppm. The commingled RRM in Areas A and H fall under these regulations.

Because a disposal site currently does not exist that will accept RCRA-listed and/or TSCA-regulated PCB waste commingled with RRM, the commingled waste material must be treated to remove the nonradiological contaminants from the RRM. Several treatment technologies may be required to selectively remove the VOCs and the PCBs from the RRM. Upon approval by EPA and CDPHE, the nonradiologic wastes can then be disposed of as appropriate. Treatment technologies and suitable treatment and disposal facilities must be identified.

Several methods exist for treating PCB-contaminated soil, including incineration, soil washing with solvents, thermal separation, and PCB dechlorination. Although incineration has been demonstrated to be the most practical method for treating PCB-contaminated soil, several problems would have to be overcome before this method can be applied to the waste on this property. At this time, only one operating incinerator is licensed to treat radioactive material mixed with TSCA-regulated PCBs. This incinerator is operated by a DOE contractor in Oak Ridge, Tennessee. The treatment is expensive (approximately $10,000 to $20,000 per cubic yard) and this facility has a backlog of work that would delay treatment for many years. Obtaining the necessary permits and approvals to set up an onsite incinerator to treat this small quantity of material would be economically and politically difficult, if not impossible.

Because incineration is not a feasible alternative, one of the other aforementioned treatment technologies would be considered. While researching treatment alternatives for the PCB-contaminated RRM on the Grand Junction Steel property, several commercial vendors had expressed interest in using their treatment technology to treat the commingled waste onsite. All of these vendors stated that they would have to first conduct treatability studies on the material on a bench or pilot scale before cost and schedule estimates could be developed. Prior to conducting onsite treatment to remove PCBs, DOE would have to obtain a TSCA permit from EPA. Typically, a one year lead time is required to obtain a TSCA permit.

Additional permits and treatability studies may be required to treat the RCRA-regulated VOC waste components. Treatment of the listed waste also would require a consent agreement between DOE and the Colorado Department of Public Health and Environment (CDPHE). DOE and the CDPHE attempted to negotiate a consent agreement for the treatment of characteristic waste but were unable to reach consensus on the terms of the agreement. The TAR envisions that a consent agreement for listed waste will be more difficult to negotiate. The Permit-by Rule provisions being used to treat characteristic hazardous wastes do not apply to listed wastes.

Excavation and handling of the contaminants associated with these deposits of RRM will necessitate the contracting of specially trained presonnel. Because not many subcontactors could meet the site-specific requirements, subcontract costs are expected to be higher than for a normal UMTRA remedial action that does not involve commingled waste.

The hazardous waste component of the deposit was not generated by DOE. DOE believes it does not have the authority to manage the hazardous waste under UMTRCA. Additionally, if the material is excavated by DOE and not successfully treated, DOE would probably inherit the responsibility for its ultimate disposal.

Although treatment methods such as incineration and thermal disorption are commercially available, they are not always successful on larger scale operations involving clayey soils such as are associated with the hazardous wastes at this property. Also, CDPHE's past interpretation of the "contained-in" policy required treatment of the material to a nondetectable level. This treatment standard is more restrictive than normal Land Disposal Restrictions standards.

C.5.2.5 Engineering Data

No RRM that exceeds EPA standards will remain in place. Approximately 16 cubic yards of assessed RRM will be removed under this alternative, all of which contain either RCRA-listed and/or RCRA-characteristic VOCs in concentrations exceeding the regulatory limits and TSCA-regulated toxic substances. The estimated subcontract cost for remedial action, which includes a 20-percent contingency factor for those costs, is approximately $143,500 (Table C–3). The subcontracted unit

cost to remove these tailings is approximately $7,475 per cubic yard. This unit cost is obtained by dividing the estimated subcontract cost (with no contingency) by the estimated quantity of tailings to be removed. No contingency factor was used in calculating the unit cost because one of the escalation factors accounted for in the 20-percent contingency is an increase in the quantity of material to be removed. The subcontract cost estimate does not include the costs associated with negotiating a consent agreement, bench-scale testing, development of work plans, and TAR oversight of the subcontractor.

Table C–3. Subcontract Cost Estimate for Alternative 2—Complete Remediation

No.	Task	Qty	Units	Unit Cost	Extended Cost
1	Mobilize/Demobilize	1	LS	$10,032.00	$10,032
2	Excavate/Drum Contaminated Material	62	55-gal Drums	$101.61	$6,300
3	Load/Haul Contaminated Material	62	Drums	$182.47	$11,313
4	Store/Treat/Dispose Contaminated Material	62	Drums	$1,297.00	$80,414
5	Backfill Remediated Area	22	tons	$101.24	$2,227
6	Install/Remove Personnel Decontamination Facility	256	ft^2	$9.41	$2,408
7	Install/Remove Equipment Decontamination Facility	1	LS	$6,898.04	$6,898
	Total Estimated Removal and Disposal Subcontract Cost				$119,593
	20 Percent Contingency				$23,919
	Total Estimated Remedial Action Cost (rounded)				**$143,500**

The above estimate assumes the following:

1. The estimate is based on 1997 dollars.
2. A licensed disposal facility has not been found that can accept these wastes. The above estimate assumes that the material can be shipped to Envirocare, Inc. in Utah for storage until that facility receives a pending license to permanently dispose or treat wastes of this composition. The Oak Ridge incinerator was not considered in this estimate.
3. This estimate does not address unforeseen legal complications associated with transportation and storage of these wastes.
4. The estimate does not address possible cost escalations due to the presence of a combination of RCRA- and TSCA-regulated materials, which may require multiple treatments at different facilities. The treatment apparatus would require decontamination to remove all RRM; if unsuccessful, the apparatus may require disposal as well.

Key: ft^2 = square feet
gal = gallon
LS = lump sum

C.5.3 Alternative 3—Partial Remediation/Supplemental Standards

A partial remediation alternative would include characterizing the RRM to define the extent and concentration of contaminants; establishing a cleanup standard for PCBs through negotiation with EPA; removing and disposing of that portion of the RRM that does not exceed the PCB cleanup standard or the applicable VOC authorized limits; and restoring the excavated area.

Alternative 3 is not applicable to these occurrences of RRM because existing data indicate that all of the RRM is commingled with PCBs at concentrations exceeding 2 ppm. This is a typical cleanup level required by EPA for deposits of PCB-contaminated material that have a discovery concentration equivalent to or greater than 50 ppm.

C.6 Summary

The commingled RRM that will remain on the site under Alternative 1—No Remediation/ Supplemental Standards will not pose a significant present or future human health risk due to the relatively low levels of radioactivity of the RRM and incomplete exposure pathways for workers and the public.

The subcontract cost of Alternative 2—Complete Remediation is excessive when compared to the health risk resulting from the RRM and the hazardous materials at the site. The estimated cost addresses only the PCBs; additional costs would be incurred to treat the VOC component of the commingled waste. In addition to the subcontract cost of remediation, additional unpredictable costs for administration, treatment, and disposal would be incurred in the course of obtaining approval from CDPHE to treat and dispose of the PCB- and VOC-contaminated material.

Alternative 3—Partial Remediation/Supplemental Standards is not applicable because data indicate all RRM contains TSCA-regulated PCB contamination.

The alternatives examined by this Application can be summarized as follows:

Alternative 1—No Remediation/Supplemental Standards
- Health Risk: See Table C–1 for health risk resulting from gamma exposure
- Estimated Subcontracted Construction Cost - $0
- Approximate Volume of Contaminated Materials Removed: 0 yd^3
- Approximate Volume of Contaminated Materials Remaining: 16 yd^3

Alternative 2—Complete Remediation
- Health Risk: Reduced to EPA Standards
- Estimated Subcontracted Construction Cost: $143,500
- Approximate Volume of Contaminated Materials Removed: 16 yd^3
- Approximate Volume of Contaminated Materials Remaining: 0 yd^3

Alternative 3—Partial Remediation/Supplemental Standards
- Not applicable because all RRM is commingled with PCBs.

C.7 Recommendations

Alternative 1—No Remediation/Supplemental Standards should be implemented under 40 CFR 192.21, Criteria C and D (see Section C.1).

Prepared by

Michael R. Widdop
Technical Reports Group

11/6/97
Date

Reviewed by

Gary Baur
UMTRA Construction Project Manager

11/6/97
Date

MACTEC ENVIRONMENTAL RESTORATION SERVICES, LLC

CONTRACT NO.: DE-AC13-96GJ87335
TASK ORDER NO.: 96-05.04

August 14, 1997

Mr. Tim Woodmansee
Property Administrator, City of Grand Junction
250 North Fifth Street
Grand Junction, Colorado 81501

Subject: Contract No. DE-AC13-96GJ87335—Application for Supplemental Standards for DOE ID No. GJ-00673-CS, Located at 531 South Avenue, Grand Junction, Colorado

Dear Mr. Woodmansee:

This letter is to inform you that MACTEC-ERS is proceeding with an Application for Supplemental Standards for approximately 16 cubic yards of residual radioactive material (RRM) remaining in two deposits at the subject property. Approximately 9 cubic yards of this RRM is contaminated with polychlorinated biphenyls (PCBs) and approximately 7 cubic yards of the RRM is contaminated with volatile organic compounds (VOCs) in the form of spent solvents and PCBs. As part of the process of applying supplemental standards, MACTEC-ERS has the responsibility to explain this process and solicit comments from the owner.

The U.S. Environmental Protection Agency supplemental standards procedures contained in 40 CFR 192 allow deposits of RRM to remain in place when one or more of the following situations exists: a) clear and present risk to workers and/or the general public; b) excessive environmental harm; c) excessive cost of land cleanup relative to long-term benefits for deposits of RRM that pose no clear present or future hazard; d) excessive cost of building cleanup relative to benefits; e) there is no known remedial action; or f) radionuclides other than Ra-226 exist. The presence of PCBs and VOCs makes the cost of cleaning up the remaining RRM very expensive. Therefore, Items "c" and "d" of the preceeding list are the justification that MACTEC-ERS will cite for this Application for Supplemental Standards. If this Application is approved, all of the RRM remaining in the two deposits will remain in place. Information concerning the depths, concentrations, and locations where MACTEC-ERS intends to apply supplemental standards is included as Attachment 1.

This letter extends to you the opportunity to comment or express any concerns that you may have about this Application for Supplemental Standards. It is requested that your response:

1. Acknowledge that this Application for Supplemental Standards has been explained to you or your staff in accordance with the Owner Notification Checklist (Attachment 2).

2. Indicates any proposed construction or land use changes in this area in the foreseeable future: and

3. Includes any other questions or comments you may have regarding this Application for Supplemental Standards.

2597 B 3/4 ROAD
GRAND JUNCTION, COLORADO 81503
970/248-6000 (FAX) 970/248-6040

Printed on recycled paper

If possible, please send you written comment to MACTEC–ERS by September 5, 1997. If you have any questions regarding this Application for Supplemental Standards, please contact me at (970) 248–6356.

Sincerely,

John E. Elmer
UMTRA Program Manager

MW/kd
Attachments (2)

cc w/: Jim Hams, Colorado Department of Public Health and Environment

cc w/o: Contract File (C. Spor)
D. Quamme
R. E. Bray
Records Management
Engineering File

Attachment 1

Radiological and Nonradiological Contamination Data Pertaining To GJ–00673–CS

Table 1. Summary of Radiological Data Identified in the Supplemental Standards Areas

Table 2. Health Risk Analysis for Alternative 1—No Remediation/Supplemental Standards

Table 3. Summary of Nonradiological Contamination Identified in the Supplemental Standards Areas

Figure A–1. Location Map

Figure A–2. Gamma Exposure Rates and Extent of Contamination

Attachment 2

Owner Notification "Checklist"

1. Explanation of EPA 40 CFR 192.12 standards and why the deposit exceeds the standards.

2. Explanation of EPA 40 CFR 192.21, Application of Supplemental Standards.

3. Explanation of which criteria potentially applies to the deposit(s).

4. Maps showing areas considered for supplemental standards.

5. Health risks associated with the gamma radiation and radon gas that is being emitted from the deposit(s). This should be in layman's language, presented scientifically correct and as simply as possible.

6. Include information that future health risks could be associated with building upon or disturbing the contaminated deposit(s).

7. Discuss alternate remedial actions or partial removals.

8. Reference must be made to the benefits of both removal and non-removal of the deposit(s).

9. The application should indicate the use of the approved checklist, as listed above.

10. Discuss the long-term status of the disposal cell.

11. Address any additional questions or concerns of the property owner.

K:\ENGR\TCWP6\UMTRA\GJVP\SUP-STD\GX0673LE.STD

October 31, 1997

City of Grand Junction, Colorado
250 North Fifth Street
81501-2668
FAX: (970)244-1599

Mr. John E. Elmer
UMTRA Program Manager
MACTEC-ERS
2597 B 3/4 Road
Grand Junction, CO 81503

Subject: Contract No. DE-AC13-96GJ87335 - Application for Supplemental Standards for DOE ID No.GJ-00673-CS, Located at 531 South Avenue, Grand Junction, Colorado

Dear Mr. Elmer:

The City of Grand Junction has received your letter regarding the intent of MACTEC-ERS to proceed with an Application for Supplemental Standards for approximately 16 cubic yards of residual radioactive material (RRM) remaining in two deposits at the subject property owned by the City. The City of Grand Junction opposes the Application for Supplemental Standards.

The subject property is the cornerstone of the City's South Downtown Redevelopment Project, the goals of which include beautifying the southern entrance to Grand Junction, promoting environmental protection and restoration, facilitating economic redevelopment and job creation, and facilitating community revitalization and public health protection through the cleanup and sustainable reuse of dilapidated and contaminated properties. Community interest in the South Downtown Redevelopment Project and future utilization of the subject property is well documented. Recently accomplished and planned redevelopment efforts include:

- Replacement of the Fifth Street Viaduct by the Colorado Department of Transportation;
- Public acquisition (with financial assistance from the Department of Energy) and redevelopment of the 50 acre Jarvis property;
- Public acquisition and redevelopment of the Dunn property;
- Public acquisition and redevelopment of the Lewis property;
- Public acquisition of the subject property;
- Public acquisition of other miscellaneous properties;
- Publicly funded removal of dilapidated structures;
- Development of a 12 acre botanical garden;
- Installation of the Colorado River Flood Control Levee;
- Construction of the Colorado River pedestrian bridge to Orchard Mesa;
- Development of Las Colonias Park (formerly the Climax Mill Site);
- Installation of paved foot trails from Las Colonias Park to Highway 50;
- The South Fifth Street Lighting and Streetscape Project (funded by a $500,000 Community Development Block Grant);
- A re-use feasibility study pertaining to the subject property conducted by the Colorado Department of Local Affairs.

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You letter states as justification for the Application for Supplemental Standards: a) excessive cost of land cleanup relative to long-term benefits for deposits of RRM that pose no clear present or future hazard, and; b) excessive cost of building cleanup relative to benefits. The City believes this justification is disputable.

The RRM deposits are located in surface areas without any controls and are subject to disturbance and human contact. The water table at the subject location is very shallow creating a potential to spread the RRM deposits. Consequently, the current health risk is quite high and allowing the RRM deposits to remain will pose a clear health hazard.

The City's plans for future use of the property will provide significant social and economic benefits to the community, including each and every goal of the City's South Downtown Redevelopment Project. Following remediation of the remaining RRM deposits, the property will be converted to uses associated with long spans of human occupancy. Child daycare, performing arts and public recreational activities are just a few of the uses being considered which are associated with long spans of human occupancy. Remediation of the remaining RRM deposits is the only issue preventing the City from implementing its plan to convert the property from a former steamplant to more desirable and beneficial uses.

The City believes the South Downtown Redevelopment Project will be jeopardized and future utilization of the subject property will be complicated or precluded in the event deposits of RRM are allowed to remain. Allowing the RRM deposits to remain will likely cause potential user groups and financial contributors to disassociate themselves from the subject property. Please consider the potential long term impacts of your Application for Supplemental Standards.

Thank you for the opportunity to comment. We look forward to working with you on this project and hope our concerns may be resolved in the best interests of the community.

Sincerely,

Tim Woodmansee

Tim Woodmansee

cc list attached.

cc: Grand Junction City Council
Mr. Mark Achen, City Manager
Mr. Dan Wilson, City Attorney
Mr. John Shaver, Assistant City Attorney
Mr. James Shanks, Director of Public Works and Utilities
Ms. Barbara Creasman, Director, Downtown Development Authority
Mr. John Schler, Colorado Department of Local Affairs
Ms. Jan McLean, Director, Museum of Western Colorado
Ms. Mary Brinton, Powerhouse Inc.
Mr. Kirk McConnell, Director, Doo Zoo Inc.
Mr. Frank Prager, Associate General Counsel, Public Service Company of Colorado
Mr. Jim Hams, Colorado Department of Public Health & Environment
Mr. Milt Lammering, United States Environmental Protection Agency

STATE OF COLORADO

Roy Romer, Governor
Patti Shwayder, Executive Director

Dedicated to protecting and improving the health and environment of the people of Colorado

Grand Junction Regional Office
222 S. 6th Street, Room 232
Grand Junction, Colorado 81501-2768
Fax (970) 248-7198

Colorado Department
of Public Health
and Environment

September 18, 1998

Mr. Michael Tucker
Project Manager
U.S. Department of Energy
2597 B 3/4 Road
Grand Junction, Colorado 81503

Re: Supplemental Standards GJ-00673-CC "Public Service Building"

Dear Mr. Tucker:

I have reviewed the supplemental standards application for the property at 531 South Avenue, Grand Junction, Colorado. I have also reviewed the commingled waste report, the health risk modeling, the City of Grand Junction comments, and the Walsh Environmental report.

This property has had hazardous wastes identified within the deposits of uranium mill tailings that exceed EPA Standards. No viable treatment or disposal options existed for such commingled wastes. The U.S. Department of Energy (DOE) has repeadedly stated that they do not have the authority to manage or accept hazardous wastes. Therefore, no remedial action has occured and a supplemental standards application, as allowed under the EPA Standards, has been submitted proposing to leave the tailings deposits in place.

The City of Grand Junction has opposed the use of supplemental standards due to future use of the property. If the use of the building is to be with high human occupancy, as suggested by the City, the presence of hazardous wastes, and to a much lesser degree the uranium tailings, could represent a potential health risk. The City has not solicited options for management of the deposits from the EPA or State of Colorado and it appears uncertain if the building will be remodeled or demolished. In its present state, it is abandoned and unused.

The EPA has recently published new PCB regulations which may allow more options for disposal. These new regulations have been published too late to allow the lengthy reviews by the EPA, DOE, State of Colorado, and NRC to determine if any of the deposits of PCB's would be regulated and what disposal options exist under the UMTRA Project authority. The UMTRA Project authority ends September 30, 1998.

I concur that the use of supplemental standards on this property meets the requirements of 40 CFR 192.21 © that the estimated cost of remedial action is unreasonably high relative to the long-term benefits, and the residual radioactive materials do not pose a clear present or future hazard.

If you have any questions, please call me at (970) 248-7170.

Sincerely,

Jim Hams

Jim Hams
Hazardous Materials and
Waste Management Division

cc: J. Elmer Mactec
C. Abrams NRC
T. Woodmansee City of Grand Junction

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

March 25, 1998

Mr. Michael K. Tucker
U.S. Department of Energy
Grand Junction Office
2597 B 3/4 Road
Grand Junction, CO 81503

MAR 30 1998

SUBJECT: REVIEW OF SUPPLEMENTAL STANDARDS APPLICATION FOR VICINITY PROPERTY GJ-00673-CS, SOUTH AVE.

The U.S. Nuclear Regulatory Commission (NRC) staff has completed its review of the Radiologic and Engineering Assessment (REA) for Vicinity Property GJ-00673 at 531 South Avenue, Grand Junction, Colorado. The subject supplemental standards application was submitted by the U.S. Department of Energy (DOE) by letter of November 10, 1997, and supplemented by information provided by DOE's letter of December 19, 1997. The REA proposes utilization of supplemental standards for two deposits of surface residual radioactive material (RRM) on the South Avenue property: 1) RRM commingled with Resource Conservation and Recovery Act (RCRA) characteristic and listed hazardous wastes on the exterior of a building at that location; and 2) RRM with RCRA and Toxic Substance Control Act (TSCA) hazardous waste in the basement of the unoccupied building.

DOE recommends that the deposits remain in place under supplemental standards based on 40 CFR 192.21 Criteria c and d, "the cost of remedial action ... is unreasonably high relative to the long-term benefits, and the residual radioactive materials do not pose a clear present or future hazard." In its REA, DOE evaluated three remedial action alternatives (no remediation, complete remediation, and partial remediation) and the associated health risks and determined that no significant health risks would occur from the application of a supplemental standard of "no remediation."

Based on its review of the data provided by DOE, the NRC staff concurs with the proposed application of supplemental standards for the South Avenue Vicinity Property. The staff's review is documented in the enclosed Technical Evaluation Report. If you have any questions concerning this letter or the enclosure, please contact Ms. Charlotte Abrams, of my staff, at (301) 415-5808.

Sincerely,

Charlotte Abrams for

Joseph J. Holonich, Chief
Uranium Recovery Branch
Division of Waste Management
Office of Nuclear Material Safety
and Safeguards

Enclosure: As stated

cc E. Artiglia, TAC Alb
R. Edge, DOE GRJ

TECHNICAL EVALUATION REPORT
REVIEW OF SUPPLEMENTAL STANDARDS APPLICATION
FOR VICINITY PROPERTY GJ-00673-CS, SOUTH AVE.

DATE: March 20, 1998

PROJECT MANAGER: Charlotte Abrams

TECHNICAL REVIEWER: Elaine Brummett

SUMMARY AND CONCLUSIONS:

On November 10, 1997, the U.S. Department of Energy (DOE) submitted the Radiologic and Engineering Assessment (REA) for Vicinity Property GJ-00673 at 531 South Avenue, Grand Junction, Colorado. The REA was supplemented by information provided by DOE's letter of December 19, 1997. The REA proposes utilization of supplemental standards for two deposits of surface residual radioactive material (RRM) on the South Avenue property: 1) RRM commingled with Resource Conservation and Recovery Act (RCRA) characteristic and listed hazardous wastes on the exterior of a building at that location, and 2) RRM with RCRA and Toxic Substance Control Act (TSCA) hazardous waste in the basement of the unoccupied building.

DOE recommends that the deposits remain in place under supplemental standards based on 40 CFR 192.21 Criteria c and d, "the cost of remedial action ... is unreasonably high relative to the long-term benefits, and the residual radioactive materials do not pose a clear present or future hazard." In its REA, DOE evaluated three remedial action alternatives (no remediation, complete remediation, and partial remediation) and the associated health risks, and determined that no significant health risks would occur from the application of a supplemental standard of "no remediation." Based on its review of the data provided by DOE, the NRC staff concurs with the proposed application of supplemental standards for the South Avenue Vicinity Property.

TECHNICAL EVALUATION:

The REA for Vicinity Property GJ-00673 at 531 South Avenue, Grand Junction, Colorado, proposes utilization of supplemental standards for two deposits of surface residual radioactive material (RRM) on the South Avenue property: 1) RRM commingled with Resource Conservation and Recovery Act (RCRA) characteristic and listed hazardous wastes on the exterior of a building at that location; and 2) RRM with RCRA and Toxic Substance Control Act (TSCA) hazardous waste in the basement of the unoccupied building.

The property is the site of the former Public Service Company steam plant and maintenance facility, and is now owned by the City of Grand Junction. The former property owner had some of the commingled material removed in 1990 (6-to-18 inches from two exterior deposits and approximately 10 inches from the interior deposit). Currently, three exterior deposits (in the northwest corner of the lot near loading dock) consist of an estimated 9 cubic yards (cys) of

Enclosure

RRM 6 inches in depth, containing polychlorinated biphenyls (PCBs) regulated under TSCA. The maximum estimated Ra-226 concentration of the exterior deposits is 28 pCi/g. The interior deposit consists of an estimated 7 cys of RRM commingled with RCRA wastes (volatile organic compounds), as well as with PCBs. This deposit is up to 11 inches deep and the estimated maximum remaining Ra-226 activity is 34 pCi/g.

DOE's REA indicates that a disposal site does not exist that will accept RCRA listed waste or TSCA regulated waste commingled with radioactive material. Treatment of such waste would require treatability studies and permits, and the treatment of material to remove the hazardous waste is not always successful. DOE also indicated that it does not have authority to manage the hazardous waste under the Uranium Mill Tailings Radiation Control Act because the waste is not related to the milling process, but was spilled on the tailings at the vicinity property.

DOE recommends that the deposits remain in place under supplemental standards based on 40 CFR 192.21 Criteria c and d, "the cost of remedial action ... is unreasonably high relative to the long-term benefits, and the residual radioactive materials do not pose a clear present or future hazard." DOE evaluated three remedial action alternatives (no remediation, complete remediation, and partial remediation) and the associated health risks and determined that no significant health risks would occur from the application of a supplemental standard of "no remediation." An additional health risk assessment provided by DOE on December 30, 1997, indicated a potential dose of 40 mrem/yr from the contaminated dirt basement floor, if the building were occupied. Further, a dose of 4 mrem/yr could occur if a slab were placed over the dirt.

Based on its review of the information provided, the NRC staff concurs with DOE's recommended alternative, application of supplemental standards for no remediation, because the cost of remediation is excessive in comparison to any likely health benefit that might result from remediation.

U.S. Department of Energy
Grand Junction Office
2597 B 3/4 Road
Grand Junction, CO 81503

DEC 19 1997

Mr. Joseph J. Holonich, Chief
High-Level Waste and Uranium Recovery Projects Branch
Division of Waste Management
Office of Nuclear Material Safety and Safeguards
Mail Stop T7J9
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Application for Supplemental Standards for 531 South Avenue (former Public Service Company), Grand Junction, CO

Dear Mr. Holonich:

We offer the following response to NRC's questions regarding the application for Supplemental Standards for the former Public Service Company building located at 531 South Avenue, Grand Junction, Colorado.

Information regarding the hazardous wastes located on the site has been transmitted to the city, owner of the property, on several occasions. The DOE has worked closely with Public Service, the former owner, and the city on trying to resolve the hazardous waste issues. The information was transmitted to the city's environmental consultant on December 11, 1996, and directly to the city officials on August 14, 1997, during the meeting where we briefed the city on the application.

The application on page C-12 states: "all diluted PCB-contaminated media with a concentration in excess of 2 ppm (the regulatory detection limit) must be treated as if it contained concentrations greater than 50 ppm." As documented in the enclosed May 1 memorandum, the 2 ppm standard was given to DOE from Dan Bench, PCB Coordinator for EPA Region VIII. The standard applies to the cleanup level for deposits, resulting from spills which had a concentration originating from a source above 50 ppm.

The cost estimate and footnotes for Alternative 2--Complete Remediation as shown in Table C-3, will be revised to reflect treatment. Page C-15 and page 2 of the REA (Section 2.0 Evaluation) were revised to reflect the new cost estimate.

The DOE will submit, under separate cover, a revised health risk analysis which incorporates internal exposure.

If you have any further questions, please contact John Elmer at 970/248-6356.

Sincerely,

Joseph E. Virgona
Project Manager

Enclosure

cc w/o enclosure:
J. Deckler, CDPHE–Denver
J. Hams, CDPHE–Grand Junction
J. Elmer, MACTEC-ERS
M. Widdop, MACTEC-ERS

jev\holonich.jee

U.S. Department of Energy
Grand Junction Office
2597 B 3/4 Road
Grand Junction, CO 81503

NOV 10 1997

Mr. Joseph H. Holonich, Chief
High-Level Waste and Uranium Recovery Projects Branch
Division of Waste Management
Office of Nuclear Material Safety and Safeguards
Mail Stop T7J9
U. S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: Approval of Remedial Action Design Package Utilizing Supplemental Standards for 531 South Avenue, (former Public Service Company) Grand Junction, Colorado

Dear Mr. Honolich:

Enclosed are two copies of the Radiologic and Engineering Assessment (REA) for the following location:

GJ-00673-CS 531 South Ave

The REA has been reviewed and approved by the Department of Energy (DOE) and is being forwarded to the Nuclear Regulatory Commission for their review and approval. The engineering assessment proposes utilization of EPA supplemental standards for an estimated 16 cubic yards of residual radioactive material (RRM), which are commingled with Resource Conservation and Recovery Act (RCRA) listed and Toxic Substance Control Act (TSCA) hazardous wastes. The depth of RRM ranges from 6 to 11 inches.

The area being proposed for supplemental standard is located on the grounds of the former Public Service Company (PSCo) now owned by the city of Grand Junction. This property is the site of the former (PSCo) steam plant and maintenance facility, which was housed in a two story brick building with a basement.

This supplemental standards application addresses two deposits of RRM on this property. An exterior deposit of RRM was left in place because it is commingled with polychlorinated biphenyls (PCBs). An interior deposit of RRM was left in place because it is commingled with volatile organic compounds (VOCs) and PCBs. The PCBs are regulated under (TSCA) while the VOCs are regulated under (RCRA) as characteristic or listed hazardous wastes.

The regulations governing PCB remediation, 40 CFR 761, contain provisions that discourage dilution of PCB-contaminated media. Disposal requirements for materials containing PCB concentrations of 50 ppm or greater may not be circumvented by either accidental or intentional

dilution—all diluted PCB-contaminated media with a concentration in excess of 2 ppm (the regulatory detection limit) must be treated as if it contained concentrations greater than 50 ppm. The commingled RRM in this application falls under these regulations.

Because a disposal site currently does not exist that will accept RCRA-listed and/or TSCA-regulated PCB waste commingled with RRM, the commingled waste material must be treated to remove the nonradiological contaminants from the RRM. Several treatment technologies may be required to selectively remove the VOCs and the PCBs from the RRM. Upon approval by EPA and CDPHE, the nonradiologic wastes can then be disposed of as appropriate. Treatment technologies and suitable treatment and disposal facilities must be identified.

Several methods exist for treating PCB-contaminated soil, including incineration, soil washing with solvents, thermal separation, and PCB dechlorination. Although incineration has been demonstrated to be the most practical method for treating PCB-contaminated soil, several problems would have to be overcome before this method can be applied to the waste on this property.

Several commercial vendors had expressed interest in using their treatment technology to treat the commingled waste onsite. All of these vendors stated that they would have to first conduct treatability studies on the material on a bench or pilot scale before cost and schedule estimates could be developed. Prior to conducting onsite treatment to remove PCBs, DOE would have to obtain a TSCA permit from EPA. Typically, a one year lead time is required to obtain a TSCA permit.

Additional permits and treatability studies may be required to treat the RCRA-regulated VOC waste components. Treatment of the listed waste would require a consent agreement between DOE and CDPHE. DOE and CDPHE attempted to negotiate a consent agreement for the treatment of characteristic waste, but were unable to reach consensus on the terms of the agreement. The DOE envisions that a consent agreement for listed waste will be more difficult to negotiate. The Permit-by Rule provisions being used to treat characteristic hazardous wastes do not apply to the listed wastes and PCB.

The hazardous waste component of the deposit was not generated by DOE, and DOE believes it does not have the authority to manage the hazardous waste under UMTRCA. Additionally, if the material is excavated by DOE and not successfully treated, DOE would probably inherit the responsibility for its ultimate disposal.

Although treatment methods such as thermal disorption are commercially available, they are not always successful on larger scale operations involving clayey soils such as are associated with the hazardous wastes at the PSCo property. Also, CDPHE's past interpretation of the "contained-in" policy required treatment of the material to nondeductible level. This treatment standards is more restrictive than normal Land Disposal Restrictions standards.

The DOE has evaluated three possible remedial action alternatives and the associated health risks, and has determined that no remediation is the best alternative. The Health Risk Analysis suggest that there are no identifiable significant health risks if supplemental standards are applied.

This proposed course of action has been discussed with Jim Hams, CDPHE, Grand Junction Office, and the property owner, the City of Grand Junction. Comments were received from the property owner, who opposes the use of supplemental standards and desires that DOE remove all RRM from the property.

The Owner Notification Checklist and copies of the characterization results were presented to representatives of the City of Grand Junction. The City of Grand Junction opposes the application of supplemental standards on the subject property because this property was acquired as part of the South Downtown Redevelopment Project, and the City intends to use the building for community purposes. Future uses are anticipated to result in long durations of human occupation. The City states that the RRM that will remain in place poses a health hazard because the contamination is located in surface areas without controls, and a high water table created a potential for spreading the RRM. The City feels that application of supplemental standards might complicate or prevent the conversion of the building and property to public use, with an attendant loss of long-term social and economic benefit, and will jeopardize the South Downtown Redevelopment Project.

The response of the City of Grand Junction does not address the nonradiological hazardous materials that are commingled with all remaining RRM. Because of the regulatory uncertainties and high cost of removing and disposing of the commingled waste on this property, DOE should not attempt to remove and dispose of the commingled waste. DOE is not the responsible party for the nonradiological component of the commingled waste and the DOE believes, on the basis of past legal advice, that DOE does not have the authority to assume the risk or liability for this waste. The RRM in the waste is shown to not present a risk to the public under reasonable use scenarios. If the City decides to redevelop the building for public use, the City has the option of either placing the commingled waste in temporary storage containers or placing a cap over the deposits of commingled waste.

The DOE also has agreed to prepare a database to track all deposits left behind on vicinity properties through the application of supplemental standards. The end user of this database appears to be CDPHE, who will use it to control RRM from being improperly disturbed or disposed.

The justification checklists, property condition description, considerations, cost application breakdown, justification and the property owner comments are included in the REA. In summary, the commingled RRM that would remain on the site under Alternatives 1-No Remediation/Supplemental Standards will not result in unacceptable health risks. Also, disposal and treatment options for these commingled wastes either do not exist on a commercial scale or

are inordinately and unpredictably expensive. For these reasons, the DOE recommends that no remediation be conducted on the remaining RRM. Although implementation of Alternative 2-Complete Remediation would result in meeting applicable standards, there are no significant health risks at present from the RRM left in place. This property is an industrial site and future land use will not likely change. Also, the $143,500 subcontract cost would be inordinately expensive relative to the minor risks of leaving 16 cubic yards of radiologically contaminated material in place. The supplemental standards application is being requested because remedial action would result in an estimated cost which is unreasonably high relative to the long-term health benefits (Criteria C) and because the cost of remedial action for cleanup of a building is unreasonably high relative to the benefits (Criteria D).

The GJO would appreciate timely review of this application because all UMTRA Project activities are scheduled to end this fiscal year. If you have any questions or require any additional information, please contact John Elmer of MACTEC-ERS at 970-248-6356 or myself at 970-248-6006.

Sincerely,

Joseph E. Virgona

Joseph E. Virgona
Project Manager

Enclosures (2)

cc w/o enclosures:
J. Deckler, CDPHE/Denver
J. Hams, CDPHE/Grand Junction
F. Bosiljerac, DOE- AL, ERD/UMTRA
J. Elmer, MACTEC-ERS

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Deposit A, located outside the northwest corner of the building and consisting of three separate contaminated soil areas, contains an estimated 9 cubic yards (yd^3) of RRM, 6 inches deep, distributed over an area of 45 square meters (m^2) or 484 square feet (ft^2). The RRM is commingled with PCBs in concentrations regulated under TSCA. The maximum measured Ra-226 concentration in the assessed area is 27.8 picocuries per gram (pCi/g).

Deposit H, located in the basement of the building, contains an estimated 7 yd^3 of RRM, 8 to 11 inches deep, distributed over an area of 20 m^2 (217 ft^2). The RRM is commingled with RCRA toxicity-characteristic and listed hazardous wastes and TSCA regulated waste. The maximum measured Ra-226 concentration in the assessed area is 51.5 pCi/g.

The following alternatives are evaluated in Appendix C:

Alternative 1—No Remediation/Supplemental Standards
Health Risk: No health risk from gamma exposure, possible future risk from exposure to nonradiological contaminants
Estimated Subcontracted Construction Cost: $ 0
Approximate Volume of Contaminated Materials Removed: 0 yd^3
Approximate Volume of Contaminated Materials Remaining: 16 yd^3

Alternative 2—Complete Remediation
Health Risk: Reduced to EPA standards
Estimated Subcontract Construction Cost:$286,500
Approximate Volume of Contaminated Materials Removed: 16 yd^3
Approximate Volume of Contaminated Materials Remaining: 0 yd^3

Alternative 3—Partial Remediation/Supplemental Standards
Not applicable because all RRM is commingled with PCBs.

3.0 Conclusions and Recommendations

The results of the analysis of health risks and engineering data in Appendix C indicate that implementation of Alternative 1—No Remediation/Supplemental Standards will not result in unacceptable health risks. Also, disposal and treatment options for these commingled wastes either do not exist currently on a commercial scale or are inordinately and unpredictably expensive. For these reasons, the TAR recommends that no remediation be conducted on the remaining RRM. The property owner, the City of Grand Junction, opposes this alternative. Although implementation of Alternative 2—Complete Remediation would result in meeting applicable standards, there are no significant health risks at present from the RRM left in place. This property is an industrial site and future land use will not likely result in a change of occupancy patterns. Also, the $286,500 subcontract cost would be inordinately expensive relative to the minor risk of leaving the radiologically contaminated material in place.

C.5.2 Alternative 2—Complete Remediation of All RRM

C.5.2.1 Work Description

This alternative includes conducting additional sampling to delineate the extent of radiological contamination; obtaining EPA approval to treat the PCBs and VOCs in the RRM; removing all remaining RRM from assessed Areas A and H; hauling the commingled RRM to a licensed treatment, storage, and disposal facility for treatment to remove PCBs and VOCs to below regulatory standards; and hauling the treated RRM to a RCRA-approved facility for permanent disposal.

C.5.2.2 Health Risk Analysis

The health risks in the supplemental standards application areas from RRM will be reduced to the level attained by meeting EPA cleanup standards. No risks resulting from exposure to the hazardous waste component of the commingled waste will remain.

C.5.2.3 Construction Parameters

Remediation operations for this alternative will include:

a. Characterize the commingled RRM.

b. Excavate all commingled RRM on the site.

c. Haul the commingled RRM to a licensed treatment, storage, and disposal facility to remove the hazardous waste and PCB contaminants to below regulated limits. Test the treated RRM to verify compliance with TSCA and RCRA regulatory limits.

d. Dispose of the treated-commingled RRM at a RCRA-approved facility.

e. Backfill the site with roadbase and restore to preremedial action condition.

C.5.2.4 Alternative-Specific Issues

The regulations governing PCB remediation, 40 CFR 761, contain provisions that discourage dilution of PCB-contaminated media. Disposal requirements for materials containing PCB concentrations of 50 ppm or greater may not be circumvented by either accidental or intentional dilution—all diluted PCB-contaminated media with a concentration in excess of 2 ppm (the regulatory detection limit) must be treated as if it contained concentrations greater than 50 ppm. The commingled RRM in Areas A and H fall under these regulations.

Because a disposal site currently does not exist that will accept TSCA-regulated PCB waste commingled with RRM, the commingled waste material must be treated to remove the PCBs from the RRM. Treatment technologies and suitable treatment and disposal facilities must be identified.

Several methods exist for treating PCB-contaminated soil, including incineration, soil washing with solvents, thermal separation, and PCB dechlorination. Although incineration has been demonstrated to be the most practical method for treating PCB-contaminated soil, several problems would have to be overcome before this method can be applied to the waste on this property. At this time, only one operating incinerator is licensed to treat radioactive material mixed with TSCA-regulated PCBs. This incinerator is operated by a DOE contractor in Oak Ridge, Tennessee. The treatment is expensive

(approximately $0.50 per pound, plus additional costs for characterization and transportation) and this facility has a backlog of work that would delay treatment for many years. Currently, this incinerator is not permitted to accept out-of-state waste for treatment. The incinerator also would treat the VOCs at the same time as the PCBs. Obtaining the necessary permits and approvals to set up an onsite incinerator to treat this small quantity of material would be economically and politically difficult, if not impossible.

Because incineration is not a feasible alternative, one of the other aforementioned treatment technologies would be considered. While researching treatment alternatives for the PCB-contaminated RRM on the Grand Junction Steel property, several commercial vendors had expressed interest in using their treatment technology to treat the commingled waste onsite. All of these vendors stated that they would have to first conduct treatability studies on the material on a bench or pilot scale before cost and schedule estimates could be developed. Prior to conducting onsite treatment to remove PCBs, DOE would have to obtain a TSCA permit from EPA. Typically, a one year lead time is required to obtain a TSCA permit.

Additional permits and treatability studies may be required to treat the RCRA-regulated VOC waste components. Treatment of the listed waste also would require a consent agreement between DOE and the Colorado Department of Public Health and Environment (CDPHE). DOE and the CDPHE attempted to negotiate a consent agreement for the treatment of characteristic waste but were unable to reach consensus on the terms of the agreement. The TAR envisions that a consent agreement for listed waste will be more difficult to negotiate. The Permit-by Rule provisions being used to treat characteristic hazardous wastes do not apply to listed wastes.

Excavation and handling of the contaminants associated with these deposits of RRM will necessitate the contracting of specially trained presonnel. Because not many subcontactors could meet the site-specific requirements, subcontract costs are expected to be higher than for a normal UMTRA remedial action that does not involve commingled waste.

The hazardous waste component of the deposit was not generated by DOE. DOE believes it does not have the authority to manage the hazardous waste under UMTRCA. Additionally, if the material is excavated by DOE and not successfully treated, DOE would probably inherit the responsibility for its ultimate disposal.

Although treatment methods such as incineration and thermal disorption are commercially available, they are not always successful on larger scale operations involving clayey soils such as are associated with the hazardous wastes at this property. Also, CDPHE's past interpretation of the "contained-in" policy required treatment of the material to a nondetectable level if it were to go to the Cheney disposal cell. This treatment standard is more restrictive than normal Land Disposal Restrictions standards. Delisting a RCRA-listed waste is difficult and time-consuming, if possible at all; therefore, the treated commingled RRM would probably have to be handled and disposed of as a RCRA-listed waste at an approved RCRA facility.

C.5.2.5 Engineering Data

No RRM that exceeds EPA standards will remain in place. Approximately 16 cubic yards of assessed RRM will be removed under this alternative, all of which contain either RCRA-listed and/or RCRA-characteristic VOCs in concentrations exceeding the regulatory limits and TSCA-regulated toxic substances. The estimated subcontract cost for remedial action, which includes a 20-percent contingency factor for those costs, is approximately $286,500 (Table C–3). The subcontracted unit cost to remove these tailings is approximately $17,906 per cubic yard. This unit cost is obtained by

dividing the estimated subcontract cost (with no contingency) by the estimated quantity of tailings to be removed. No contingency factor was used in calculating the unit cost because one of the escalation factors accounted for in the 20-percent contingency is an increase in the quantity of material to be removed. The subcontract cost estimate does not include the costs associated with negotiating a consent agreement, bench-scale testing, development of work plans, and TAR oversight of the subcontractor.

Table C–3. Subcontract Cost Estimate for Alternative 2—Complete Remediation

No.	Task	Qty	Units	Unit Cost	Extended Cost
1	Mobilize/Demobilize	1	LS	$10,032.00	$10,032
2	Excavate/Drum Contaminated Material	62	55-gal Drums	$101.61	$6,300
3	Characterize Contaminated Material	2	waste stream	$25,000	$50,000
4	Load/Haul Contaminated Material to Oak Ridge, Tennessee	62	Drums	$439.74	$27,264
5	Incinerate Contaminated Material	41,600	pounds	$.50	$20,800
6	Load/Haul Contaminated Material to Envirocare, Inc. in Clive, Utah	62	Drums	$521.98	$32,363
7	Dispose Contaminated Material	62	Drums	$1,297.00	$80,414
8	Backfill Remediated Area	22	tons	$101.24	$2,227
9	Install/Remove Personnel Decontamination Facility	256	ft^2	$9.41	$2,408
10	Install/Remove Equipment Decontamination Facility	1	LS	$6,898.04	$6,898
	Total Estimated Removal, Treatment, and Disposal Subcontract Cost				$238,706
	20 Percent Contingency				$47,741
	Total Estimated Remedial Action Cost (rounded)				**$286,500**

The above estimate assumes the following:

1. The estimate is based on 1997 dollars.
2. The cost estimate assumes that the contaminated material will be treated in the DOE Oak Ridge incinerator to remove the PCB contamination and then shipped to Envirocare, Inc. in Utah for disposal as RCRA-listed radiological waste.
3. This estimate does not address unforeseen legal complications associated with transportation, treatment, and disposal of these wastes.

Key: ft^2 = square feet
gal = gallon
LS = lump sum

C.5.3 Alternative 3—Partial Remediation/Supplemental Standards

A partial remediation alternative would include characterizing the RRM to define the extent and concentration of contaminants; establishing a cleanup standard for PCBs through negotiation with EPA; removing and disposing of that portion of the RRM that does not exceed the PCB cleanup standard or the applicable VOC authorized limits; and restoring the excavated area.

Alternative 3 is not applicable to these occurrences of RRM because existing data indicate that all of the RRM is commingled with PCBs at concentrations exceeding 2 ppm. This is a typical cleanup level required by EPA for deposits of PCB-contaminated material that have a discovery concentration equivalent to or greater than 50 ppm.

C.6 Summary

The commingled RRM that will remain on the site under Alternative 1—No Remediation/ Supplemental Standards will not pose a significant present or future human health risk due to the relatively low levels of radioactivity of the RRM and incomplete exposure pathways for workers and the public.

The subcontract cost of Alternative 2—Complete Remediation is excessive when compared to the health risk resulting from the RRM and the hazardous materials at the site. In addition to the subcontract cost of remediation, additional unpredictable costs for administration, treatment, and disposal would be incurred in the course of obtaining approval from CDPHE and EPA to treat and dispose of the PCB- and VOC-contaminated material.

Alternative 3—Partial Remediation/Supplemental Standards is not applicable because data indicate all RRM contains TSCA-regulated PCB contamination.

The alternatives examined by this Application can be summarized as follows:

Alternative 1—No Remediation/Supplemental Standards
- Health Risk: See Table C–1 for health risk resulting from gamma exposure
- Estimated Subcontracted Construction Cost - $0
- Approximate Volume of Contaminated Materials Removed: 0 yd^3
- Approximate Volume of Contaminated Materials Remaining: 16 yd^3

Alternative 2—Complete Remediation
- Health Risk: Reduced to EPA Standards
- Estimated Subcontracted Construction Cost:$286,500
- Approximate Volume of Contaminated Materials Removed: 16 yd^3
- Approximate Volume of Contaminated Materials Remaining: 0 yd^3

Alternative 3—Partial Remediation/Supplemental Standards
- Not applicable because all RRM is commingled with PCBs.

U.S. Department of Energy
Grand Junction Office
2597 B 3/4 Road
Grand Junction, CO 81503

DEC 30 1997

Mr. Joseph J. Holonich, Chief
High-Level Waste and Uranium Recovery Projects Branch
Division of Waste Management
Office of Nuclear Material Safety and Safeguards
Mail Stop T7J9
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Application for Supplemental Standards at 531 South Avenue (former Public Service Company Building), Grand Junction, Colorado

Dear Mr. Holonich:

We have revised the Health Risk Assessment for the application of Supplemental Standards for the former Public Service Company Building located at 531 South Avenue, Grand Junction, Colorado. As requested, the Health Risk Assessment now includes internal pathways and considers a change of use from the currently vacant building to a generic building occupancy scenario. We have chosen an interior deposit as the worst case because any exposure from an exterior deposit would be less than an interior deposit.

The RESRAD-BUILD Version 2.10 software was used to model the pathways. Two scenarios were considered, one with exposed earth (tailings) and one with a concrete floor over the tailings.

The enclosed table indicates the assumptions used to build the model. The "most likely case" is an average of the five receptors shown on the drawing. The "reasonable maximum exposure case" is for receptor #1, which models someone sitting over the deposit. As you can see, the Total Effective Dose Equivalent is 40.1 millirem/year for the reasonable maximum exposure case. This is still well below the 100 millirem/year standard cited in the application. Because the building is unlikely to be occupied without a concrete slab over the deposit, the more realistic dose equivalent ranges from 2 to 4 millirem/year.

Also, a copy of this letter and the December 19, 1997 clarification letter will be forwarded to the owner, the city of Grand Junction, so that the owner has the complete documentation.

If you have any questions, please contact Michael K. Tucker at 970/248-6004 or John Elmer at 970/248-6356.

Sincerely,

Joseph E. Virgona
Project Manager

Enclosure

cc w/enclosure:
J. Deckler, CDPHE-Denver
J. Hams, CDPHE-GJ
J. Elmer, MACTEC-ERS
M. Widdop, MACTEC-ERS

jev/psco.doc

MACTEC ENVIRONMENTAL RESTORATION SERVICES, LLC

CONTRACT NO.: DE-AC13-96GJ87335
TASK ORDER NO.:
CONTROL NO.: 3100-

MEMO TO: John Elmer

FROM: Jeffrey Lively

DATE: 23 December 1997

SUBJECT: Radiological Pathway Exposure Modeling on UMTRA Property #GJ-00673-CS

A copy of the MACTEC-ERS Health Safety & Radiation Protection calculation #HP-Q-A54 which details the results of computer modeling of potential public dose at the subject site is enclosed. I evaluated the exposure potential in two variations on an anticipated reasonable exposure scenario; with and without a concrete slab over the contaminated deposit.

The model provides output results for each nuclide and for each pathway as well as a summary or total dose from all sources and all pathways combined. The specific question raised by the regulators as to the inhalation dose from the residual radioactive material identified in the supplemental standards application is answered in detail and summarized in my synopsis.

Should you or the regulators have any further questions, please don't hesitate to call.

cc: Contract File (C. Spor)
Project File Index: HSS 2.6
M. Hurshman
S. Rima

M. Widdop

F:\HOME\J50834\PROJECTS\GJ-00673.MEM

Document Title Sheet

Document No. **HP-Q-A54**

Document Title: **Evaluation of Potential Future Radiological Dose Resulting from Radiological Deposit Using RESRAD-BUILD**

Rev #	Revision Date	Originator Name/Signature	Tech. Reviewer Name/Signature	Revisor Name/Signature	Project(s)
0	12/23/97	J. Lively	V. King	N/A	UMTRA GJ-00673-CS
				N/A	

Description of Document / Purpose

A microcomputer pathway modeling code was used to predict the potential dose to a member of the public as a result of leaving radiologically contaminated soil in place in a deposit within a structure. The code RESRAD-BUILD, version 2.10, July 1996 was used to model the exposure scenario. A summary of the evaluation as well a copies of the reports from the modeling calculations are attached.

This computer modeling provides an estimate of the total effective dose and a pathway specific dose estimate. This modeling was performed in response to a request from the NRC for more detailed pathway specific information related to the application for supplemental standards at this site.

Description of Revision / Purpose for Revision

NA

This work is in response to the NRC's request for additional information concerning the exposure potential resulting from the remaining residual radiological material and the application of supplemental standards. Specifically, the NRC requested potential future dose information from the inhalation exposure pathway.

In order to analyze this pathway, the microcomputer modeling code RESRAD-BUILD was used. This model evaluates the source term and provides pathway specific and summary dose estimates for the modeled scenario. In the application for supplemental standards, a Radiologic and Engineering Assessment considered the potential future doses to a member of the public using point measurements of the gamma exposure rate at ground surface level and extrapolated these to arrive at the number of hours a person could be exposed without exceeding published public dose limits. This method has been used consistently for such evaluations in support of supplemental standards applications. Pathway analysis models, however, require that a specific exposure scenario be developed for input to the model. In this way, the method used here deviates from that historically used in UMTRA supplemental standards evaluations.

The scenario constructed for this evaluation is considered to be a reasonable approximation of the maximally exposed member of the public as a result of future use of the property on which no subsequent cleanup is effected. The scenario describes an individual's expose to radiation and contamination resulting from the radiological deposit contained inside the building, deposit "H." A deposit of radioactive material exists outside of the structure on this property, but since the question raised by the NRC involves the dose potential for the inhalation pathway, the contaminated soil inside the structure provides the best estimate of the highest inhalation dose obtainable on this property. Thus, the exterior source was not modeled.

The scenario constructed and modeled is one in which the building is used at some time in the future to house an enterprise which operates essentially as a business. The exposure and occupancy factors used to characterize the receptors are typical for a workplace. The structure is currently unfit for occupancy. It was formerly an industrial facility used by an electric power utility. Extensive renovation and improvement would be necessary for any future occupancy to occur. It is estimated that, with substantial improvement, the current future useful life of the structure is no more than 100 years. Several conservative assumptions were made to bound the potential future exposures to workers and others in this building. Perhaps most significant among these is the assumption that no improvement is made to the dirt floor in the basement where the contaminated deposit is located. Therefore, the assumption of no improvement tends to overstate the resulting dose estimates.

Table 1 presents the computer modeling code input parameters that define the exposure scenario for future use of this structure.

Table 1. Future Use of the Building Scenario

Input Parameter	Value Used	Model Default	Remarks
Receptor Characteristics			
Number of Receptor Locations	5	NA	Receptors located in the basement—the level closest to the radiological deposit. One receptor is stationed directly over the deposit for the entire time of occupancy of the building. This approximates the worst-case receptor position with respect to the source. The mean receptor dose in the building could be approximated by the arithmetic mean of the individual receptor doses.
Days per Year	240	365	Assume typical work year with two weeks vacation, five holidays, and five personal/sick days per year (48 work weeks).
Fraction of Time Indoors	0.292	0.5	.292 is seven of 24 hours indoors. This accounts for the reasonable maximum period a worker spends inside the building during the work day.
Fraction of Time in Room	1	1	Maximum case (default).
Inhalation Rate (m^3/day)	20	18	EPA recommended default value is substituted for ICRP recommended value used as a default in the code.
Ingestion Rate (m^2/hour)	0.0001	0.0001	Default.
Source Characteristics			
Number of Sources	1	NA	Deposit "H"
Source Geometry	Volume	NA	Best source geometry match. 20m^2 by 0.3m thick.
Source Concentration (pCi/g) U-234 U-235 U-238 Th-230 Ra-226	 1.74 E+0 8.28 E-2 1.74 E+0 2.18 E+1 2.18 E+1	NA	Ratio based on a typical isotopic ratio of radionuclides found in uranium mill tailings (Technical Basis Document for Internal Dosimetry) and radium characterization data for deposit "H."
Erosion Rate (cm/day)	5.5 E-5*	2.4 E-8	Allows for 2 centimeters of the contaminated surface to be eroded over the evaluation period. This is very conservative since the grade of the contaminated region is at least 12 inches below the grade necessary to improve the building for occupancy. At a minimum, one foot of clean fill material would be brought in to cover this area before occupancy would be reasonable. In the scenario in which a concrete slab is installed over the area, the default erosion rate is used.
Air Release Fraction	0.01	0.1	Contamination medium not readily aerosolized.
Radon Emanation Fraction	0.35	0.2	0.35 recommended NRC default parameter. USNRC RegGuide 3.64, "Calculation of Radon Flux Attenuation by Earthen Uranium Mill Tailings Covers," June 1989.

Input Parameter	Value Used	Model Default	Remarks
Release Period (days)	36,500	365	36,500 days is equal to the 100-year future life expectancy of the building.
Shielding Thickness (cm)*	15	NA	The model was run first with no improved flooring over the radiological deposit and then with a 6 inch (15 cm) concrete slab floor over the deposit. The concrete floor represents the most likely future case.
Shielding Material Density (g/cm^3)	2.35	NA	Concrete density estimate (Health Physics and Radiological Health Handbook).
Building Characteristics			
Number of Rooms	1	1	The building consists of several structures appended to the original. They are largely open to one another with little or no impediment of airflow and few interior partitions.
Air Exchange Rate (1/hour)	0.4	0.8	Value used (0.4/hr) is more conservative than existing conditions and more conservative than the model default value. The value used is based on professional judgement of a resident civil engineer.
Dimensions: Area (m^2) Eff. Height (m)	 2187 7.9	NA	Effective height is the height necessary to compensate the air model for the multistory variability in structure height. Most of the structure is two stories above a basement. Area is measured.
General Factors			
Evaluation Periods (Years)	0, 1, 5, 20, 100	NA	Assumes a 100-year future life for the structure. Five periods evaluated to demonstrate dose trends over time.
Deposition Velocity (m/sec)	0.01	0.01	Default
Resuspension Factor (1/sec)	5.0 E–7	5.0 E–7	Default

Key:

cm = centimeter(s)
g/cm^3 = gram(s) per cubic centimeter(s)
m = meter(s)
m^2 = square meter(s)
m^3 = cubic meter(s)
NA = not applicable
pCi/g = picocurie(s) per gram
sec = second(s)

Note: See RESRAD-BUILD computer run (Appendix A).

The summary of the modeling results (presented in Table 2 below) indicates that the future potential dose to members of the public occupying and using this structure is well within the

allowable public dose limits. Specifically, the dose from the inhalation pathway is small compared to the pathway resulting in the highest dose—external radiation dose. As expected, the maximally exposed individual in the case modeled is the receptor stationed directly over the deposit. This receptor's dose is presented as the RME case. The arithmetic mean dose of all receptors considered is presented as the most likely case. The modeling shows that the external (gamma) radiation component from the Ra-226 is approximately two orders of magnitude more significant than any other exposure pathway.

Table 2, Summary Estimated Future Public Dose

	Earthen Floor		**Concrete Slab over Deposit**	
	Total Effective Dose Equivalent (mrem/y)	Inhalation Dose (mrem/y)	Total Effective Dose Equivalent (mrem/y)	Inhalation Dose (mrem/y)
Most Likely Case	9	<0.1	2	<<<0.1
Reasonable Maximum Exposure Case	40.1	<0.1	4	<<<0.1

Appendix A

RESRAD-Build Computer Modeling Results

RESRAD-BUILD Table of Contents

Input Parameters..... 0-1
For Each Time (I) :.....
   Time Specific Parameters..... I-1
   Receptor-Source Dose Summary..... I-2
   Dose by Pathway Detail..... I-3
   Dose by Nuclide Detail..... I-4
Full Summary..... F-1

Title : UMTRA - Public Service Building
Input File : C:\WINBLD\GJ-0673C.I

RESRAD-BUILD Input Parameters

Number of Sources : 1
Number of Receptors: 5
Total Time : 2.400000E+02 days
Fraction Inside : 2.920000E-01

Receptor Information

Receptor	Room	x [m]	y [m]	z [m]	FracTime	Inhalation [m3/day]	Ingestion(Dust) [m2/hr]
1	1	26.000	26.000	1.000	1.000	2.00E+01	1.00E-04
2	1	4.000	20.000	1.000	1.000	2.00E+01	1.00E-04
3	1	46.000	31.000	1.000	1.000	2.00E+01	1.00E-04
	1	58.000	18.000	1.000	1.000	2.00E+01	1.00E-04
	1	76.000	4.000	1.000	1.000	2.00E+01	1.00E-04

Receptor-Source Relationship

Recept	Source 1 Density [g/cm3]	Thickness [cm]	Or
1	2.35E+00	1.50E+01	RT
2	2.35E+00	1.50E+01	RT
3	2.35E+00	1.50E+01	RT
4	2.35E+00	1.50E+01	RT
5	2.35E+00	1.50E+01	RT

Building Information

Building Air Exchange Rate: 4.00E-01 1/hr

```
Height[m]          Air Exchanges [m3/hr]
Area [m2]
                  ******************************
                  *                            *
                  *                            *
                  *                            <=Q01: 6.91E+03
H1:    7.900      *            Room  1         *      Q10 :  6.91E+03
                  *   LAMBDA: 4.00E-01         *
Area2187.000      *                            *
                  *                            *
                  ******************************
```

Deposition velocity: 1.00E-02 [m/s] Resuspension Rate: 5.00E-07 [1/s]

Source Information

Source: 1
Location:: Room : 1 x: 26.00 y: 26.00 z: 0.00[m]
Geometry:: Type: Volume Area:2.00E+01 [m2] Direction: z
Pathway ::
Direct Ingestion Rate: 0.000E+00 [gm/hr]
Fraction released to air: 1.000E-02

Containment :: Number of Regions: 1 Contaminated Region: 1

Region	: 1
Thickness [cm]	:3.00E+01
Density [g/cm3]	:1.60E+00
Erosion Rate [cm/day]	:2.40E-08
Porosity	:4.10E-01
Eff. Diffusion [m2/s]	:2.00E-05
Emanation Fractions(1)	:2.00E-01
(2)	:3.50E-01

ntamination::

Nuclide	Concentration [pCi/g]	Dose Conversion Factors: Ingestion [mrem/pCi]	Inhalation [mrem/pCi]	External (Surface) [mrem/yr/(pCi/m2)]	External (Volume) [mrem/yr/(pCi/m3)]	Submersion [mrem/yr/(pCi/m3)]
U-238	1.740E+00	2.500E-04	1.200E-01	3.530E-06	9.510E-08	1.600E-04
U-235	8.280E-02	2.500E-04	1.200E-01	1.950E-05	4.740E-07	9.030E-04
U-234	1.740E+00	2.600E-04	1.300E-01	8.750E-08	2.520E-10	8.930E-07
PA-231	0.000E+00	1.100E-02	1.300E+00	4.760E-06	1.190E-07	2.010E-04
TH-230	2.180E+01	5.300E-04	3.200E-01	8.780E-08	7.570E-10	2.040E-06
AC-227	0.000E+00	1.500E-02	6.700E+00	4.530E-05	1.260E-06	2.160E-03
RA-226	2.180E+01	1.100E-03	7.900E-03	1.940E-04	7.000E-06	1.040E-02
PB-210	0.000E+00	6.700E-03	2.100E-02	4.140E-07	3.820E-09	1.430E-05

Title : UMTRA - Public Service Building
Input File : C:\WINBLD\GJ-0673C.IEvaluation Time: 0.000000 years

Assessment for Time: 1
Time =0.00E+00 yr

Source Information

Source: 1
Location:: Room : 1 x: 26.00 y: 26.00 z: 0.00 [m]
Geometry:: Type: Volume Area:2.00E+01 [m2] Direction: z
Pathway ::
Direct Ingestion Rate :0.000E+00 [gm/hr]
Fraction released to air: 1.000E-02

Containment :: Number of Regions: 1 Contaminated Region: 1

Region	: 1
Thickness [cm]	:3.00E+01
Fraction Contaminated	:1.00E+00
Density [g/cm3]	:1.60E+00
Porosity	:4.10E-01
Eff. Diffusion [m2/s]	:2.00E-05
Emanation Fractions(1)	:2.00E-01
(2)	:3.50E-01
Erosion Rate [cm/day]	:2.40E-08

Contamination::

Nuclide	Concentration [pCi/g]
U-238	1.740E+00
U-235	8.280E-02
U-234	1.740E+00
PA-231	0.000E+00
TH-230	2.180E+01
AC-227	0.000E+00
RA-226	2.180E+01
PB-210	0.000E+00

RESRAD-BUILD Dose Tables

Receptor Point-Source Doses

[mrem]

	Source 1	Total
Receptor 1	4.0E+00	4.0E+00
Receptor 2	5.8E-01	5.8E-01
Receptor 3	5.8E-01	5.8E-01
Receptor 4	5.6E-01	5.6E-01
Receptor 5	5.6E-01	5.6E-01
Total	6.3E+00	6.3E+00

Pathway Detail of Doses

[mrem]

Source: 1

Receptor	External	Deposition	Immersion	Inhalation	Radon	Ingestion
1	3.42E+00	5.09E-09	2.02E-11	4.93E-06	5.54E-01	5.68E-08
2	2.10E-02	5.09E-09	2.02E-11	4.93E-06	5.54E-01	5.68E-08
3	2.58E-02	5.09E-09	2.02E-11	4.93E-06	5.54E-01	5.68E-08
4	1.00E-02	5.09E-09	2.02E-11	4.93E-06	5.54E-01	5.68E-08
5	3.75E-03	5.09E-09	2.02E-11	4.93E-06	5.54E-01	5.68E-08
Total	3.48E+00	2.55E-08	1.01E-10	2.46E-05	2.77E+00	2.84E-07

Nuclide Detail of Doses

[mrem]

Source: 1

Nuclide	Receptor 1	Receptor 2	Receptor 3	Receptor 4	Receptor 5	Total
U-238						
U-238	2.56E-03	1.59E-05	1.94E-05	7.63E-06	2.95E-06	2.61E-03
U-235						
U-235	2.75E-05	1.75E-07	2.13E-07	8.67E-08	3.66E-08	2.80E-05
U-234						
U-234	2.19E-07	1.48E-07	1.48E-07	1.48E-07	1.48E-07	8.10E-07
TH-230						
TH-230	1.15E-05	4.59E-06	4.60E-06	4.57E-06	4.55E-06	2.98E-05
RA-226						
RA-226	3.97E+00	5.75E-01	5.80E-01	5.64E-01	5.58E-01	6.25E+00

Assessment for Time: 2
Time =1.00E+00 yr

Source Information

Source: 1

Location:: Room : 1 x: 26.00 y: 26.00 z: 0.00 [m]
Geometry:: Type: Volume Area:2.00E+01 [m2] Direction: z
Pathway ::
Direct Ingestion Rate :0.000E+00 [gm/hr]
Fraction released to air: 1.000E-02

Containment :: Number of Regions: 1 Contaminated Region: 1

Region	: 1
Thickness [cm]	:3.00E+01
Fraction Contaminated	:1.00E+00
Density [g/cm3]	:1.60E+00
Porosity	:4.10E-01
Eff. Diffusion [m2/s]	:2.00E-05
Emanation Fractions(1)	:2.00E-01
(2)	:3.50E-01
Erosion Rate [cm/day]	:2.40E-08

Contamination::

Nuclide	Concentration [pCi/g]
U-238	1.740E+00
U-235	8.280E-02
U-234	1.740E+00
PA-231	1.751E-06
TH-230	2.180E+01
AC-227	2.768E-08
RA-226	2.180E+01
PB-210	6.675E-01

RESRAD-BUILD Dose Tables

Receptor Point-Source Doses

[mrem]

	Source 1	Total
Receptor 1	4.0E+00	4.0E+00
Receptor 2	5.8E-01	5.8E-01
Receptor 3	5.8E-01	5.8E-01
Receptor 4	5.6E-01	5.6E-01
Receptor 5	5.6E-01	5.6E-01
Total	6.3E+00	6.3E+00

Pathway Detail of Doses

[mrem]

Source: 1

Receptor	External	Deposition	Immersion	Inhalation	Radon	Ingestion
1	3.42E+00	5.09E-09	2.02E-11	4.94E-06	5.54E-01	6.36E-08
2	2.10E-02	5.09E-09	2.02E-11	4.94E-06	5.54E-01	6.36E-08
3	2.58E-02	5.09E-09	2.02E-11	4.94E-06	5.54E-01	6.36E-08
4	1.00E-02	5.09E-09	2.02E-11	4.94E-06	5.54E-01	6.36E-08
5	3.75E-03	5.09E-09	2.02E-11	4.94E-06	5.54E-01	6.36E-08
Total	3.48E+00	2.55E-08	1.01E-10	2.47E-05	2.77E+00	3.18E-07

Nuclide Detail of Doses

[mrem]

Source: 1

Nuclide	Receptor 1	Receptor 2	Receptor 3	Receptor 4	Receptor 5	Total
U-238						
U-238	2.56E-03	1.59E-05	1.94E-05	7.63E-06	2.95E-06	2.61E-03
U-234	6.19E-13	4.19E-13	4.19E-13	4.18E-13	4.18E-13	2.29E-12
TH-230	1.17E-17	4.67E-18	4.68E-18	4.65E-18	4.63E-18	3.03E-17
RA-226	5.16E-16	7.48E-17	7.54E-17	7.34E-17	7.26E-17	8.13E-16
PB-210	1.49E-23	2.51E-25	2.71E-25	2.03E-25	1.76E-25	1.58E-23
U-235						
U-235	2.75E-05	1.75E-07	2.13E-07	8.67E-08	3.66E-08	2.80E-05
PA-231	6.85E-10	5.71E-12	6.66E-12	3.51E-12	2.26E-12	7.03E-10
AC-227	1.56E-10	1.08E-12	1.29E-12	5.74E-13	2.89E-13	1.59E-10
U-234						
U-234	2.19E-07	1.48E-07	1.48E-07	1.48E-07	1.48E-07	8.10E-07
TH-230	8.27E-12	3.30E-12	3.31E-12	3.28E-12	3.27E-12	2.14E-11
RA-226	6.19E-10	8.96E-11	9.04E-11	8.79E-11	8.70E-11	9.74E-10
PB-210	7.67E-17	1.29E-18	1.39E-18	1.04E-18	9.05E-19	8.13E-17
TH-230						
TH-230	1.15E-05	4.59E-06	4.60E-06	4.57E-06	4.55E-06	2.98E-05
RA-226	1.72E-03	2.49E-04	2.51E-04	2.45E-04	2.42E-04	2.71E-03
PB-210	3.19E-10	5.36E-12	5.80E-12	4.34E-12	3.77E-12	3.38E-10
RA-226						
RA-226	3.97E+00	5.75E-01	5.80E-01	5.64E-01	5.58E-01	6.25E+00
PB-210	1.46E-06	2.46E-08	2.66E-08	1.99E-08	1.73E-08	1.55E-06

Title : UMTRA - Public Service Building
Input File : C:\WINBLD\GJ-0673C.IEvaluation Time: 5.00000 years

Assessment for Time: 3
Time =5.00E+00 yr

Source Information

Source: 1
Location:: Room : 1 x: 26.00 y: 26.00 z: 0.00 [m]
Geometry:: Type: Volume Area:2.00E+01 [m2] Direction: z
Pathway ::
Direct Ingestion Rate :0.000E+00 [gm/hr]
Fraction released to air: 1.000E-02

Containment :: Number of Regions: 1 Contaminated Region: 1

Region	: 1
Thickness [cm]	:3.00E+01
Fraction Contaminated	:1.00E+00
Density [g/cm3]	:1.60E+00
Porosity	:4.10E-01
Eff. Diffusion [m2/s]	:2.00E-05
Emanation Fractions(1)	:2.00E-01
(2)	:3.50E-01
Erosion Rate [cm/day]	:2.40E-08

Contamination::

Nuclide	Concentration [pCi/g]
U-238	1.740E+00
U-235	8.280E-02
U-234	1.740E+00
PA-231	8.753E-06
TH-230	2.180E+01
AC-227	6.636E-07
RA-226	2.180E+01
PB-210	3.139E+00

RESRAD-BUILD Dose Tables

Receptor Point-Source Doses

[mrem]

	Source 1	Total
Receptor 1	4.0E+00	4.0E+00
Receptor 2	5.8E-01	5.8E-01
Receptor 3	5.8E-01	5.8E-01
Receptor 4	5.6E-01	5.6E-01
Receptor 5	5.6E-01	5.6E-01
Total	6.3E+00	6.3E+00

Pathway Detail of Doses

[mrem]

Source: 1

Receptor	External	Deposition	Immersion	Inhalation	Radon	Ingestion
1	3.42E+00	5.09E-09	2.02E-11	4.97E-06	5.54E-01	8.87E-08
2	2.10E-02	5.09E-09	2.02E-11	4.97E-06	5.54E-01	8.87E-08
3	2.58E-02	5.09E-09	2.02E-11	4.97E-06	5.54E-01	8.87E-08
4	1.00E-02	5.09E-09	2.02E-11	4.97E-06	5.54E-01	8.87E-08
5	3.75E-03	5.09E-09	2.02E-11	4.97E-06	5.54E-01	8.87E-08
Total	3.48E+00	2.55E-08	1.01E-10	2.48E-05	2.77E+00	4.44E-07

Nuclide Detail of Doses

[mrem]

Source: 1

Nuclide	Receptor 1	Receptor 2	Receptor 3	Receptor 4	Receptor 5	Total
U-238						
U-238	2.56E-03	1.59E-05	1.94E-05	7.63E-06	2.95E-06	2.61E-03
U-234	3.09E-12	2.09E-12	2.10E-12	2.09E-12	2.09E-12	1.15E-11
TH-230	2.93E-16	1.17E-16	1.17E-16	1.16E-16	1.16E-16	7.58E-16
RA-226	7.28E-14	1.06E-14	1.06E-14	1.04E-14	1.02E-14	1.15E-13
PB-210	3.29E-20	5.53E-22	5.98E-22	4.48E-22	3.88E-22	3.49E-20
U-235						
U-235	2.75E-05	1.75E-07	2.13E-07	8.67E-08	3.66E-08	2.80E-05
PA-231	3.43E-09	2.86E-11	3.33E-11	1.75E-11	1.13E-11	3.52E-09
AC-227	3.74E-09	2.58E-11	3.10E-11	1.37E-11	6.93E-12	3.81E-09
U-234						
U-234	2.19E-07	1.48E-07	1.48E-07	1.48E-07	1.48E-07	8.10E-07
TH-230	4.14E-11	1.65E-11	1.65E-11	1.64E-11	1.64E-11	1.07E-10
RA-226	1.55E-08	2.24E-09	2.26E-09	2.20E-09	2.17E-09	2.43E-08
PB-210	9.29E-15	1.56E-16	1.69E-16	1.26E-16	1.10E-16	9.85E-15
TH-230						
230	1.15E-05	4.59E-06	4.60E-06	4.57E-06	4.55E-06	2.98E-05
226	8.60E-03	1.25E-03	1.26E-03	1.22E-03	1.21E-03	1.35E-02
PB-210	7.66E-09	1.29E-10	1.39E-10	1.04E-10	9.03E-11	8.12E-09
RA-226						
RA-226	3.96E+00	5.74E-01	5.79E-01	5.63E-01	5.57E-01	6.24E+00
PB-210	6.88E-06	1.16E-07	1.25E-07	9.37E-08	8.12E-08	7.30E-06

Assessment for Time: 4
Time =2.00E+01 yr

Source Information

Source: 1
Location:: Room : 1 x: 26.00 y: 26.00 z: 0.00 [m]
Geometry:: Type: Volume Area:2.00E+01 [m2] Direction: z
Pathway ::
Direct Ingestion Rate :0.000E+00 [gm/hr]
Fraction released to air: 1.000E-02

Containment :: Number of Regions: 1 Contaminated Region: 1

Region	: 1
Thickness [cm]	:3.00E+01
Fraction Contaminated	:1.00E+00
Density [g/cm3]	:1.60E+00
Porosity	:4.10E-01
Eff. Diffusion [m2/s]	:2.00E-05
Emanation Fractions(1)	:2.00E-01
(2)	:3.50E-01
Erosion Rate [cm/day]	:2.40E-08

Contamination::

Nuclide	Concentration [pCi/g]
U-238	1.740E+00
U-235	8.280E-02
U-234	1.740E+00
PA-231	3.501E-05
TH-230	2.180E+01
AC-227	9.142E-06
RA-226	2.180E+01
PB-210	1.010E+01

RESRAD-BUILD Dose Tables

Receptor Point-Source Doses

[mrem]

	Source 1	Total
Receptor 1	4.0E+00	4.0E+00
Receptor 2	5.8E-01	5.8E-01
Receptor 3	5.8E-01	5.8E-01
Receptor 4	5.6E-01	5.6E-01
Receptor 5	5.6E-01	5.6E-01
Total	6.3E+00	6.3E+00

Pathway Detail of Doses

[mrem]

Source: 1

Receptor	External	Deposition	Immersion	Inhalation	Radon	Ingestion
1	3.42E+00	5.10E-09	2.02E-11	5.06E-06	5.54E-01	1.60E-07
2	2.10E-02	5.10E-09	2.02E-11	5.06E-06	5.54E-01	1.60E-07
3	2.58E-02	5.10E-09	2.02E-11	5.06E-06	5.54E-01	1.60E-07
4	1.00E-02	5.10E-09	2.02E-11	5.06E-06	5.54E-01	1.60E-07
5	3.75E-03	5.10E-09	2.02E-11	5.06E-06	5.54E-01	1.60E-07
Total	3.48E+00	2.55E-08	1.01E-10	2.53E-05	2.77E+00	7.98E-07

Nuclide Detail of Doses

[mrem]

Source: 1

Nuclide	Receptor 1	Receptor 2	Receptor 3	Receptor 4	Receptor 5	Total
U-238						
U-238	2.56E-03	1.59E-05	1.94E-05	7.63E-06	2.95E-06	2.61E-03
U-234	1.24E-11	8.38E-12	8.38E-12	8.36E-12	8.36E-12	4.58E-11
TH-230	4.68E-15	1.87E-15	1.87E-15	1.86E-15	1.85E-15	1.21E-14
RA-226	4.66E-12	6.75E-13	6.81E-13	6.62E-13	6.55E-13	7.33E-12
PB-210	7.75E-18	1.30E-19	1.41E-19	1.05E-19	9.15E-20	8.22E-18
U-235						
U-235	2.75E-05	1.75E-07	2.13E-07	8.67E-08	3.66E-08	2.80E-05
PA-231	1.37E-08	1.14E-10	1.33E-10	7.01E-11	4.51E-11	1.41E-08
AC-227	5.15E-08	3.55E-10	4.27E-10	1.89E-10	9.55E-11	5.25E-08
U-234						
U-234	2.19E-07	1.48E-07	1.48E-07	1.48E-07	1.48E-07	8.10E-07
TH-230	1.65E-10	6.60E-11	6.61E-11	6.56E-11	6.55E-11	4.29E-10
RA-226	2.47E-07	3.58E-08	3.60E-08	3.51E-08	3.47E-08	3.88E-07
PB-210	5.32E-13	8.93E-15	9.66E-15	7.24E-15	6.27E-15	5.64E-13
TH-230						
230	1.15E-05	4.59E-06	4.60E-06	4.56E-06	4.55E-06	2.98E-05
226	3.43E-02	4.97E-03	5.01E-03	4.87E-03	4.82E-03	5.39E-02
PB-210	1.06E-07	1.77E-09	1.92E-09	1.44E-09	1.25E-09	1.12E-07
RA-226						
RA-226	3.94E+00	5.70E-01	5.75E-01	5.60E-01	5.53E-01	6.20E+00
PB-210	2.21E-05	3.70E-07	4.01E-07	3.00E-07	2.60E-07	2.34E-05

Title : UMTRA - Public Service Building
Input File : C:\WINBLD\GJ-0673C.IEvaluation Time: 100.000 years

Assessment for Time: 5
Time =1.00E+02 yr

Source Information

Source: 1
Location:: Room : 1 x: 26.00 y: 26.00 z: 0.00 [m]
Geometry:: Type: Volume Area:2.00E+01 [m2] Direction: z
Pathway ::
Direct Ingestion Rate :0.000E+00 [gm/hr]
Fraction released to air: 1.000E-02

Containment :: Number of Regions: 1 Contaminated Region: 1

Region	: 1
Thickness [cm]	:3.00E+01
Fraction Contaminated	:1.00E+00
Density [g/cm3]	:1.60E+00
Porosity	:4.10E-01
Eff. Diffusion [m2/s]	:2.00E-05
Emanation Fractions(1)	:2.00E-01
(2)	:3.50E-01
Erosion Rate [cm/day]	:2.40E-08

Contamination::

Nuclide	Concentration [pCi/g]
U-238	1.740E+00
U-235	8.280E-02
U-234	1.740E+00
PA-231	1.749E-04
TH-230	2.178E+01
AC-227	1.224E-04
RA-226	2.180E+01
PB-210	2.083E+01

RESRAD-BUILD Dose Tables

Receptor Point-Source Doses

[mrem]

	Source 1	Total
Receptor 1	4.0E+00	4.0E+00
Receptor 2	5.8E-01	5.8E-01
Receptor 3	5.8E-01	5.8E-01
Receptor 4	5.6E-01	5.6E-01
Receptor 5	5.6E-01	5.6E-01
Total	6.3E+00	6.3E+00

Pathway Detail of Doses

[mrem]

Source: 1

Receptor	External	Deposition	Immersion	Inhalation	Radon	Ingestion
1	3.42E+00	5.11E-09	2.02E-11	5.20E-06	5.54E-01	2.69E-07
2	2.10E-02	5.11E-09	2.02E-11	5.20E-06	5.54E-01	2.69E-07
3	2.58E-02	5.11E-09	2.02E-11	5.20E-06	5.54E-01	2.69E-07
4	1.00E-02	5.11E-09	2.02E-11	5.20E-06	5.54E-01	2.69E-07
5	3.75E-03	5.11E-09	2.02E-11	5.20E-06	5.54E-01	2.69E-07
Total	3.48E+00	2.55E-08	1.01E-10	2.60E-05	2.77E+00	1.34E-06

Nuclide Detail of Doses

[mrem]

Source: 1

Nuclide	Receptor 1	Receptor 2	Receptor 3	Receptor 4	Receptor 5	Total
U-238						
U-238	2.56E-03	1.59E-05	1.94E-05	7.63E-06	2.95E-06	2.61E-03
U-234	6.19E-11	4.19E-11	4.19E-11	4.18E-11	4.18E-11	2.29E-10
TH-230	1.17E-13	4.67E-14	4.68E-14	4.64E-14	4.63E-14	3.03E-13
RA-226	5.77E-10	8.37E-11	8.43E-11	8.21E-11	8.11E-11	9.09E-10
PB-210	3.24E-15	5.44E-17	5.89E-17	4.41E-17	3.82E-17	3.44E-15
U-235						
U-235	2.75E-05	1.75E-07	2.13E-07	8.67E-08	3.66E-08	2.80E-05
PA-231	6.84E-08	5.70E-10	6.65E-10	3.50E-10	2.25E-10	7.02E-08
AC-227	6.89E-07	4.76E-09	5.71E-09	2.54E-09	1.28E-09	7.03E-07
U-234						
U-234	2.18E-07	1.48E-07	1.48E-07	1.48E-07	1.48E-07	8.10E-07
TH-230	8.27E-10	3.30E-10	3.30E-10	3.28E-10	3.27E-10	2.14E-09
RA-226	6.10E-06	8.83E-07	8.91E-07	8.66E-07	8.57E-07	9.59E-06
PB-210	4.08E-11	6.86E-13	7.42E-13	5.56E-13	4.82E-13	4.33E-11
TH-230						
[illegible]230	1.15E-05	4.58E-06	4.59E-06	4.56E-06	4.55E-06	2.98E-05
[illegible]226	1.68E-01	2.44E-02	2.46E-02	2.39E-02	2.37E-02	2.65E-01
PB-210	1.41E-06	2.37E-08	2.57E-08	1.92E-08	1.67E-08	1.50E-06
RA-226						
RA-226	3.80E+00	5.51E-01	5.56E-01	5.40E-01	5.34E-01	5.98E+00
PB-210	4.43E-05	7.44E-07	8.05E-07	6.03E-07	5.23E-07	4.70E-05

RESRAD-BUILD Dose (Time) Tables

Receptor Doses By Time

[mrem]

	Time [yr]				
	0.00E+00	1.00E+00	5.00E+00	2.00E+01	1.00E+02
1	3.97E+00	3.97E+00	3.97E+00	3.97E+00	3.97E+00
2	5.75E-01	5.75E-01	5.75E-01	5.75E-01	5.75E-01
3	5.80E-01	5.80E-01	5.80E-01	5.80E-01	5.80E-01
4	5.64E-01	5.64E-01	5.64E-01	5.64E-01	5.64E-01
5	5.58E-01	5.58E-01	5.58E-01	5.58E-01	5.58E-01

Receptor Doses Per Year

[mrem/yr]

	Time [yr]				
	0.00E+00	1.00E+00	5.00E+00	2.00E+01	1.00E+02
1	6.05E+00	6.05E+00	6.05E+00	6.05E+00	6.05E+00
2	8.76E-01	8.76E-01	8.76E-01	8.76E-01	8.76E-01
3	8.83E-01	8.83E-01	8.83E-01	8.83E-01	8.83E-01
4	8.59E-01	8.59E-01	8.59E-01	8.59E-01	8.59E-01
5	8.49E-01	8.49E-01	8.49E-01	8.49E-01	8.49E-01

RadDecay for Windows Version 1.1
Licensed to: RUST Geotech
Serial No.: 1.10-00031
Report Date: 12/19/97

GJ-00673

Nuclide Library : GROVE (Kocher)
File Name : UNTITLED
Case Name : Mill Tailings
Description : Isotpic mixture found in uranium mill tailing
Assay Date : 12/19/00
Final Date : 12/20/97
Decay Interval : 35430 day(s)

Run Date: 12/19/97

NUCLIDE DATA

Nuclide	Original (Ci)	Decayed (Ci)
Ac-227		5.3840E-06
Bi-210		9.5077E-01
Bi-211		5.3749E-06
Bi-214		9.9978E-01
Fr-223		7.4299E-08
Pa-231		7.7908E-06
Pa-234		1.2800E-04
Pa-234m		8.0000E-02
Pb-210		9.5080E-01
Pb-211		5.3749E-06
Pb-214		9.9978E-01
Po-210		9.4993E-01
Po-211		1.4673E-08
Po-214		9.9957E-01
Po-215		5.3749E-06
Po-218		9.9998E-01
Ra-223		5.3749E-06
Ra-226	1.0000E+00	9.9998E-01
Rn-219		5.3749E-06
Rn-222		9.9998E-01
Th-227		5.3041E-06
Th-230	1.0000E+00	9.9920E-01
Th-231		3.8000E-03
Th-234		8.0000E-02
Tl-207		5.3602E-06
U-234	8.0000E-02	8.0000E-02
U-235	3.8000E-03	3.8000E-03
U-238	8.0000E-02	8.0000E-02

TABLE A-1: RELATIVE RADIONUCLIDE ACTIVITIES IN URANIUM MILL TAILINGS AS FRACTION OF ORIGINAL ^{238}U ACTIVITY

RADIONUCLIDE	RELATIVE ACTIVITY FRACTION	RADIONUCLIDE	RELATIVE ACTIVITY FRACTION
^{238}U	0.08	^{235}U	0.0038
^{234}Th	0.08(1)	^{231}Th	0.0038(1)
^{234m}Pa	0.08(1)	^{231}Pa	0.047
^{234}U	0.08	^{227}Ac	0.047
^{230}Th	1.0	^{227}Th	0.047
^{226}Ra	1.0	^{223}Ra	0.047
^{222}Rn	1.0(2)	^{219}Rn	0.047
^{218}Po	1.0(2)	^{215}Po	0.047
^{214}Pb	1.0(2)	^{211}Pb	0.047
^{214}Bi	1.0(2)	^{211}Bi	0.047
^{214}Po	1.0(2)	^{207}Tl	0.047
^{210}Pb	1.0(2)		
^{210}Bi	1.0(2)		
^{210}Po	1.0(2)		

(1) Due to the short radiological halflives of these radionuclides, they rapidly establish activity equilibrium with the uranium precursor.
(2) The actual relative fractions for these radionuclides in tailings is dependant upon the degree of ^{222}Rn emanation from the parent material and may vary from near zero (for a significant degree of ^{222}Rn emanation) up to the value indicated (which conservatively assumes no ^{222}Rn emanation).

TABLE A-2: RADIOLOGICAL AND PHYSICAL CHARACTERISTICS OF RADIONUCLIDES IN URANIUM MILL TAILINGS

RADIONUCLIDE [RADIATIONS EMITTED]	HALFLIFE	PARTICLE SIZE(μm) [SOLUBILITY CLASS]	EFFECTIVE DOSE CONVERSION FACTOR (Sv Bq^{-1}) (1)	ORGAN OR TISSUE DOSE CONVERSION FACTOR (Sv Bq^{-1}) (1)
^{238}U [α]	$4.468 \cdot 10^9$ y	15 [0.65-D, 0.35-Y]	$1.8 \cdot 10^{-6}$	N/A
^{234}Th [β]	24.1 d	11 [Y]	N/A	N/A
^{234m}Pa [β]	1.17 m	15 [Y]	N/A	N/A
^{234}U [α]	$2.445 \cdot 10^5$ y	15 [0.65-D, 0.35-Y]	$2.0 \cdot 10^{-6}$	N/A
^{230}Th [α]	77,000 y	11 [Y]	$1.8 \cdot 10^{-5}$	$3.0 \cdot 10^{-4}$
^{226}Ra [α]	1600 y	15 [W]	$5.4 \cdot 10^{-7}$	$1.0 \cdot 10^{-5}$

DATA EVALUATION STATISTICS

Data Description **Public Service Building Supplemental Standards Calculation GJ-00673-CS**

Aggregate of Soil Sampling Data in Deposit "H" Below 9" Depth

DCL Limit	51

Sample Data

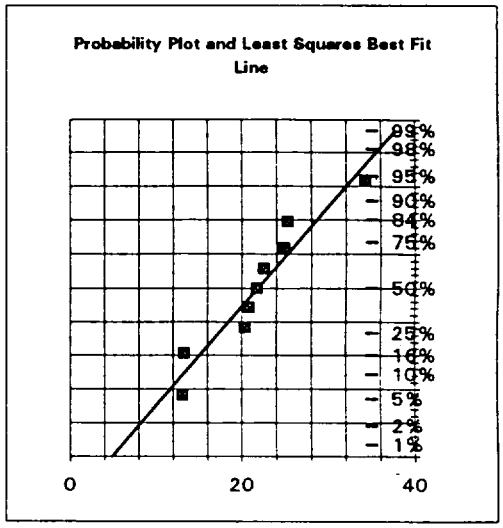
UNITS - pCi/g (Ra-226)

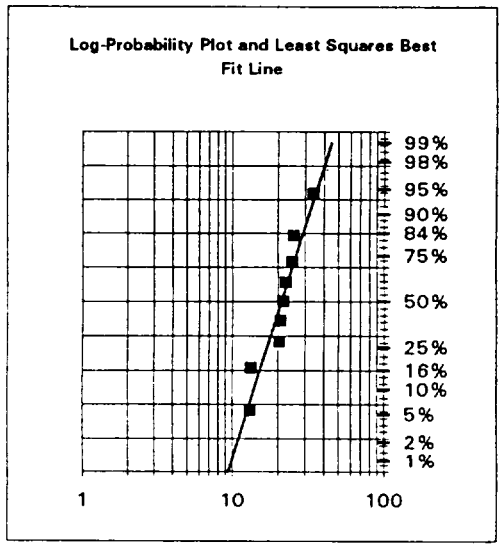
25
25
34
23
21
13
22
20
13

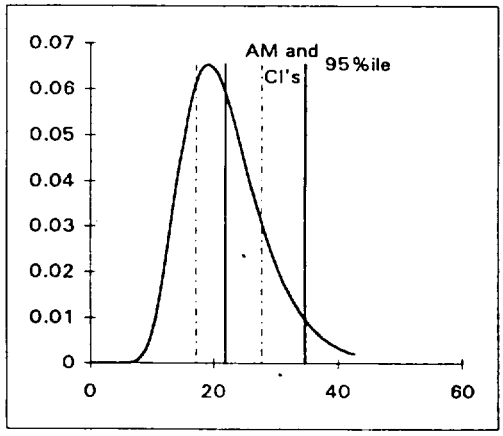
Descriptive Statistics	
Number of Samples	9.000
Mean	21.822
Median	21.700
Standard Deviation	6.419
CV	0.294162
Range	21.200
Minimum	13.100
Maximum	34.300
GM	20.968
GSD	1.356
Mean of LN(Data)	3.043
SD of LN(Data)	0.305
Percent > OEL	0.000

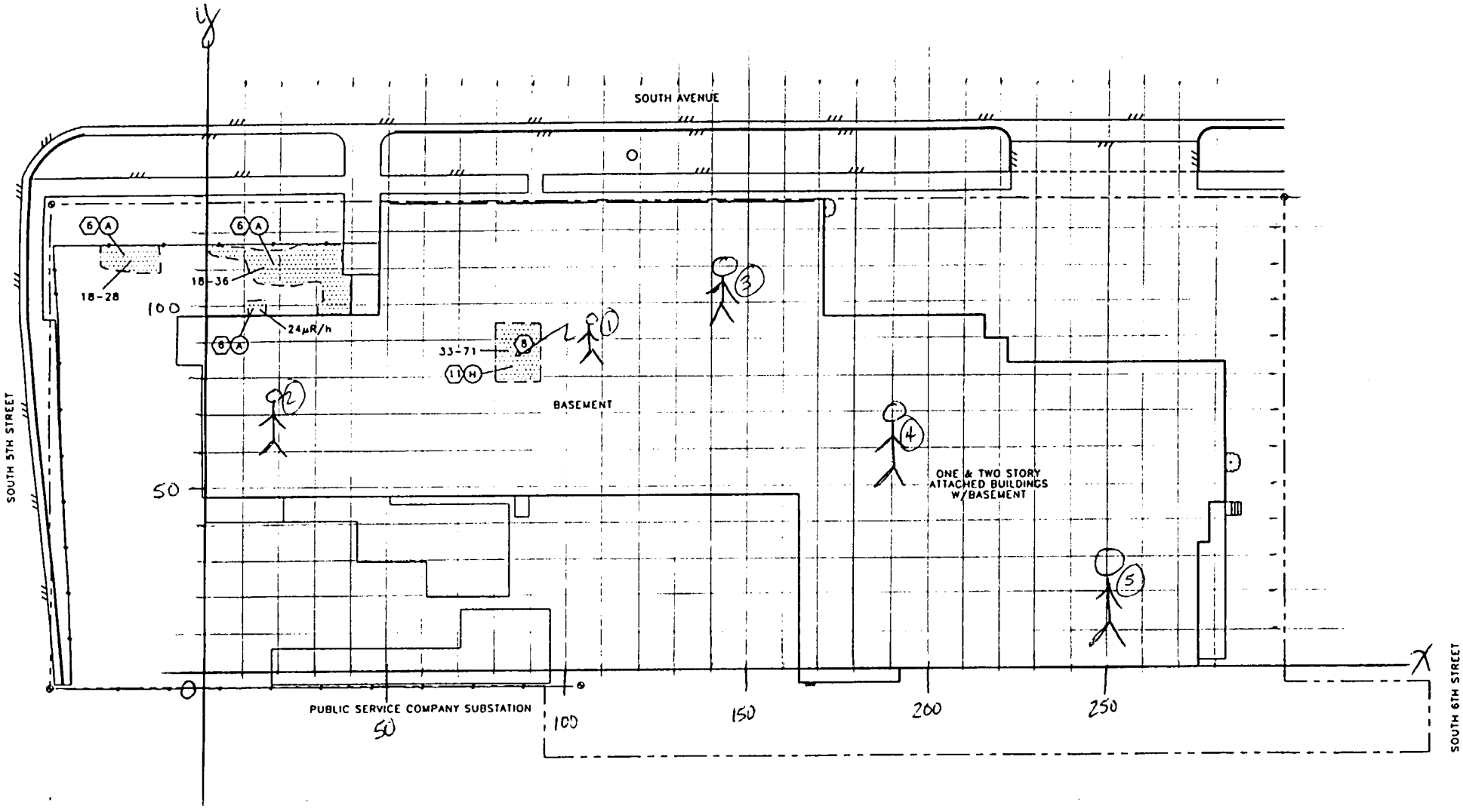
Normal Statistics	
Mean	21.822
UCL(Mean) - Z	26.016
LCL(Mean) - Z	17.628
95%ile - Z	32.382
Percent > OEL	0.000
W Test (Data)	0.922114
Normal (a=0.05)?	Yes

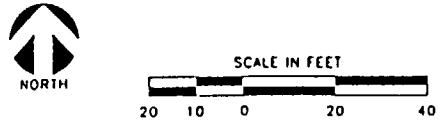
Lognormal Statistics	
GM	20.968
GSD	1.356
AM of data	21.822
AM - MVUE	21.848
AM - MLE	21.965
UCL - Norm t stats	26.757
LCL - Norm t stats	16.888
UCL LogNorm t	27.763
LCL LogNorm t	17.377
UCL - Modified Cox	27.783
LCL - Modified Cox	17.181
UCL - "Exact"	
LCL - "Exact"	
95%ile	34.618
UTL 95%, 95%	52.815
Percent > OEL	0.177
PEP (Upper)	3.133
PEP (Lower)	2.47E-05
W Test (ln Data)	0.91054
Lognorm (a=0.05)?	Yes











LEGEND

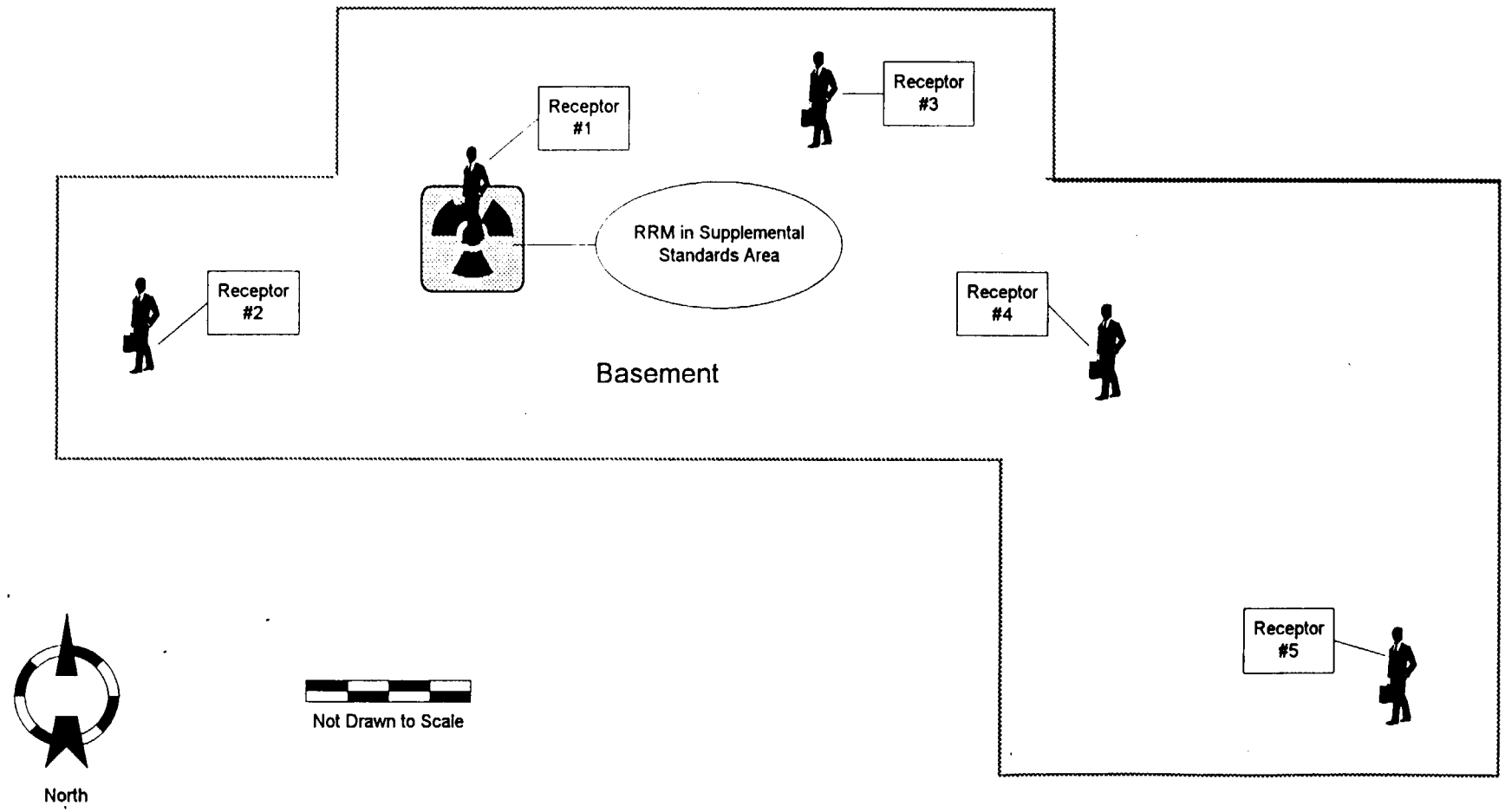
ALL DEPTHS/HEIGHTS IN INCHES
ALL EXPOSURE RATES IN μR/h

(A) ASSESSED AREA IDENTIFIER

(6) AVERAGE DEPTH OF ASSESSED CONTAMI

PUBLIC SERVICE BUILDING

Property # GJ-00673-CS
531 South Ave., Grand Junction, CO.



Appendix D

Descriptions of PCB/Radioactive Waste Streams

Descriptions of PCB/Radioactive Waste Streams

Grand Junction Steel Property

8 cubic yards of residual radioactive material contaminated with PCBs is stored in steel bins on the Grand Junction Steel property. The concentration range of samples taken prior to remediation of this material was 51 to 93 ppm. Because of over-excavation requirements, sampling and analysis of the remediated material resulted in a concentration of 22 ppm.

Additionally, approximately 100 pounds of excess sample material and a 55-gallon drum of personal protective equipment (PPE) and other investigation-derived waste (IDW) require disposal. These wastes were generated during an earlier waste-screening event where concentrations of PCBs ranged from 51 to 1600 ppm. The potential for IDW to be significantly contaminated with PCBs from contaminated soil is remote. However, because the PPE contacted regulated levels of PCBs, it remains a dually regulated disposal issue.

Lewco Steel Property

Soil suspected to be contaminated with Toxic Substances Control Act- (TSCA-) regulated concentrations of PCBs was excavated on the Lewco Steel property. EPA determined that the deposit from which this material originated was not subject to TSCA regulation, and the remediated material was sent to the Grand Junction Disposal Cell. Approximately 10 pounds of excess sample material from "hot spots" remain at the GJO facility. Concentrations of this material range from 579 to 1273 ppm.

Former Public Service Company Property

A property formerly owned by the Public Service Company of Colorado (Public Service) was determined to contain a PCB deposit with concentrations up to 680 ppm. Public Service remediated the deposit. However, on the basis of postremediation field test results, DOE suspects that the deposit outside the building and an interior deposit were not completely remediated. These areas still contain residual radioactive material contaminated with regulated concentrations of PCBs. Additionally, 10 pounds of excess samples with a concentration range of 150 to 290 ppm and a 55-gallon drum of IDW assumed to exceed 50 ppm are currently being managed at the GJO facility.

Grand Junction Office Remedial Action Project (GJORAP)

Several residual radioactive waste streams containing PCBs that resulted from upgrading or demolishing contaminated buildings are managed at the GJO facility. These include a 55-gallon drum of small electrical equipment and rusted parts, a 55-gallon drum of light ballasts and fixtures that are leaking PCBs, and two empty 55-gallon drums contaminated with PCBs and radioactive materials.

Appendix E

Interim Long-Term Surveillance Plan for the Cheney Disposal Site near Grand Junction, Colorado

DOE/AL/62350-243
REV. 1

Interim Long-Term Surveillance Plan for the Cheney Disposal Site Near Grand Junction, Colorado

April 1998

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Prepared for

U.S. Department of Energy
Environmental Restoration Division
UMTRA Project Team
Albuquerque, New Mexico

Prepared by

Jacobs Engineering Group Inc.
Albuquerque, New Mexico

Preface

The Cheney disposal cell is scheduled to remain open until 2023 or until the cell is filled to its design capacity. The site will operate during the summer months to accept wastes from vicinity properties. Long-term surveillance and monitoring will be conducted on the completed portions of the cell. This preface addresses the unique issues of inspecting and monitoring a partially-operating cell. When the cell is closed, this information will no longer be valid. While the cell is operational, the following information applies:

- The cell-closure hole is located at what will be the crest of the topslope. The hole is approximately 1200 feet (ft) (366 meters [m]) by 750 ft (230 m) and varies in depth from about 10 to 30 feet (3 to 9 m). The sides are sloped at 3 to 1 and a ramp provides access for placing incoming contaminated materials. Runoff from precipitation stays within the cell-closure hole. Eventually, the hole will be filled; closure is planned for 2023 or when the cell is filled to design capacity. Transition material will be added to spaces not filled by contaminated materials to bring the surface to the proper grade. Then the cover will be extended from the hole boundaries to complete the disposal cell.
- While the site is operational, the U.S. Department of Energy (DOE) will notify the disposal cell operating contractor of inspections and coordinate with the operating contractor while on the site.
- The open, operating pit at the site is excluded from long-term surveillance plan (LTSP) inspections. However, observed operations that could influence the performance of the closed portions of the disposal cell should be considered and noted during the inspection. For example, a lined settling pond at the site is used to decontaminate vicinity property trucks leaving the site. Draining the pond and water loss by evaporation or leakage could result in airborne dispersion of the radiologically-contaminated pond sediments on and off the site.
- Site inspections will cover the completed portions of the disposal cell, the surrounding disposal site area, and the immediate off-site areas.
- Off-site DOE monitor wells will be inspected until they are properly decommissioned.
- Site inspections will be conducted in accordance with a DOE-approved safety and health plan. While the site is operational, inspectors will comply with operating contractor health and safety requirements including site sign-in, industrial hygiene monitoring, traffic patterns, and personal protective equipment.

Some details in this document will be not be available until after cell closure. These include number of survey markers, boundary markers, and plates 1 and 2 (as-built drawings).

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LIST OF ACRONYMS

Acronym	Definition
BLM	Bureau of Land Management
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
LTSP	long-term surveillance plan
MCL	maximum concentration limit
NGVD	National Geodetic Vertical Datum
NRC	U.S. Nuclear Regulatory Commission
POC	point of compliance
QA	quality assurance
RAP	remedial action plan
TDS	total dissolved solids
UMTRA	Uranium Mill Tailings Remedial Action
UMTRCA	Uranium Mill Tailings Radiation Control Act

1. 0 PURPOSE AND SCOPE

This interim long-term surveillance plan (LTSP) describes the U.S. Department of Energy's (DOE) long-term care program for the Uranium Mill Tailings Remedial Action (UMTRA) Project Cheney disposal site. The site is in Mesa County near Grand Junction, Colorado.

The U.S. Nuclear Regulatory Commission (NRC) developed regulations for the issuance of a general license for the custody and long-term care of UMTRA Project disposal sites in 10 CFR Part 40. The purpose of this general license is to ensure that the UMTRA Project disposal sites are cared for in a manner that protects public health and safety and the environment. Before each disposal site is licensed, the NRC requires the DOE to submit a site-specific LTSP. The DOE prepared this interim LTSP to meet this requirement for the Cheney disposal site. The general license becomes effective when the NRC concurs with the DOE's determination that remedial action is complete at the Cheney cell and the NRC formally accepts a final LTSP. Attachment 1 contains the concurrence letter from the NRC.

This document describes the long-term surveillance program the DOE will implement to ensure that the Cheney disposal site performs as designed. The program is based on site inspections to identify potential threats to disposal cell integrity. The LTSP is based on the UMTRA Project long-term surveillance program guidance (DOE, 1996a) and meets the requirements of 10 CFR §40.27 (b) and 40 CFR §192.03.

The DOE Grand Junction Office (GJO) will be responsible for all future operation and maintenance of the open pit area of the cell, temporary storage of future materials, and the transportation and placement of the materials. The GJO will be responsible for preparing a Cheney disposal site

operations plan and obtaining NRC concurrence.

2. 0 FINAL SITE CONDITIONS

Remedial action at the former uranium processing site in Grand Junction, Colorado, and the cleanup of vicinity properties in and around Grand Junction consisted of excavating and relocating residual radioactive materials to the Cheney disposal site.The DOE constructed a disposal cell to control the residual radioactive material in accordance with 40 CFR Part 192. The site completion report is being prepared in two phases and contains a detailed description of final site conditions. Phase I of the completion report reflects activities through August 1994. The Phase II completion report will document the project to closure.

1. SITE HISTORY

The Cheney disposal site was constructed to stabilize waste from a uranium processing site in Grand Junction, Colorado.

The Climax Uranium Company opened a mill in Grand Junction in 1951. It was designed and built for uranium production, with by-product vanadium production. A solvent-extraction circuit was added in 1956. The mill process included ore neutralization, sand/slime separation, and treatments for sand and slime. An acid-leaching and solvent extraction process recovered uranium from the sand. The slimes were salt-roasted, then water-leached to remove vanadium, and finally acid-leached with a solvent-extraction step to extract uranium and the remaining vanadium.

In 1960, the Climax Uranium Company was incorporated into American Metals Climax, Inc., which operated the mill until February 1970. Approximately 4.6 million dry tons of tailings were produced. Climax released approximately 500,000 cubic yards (yd^3) (400,000 cubic meters [m^3]) of tailings to private individuals and contractors for use as construction fill material from 1951 to 1966.

The mill was dismantled and the tailings pile was stabilized in place from late 1970 to early 1971. Contaminated materials remediated from vicinity properties in the Grand Junction area were stored in the evaporation ponds east of the tailings pile.

In 1989, Phase I of the UMTRA Project remedial action, which included fencing around the processing site, constructing water retention ponds, and constructing the wastewater treatment plant foundation, was completed. Phase II construction began in 1990; it included constructing the disposal cell and assembling the wastewater treatment plant. Tailings relocation to the Cheney disposal cell started in the spring of 1991. Remedial action at the Grand Junction processing site was completed in 1994.

At the Cheney disposal site, the residual radioactive materials were placed in a single disposal cell. Residual radioactive materials from remediation of vicinity properties were also relocated to the Cheney disposal site.

The completion report documents compliance with the remedial action plan (RAP) and the site as-built conditions (DOE, 1997). In addition, the DOE will prepare a final audit report and certification summary and submit it, along with the completion report, to the NRC for concurrence. Concurrence from the NRC on the completion report will be included in the permanent site file.

2. GENERAL DESCRIPTION OF THE SITE VICINITY

The Cheney disposal site is in Mesa County in southwest Colorado on the western slope of the Rocky Mountains. The site is approximately 18 miles (mi) (29 kilometers [km]) south of the town of Grand Junction, Colorado in Township 3 South, Range 2 East, Sections 11 and 12 (Figure 2.1). The site vicinity is briefly described below. The site environmental impact statement (DOE, 1986) and the RAP (DOE, 1991a) contain detailed descriptions.

The general climatic regime in the vicinity of the Cheney disposal site is semiarid. Summer days with maximum temperatures near 90° Fahrenheit (F) (32° Centigrade [C]) and minimum temperatures near 60° F (16° C) are common. Monthly average temperatures range from 26.6° F (-3.0° C) in January to 78.7° F (26° C) in July. Summer rains occur mainly as scattered intense showers from thunderstorms that develop over the nearby mountains. Winter snows are fairly frequent; however, they are mostly light and the snow melts quickly. Grand Junction's average annual precipitation is 8.4 inches (21 centimeters [cm]). Snowfall at Grand Junction averages 24 inches (69 cm).

The Cheney site is located on a pediment surface that forms a drainage divide between two small ephemeral washes. The drainage divide slopes gently southwest at approximately 2 percent. The site elevation ranges from about 5190 to 5270 feet (ft) (1580 to 1600 meters [m]) above mean sea level. The two washes merge with Indian Creek, approximately two-thirds of a mile below the site. Indian Creek flows into Kannah Creek 4 to 5 mi (6 to 8 km) below the confluence of the ephemeral washes. Kannah Creek empties in the Gunnison_River 2 mi (3 km) beyond its confluence with Indian Creek.

An area of 240 acres (ac) (97 hectares [ha]) drains toward the Cheney disposal site. Slopes in the watershed average 3 percent. The maximum flow length is approximately 9500 ft (2900 m). Sheetwash and rill erosion are the primary erosive forces currently active at the site. Minor gullying occurs in the small ephemeral washes. A small upland watershed east of the site and a deeply incised surface gully south of the site are the only significant surface water and geomorphic features. A drainage swale diverts water from the disposal cell watershed. Water that falls on top of the cell drains to aprons and to the ground around the ceil.

- Click here for Figure 2.1 Cheney disposal site, Mesa County, Colorado

3. DISPOSAL SITE DESCRIPTION

This section briefly describes the disposal site; detailed descriptions can be found in the site RAP (DOE, 1991a) and completion report (DOE, 1997).

1. Site ownership and legal description

The United States government currently owns the Cheney disposal site and most of the surrounding area. The Bureau of Land Management (BLM) permanently transferred administration of public land to the DOE in February 1990 for use as the Cheney disposal site. The BLM administers the adjacent surrounding lands. Attachment 2 gives a legal description of the disposal site. Plate 1 shows the final site boundary and identifies ownership of the site and surrounding areas at the time of licensing.

2. Directions to the disposal site

Following the directions below, the Cheney disposal site can be reached by automobile via paved roads (Figure 2.1).

- From Grand Junction, Colorado, take U.S. Highway 50 South.
- Follow Highway 50 past the junction of State Highway 141. Approximately 7 mi (12 km) past this junction, turn left onto the access road.
- Follow the access road approximately 1.5 mi (2.5 km) to the locked gate.

Entry to the disposal site is restricted by a fence at the site entrance. The south access gate is locked; the key needed to enter the site may be obtained at the GJO.

1. Description of surface conditions

The Cheney disposal cell covers approximately 60 ac (24 ha) within the 360 ac (146 ha) of land set aside for the site. The completion report contains a detailed description of site conditions, including the results of the site topographic survey (Plate 1).

During final site grading, all areas were contoured to promote drainage away from the disposal cell. A mix of grasses and sagebrush was used to revegetate all

disturbed areas of the disposal site not covered by riprap (DOE, 1991b).

At the completion of remedial action, the DOE documented final disposal site conditions with site maps, as-built drawings, and ground and aerial photographs.

2. Permanent site-surveillance features

Survey and boundary monuments, site markers, and warning signs are the permanent long-term surveillance features of the Cheney disposal site. Plate 1 shows the locations of these features and Table 2.1 provides survey grid coordinates. Typical construction and installation specifications for these features are shown in the long-term surveillance guidance (DOE, 1996a) and subcontract (DOE, 1991b) documents.

(Number) survey monuments establish permanent horizontal control based on the Colorado State Plane Coordinate System (Central Zone) and are referenced to the Project Survey Control Points. Plate 1 shows these control points and Table 2.1 gives their location coordinates. The permanent survey monuments (SM-x) are Berntsen RT-1 markers set in concrete, with the monument about 4 inches (10 cm) above ground level. Magnets in the markers permit easier detection if the markers become buried over time. The survey monument identification number is stamped on the top of the metal cap.

(Number) site boundary corners define the final site boundary. Of these, (number) are marked with boundary monuments. The boundary monuments are Berntsen A-1 markers set in concrete. Of these, standard boundary monuments are used at (number) locations. The standard monuments are reinforced concrete that extend to a depth of 6 ft (1.8 m) or to hard rock. The marker extends about 1 inch (2.5 centimeters [cm]) above the ground surface. The remaining (number) monuments have been modified for area conditions and are concrete, placed to a minimum depth of 3 ft (1 m) or 6 inches (15 cm) below rock. In these, the marker extends a minimum of 12 inches (0.3 m) above ground surface. Magnets in the A-1 monuments allow easier detection if they become buried. The boundary monument identification number is stamped on the top of the metal cap.

Two unpolished granite markers with an incised message identify the Cheney disposal site. The message includes a drawing showing the general location of the stabilized disposal cell within the site boundaries, the date of closure, the weight of the tailings, and the amount of radioactivity (in Curies). Site marker SMK-1 near the west site access gate is set in reinforced concrete extending 6 ft (1.8 m) below the ground surface. Site marker SMK-2 is set in reinforced concrete extending to the top of the frost protection barrier.

The DOE posted 18-inch (946-cm) by 24-inch (61-cm) property-use warning signs around the disposal site perimeter at approximately 200-ft (60-m) intervals. The site entrance sign is at the south access gate near site marker SMK-1 (location to be confirmed). The entrance sign displays the DOE 24-hour telephone number for calls concerning the site. In addition to the entrance sign, (number) perimeter warning signs are located about 5 ft (1.5 m) inside the site

- Table 2.1

fence. The warning signs on the southern end of the site are attached to the fence. The other warning signs are mounted on steel posts with the tops of the signs about 6 ft (1.8 m) above the ground surface (locations to be confirmed). The sign posts are embedded in concrete to a depth of about 3 ft (1 m) below the ground surface.

1. DISPOSAL CELL DESIGN

The 60-ac (24-ha) disposal cell is located on a pediment surface that forms a drainage divide between two small ephemeral washes. The area of the disposal cell is not subject to significant hazard from slope failure processes such as landslides, debris flows, mud flows, and rock falls. The geomorphic processes posing a potential hazard to the stabilized disposal cell are ephemeral drainage channel changes, low-gradient slope erosion, and wind erosion; however, these processes are not reasonably expected to affect the disposal cell within the next 1000 years, or within 200 years at a minimum.

The disposal cell is constructed partially below grade and rises above the surrounding terrain to a maximum elevation of about 5260 ft (1603 m) above National Geodetic Vertical Datum (NGVD) at the top of the 2.3 percent slope. The disposal cell contains 4,031,402 yd^3 (3,082,410 m^3) of relocated tailings and other residual radioactive materials, primarily contaminated soils and demolition debris. A cell-closure hole was incorporated into the tailings embankment to allow approximately 500,000 yd^3 (382,300 m^3) of additional contaminated material from vicinity properties to be placed in the tailings embankment. Clean fill dikes contain the above grade portion of the cell. The dikes are sloped at 20 percent. The top of the cell slopes 2.1 to 2.3 percent.

The top of the disposal cell is capped with a multiple-component cover. A 1.5-ft (0.45-m)-thick transition layer of off-pile materials was placed on top of the contaminated materials. A 2-ft (0.6-m)-thick radon/infiltration barrier was placed over the transition materials. This barrier is constructed of selected on-site materials obtained from the embankment foundation excavation. It is designed to reduce the radon-222 flux from the disposal cell to less than 20 picocuries per square meter per second and minimize water infiltration into the tailings. A 2-ft (0.6 m) frost-protection layer was placed over the radon barrier to prevent the adverse effects of freeze-thaw cycles. A 0.5-ft (0.15-m)-thick, coarse-grained bedding layer on top of the radon/infiltration barrier provides a capillary break, promotes drainage of infiltrating water away from the radon barrier, and prevents damage from the erosion-protection layer. This layer also extends over the clean fill dike sideslopes. The topslopes and sideslopes of the disposal cell are capped with riprap to protect against wind and water erosion and prevent damage to the underlying frost-protection and radon/infiltration barrier layers.

The erosion-protection layer is 1 ft (0.3 m) thick. Maximum grade is 2.3 percent on the topslopes and 20 percent on the sideslopes. These grades, in conjunction with the bedding layer, divert excess surface water runoff from the disposal cell and convey it to adjacent site grades, thereby minimizing the risk of significant erosion. Both the topslope and sideslope covers are designed to minimize the potential for deep percolation of precipitation into the residual radioactive material.

At the toe of the disposal cell a riprap apron and toe ditch carry water away from the cell and provide erosion protection from gullying. A rock-lined interceptor ditch

abuts the upslope portion of the disposal cell to divert surface flow away from the cell (DOE, 1997).

The site completion report contains detailed engineering drawings of the disposal cell (DOE, 1997).

2. GROUND WATER CHARACTERIZATION

The DOE has characterized the hydrogeologic units, aquifer hydraulic and transport properties, and geochemical conditions at the Cheney disposal site. This information is summarized below, with details provided in Attachments 3 and 4 of the RAP (DOE, 1991a) and the environmental impact statement (DOE, 1986).

1. Hydrogeologic setting

The disposal site area is on a broad, moderately sloping surface on the west flank of Grand Mesa, east of the Gunnison River. The surface consists of alluvium, colluvium, and terrace gravels underlain by a thick sequence (greater than 8000 ft [2438 m]) of sedimentary rock. The disposal site is underlain by 5 to 40 ft (1.5 to 131 m) of alluvium. Beneath the alluvium is approximately 700 ft (213 m) of Mancos Shale, which overlies the Dakota Sandstone.

Ground water in the disposal site area occurs transiently in thin paleochannels within the lower portion of the alluvium, in fracture systems in the underlying Mancos Shale; and permanently in the Dakota Sandstone. Detailed field investigations, including geophysical surveys and test pits, identified a large area suitable for the disposal cell that was devoid of paleochannels containing saturation zones. The Dakota Sandstone is defined as the uppermost aquifer beneath the Cheney disposal site.

Alluvial paleochannels exposed by continuous trenches contain saturation zones ranging from less than 1 to more than 6 ft (1.8 m) thick. Paleochannels are separated in some cases by relatively large distances (greater than 500 ft [152 m]). Three separate paleochannel flow systems have been identified in the disposal site vicinity. One system passes within approximately 100 ft [30 m] of the northwest corner of the disposal cell footprint and was relocated outside the footprint. The other two are within approximately 600 ft [183 m] of the southern portion of the footprint.

Ground water in the Mancos Shale is found in discontinuous zones separated both laterally and vertically by large regions of unsaturated rock. Aquifer pumping tests and computer simulations demonstrate that the Mancos Shale yields less than 150 gallons (568 L) per day and is considered "limited use" (DOE, 1991a). Pockets of ground water were found in isolated intervals in the unweathered Mancos Shale at several depths, but principally between 50 and 120 ft (15 and 37 m) and between 275 and 492 ft (84 and 150 m). The ground water occurs in saturated, multiple fracture zones. Core water saturation measurements indicate the Mancos Shale

matrix is unsaturated even in zones adjacent to water-filled fractures.

Three monitor wells completed in the Dakota Sandstone encountered confined ground water, with hydraulic pressures greater than 360 ft (110 m) above the Mancos Shale/Dakota Sandstone contact. Ground water in the Dakota Sandstone is confined by unsaturated low-permeability shales and sandstone. Total dissolved solids (TDS) concentrations exceed 10,000 milligrams per liter (mg/L), and thus ground water in the Dakota Sandstone (uppermost aquifer) is considered "limited use" (DOE, 1991a).

Age dating, hydraulic testing, and chemical analyses show very little, if any, hydraulic connection between the alluvium, Mancos Shale, and Dakota Sandstone. Comparison of the ages of paleochannel ground water with the ages of shallow Mancos Shale and Dakota Sandstone ground water indicates no direct interconnection. Carbon-14 analyses of ground water samples collected from the three units show that alluvial ground water is relatively young (less than 2000 years), the shallow Mancos Shale ground water is old (20,000 to 30,000 years), and the Dakota Sandstone ground water is very old (probably more than 42,000 years).

2. Background ground water quality

Background ground water quality beneath the Cheney disposal site was determined prior to emplacement of tailings material in the disposal cell. Ground water quality data are presented in Attachment 3 of the RAP (DOE, 1991a). In general, ground water quality is good in the alluvium, poor in the Mancos Shale, and unusable even for stock watering in the Dakota Sandstone. Water quality in these units correlates well with the ages of the ground water, as noted above. The large differences in the chemical conditions of the ground water also suggest little if any hydraulic interconnection between the ground water zones.

Background ground water quality in the alluvium is fresh to slightly brackish, with TDS concentrations ranging from 640 to 1690 mg/L. No concentrations of constituents listed in the U.S. Environmental Protection Agency (EPA) ground water protection standards (except selenium) exceed maximum concentration limits (MCL) (DOE, 1991a). Average sulfate and TDS concentrations exceed the EPA National Secondary Drinking Water Standards (40 CFR Part 143) of 250 and 500 mg/L, respectively, by factors of less than 2. Ground water in the alluvium is a mixed cation-sulfate type. Background ground water quality in the

Mancos Shale is brackish, with elevated TDS levels ranging from 870 to 7010 mg/L. Average selenium concentrations slightly exceed the EPA MCL of 0.01 mg/L. Background ground water quality in the Dakota Sandstone is saline, with TDS concentrations exceeding 10,000 mg/L. Ground water in this unit is thus considered "limited use," and the aquifer is neither a current nor a potential source of drinking water. In addition, ground water from this unit contains natural gas, and average concentrations of radium-226 and -228 exceed the EPA MCL of 5 picocuries per liter (pCi/L). Ground water in the Dakota Sandstone at the Cheney disposal site is a sodium-bicarbonate type.

The geochemical environment at the Cheney disposal site is favorable for

attenuation of the hazardous constituents present in the Grand Junction tailings pore water. Attenuation data show that alluvial materials are likely to remove concentrations of most hazardous constituents in the tailings pore water to below their regulated concentration limits or laboratory method detection limits. The geochemical condition of the ground water in the Mancos Shale, where it is present below the disposal site, is highly reducing, and it is anticipated that many hazardous constituents (including cadmium, lead, molybdenum, selenium, and uranium) will be removed from the ground water by chemical precipitation. Geochemical modeling shows that these constituents are insoluble in the ground water in the Mancos Shale (DOE, 1991a).

3. GROUND WATER PROTECTION

1. Ground water monitoring for compliance

To achieve compliance with the EPA ground water protection standards, the DOE's narrative supplemental standard ensures sufficient protection of human health and the environment (40 CFR Part 192). The supplemental standard applies to the uppermost aquifer (Dakota Sandstone) and does not include numerical concentration limits for the hazardous constituents identified in the former contaminated materials at the Grand Junction processing site and vicinity properties. The basis of the supplemental standard is the "limited use" designation of the ground water in the Dakota Sandstone because the TDS content is greater than 10,000 mg/L and the ground water is not considered a current or potential source of drinking water (40 CFR §192.11(e)). Furthermore, the uppermost aquifer lies approximately 750 ft (229 m) below the existing ground surface and is hydrogeologically isolated from surface recharge by confining mudstones and shales overlying the confined aquifer.

The DOE assessed the performance of the disposal cell in conjunction with the hydrogeologic system. The assessment shows the disposal cell will minimize and control releases of hazardous constituents to ground water and surface water and of radon emanation to the atmosphere, to the extent required to protect human health and the environment (DOE, 1991a). Natural, stable materials were used in constructing the Cheney disposal cell, thereby ensuring long-term performance. The DOE also demonstrated that design features necessary for compliance with the EPA ground water protection standards minimize the need for further disposal cell maintenance.

Dakota aquifer ground water will not be monitored at the Cheney disposal site. Based on an evaluation of site characterization data, a program to monitor the uppermost aquifer to demonstrate disposal cell performance has been determined inappropriate because ground water in the uppermost aquifer is of limited use, and a narrative supplemental standard has been applied to the site that does not include numerical concentration limits or a point of compliance (POC) (40 CFR §192.21(g)). The basis for the limited use designation is the fact that ground water in the uppermost aquifer is neither a current nor a potential source of drinking water because the TDS content exceeds 10,000 mg/L (40 CFR §192.11(e)). Also, the ground water in the uppermost aquifer at the Cheney disposal site is hydrogeologically isolated from the tailings material. Defining concentration limits and a POC would not

further protect human health and the environment.

2. **Paleochannel monitoring**

In lieu of monitoring ground water in the uppermost aquifer, best management practice monitoring of water in two monitor wells in or very near paleochannels adjacent to the disposal cell, and one monitor well in the disposal cell will be undertaken in an effort to assess performance of the disposal cell and to ensure that any water in the paleochannels is not impacted by seepage from the disposal cell. Two paleochannel monitor wells were installed downgradient of the disposal cell at the alluvium/Mancos Shale interface in November 1994. The screened intervals intercept the boundary between the alluvium and shallow Mancos Shale, potentially tapping water flowing within the alluvium, along the boundary, or in fractures in the shallow Mancos Shale. Monitor well 731 is located approximately eight feet from the perimeter ditch and approximately 175 feet south of the northwestern corner of the disposal cell. Monitor well 732 is located near the southwestern corner of the disposal cell, approximately eight feet from the perimeter ditch, and 150 feet east of the low point of the perimeter ditch. The perimeter ditch collects surface water that flows in the riprap and bedding layers over the clean fill berms. In addition, a monitor well was installed in the disposal cell in 1998 to measure potential water levels in the deepest part of the cell.

Dynamic water levels will be measured on a continual basis by data loggers and pressure transducers installed in each of these three wells. If sufficient water is observed in these wells, they will be sampled on a semi-annual basis for five years, starting in 1998, and annually after 2003. Sampling will include the following list of indicator analytes: selenium, molybdenum, uranium, vanadium, sulfate, nitrate, PCBs, and TDS. In addition, standard field parameters will be measured. If a monitor well sample exhibits increasing trends, greater than the MCL/risk-based threshold, in one or more parameters during three consecutive sampling rounds, a more rigorous evaluative monitoring program will be conducted. Evaluative monitoring would include quarterly sampling with an expanded list of analytes including arsenic, cadmium, iron, manganese, radium-226 and -228, and gross alpha. Results of evaluative monitoring could invoke further characterization.

Every five years, the need for continued sampling will be re-evaluated. This best management practice monitoring effort should provide an early warning of potential impact to the shallow water in the paleochannels. Should such an indication occur, the DOE will inform the NRC and the state of Colorado, and will perform a detailed re-evaluation of disposal cell performance.

4. VOLUNTEER PLANT GROWTH

During the summer of 1995, a large number of volunteer plants were observed growing on the disposal cell. As a result of the subsequent study, monitoring volunteer plant growth

will be one element of long-term surveillance monitoring at the Cheney disposal cell. UMTRA Project staff familiar with plant biointrusion on other UMTRA Project disposal cells visited the site on 19-20 September 1995, to assess plant growth on the cell (TAC, 1995).

1. Plant species and density

Numerous plant were observed growing on the topslope and eastern (2 percent) slope on the cell (Figure 2.2). No plants were observed on the steep sideslopes around the remainder of the cell. All plants observed were growing in soil that had been deposited among the rocks. Areas of the rock cover where the voids were not filled with dirt had no plants. The common plant species observed were summer cypress (*Kochia sieversiana*), Russian thistle (*Solsola iberica*), and halogeton (*Halogeton glomertus)* . A few pigweed (*Chenopodium* sp.) and one shadscale (*Atriplex confertifolia*) were also observed. The dominant plant species are the same as those observed growing on the Shiprock, New Mexico, disposal cell except for halogeton, which was very rare on the Shiprock cell (DOE, 1992).

The plant growth on the topslope was mapped according to subjectively determined plant density using recent aerial photographs (Figure 2.2). Four plant density categories were identified: negligible, sparse, moderate, and dense. The number of plants within each category was estimated by tallying all plants in 6-ft (2-m)-wide belt transects of varying lengths. Four belt transects were sampled.

Plant growth was observed on approximately 46 ac (19 ha) of the 55-ac (22-ha) topslope. In this area, the few plants observed were negligible, typically 20 to 50 ft (6 to 15 m) apart. Based on data from a 600-ft (183-m)-belt in transect C, the estimated density was 0.0028 plants per square foot (ft^2) (0.03 per square meter [m^2]) (Table 2.2). Moderate plant growth covered an estimated 8.4 ac (3.4 ha). Based on two 100-ft (30-m) transects (transects A & B), the estimated plant density was 0.82 per 1 ft^2 (8.8 per 1 m^2). Dense plant growth covered about 1 ac (0.4 ha). Based on one 100-ft (30-m) transect (transect D), the density was 1.02 plants per 1 ft^2 (11 per 1 m^2). Based on these data, the

- Figure 2.2 Locations of plant densities, vegetation transects, and plant excavations, Cheney disposal cell, Grand Junction, Colorado

Table 2.2 Estimated number of plants on the Cheney disposal cell near Grand Junction, Colorado

	Density category			
Species	Sparse	Moderate	High	Tot
Summer cypress				
Plants per 1 ft^2	0.0022[a]	0.57[b]	0.68[c]	
Total plants	4400	209000	26500	239900
Russian thistle				
Plants per 1 ft^2	0.00055[a]	0.14[b]	0.26[c]	
Total plants	1100	51200	10100	62400
Halogeton				
Plants per 1 ft^2	0	0.11[b]	0.08[c]	
Total plants	0	40200	3100	43300
Total				
Plants per 1 ft^2	0.0028	0.82	1.02	
Total plants	5500	300400	39700	345600

[a]Based on number of plants in 1 600 x 6 ft (183 x 2 m) belt transect.
[b]Based on number of plants in 2 100 x 6 ft (30 x 2 m) belt transects.
[c]Based on number of plants in 1 100 x 6 ft (30 x 2 m) belt transect.

NOTE: Vegetation was measured as sparse (46 ac [19 ha]), moderate (8.4 ac [3.4 ha]), and dense (0.9 ac [0.4 ha]) in September 1995.

55-ac (22-ha) topslope of the Cheney disposal cell contained an estimated 345,600 plants in September 1995 (Table 2.2). Most of the mature plants growing on the topslope were 2 to 4 ft (0.6 to 1.2 m) tall.

Twenty 9-ft^2 (0.8-m^2) quadrants were sampled on the 2 percent eastern sideslope and the estimated number of plants on this 22-ac (9-ha) area was 4,000,000. As with the topslope, summer cypress was the most common plant. Russian thistle and halogeton were much more common in this area than on the topslope. Plants in this

area were shorter than on the topslope, typically being 6 to 18 inches (15 to 46 cm) tall.

2. **Rooting patterns**

Plants were excavated in the sparse and dense plant growth areas to determine rooting patterns. Excavation number one was of a 4.5-ft (1.4-m)-tall summer cypress (Figure 2.2). Soil filled 12 inches (20 cm) of the 14-inch (36-cm) rock layer. A tap root grew through the rock layer ending at the frost protection layer. Lateral roots grew out from the tap root into the rock/soil matrix. Some fine roots were growing into the frost protection layer, but the roots of this plant basically were restricted to the rock/soil matrix portion of the cover.

Excavation number two was in dense vegetation and included a 34-inch (86-cm) -tall Russian thistle, a 32-inch (81-cm) tall summer cypress, and an 18-inch (46-cm)-tall halogeton (Figure 2.2). These plants did not display the branching rooting pattern observed in the summer cypress in the sparse plant density area. Instead, the tap roots went straight down. The halogeton tap root ended in the rock/soil matrix while the tap roots of the Russian thistle and summer cypress grew through the frost protection layer and up to 9 inches (23 cm) into the radon barrier. To verify the apparently shallow halogeton root system, a 17-inch (43-cm)-tall halogeton was excavated; the roots were confined mostly to the 13-inch (33-cm) rock/soil matrix (excavation three).

Based on the limited number of excavations, it appears that the roots of plants growing in the areas of sparse plant density may be confined to the rock/soil matrix and the upper part of the frost-protection layer. Mature summer cypress and Russian thistle growing in the areas of moderate to dense plant growth likely have grown through the frost-protection layer and into the radon barrier.

3. **Subsequent Actions**

As stated in Section 4.0, the DOE does not plan on conducting routine maintenance. However, if there is significant modification of the rock cover by deep-rooted plants, and it is determined to be a threat to the integrity of the cover, the plants will be removed by mechanical means and or the use of applied herbicides. Section 3.0 describes the frequency of the site inspections. If problems are observed that required more investigation, follow-up surveys will be performed.

1. 0 SITE INSPECTIONS

The DOE will inspect the Cheney disposal site to detect progressive change caused by slow-acting natural processes and to identify potential problems before the need for extensive maintenance, repairs, or corrective action. Inspections may also be conducted to follow-up on events or conditions that potentially could affect the disposal site. The DOE will compare the findings from these inspections to initial baseline conditions to identify changes over time and to provide a basis for future inspections, repairs, and corrective

actions. Figure 3.1 shows this process. Section 5.0 describes custodial maintenance and repair. Section 5.0 discusses corrective action.

1. *INSPECTION FREQUENCY*

The DOE will inspect the Cheney disposal site annually. The DOE may schedule more frequent inspections if necessary. The DOE will notify the NRC of the inspection schedule.

2. INSPECTION TEAM

The inspection team will consist of a minimum of two inspectors who are qualified to inspect disposal cell integrity and to make preliminary assessments of modifying processes that could adversely affect the disposal cell.

If problems are observed that require more investigation, follow-up inspections will be performed and teams will include one or more technical specialists in appropriate disciplines.

3. ANNUAL INSPECTIONS

Inspectors will conduct a preinspection briefing before each inspection. The long-term surveillance program guidance document contains information useful in preparing for inspections (DOE, 1996a).

Site inspections will cover the disposal cell, the surrounding disposal site area, and the immediate off-site areas. Site inspections must be thorough enough to identify significant changes or active modifying processes that potentially could adversely impact the disposal cell. Surveillance will be performed to identify the unanticipated effects of modifying processes such as gully formation, slope erosion, changes to the rock cover, ephemeral drainage channel changes, and significant modifications by humans, animals, or plants.

- **Click here for Figure 3.1 Steps for follow-up inspections, custodial maintenance, and corrective action, Grand Junction, Colorado, Colorado, disposal site**

Inspectors will evaluate the integrity of the disposal cell by walking a series of transects around the perimeter and over the rock cover. Sufficient transects, at approximately 150-ft (46-m) intervals, will be walked to ensure that the disposal cell is thoroughly covered and inspected. Diagonal transects of the topslopes will be made and the crest line will be walked. Additional transects will be walked along the sideslopes and rock apron. Transects along the entire length of the diversion ditch will be made to determine whether it is functioning as designed and can be expected to continue to function properly. Inspectors will make efforts to vary the transect paths from one inspection to the next to ensure small anomalies are not overlooked. The sample inspection checklist in the LTSP guidance document lists items that should be examined during inspections (DOE, 1996a).

The disposal cell has a rock cover and vegetation is not planned for the disposal cell. However, remedial action of the areas surrounding the disposal cell included revegetation. The area surrounding the disposal cell will be monitored to determine the success of the revegetation efforts. Inspectors also will inspect this area for evidence of erosion caused by wind, sheetwash, or changes in drainage patterns.

Site inspectors also will monitor damage to or disturbance of permanent site-surveillance features, fencing, the gate, and locks.

From inside the disposal site, inspectors will visually survey the area approximately 0.25 mi (0.40 km) outside the disposal site boundary for evidence of land-use changes that indicate increased human activity such as land development or new roads and paths. Inspectors will note the condition of and changes to site access roads, surrounding vegetation, and relevant geomorphic features like gullies or ephemeral drainage channels. Potential impacts to the site will be noted. Off-site DOE monitor wells will be inspected until they are properly decommissioned.

4. FOLLOW-UP INSPECTIONS

In addition to annual inspections, DOE may conduct follow-up inspections due to unusual or annual inspection findings or observations. DOE also may conduct follow-up inspections to investigate and quantify specific problems found during a previous inspection or other DOE-initiated activity, or confirmed reports of vandalism (intrusion or damage), unusual occurrences, or other significant threat to the disposal site. The DOE will monitor the disposal cell area for the occurrence of extreme natural events (e.g., earthquakes, tornadoes, floods) and vandalism to ensure such events are investigated in a timely manner. To facilitate this, the DOE has requested notification from federal, state, and local agencies of discoveries or reports of purposeful intrusion or damage at the disposal site and in the disposal site area. Notification agreements with the Mesa County Sheriff's Office and the U.S. Geological Survey's National Earthquake Information Center are included in Attachment 3. The DOE will also monitor the weather for the occurrence of severe storms in the disposal cell vicinity. In addition, the DOE 24-hour telephone number is posted on the site entrance sign so the public can notify the DOE if problems are discovered. If an extreme natural event or vandalism has occurred, the DOE will inspect the cell to assess the damage. The notification, response, and follow-up activities will be documented. This documentation will be included in the annual site report to the NRC and

become part of the permanent site file.

The nature of the occurrence and the amount of firsthand knowledge available will determine the DOE's response. If a situation poses a threat to the public, the DOE will notify individuals who may be affected and the appropriate federal, state, and local agencies, including the NRC. If necessary, the DOE will schedule a follow-up inspection to assess potential effects of the unusual occurrence, and will take necessary response action. Follow-up inspections also will be conducted to determine whether processes currently active at or near the site threaten site security or stability and to evaluate the need for custodial maintenance, repair, or other corrective action. The scope of these follow-up inspections may be broad and similar in nature to routine site inspections or focus on specific areas of concern.

5. QUALITY ASSURANCE

The DOE has developed and implemented a quality assurance (QA) plan (DOE, 1996b) for the site inspection program that meets the requirements of DOE Order 5700.6C. Site inspections will be conducted in accordance with this QA plan.

1. 0 CUSTODIAL MAINTENANCE AND REPAIR

The DOE does not plan to conduct routine maintenance at the Cheney site. However, DOE will perform needed custodial maintenance or repair as determined from site inspections. Unscheduled custodial maintenance or repair may include the following:

- Repairing or replacing deteriorated or vandalized warning signs, fencing, gates, and locks.
- Removing deep-rooted plants determined to be a threat to the integrity of the cover.
- Reseeding areas surrounding the disposal cell.

After the work is completed and before contractors are released, DOE will verify that work was performed according to specification. The annual report to the NRC will document repairs that are performed. Copies of records, reports, and certifications will be included in the permanent site file.

1. 0 CORRECTIVE ACTION

1. SITE-SPECIFIC ISSUES

Because ground water monitoring is not proposed at the Cheney disposal site, the only

monitoring will be visual inspections of surface conditions during routine surveillance and maintenance. Previously unnoticed seeps or other surface exposures of ground water observed during routine site surveillance shall be noted and appropriate water samples shall be collected and analyzed to determine if the water is contaminated. If the analyses indicate the water is contaminated, the source of the water and the potential threat to human health and the environment will be assessed. If appropriate and necessary, the DOE may perform corrective actions to contain the source of the contaminated water and/or limit exposure of the land surface to the water. Such corrective actions may include, but are not limited to 1) constructing a sump or other device to collect the contaminated ground water before it reaches land surface, and treating or evaporating the water as necessary; or 2) controlling access to the contaminated water by covering it with graded, large-diameter rock until it can reinfiltrate or evaporate. The DOE has determined that the probability that surface exposure of tailings seepage is nearly zero; therefore, the necessity for corrective action at the Cheney disposal site is highly improbable.

2. CORRECTIVE ACTION

Corrective action is repairs that are needed to address problems that affect the integrity of the disposal cell or compliance with 40 CFR Part 192. The NRC must approve the recommended action in advance. Site inspections are designed to identify problems at the developmental stage. Examples of conditions that might trigger corrective action are as follows:

- Surface rupture or subsidence of the disposal cell.
- Development of rills, gullies, or slope instability on the disposal cell.
- Deterioration of the erosion-protection rock on the disposal cell.
- Tailings fluids originating from the disposal cell.
- Gully development on or immediately adjacent to disposal site property that could affect the integrity of the disposal cell.
- Damage to the cell cover or disposal site property from natural catastrophic events or vandalism.
- Damage to the disposal cell cover from deep-rooted plant growth.

The DOE will evaluate the factors that caused the problem and identify actions to mitigate the impact and prevent recurrence. An onsite inspection or preliminary assessment will include but is not limited to:

- Identifying the nature and extent of the problem.
- Reevaluating germane engineering design parameters.

For conditions that warrant a follow-up inspection, the DOE will submit a preliminary assessment or status report to the NRC within 60 days of the inspection. The preliminary assessment report will evaluate the problem and recommend the next step (e.g., immediate action or continued evaluation). If the problem requires immediate repair, the DOE will develop a corrective action plan for NRC approval. Once the NRC approves the corrective action, the DOE will implement the plan. In some cases, corrective action could include temporary emergency measures instituted prior to completion of the normal approval process. If the problem does not require immediate repair, the problem will be documented in the annual report and assessed at the next annual inspection.

NRC regulations do not stipulate a time frame for implementing corrective action (except the finding of an exceedance in established ground water concentration limits, which does not apply at this site.) Assessing the extent of a problem and developing a corrective action plan is not considered to be an initiation of the corrective action program.

In addition to the preliminary assessment report, the DOE may, (as appropriate) prepare a progress report on each corrective action while it is under way or under evaluation.

After corrective action is complete, the DOE will certify work and submit a certification statement and supporting documentation to the NRC for review and concurrence. A copy of the certification statement will become part of the permanent site file, as will reports, data, and documentation generated during the corrective action.

1. 0 RECORD KEEPING AND REPORTING

1. PERMANENT SITE FILE

The DOE will maintain a permanent site file containing site inspection reports and other supporting documentation of long-term surveillance program activities. The information placed in the site file will include:

- Documentation of disposal site performance.
- Demonstration that licensing provisions were met.
- Information needed to forecast future site-surveillance and monitoring needs.
- Reports to stakeholders regarding disposal cell integrity.

After the site is brought under the general license, the DOE will compile copies of site documentation required by the long-term surveillance program guidance document (DOE, 1996a) for the Grand Junction Cheney disposal site permanent site file. Copies of deeds, custody agreements, and other property documents will be kept in the site file. The DOE will maintain surveillance and maintenance documentation identified in other sections of this interim LTSP and it will become part of the permanent site file. The DOE will update the site file as necessary after disposal site inspections, maintenance activities, or corrective actions are complete. These records will be handled in accordance with DOE directives to ensure their proper handling, maintenance, and disposition. The archival procedures set forth in 41 CFR Part 101 and 36 CFR Parts 1220-1238 (Subchapter B) will be followed. All information will be available for NRC and public review.

1. INSPECTION REPORTS/ANNUAL REPORTS

During site inspections, activities and observations will be recorded and described using site-inspection checklists, maps, photographs and photo logs, and field notes. Documentary evidence of anomalous, new, or unexpected conditions or situations must describe developing trends and enable the DOE to make decisions concerning follow-up inspections, custodial maintenance, and corrective action. This information will be contained in the permanent site file at the DOE office. The DOE will prepare a site inspection report documenting the findings and recommendations from field inspections.

Site inspection reports will be submitted to the NRC within 90 days of the annual site inspection. Inspection reports will summarize the results of follow-up inspections and maintenance completed since the previous annual inspection.

If unusual damage or disruption is discovered at the Cheney disposal site during an inspection, a preliminary report assessing the impact must be submitted to the NRC within 60 days. If maintenance, repair, or corrective action is warranted, the DOE will notify the NRC. The NRC will receive a copy of corrective action plans and of each corrective action progress report, or the reports will be attached to the annual report.

The DOE also will provide copies of inspection reports and other reports generated under the long-term surveillance program to the state of Colorado as required in the cooperative agreement.

1. 0 REFERENCES

DOE (U.S. Department of Energy), 1997. *Final Completion Report, Grand Junction, Colorado Disposal Site* , Contract No. DE-AC04-83AL18796, prepared for the U.S. Department of Energy by MK-Ferguson Company, Albuquerque, New Mexico.

DOE (U.S. Department of Energy), 1996a. *Guidance for Implementing the Long-Term Surveillance Program for UMTRA Project Title I Disposal Sites* , DOE/AL-62350-189, Rev. 0, prepared for the U.S. Department of Energy, Environmental Restoration Division, UMTRA Project Team, Albuquerque, New Mexico.

DOE (U.S. Department of Energy), 1996b. *Long-Term Surveillance and Maintenance Program, Quality Assurance Program Plan* , MAC-2152, Rev. 0, prepared by MACTEC Environmental Restoration Services, for the U.S. Department of Energy, Grand Junction Office, Grand Junction, Colorado.

DOE (U.S. Department of Energy), 1992. *Vegetation Growth Patterns on Six Rock-Covered UMTRA Project Disposal Cells* , UMTRA-DOE/AL 400677.0000, UMTRA Project Office, Albuquerque Operations Office, Albuquerque, New Mexico.

DOE (Department of Energy), 1991a. *Remedial Action Plan and Site Design for Stabilization of the Inactive Uranium Mill Tailings Site at Grand Junction, Colorado* , September 1991, DOE/AL-050505.0000, prepared for the U.S. Department of Energy, UMTRA Project Office, Albuquerque Operations Office, Albuquerque, New Mexico, Grand Junction Projects Office, UPDCC File Location No. 13.1.1.

DOE (U.S. Department of Energy, 1991b. *Uranium Mill Tailings Remedial Action Project (UMTRAP), Grand Junction, Colorado, GRJ-PH-11, Subcontract Documents, Final Design for Construction,* prepared for the U.S. Department of Energy by Morrison-Knudsen Engineers, San Francisco, California.

DOE (Department of Energy), 1986. *Final Environmental Impact Statement, Remedial Actions at the Former Climax Uranium Company, Uranium Mill Site, Grand Junction, Mesa County, Colorado,* Vol. I, Text, Vol. II, Appendices, DOE/EIS-0126-F, December 1986, UPDCC File Location No. 5.13.1.6., prepared for the U.S. Department of Energy, UMTRA

Project Office, Albuquerque Operations Office, Albuquerque, New Mexico.

TAC (Technical Assistance Contractor), 1995. Unpublished field notes, Grand Junction Colorado, UMTRA Project site, 19-20 September 1995, UPDCC File Location No. 5.15.1.1, prepared by the Technical Assistance Contractor, Albuquerque, New Mexico, for the U.S. Department of Energy, Environmental Restoration Division, UMTRA Project Team, Albuquerque, New Mexico.

CODE OF FEDERAL REGULATIONS

10 CFR Part 40, *Domestic Licensing of Source Material* , U.S. Nuclear Regulatory Commission.

36 CFR Parts 1220-1238, *National Archives and Records, Subchapter B - Records Management* , National Archives and Records Administration.

40 CFR Part 143, *National Secondary Drinking Water Regulations* , U.S. Environmental Protection Agency.

40 CFR Part 192, *Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings* , U.S. Environmental Protection Agency.

41 CFR Part 101, *Federal Property Management Regulations* , General Services Administration.

DOE ORDERS

Order 5700.6C, *Quality Assurance* , 21 August 1991, U.S. Department of Energy, Washington, D.C.

ATTACHMENT 1

NRC CONCURRENCE AND LICENSING DOCUMENTATION

Available Upon Request - Click here to email a request

ATTACHMENT 2

Site Real Estate Information

SITE REAL ESTATE INFORMATION

GENERAL

The disposal site is located on public land formerly administered by the U.S. Department of the Interior's (DOI) Bureau of Land Management (BLM). Under the requirements of the Uranium Mill Tailings Radiation Control Act (UMTRCA) of 1978, as amended, the U.S. Department of Energy (DOE) acquired the disposal site land via a Public Land Order (PLO) (42 USC §7901 *et seq.*). The PLO permanently transferred 360 acres (146 hectares) from the public domain to the DOE in accordance with the terms of the UMTRCA. As a result of the transfer, the land is no longer subject to the general land laws, including mining and mineral leasing. The transfer of the land to the DOE vested in the DOE the full management, jurisdiction, and liability for the land and all activities conducted thereon, except that the BLM retained the authority to administer any claims or interests in the land established before the effective date of the transfer.

LEGAL DESCRIPTION

A tract of land located in Township 3 North Range 2 East, Ute Principal Meridian, described by the following government land survey. Section 11: SE1/4 SW1/4, S1/2 SE1/4; Section 14: NE1/4, E1/2 NW1/4. The area described contains approximately 360 acres of public land in Mesa County, Colorado.

RECORDED

The PLO was published in the *Federal Register* , dated 13 February 1990. The *Federal Register* document is listed as 90-3302, filed 12 February 1990 as 43 CFR Public Land Order 6767. The effective date of the transfer is 13 February 1990.

REAL ESTATE FILES

The U.S. Department of Energy maintains its real estate correspondence and related documents at the Albuquerque Operations Office, Property Management Branch, Property and Administrative Services Division, P.O. Box 5400, Albuquerque, New Mexico 87115, under the supervision of the Branch Chief, 505-845-6450.

REFERENCE

42 USC §7901 *et seq* ., *Uranium Mill Tailings Radiation Control Act* , 8 November 1978.

Insert photocopy of Federal Register Notice containing the permanent land withdrawal for the Cheney Reservoir site filed on 12 February 1990.

Attachment 3

Emergency Notification Letters

Available Upon Request - Click here to email a request

Appendix F

Grand Junction, Colorado, Disposal Site
Final Completion Report
Calculation 05-670-12-00, "Seep Remediation"

Calculation Cover Sheet

ASSESSED FOR QUALITY REQUIREMENTS BY Walton 30 July 95

Contract No. 3885-34 Discipline ESCUP

Calc. No. 05-670-12-00
No. of Sheets ~~14~~ 18

Project

UMTRA - GRAND JUNCTION

Feature

EMBANKMENT DESIGN

Item

SEEP REMEDIATION
(PALEOCHANNEL)

Sources of Data

Sources of Formulae & References

Preliminary Calc. ☐ Final Calc. ☒ Supersedes Calc. No. _____

Rev No	Revision	Calculation By	Date	Checked By	Date	Approved By	Date
	[illegible]		[illegible]	[illegible]	[illegible]		
0		J. Cercone	6/30/90	[illegible]	[illegible]	P.S.	[illegible]

Form 42-110

MORRISON-KNUDSEN ENGINEERS, INC.
A MORRISON KNUDSEN COMPANY

Project UMTRA - GRJ
Feature EMBANKMENT DESIGN
Item SEEP REMEDIATION

Contract No. 3985-34
Designed H. LUBIS
Checked

Sheet i
File No.
Date 9/18/90
Date

EDS 7/23/95
REZA B 7-24-95

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SDS 7/23/95

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7-24-95

UMTRA - GRAND JUNCTION

SCOPE OF WORK FOR NW-PALEOCHANNEL
RESTORATION AT CHENEY II SITE
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1.0 SCOPE OF WORK

2.0 DESIGN OBJECTIVES

3.0 PALEOCHANNEL RESTORATION

4.0 FINAL SITE RESTORATION

Sheet iii

SYS 8/23/95

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UMTRA - GRAND JUNCTION
SCOPE OF WORK FOR NW-PALEOCHANNEL
RESTORATION AT CHENEY II SITE

1.0 SCOPE OF WORK

The Scope of Work presented herein includes the objective and purpose, materials and methods, required by the Contractor, MK-Ferguson (MKF) for restoring the paleochannel at the Cheney II Disposal Site.

This work is to be performed by the Subcontractor, Industrial Construction Company (ICC), for MKF, the Contractor. The Subcontractor shall furnish all labor, materials, equipment, transportation, fuel and supplies needed to restore the NW-paleochannel to as near to natural conditions.

Morrison-Knudsen Environmental Services (MKES) will provide technical direction for the Contractor for field supervision of the paleochannel restoration, gravel orting/selection or screening and necessary QC testing.

ne Grand Junction site office will develop a "Schedule of Quantities and Prices" nich the Subcontractor shall respond to. In addition, the Subcontractor shall rovide the following information:

- o Brief description of his equipment and procedures.
- o Time required to complete the operation.

1 DESIGN OBJECTIVES

objective of this Scope of Work is to:

- o Restore the paleochannel with granular materials as near to natural conditions as practicable to maintain existing perched flow continuity (Figure 3). NOTE: [illegible] APPENDIX, Sheet 3 [illegible]

Sheet 1

REZA B 7-24-95 SDS 7/21

- Place a buffer clay zone along both south and north sides of the paleochannel and a clay cap above the granular material to prevent water seepage into the cell from the paleochannel.

- Restore the area to design grade as the cell construction drawings specify. (This will be accomplished concurrent with the cell construction).

3.0 PALEOCHANNEL RESTORATION

The paleochannel restoration sequence will be similar to the insitu sequence exposed during the cell wall excavation, except for minor changes design to improve the flow continuity. The work will be closely monitored by MKF/MKES field personnel to insure proper placement and compaction. The suggested work sequence is as follows:

- Material in the existing paleochannel shall be completely removed down to bedrock (Mancos Shale).

- Cleaned paleochannel shall be surveyed to define its course and inlet and outlet points within the cell (Figure 2). NOTE: FIGURE 2 IS PRESENTED IN APPEND Sheet 2 H.L.

- Backfilling sequence shall be similar to the natural sequence, as shown in Figure 3.

- Initial backfill material shall be the clay obtained adjacent to the cell south of the buffer zone (Figure 1), until all clay is used up. Thereafter, clay shall be borrowed from the stockpiles. NOTE: FIGURE 1 PRESENTED IN APPEND Sheet 1

- Contact between the bedrock and the clay backfill shall be scarified to assure a satisfactory bonding.

Sheet V
SMS 7/
PCZA B 7-24-95

- Compacted clay backfill shall be placed. The clay shall be compacted to 95% standard proctor density (ASTM D698), and 0 - 3% wet of optimum moisture content. Lift thickness shall be as required for the specified compaction, but shall not exceed 12 inches.

- Clay backfill shall be brought 6 feet above grades established at trenches #1 and #4 of the paleochannel grade.

- Excavate clay backfill as specified in Figure 3, down to design paleochannel grade elevation.

- The excavated paleochannel shall be backfilled with recommended granular material (Whitewater gravel - see attached gradation in calculations) up to the required thickness (6 - 7 feet). The granular fill shall not be placed in layers exceeding 12 inches, and shall not be compacted.

- Cover granular material with porous geo-textile (Figure 3).

- Clay backfill shall be resumed above textile/granular material phase, minimum required 2-feet (Figure 3).

- Backfill remaining area to design grade concurrent with Cheney II disposal cell construction.

4.0 FINAL SITE RESTORATION

The Subcontractor will not be required to restore at this time all disturbed areas to their approximate original contours. Restoration will be completed concurrent with the disposal cell construction.

NOTE:
FIGURE 3 IS PRESENTED IN APPENDIX, Sheet 3
H.L. 9/18/95

APPENDIX

PALEOCHANNEL DESIGN AND CALCULATION

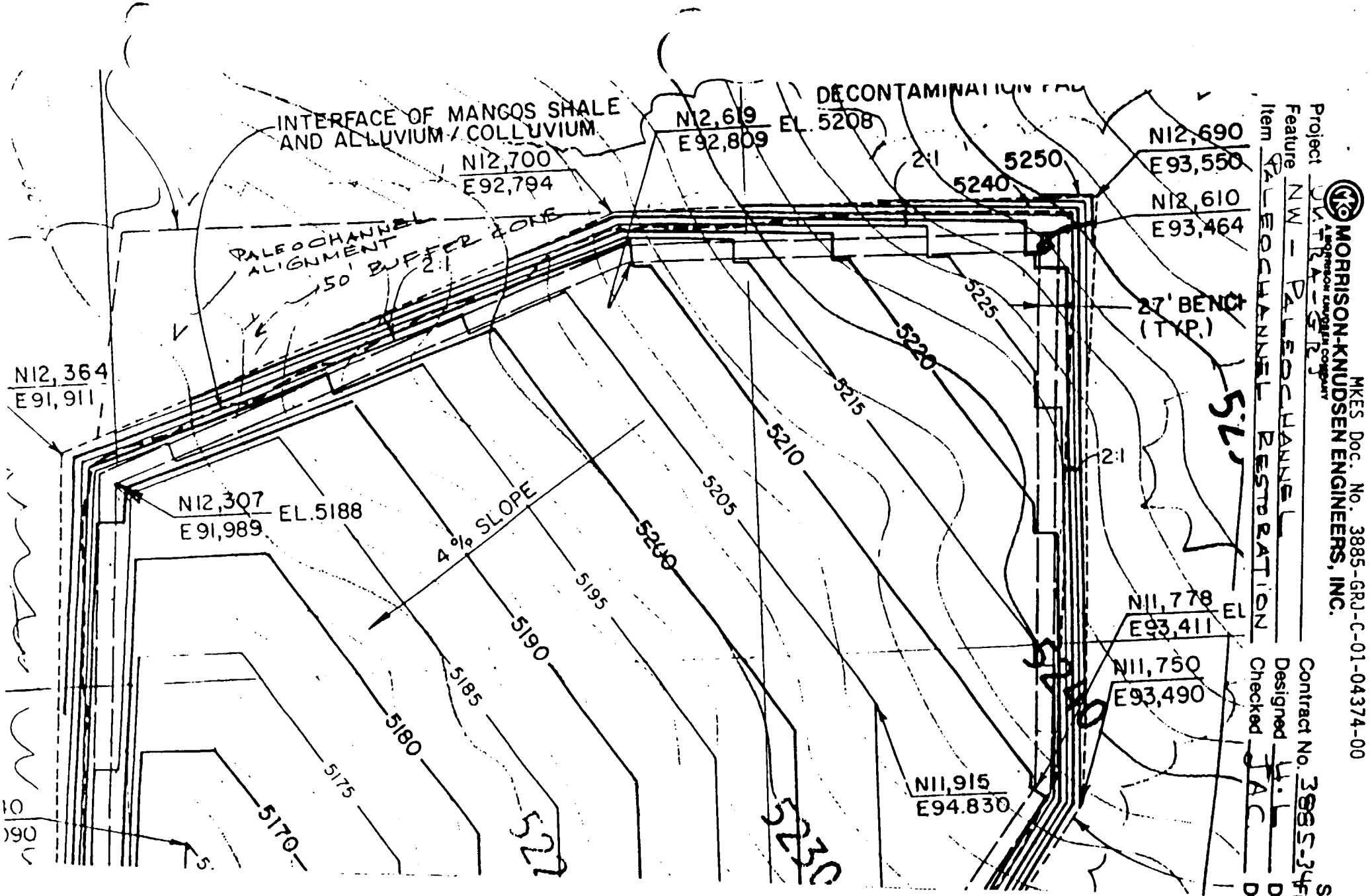


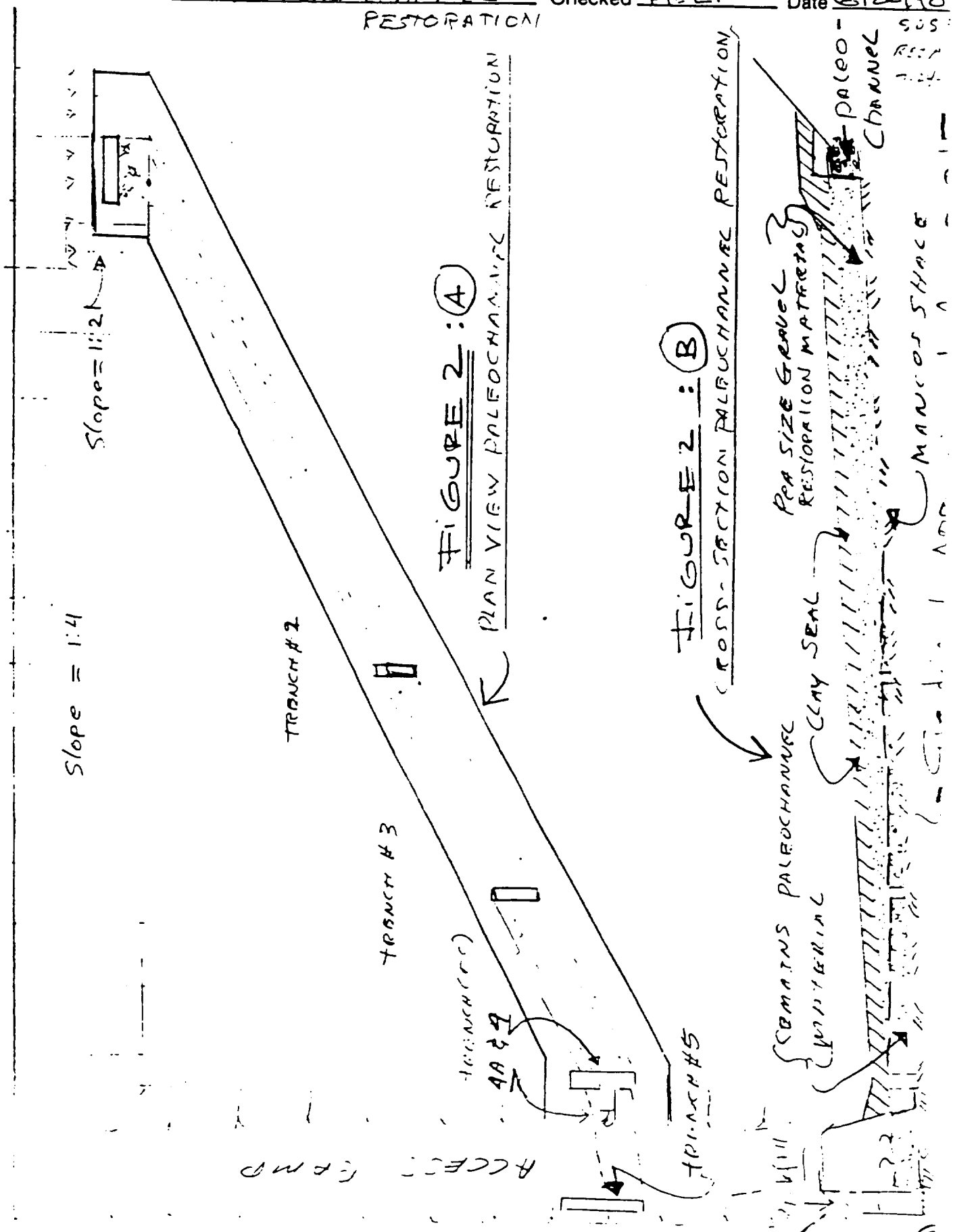
FIGURE 1 BUFFER ZONE
(50 FEET FROM THE PALEOCHANNEL ALIGNMENT)

MORRISON-KNUDSEN ENGINEERS, INC.
A MORRISON KNUDSEN COMPANY

Project
Feature NW- PALEOCHANNEL
Item PLAN VIEW - PROPOSED CHANNEL RESTORATION

Contract No. 3885-34
Designed J. CERCONE
Checked H.L.

Sheet 2
File No.
Date 5/15/90
Date 6/20/90



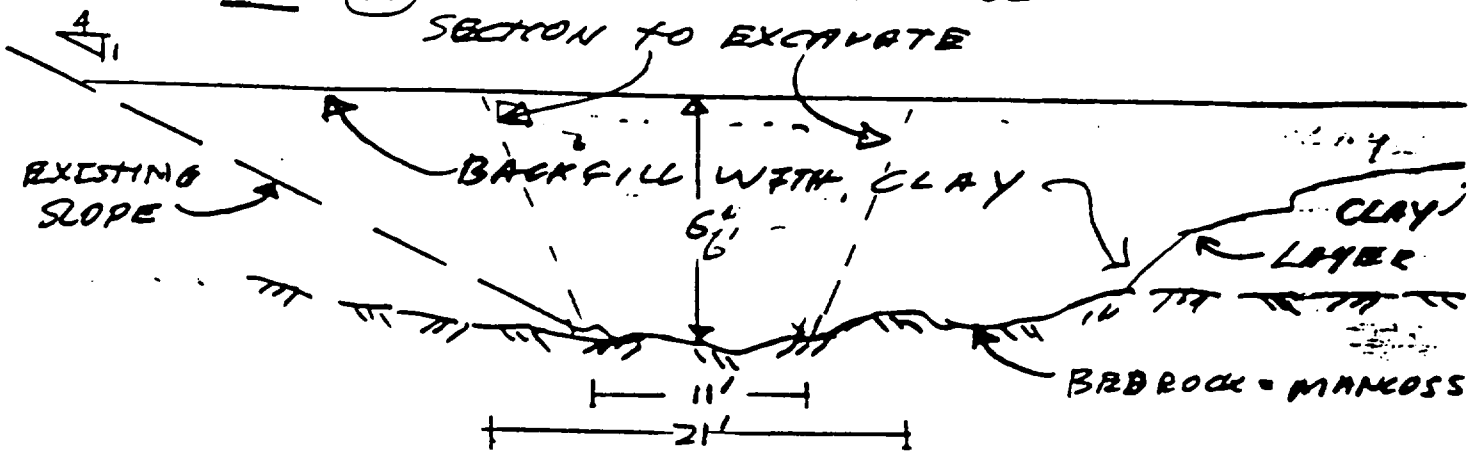
[redacted]

Project [redacted]
Feature NW – PALEOCHANNEL
Item PALEOCHANNEL RESTORATION

Contract No: [redacted]
Designed JAC
Checked H.L

[redacted]
Date 8/30/00

FIG 3 · (A) PROPOSED PALEOCHANNEL SECTION TO EXCAVATE



① BACKFILL PALEOCHANNEL & ORIGINAL GROUND WITH CLAY.

② EXCAVATE PALEOCHANNEL SECTION (SEE BELOW)

③ Backfill paleochannel section with gravels.

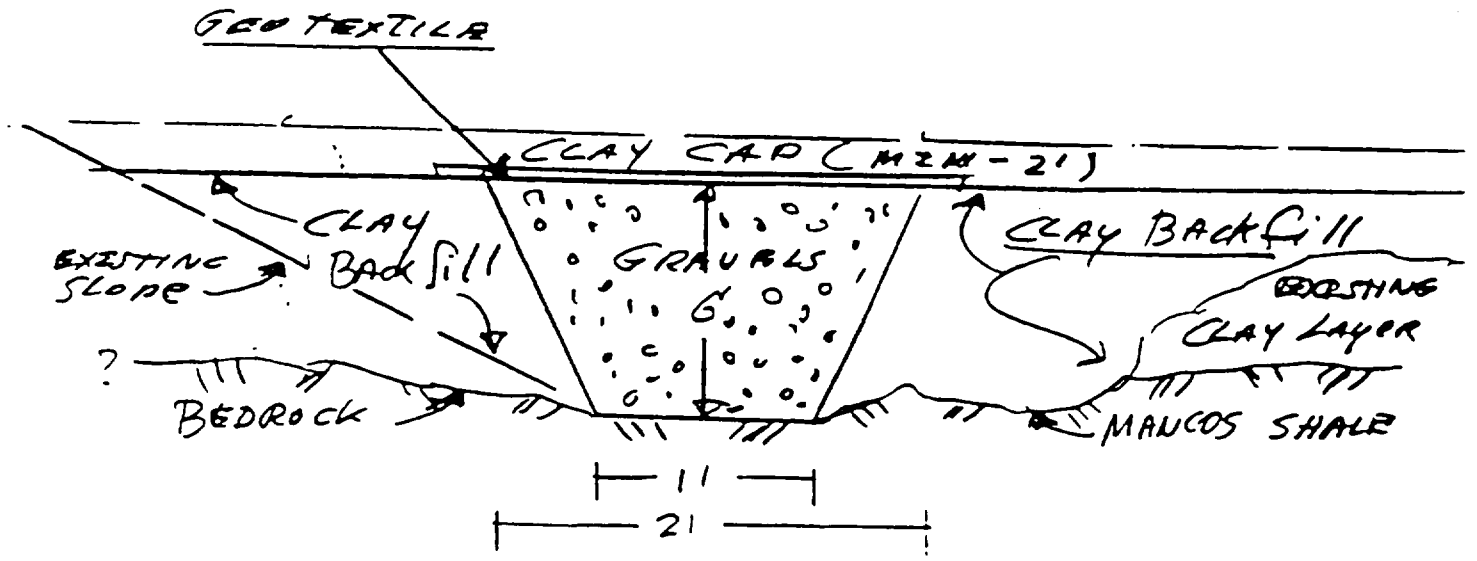


FIG 2 · (B) TYPICAL (FINAL) SECTION PALEOCHANNEL RESTORATION

Sh: 3A

[redacted] ENGINEERS, INC.

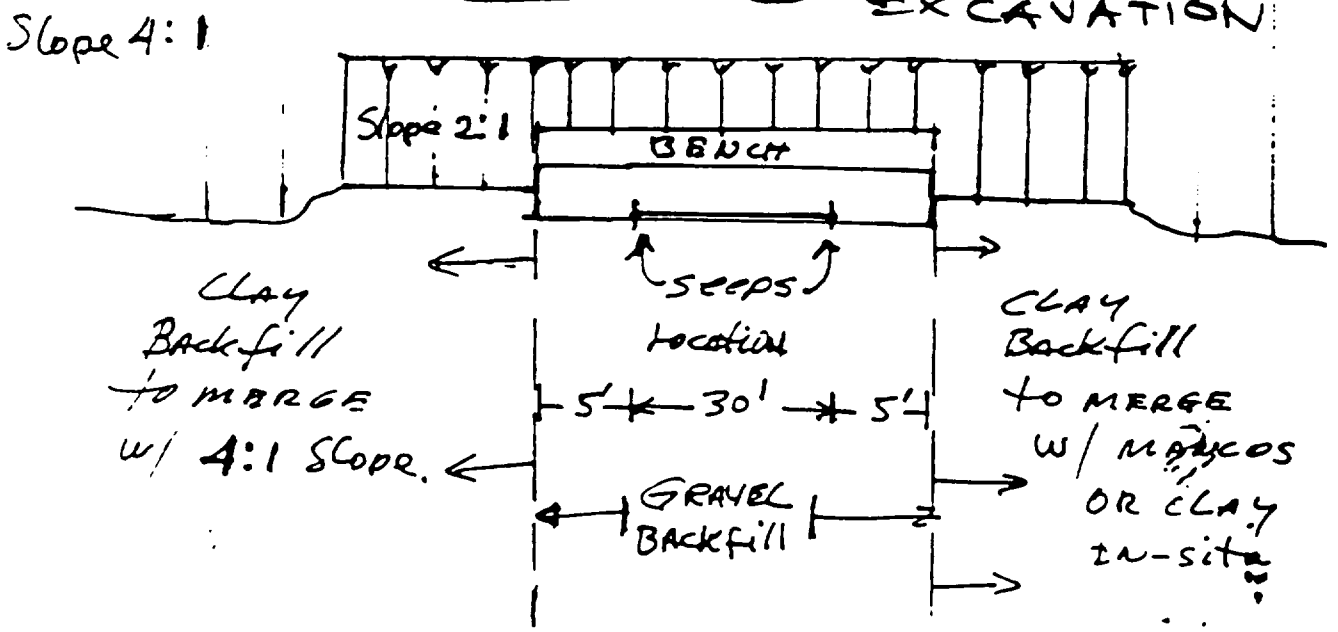
Project: [redacted] — GRJ
Feature: NW - PALEOCHANNEL
Item: PALEOCHANNEL RESTORATION

Contract No. 3885-34
Designed: J. CERCONE
Checked: H. L

[redacted]
Date: 5/31/90
Date: 8/30/90

EXCAVATION METHOD NE-END

FIG 3: (C) PLAN VIEW OF EXCAVATION



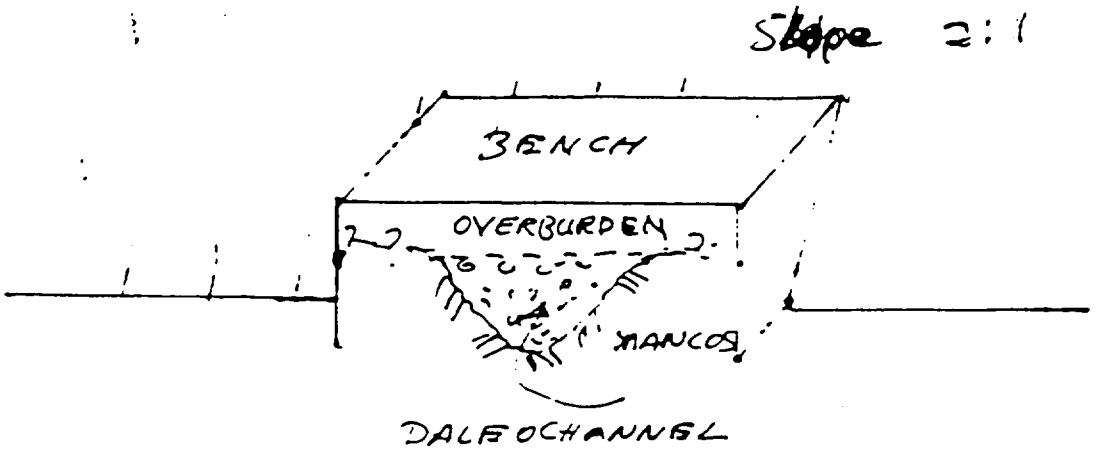


FIGURE 2: (I) VIEW ON THE SIDE SLOPE 2:1

Appendix G

Grand Junction, Colorado, Disposal Site
Final Completion Report
Calculation 05-670-13-00, "Infiltration Study"

Calculation Cover Sheet

CALC REVIEWED FOR QUALITY REQUIREMENTS BY [illegible] 31 July 95

Contract No. 3885-34 **Discipline** Hydrology

Calc. No. 05-670-13-00

No. of Sheets ~~43~~ 45

Appendix A 7 sheets
B 17 sheets
C 3 sheets
D 3 sheets
E 5 sheets
~~24~~ 30 sheets

Project

UMTRA- GRAND JUNCTION

Feature

Disposal cell

Item

Infiltration Study

Sources of Data

1) Daniel B. Stephens & Associates, Inc. May 1990. "Laboratory Analysis of Soil Hydraulic Properties of the Main GRJ Tailings and Vicinity Property Materials" Del. order COS. MKE Doc. No. 3885-GRJ-R-02-04329-00.
2) JEG Calculation GRJ-01-90-02-03-00 by G. Smith 4/5/90.

Sources of Formulae & References

1) Davis, L.A. and S.P. Neuman. Documentation and User's Guide: UNSAT2 - Variably Saturated Flow Model, Final Report, December 1983.
2) USER's Guide, RETC, United States Dept. of Agriculture, 1987.
3) Telecon [illegible] to [illegible], 4/25/90

Preliminary Calc. ☐ **Final Calc.** ☒ **Supersedes Calc. No.** _____

Rev No	Revision	Calculation By	Date	Checked By	Date	Approved By	Date
0	Original	[illegible]	5/10/90	[illegible]	5/16/90	[illegible]	[illegible]

Form 42-110

MORRISON-KNUDSEN ENGINEERS, INC.
A MORRISON KNUDSEN COMPANY

Project: UMTRA - GRJ.
Feature:
Item:

Contract No. 3885.34
Designed: SAB
Checked: PS

Sheet: 1
File No.:
Date: 11.29.90
Date: 12-21-90

Acc 11/29/90
MID 12/22/90

EMBANKMENT DESIGN - INFILTRATION

CALCULATION # 05-670-13-00

NOTE: THE 6 FEET OF ADDITIONAL DEPTH WILL NOT ADVERSELY AFFECT INFILTRATION. THE MANCOS SHALE HAS BEEN TESTED AND HAS BEEN FOUND TO BE PERMEABLE. THE LOWER ELEVATION OF THE EXCAVATION BOTTOM WILL ENHANCE THE ABILITY OF THE CELL TO MAINTAIN A WATER LEVEL WITHIN THE MANCOS LAYER.

MORRISON-KNUDSEN ENGINEERS, INC.
A MORRISON KNUDSEN COMPANY

Project: Grand Junction
Feature: Disposal Cell
Item: Infiltration Study

Contract No. 3885-34
Designed: ACC
Checked: MVD

Sheet 1
File No.
Date 27 July 90
Date 8/15/90

Purpose - to estimate the amount of water buildup within the Grand Junction Disposal Cell for transient drainage condition.

Procedures / Assumptions

- Disposal cell configuration was based on the currently* available excavation and final grading plans. See figures 1 and 2, respectively.

  * note Fig. 1 = Drawing No. 0134, Rev 4, 6/19/90
  Fig. 2 = Drawing No. 0220 (as of 6/19/90)

- A-A' on Figure 1 & 2 indicates location of cross-section through disposal cell used in the model.

- Top of Mancos shale (prior to excavation) defined by Fig. 2.5 (sheet 4)
- A 2-dimensional finite element mesh was constructed as shown on Figure 3. A total of 533 nodes and 483 elements were used. The 3-dimensional nature of the flow is neglected in this 2-D analysis.

- Maximum required depth of shale below lowest point of cell (≈ 70-80 feet) for modeling purposes was estimated from 1-D model results.

- Units for UNSAT2 are feet and days

- [illegible]

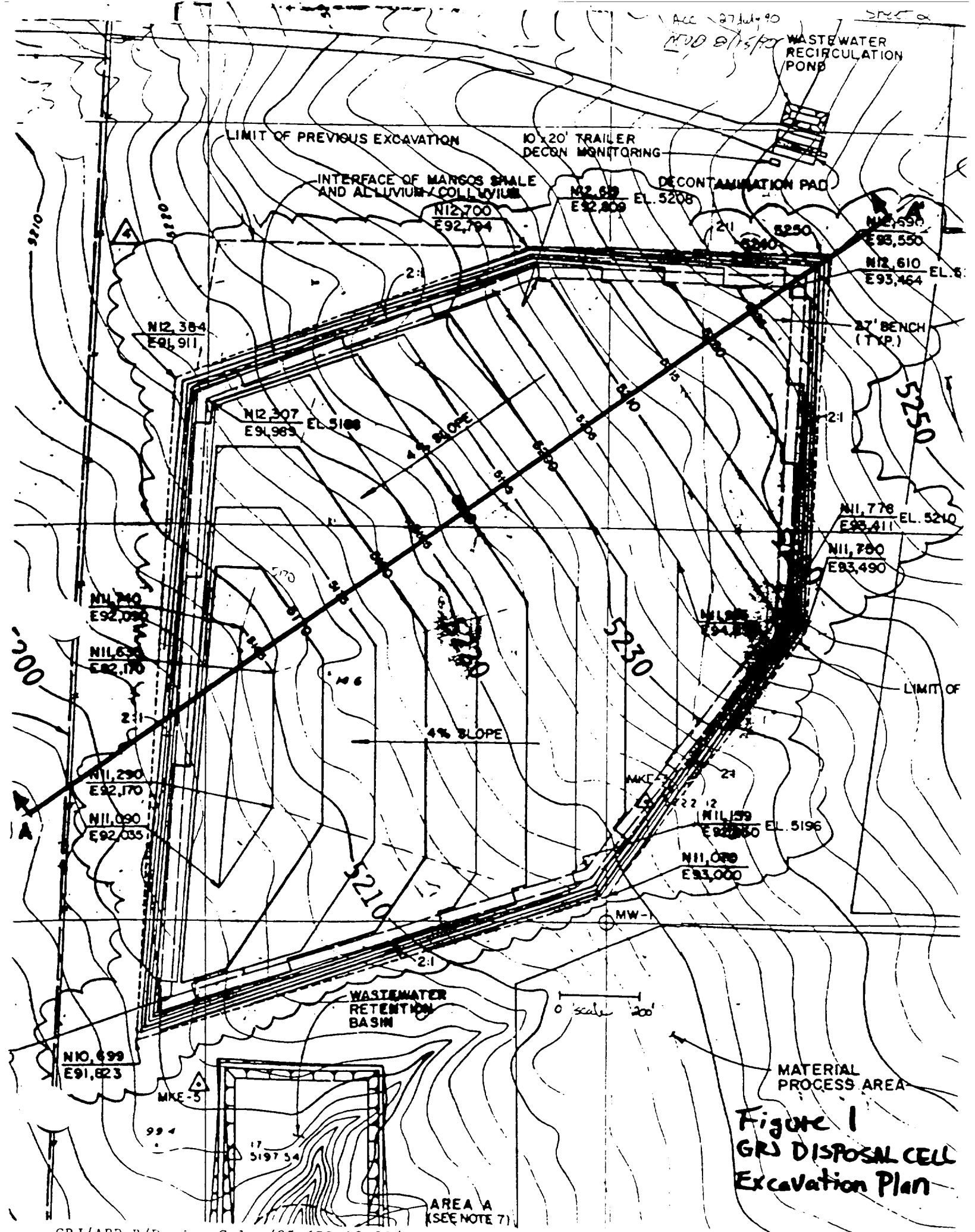


Figure 1
GRJ DISPOSAL CELL
Excavation Plan

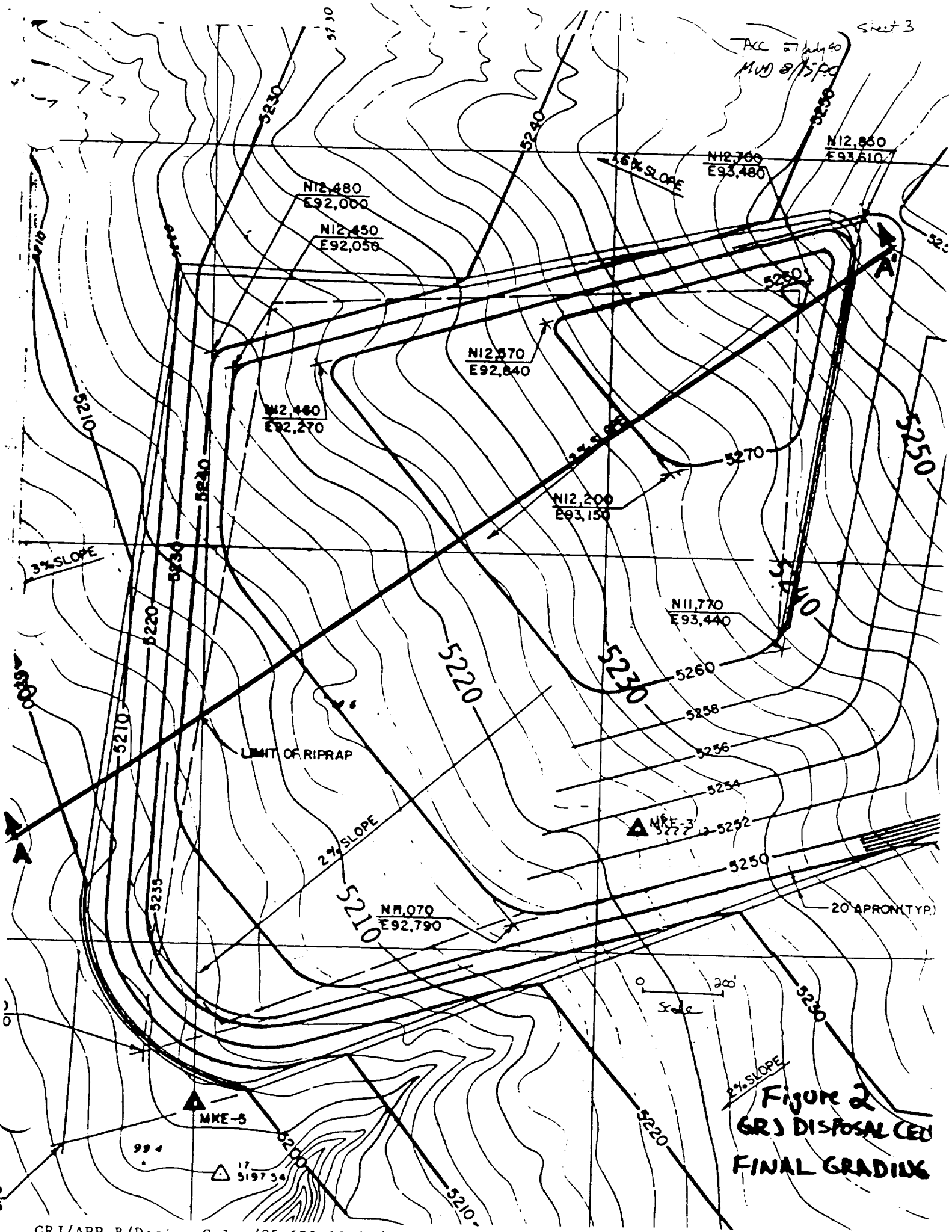


Figure 2
GRJ DISPOSAL CELL
FINAL GRADING

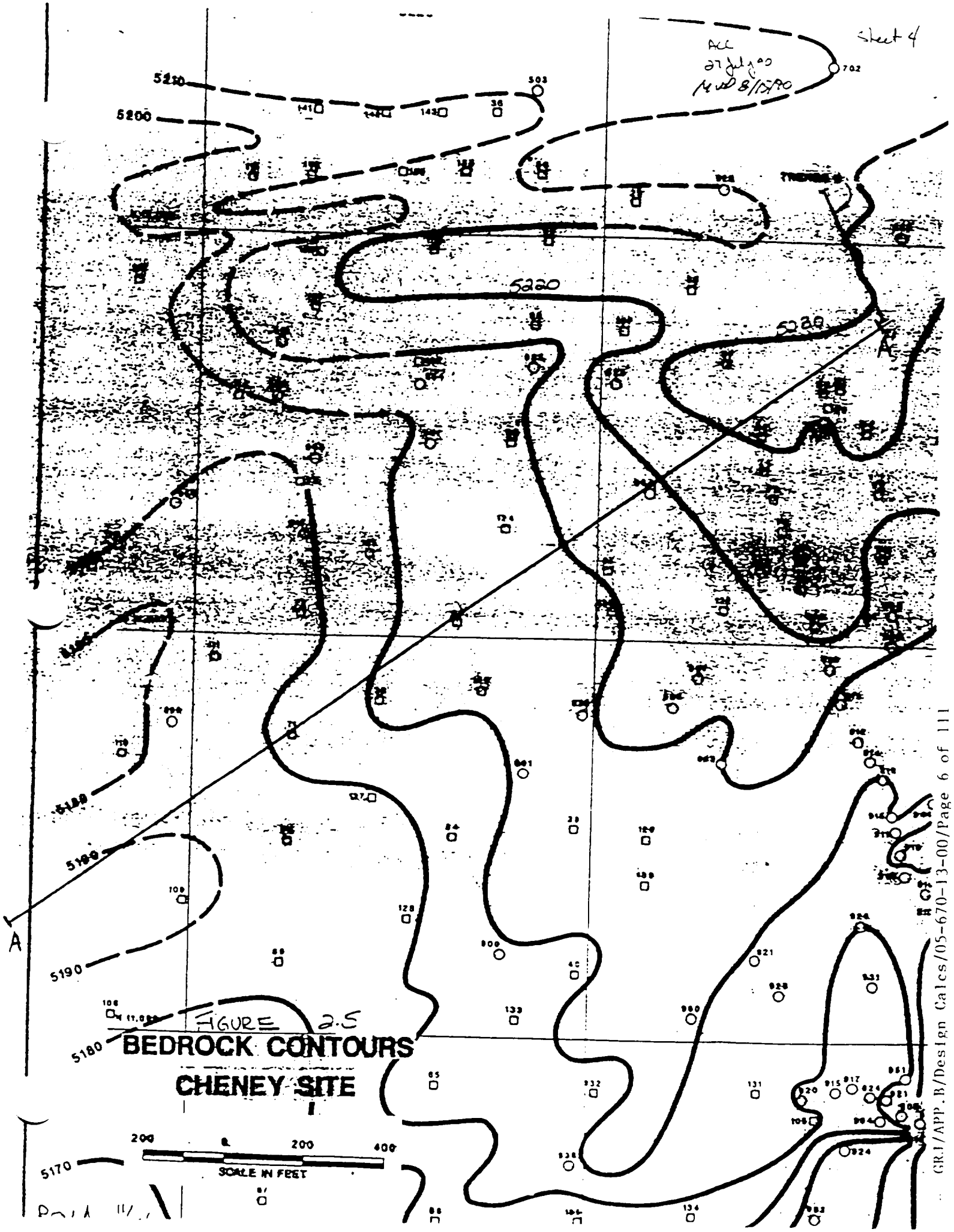
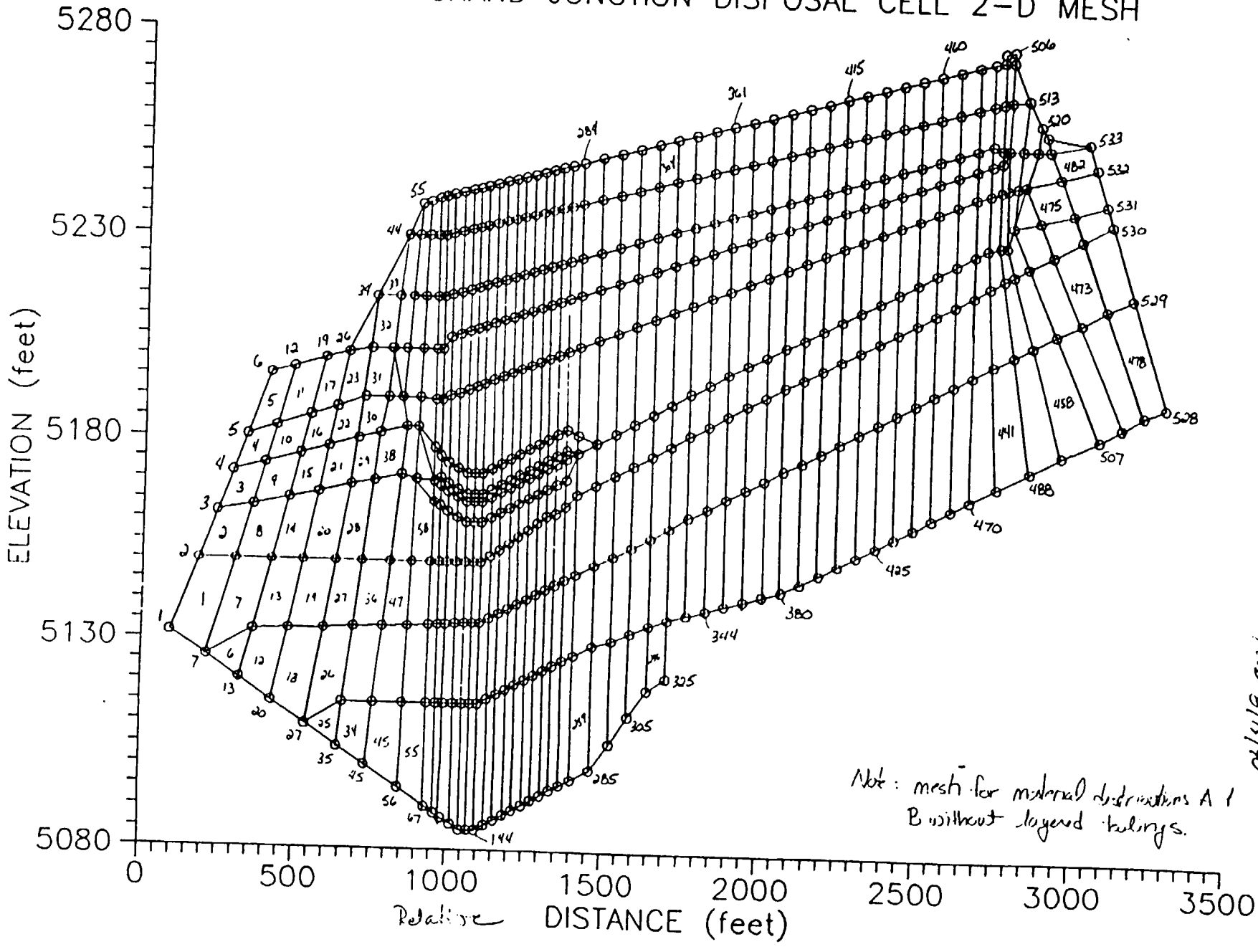


FIGURE 2.5
BEDROCK CONTOURS
CHENEY SITE

FIGURE 3
GRAND JUNCTION DISPOSAL CELL 2-D MESH



ACC
27 Jun 90
MJB 8/15/90

Sheet 5

Material Properties and Distribution

- The following materials were included in the model:
  - VP Material
  - Tailings
    - a) sand (as worst case scenario)
    - b) sand / slime (i.e., 'average' tailings)
  - Mancos Shale
  - Alluvium
  - Minus 1 inch (clean fill above grade)
  - Compacted shale (clean fill below grade)

Material properties for ~~sand/slime tailings~~, Mancos Shale and alluvium were assumed to be the same as those used by TAC (Calc No. GRJ-01-90-02-03-00, 4/5/90)

Material properties for the VP material were based on laboratory test results reported by D.E. Stephens & Associates, May 90. (See Appendix A). Moisture contents & porosity were adjusted to reflect a dry density equal to 95% of the maximum dry density as requested by P. Sircar.

Material properties for the sand tailings were based on DBS&A data and dry density equal to 90% maximum dry density (see Appendix B).

Material properties for 'average' tailings were based on DBS&A data (sample 5-12) and dry density equal to 90% maximum dry density. (see Appendix C).

Two types of clean-fill material were included in the disposal cell model: 1) minus 1 inch material for above grade; and 2) compacted shale for below grade. Properties for the minus 1" material were based on laboratory test results by Chen & Associates (for 1988). Properties for the compacted shale were based on Chen & Associates' results and pressure head versus moisture content for the Mancos Shale (see Appendix D).

The computer program RETC was used to develop the unsaturated hydraulic properties for each material. Pressure head vs. moisture content curves are shown on Figures 4 through 10. Appendix E contains inputs and outputs for the RETC runs.

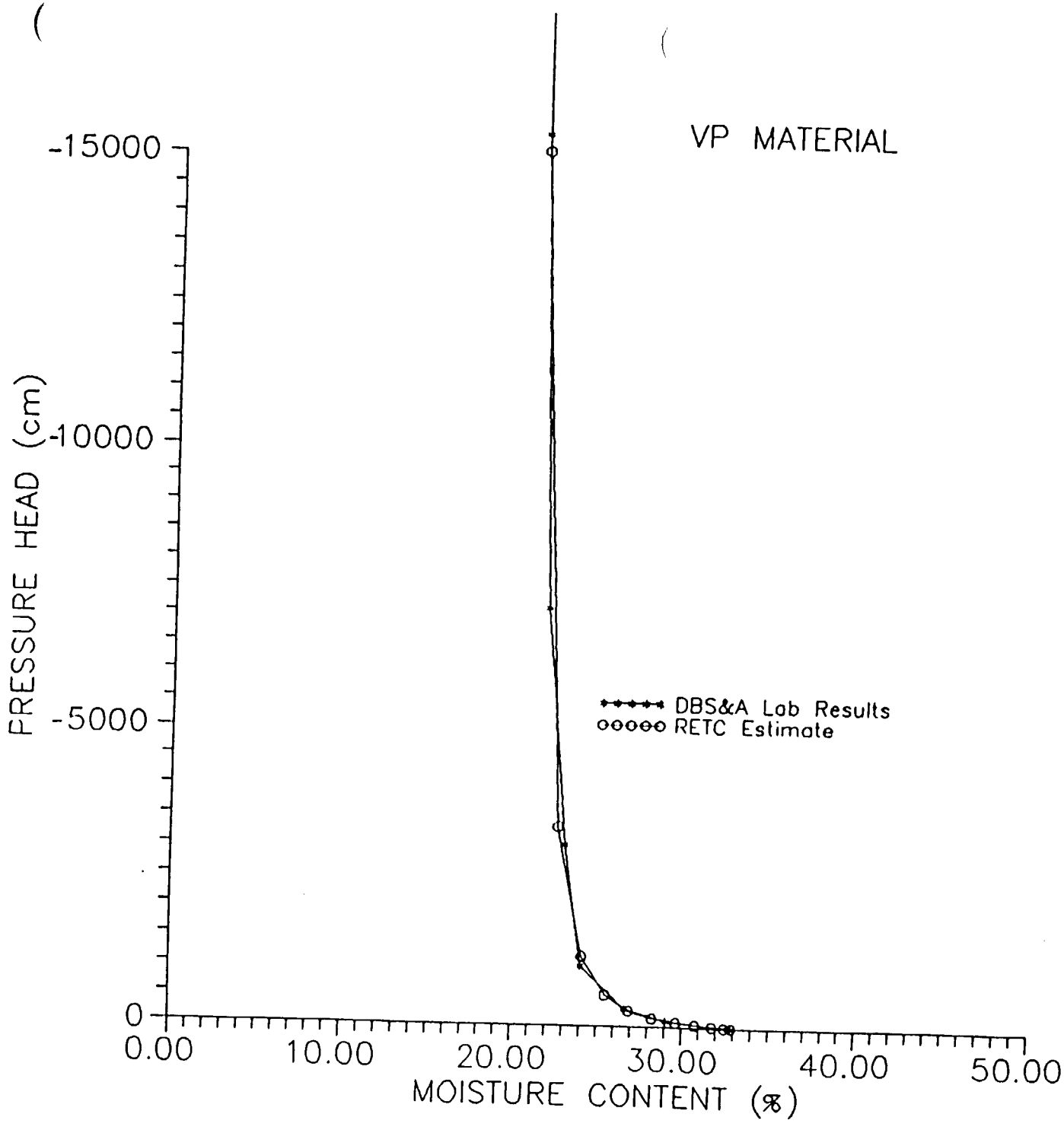


Figure 4

Sheet 8

ACC 07/24/90

MJD 8/16/90

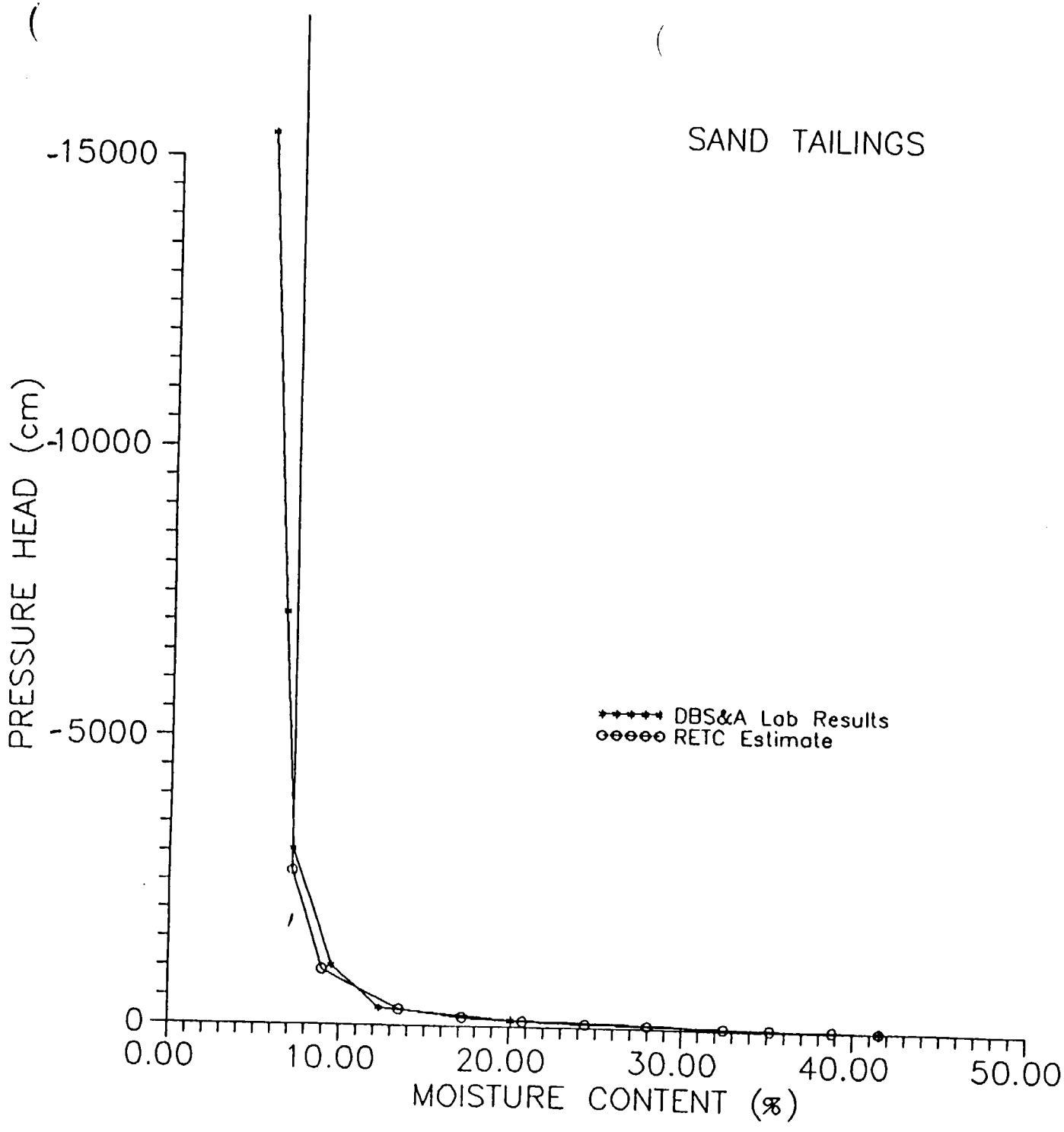
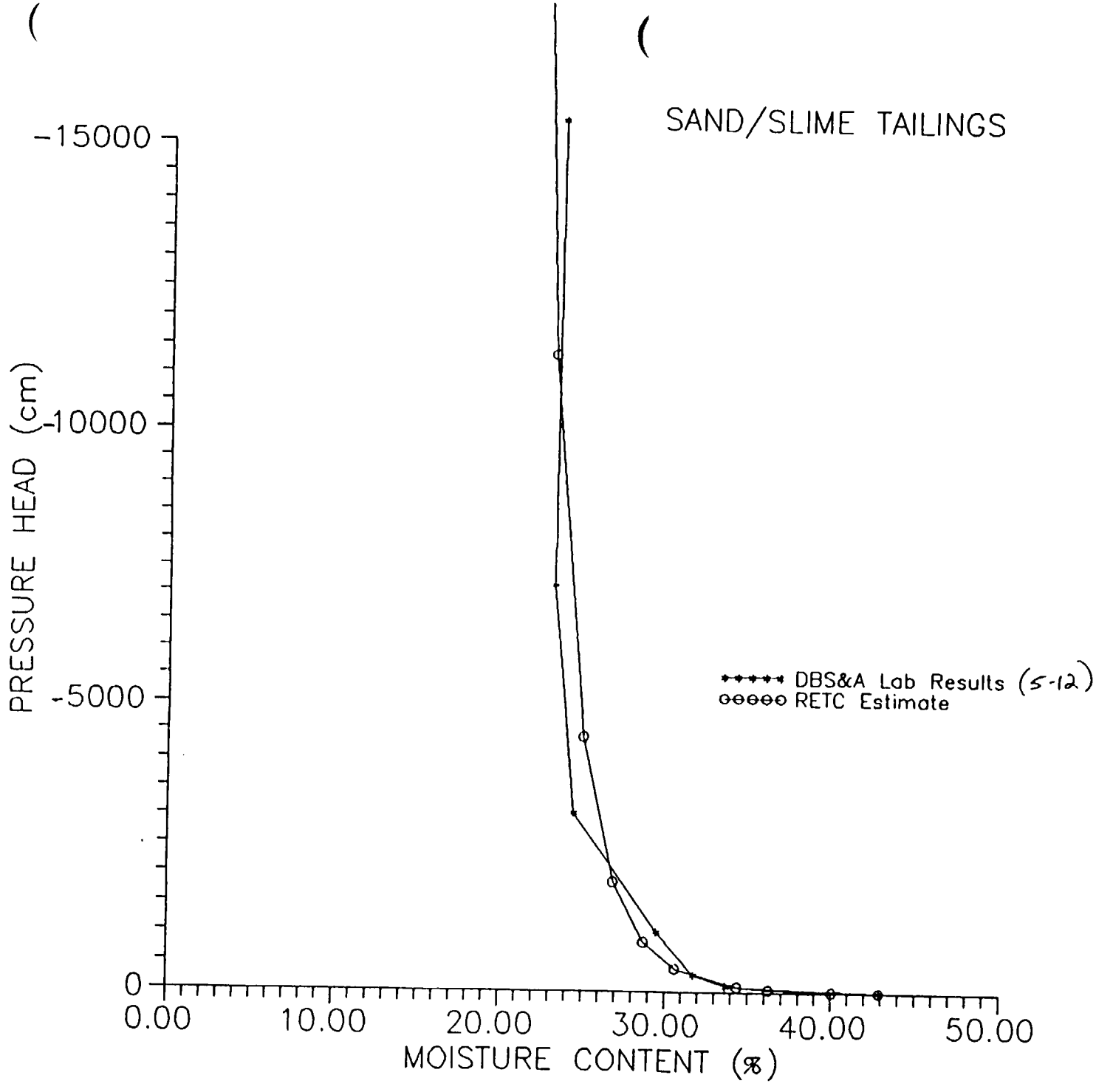


Figure 5

Sheet 9

RCC
01/17/10

MWD 8/12/20



ACC
27 July 10
M.J.D. 01/04/30

Sheet 10

FIGURE 6

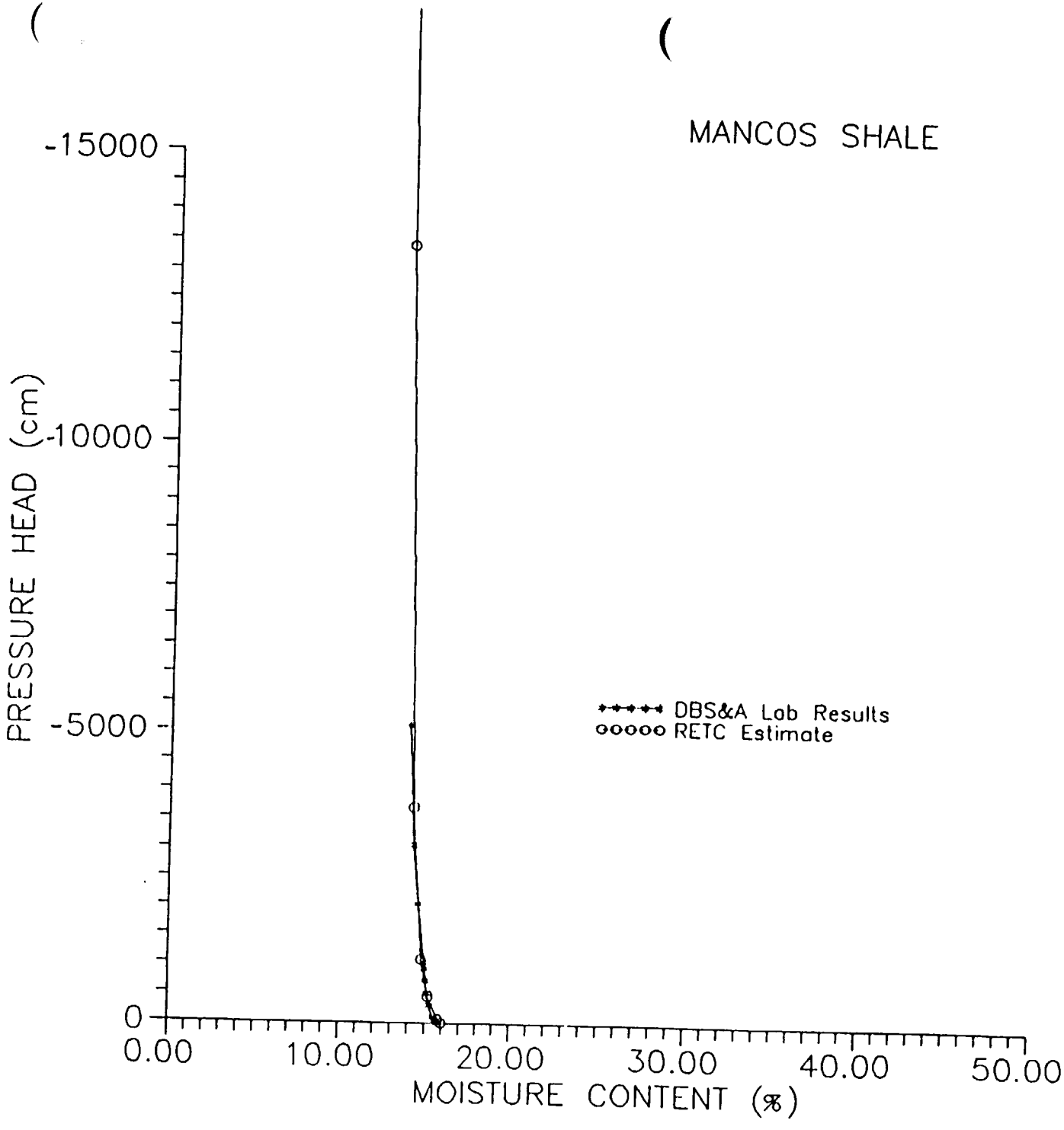

MANCOS SHALE
PRESSURE HEAD (cm)
-15000
-10000
-5000
0
0.00
10.00
20.00
30.00
40.00
50.00
MOISTURE CONTENT (%)
DBS&A Lab Results
RETC Estimate

Figure 7

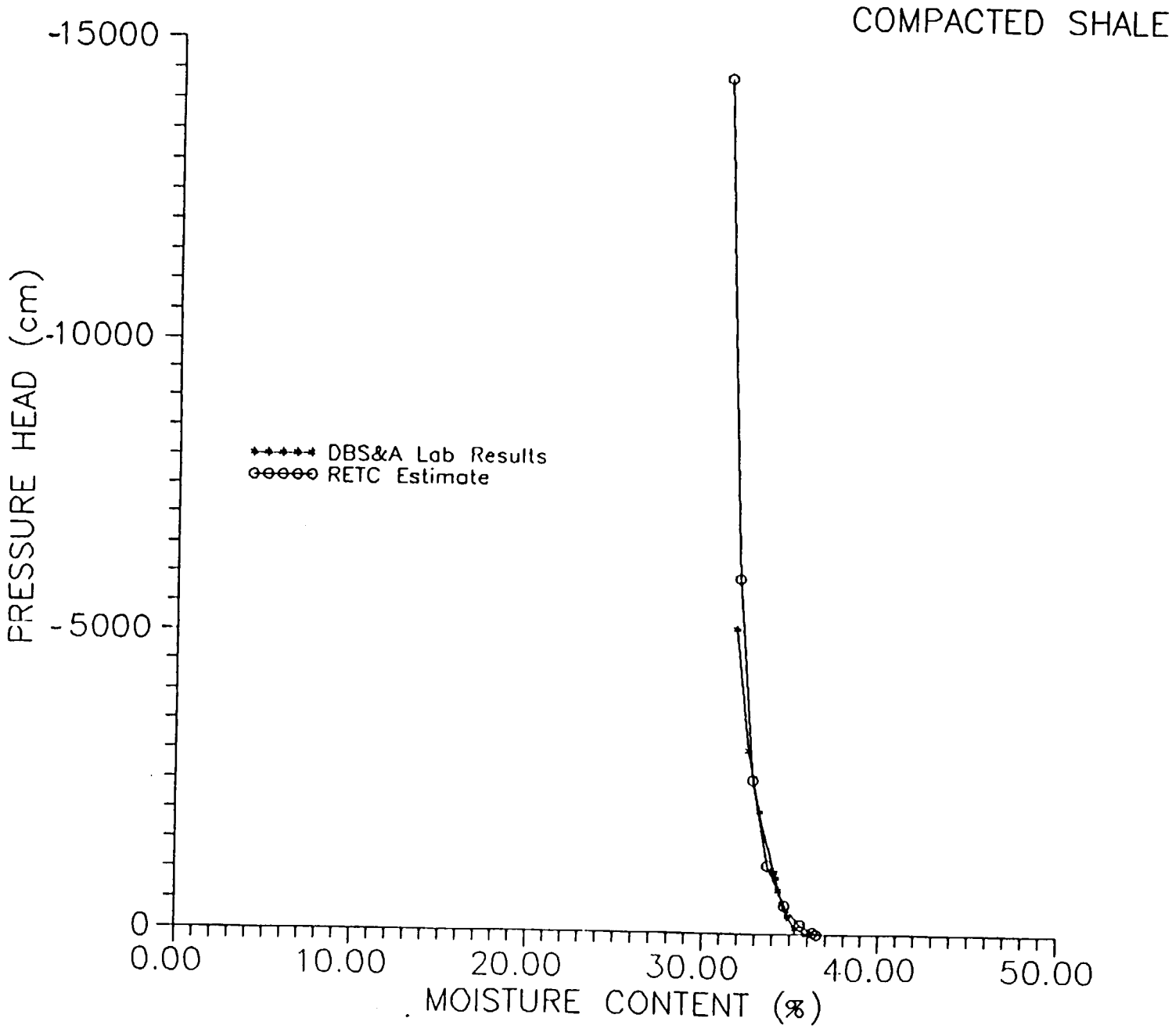


Figure 8

Sheet 12

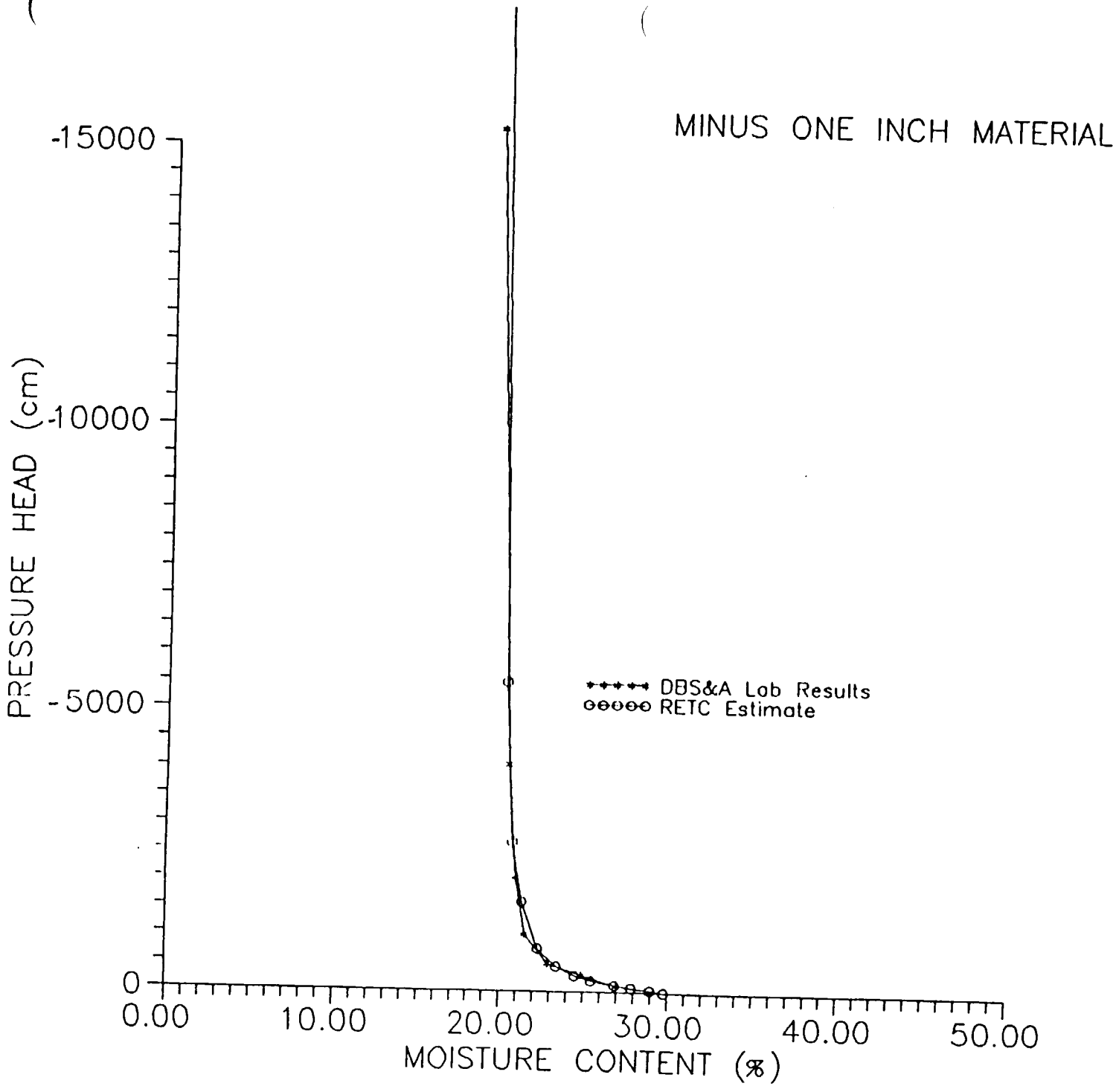

MINUS ONE INCH MATERIAL
PRESSURE HEAD (cm)
-15000
-10000
-5000
0
0.00
10.00
20.00
30.00
40.00
50.00
MOISTURE CONTENT (%)
DBS&A Lab Results
RETC Estimate

Figure 9

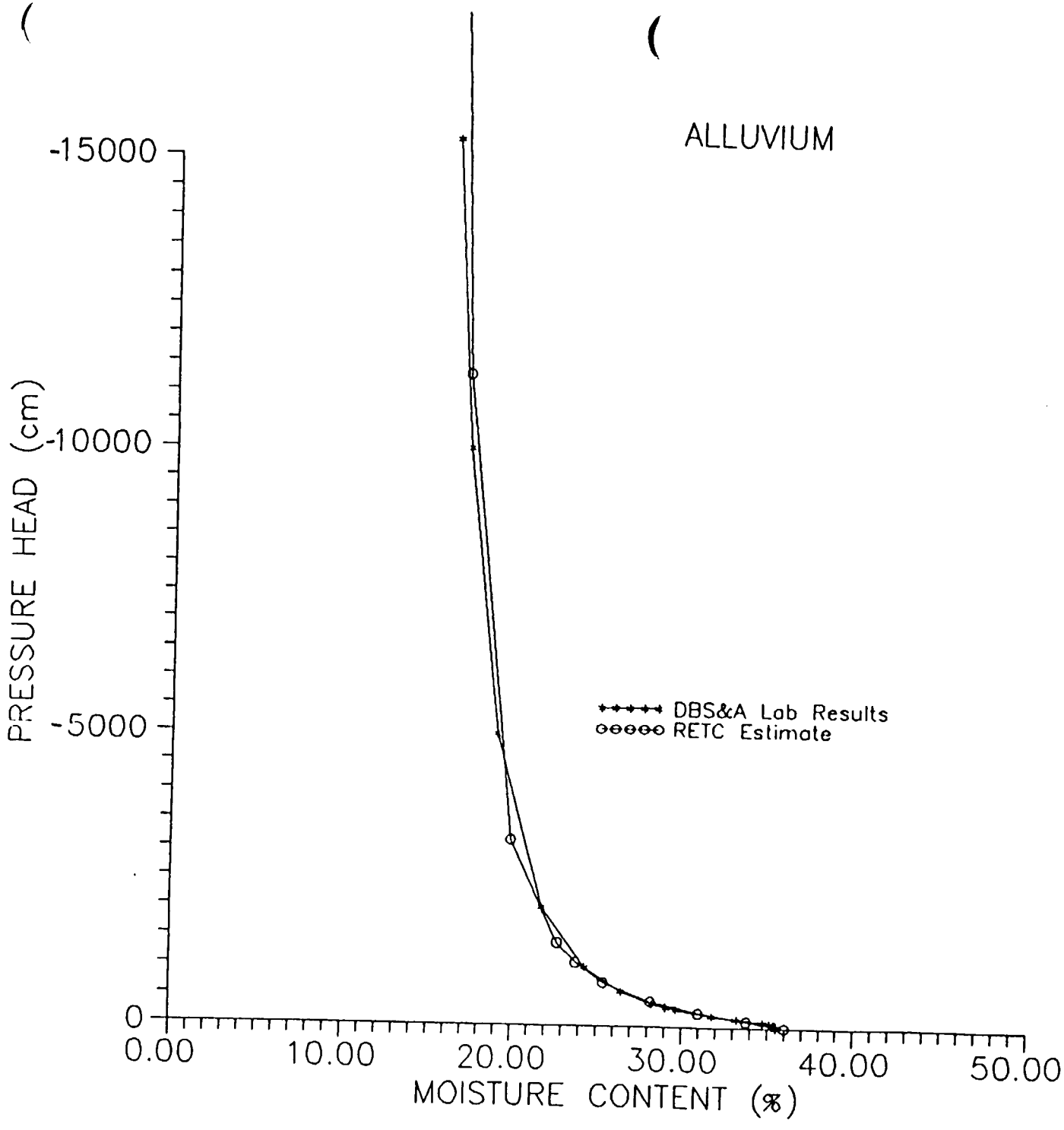

ALLUVIUM
PRESSURE HEAD (cm)
-15000
-10000
-5000
0
0.00
10.00
20.00
30.00
40.00
50.00
MOISTURE CONTENT (%)
DBS&A Lab Results
RETC Estimate

Figure 10

Material properties required for UNSAT2 input include:

- saturated hydraulic conductivity (Ksat)
- porosity
- initial pressure head
- pressure head vs. moisture content
- K vs. moisture content.

Table 1 provides a summary of these properties for the various materials used in the model.

3885-34 Sheet 1
ACC 7/18/90
H.L. 7/18/90

TABLE 1

GRAND JUNCTION - DISPOSAL CELL - MATERIAL PROPERTY SUMMARY

MATERIAL:	VP MATERIAL	SAND TAILINGS
SATURATED K:		
cm/sec	6.50E-06	~~1.38E-03~~ 7.3 E-04 ACC 7/31/90
ft/day	1.84E-02	~~3.69E+00~~ 2.07 E+00 MVD 8/10/90
POROSITY :	32.88 %	41.52 %
INITIAL VOL. MOISTURE CONT. :	25.22 % HEAD (ft)= 21.7	20.32 % HEAD (ft)= 3.6

M.C. VS Kr & HEAD (per RETC)

MOIST. CONT. (%VOL)	Kr	HEAD (cm)	HEAD (ft)
18.8	3.56E-22	986000000	3.23E+07
19.8	2.69E-12	253000	8298.4
21.2	6.29E-09	15100	495.3
22.6	3.95E-07	3350	109.9
24.1	6.81E-06	1180	38.7
25.5	6.05E-05	529	17.4
26.9	3.62E-04	268	8.8
28.3	1.70E-03	145	4.8
29.7	6.97E-03	78	2.6
30.8	1.97E-02	47	1.5
31.8	6.06E-02	23	0.8
32.5	0.164	9	0.3
32.88	1	0	0.0

NUMBER OF DATA PAIRS = 13

MOIST. CONT. (%VOL)	Kr	HEAD (cm)	HEAD (ft)
5.7	1.28E-13	60000	1968.0
7.2	1.16E-08	2680	87.9
9.0	5.23E-07	950	31.2
13.5	4.54E-05	279	9.2
17.2	3.49E-04	158	5.2
20.8	1.58E-03	102	3.3
24.4	5.33E-03	70	2.3
28.0	1.51E-02	49	1.6
32.5	4.80E-02	31	1.0
35.2	9.35E-02	23	0.8
38.8	2.41E-01	12	0.4
41.52	1	0	0

NUMBER OF DATA PAIRS = 12

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3885-34
ACC 7/18/90
H.L. 7/18/90

GRAND JUNCTION - DISPO

	MANCOS SHALE				COMPACTED SHALE			
MATERIAL:								
SATURATED K:								
cm/sec	2.00E-08 (VERT)		4.00E-07 (HORIZ)		2.80E-07			
ft/day	5.67E-05		1.13E-03		7.94E-04			
POROSITY :	16 %				36.5 %			
INITIAL VOL. MOISTURE CONT. :	14.8 %		HEAD (ft)=	35.4	32.3 %		HEAD (ft)=	146
M.C. VS Kr & HEAD (per RETC)	MOIST. CONT. (%VOL)	Kr	HEAD (cm)	HEAD (ft)	MOIST. CONT. (%VOL)	Kr	HEAD (cm)	HEAD (ft)
	9.4	9.78E-24	4.28E+11	1.40E+10	20.8	6.31E-26	4.32E+12	1.42E+11
	10.2	2.35E-18	1.54E+09	5.05E+07	23.1	1.34E-18	2.00E+09	6.56E+07
	11.0	1.16E-14	3.23E+07	1.06E+06	24.9	7.49E-15	39400000	1.29E+06
	12.0	3.09E-11	8.95E+05	29356.0	26.8	5.39E-12	1970000	64616.0
	12.8	4.58E-09	9.23E+04	3027.4	27.7	8.73E-11	555000	18204.0
	13.6	3.15E-07	1.34E+04	439.5	29.1	3.59E-09	102000	3345.6
	14.2	5.26E-06	3.70E+03	121.4	30.0	3.34E-08	37100	1216.9
	14.8	7.15E-05	1.08E+03	35.4	31.0	2.64E-07	14400	472.3
	15.2	3.95E-04	4.58E+02	15.0	31.9	1.82E-06	5960	195.5
	15.8	7.68E-03	6.91E-01	2.3	32.8	1.13E-05	2560	84.0
	16.0	1.00E+00	0.00E+00	0.0	33.7	6.46E-05	1120	36.7
					34.7	3.65E-04	469	15.4
					35.6	2.33E-03	161	5.3
					36.3	1.59E-02	34	1.1
					36.5	1	0	0.0
	NUMBER OF DATA PAIRS =		11		NUMBER OF DATA PAIRS =		15	

Sheet 18
3885-34
Acc 7/18/90
H.L. 7/18/90

GRAND JUNCTION - DISPO

	MINUS 1" MATERIAL				ALLUVIUM			
MATERIAL:	MINUS 1" MATERIAL				ALLUVIUM			
SATURATED K: cm/sec	4.80E-05				1.00E-04			
SATURATED K: ft/day	1.36E-01				2.84E-01			
POROSITY :	29.8 %				36 %			
INITIAL VOL. MOISTURE CONT. :	24.1 %		HEAD (ft)=	11.4	17 %		HEAD (ft)=	415.7
M.C. VS Kr & HEAD (per RETC)	MOIST. CONT. (%VOL)	Kr	HEAD (cm)	HEAD (ft)	MOIST. CONT. (%VOL)	Kr	HEAD (cm)	HEAD (ft)
	19.2	6.34E-15	748000	24534.4	13.9	2.20E-16	8410000	275848
	19.7	1.81E-09	18900	619.9	14.3	2.25E-12	470000	15416
	20.2	1.19E-07	5520	181.1	16.0	2.31E-08	26300	863
	20.7	1.38E-06	2690	88.2	17.1	3.44E-07	11300	371
	21.3	7.88E-06	1610	52.8	19.9	1.97E-05	3170	104
	22.3	9.27E-05	773	25.4	22.7	2.46E-04	1410	46.2
	23.4	5.42E-04	451	14.8	23.8	5.48E-04	1080	35.4
	24.5	2.19E-03	289	9.5	25.4	1.59E-03	756	24.8
	25.5	7.08E-03	194	6.4	28.2	7.31E-03	435	14.3
	26.9	2.57E-02	118	3.9	31.0	2.83E-02	246	8.1
	27.9	6.78E-02	75	2.5	33.8	0.11	115	3.8
	29.0	1.92E-01	38	1.2	36.0	1	0	0.0
	29.8	1	0	0.0				
	NUMBER OF DATA PAIRS =		13		NUMBER OF DATA PAIRS =		12	

Sheet 19
3885-34
ACC 7/3/90
H. L. 7/9

GRAND JUNCTION - DISPO

MATERIAL: SAND\SLIME TAILINGS
(DBS&A SAMPLE No. 5-12)

SATURATED K:
cm/sec 5.10E-05
ft/day 1.45E-01

POROSITY : 42.86 %

INITIAL VOL.
MOISTURE CONT. : 28.26 % HEAD (ft)= 354

M.C. VS Kr & HEAD
(per RETC)

MOIST. CONT. (%VOL)	Kr	HEAD (cm)	HEAD (ft)
8.0	8.22E-27	4.17E+11	1.37E+10
15.5	9.49E-15	1.97E+06	64649
19.3	7.19E-12	1.06E+05	3460
21.2	1.04E-10	3.24E+04	1062
23.1	1.13E-09	11330	372
25.0	9.57E-09	4401	144
26.8	6.70E-08	1862	61.1
28.7	4.00E-07	844	27.7
30.6	2.09E-06	405	13.3
34.4	4.21E-05	105	3.4
36.3	1.71E-04	54	1.8
40.0	2.86E-03	12	0.4
42.86	1.00E+00	0	0.0

NUMBER OF DATA PAIRS = 13

Sheet 20
3885-34
ACC 7/18/90
H.L. 7/18/90

: MATERIAL INTERFACES - INITIAL CONDITIONS

	AVG. HEAD (ft)
VP - TAILINGS (SAND)	12.6
VP - COMPACTED SHALE	83.8
VP - MINUS 1"	16.5
TAILINGS - SHALE	19.5
TAILINGS - COMPACTED SHALE	74.8
TAILINGS - ALLUVIUM	209.7
TAILINGS - MINUS 1"	7.5
SHALE - COMPACTED SHALE	90.7
SHALE - ALLUVIUM	225.6
ALLUVIUM - MINUS 1"	213.6
ALLUVIUM - COMPACTED SHALE	280.9
MINUS 1" - COMPACTED SHALE	78.7
TAIL - VP - MINUS 1"	12.2
TAIL - VP - COMPACTED SHALE	57.1
TAIL - SHALE - ALLUVIUM	151.6
TAIL - ALLUVIUM - COMPACTED SHALE	188.4
TAIL - SHALE - COMPACTED SHALE	61.7
SHALE - COMPACTED SHALE - ALLUVIUM	199.0
ALLUVIUM- COMPACTED SHALE- MINUS 1"	191.0
VP - COMPACTED SHALE - MINUS 1"	59.7
-TAIL - COMPACTED SHALE -MINUS 1"	45.7

note: tail - 'tailings' = sand tailings

MORRISON-KNUDSEN ENGINEERS, INC.
A MORRISON KNUDSEN COMPANY

Project: Grand Junction
Feature: Disposal Cell
Item: Infiltration Study

Contract No. 3885-34
Designed: ACC
Checked: MVO

Sheet 21
File No.
Date 3/9/90
Date 3/13/90

Hydraulic conductivities at initial moisture contents for each material are summarized below:

K at initial moisture content.

Material	Initial Moisture Content (% vol)	K (cm/sec)
VP	25.22	3.23×10^{-10}
Tailings		
sand	~~41.52~~ 30.32	1.03×10^{-6}
average	35.36	1.65×10^{-11}
Morrow Shale	14.5	1.43×10^{-12} (vertical)
Compacted Shale	32.3	1.69×10^{-12}
-1"	24.1	7.64×10^{-5}
Alluvium	17.0	3.15×10^{-11}

MORRISON-KNUDSEN ENGINEERS, INC.
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Project: Grand Junction
Feature: Disposal Cell
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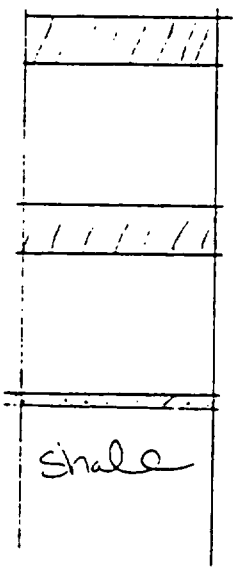
Contract No. 3885-34
Designed: ACC
Checked: MVD

Sheet 22
File No.
Date 6/21/90
Date 3/16/90

- Distribution of materials within cell for UNSAT-3 runs per PS & SEB

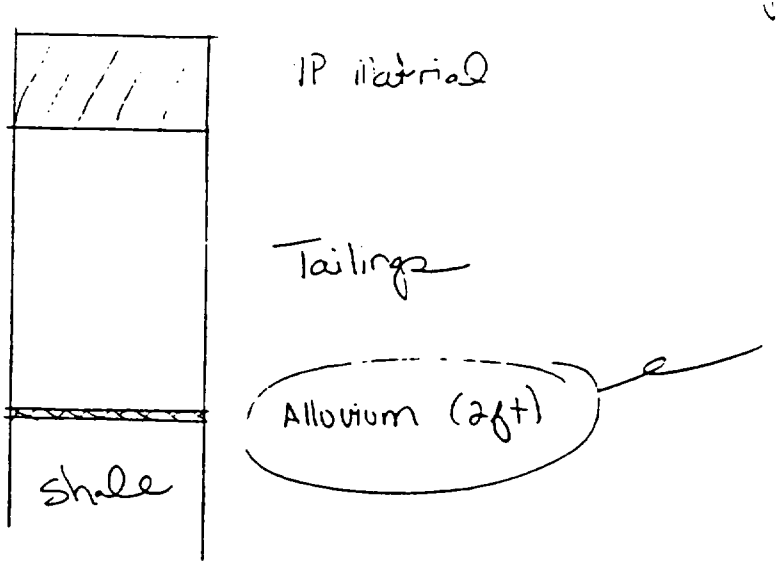
(A)



ACC 7/31/90: 2' alluvium not in cell ∴ delete from model.

per SER: 7/21/90
avg. depth of tailings = 30'
avg. depth of VP = 10 + 17 = 27'

(B)



Not to scale, schematic only

Material Distribution within disposal cell for UNSATQ (cont'd)

	Average Depth (ft)
VP Material	27
Tailings	30
Alluvium Tailings	0
	59

[7/31/90 ACC replace alluvium w/ tailings]

for UNSATQ X-section:
Max. depth in cell = 79.5 feet
Min. depth in cell = 45 feet

Estimate depths of VP & tailings layers for distribution (B)

	@ Max.	@ Min	Avg
total depth	79.5 ft	45 ft	59 ft
top VP layer (bottom alluvium) = tailings	-10 -2 67.5 ft	-10 -2 33 ft	-10 -2 47 feet
tailings depth (= Avg. tailings depth × total depth / total avg. depth)	43 ft	21 ft	30
∴ remaining VP	24.5 ft	12 ft	17 ft

For distribution (A), assume lower tailings depth is 2/3 of total tailings depth

Material Distribution A is depicted in Figure 11. This represents layers of UP material and tailings. Purpose is to determine if UP material will cause perched water zones.

Figures 12 and 13 show material distribution B, with all UP material above the tailings. In Figure 13, a 10-foot layer of sand tailings is assumed to be placed in the bottom of the cell and then overlain with average type tailings. The amount of sand tailings was approximated from the results of the tailings boring program (10 feet is considered to be a conservative estimate). [Note: 10' for sand tailings provided by P. Smart 7/31/90]

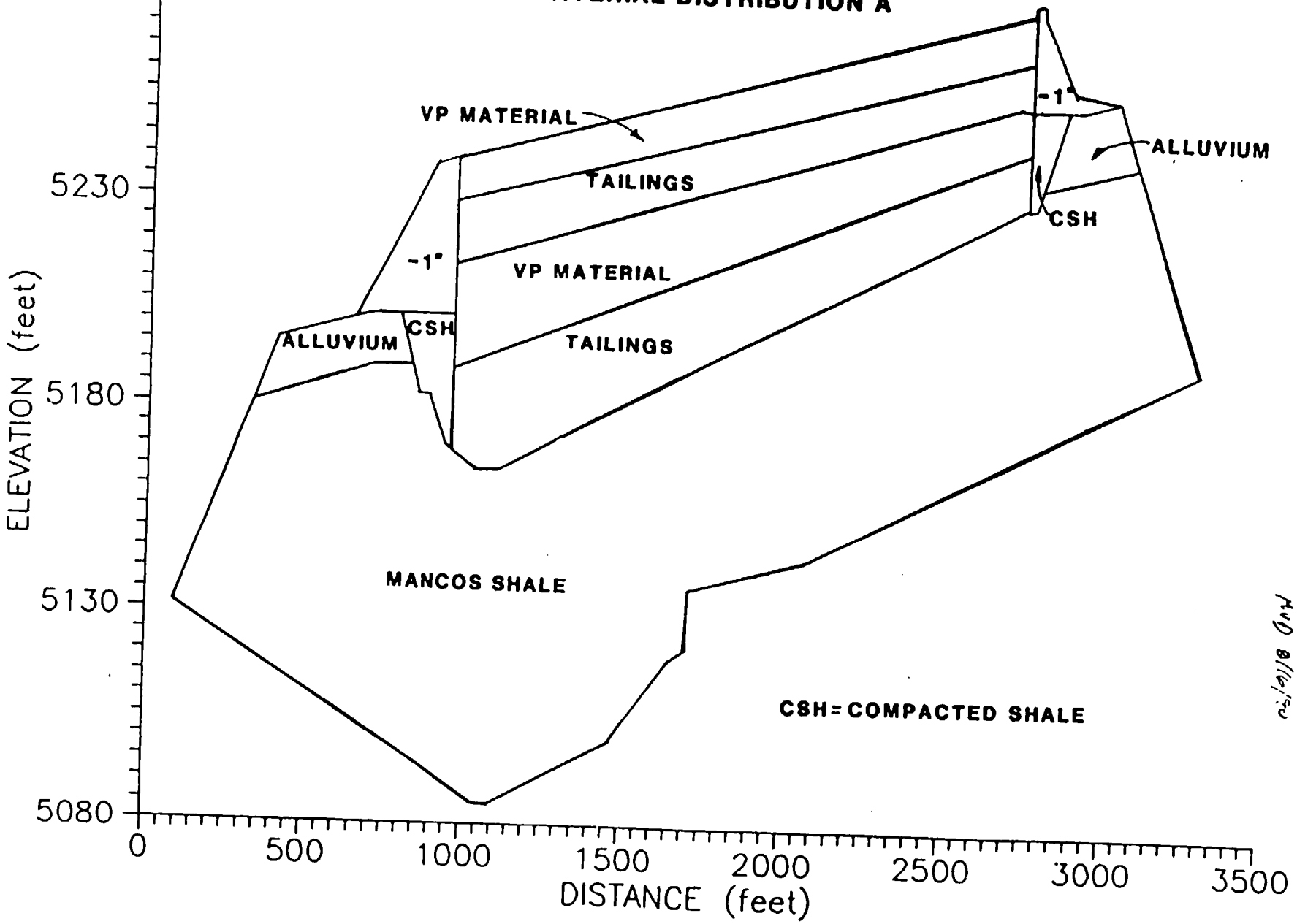
Figure 14 shows a variation of Figure 13. In this scenario, 5 feet of UP material is assumed to be placed at the very bottom of the cell. Purpose of this scenario is to determine the effect of UP material placement on potential water buildup within the cell. For modelling purposes, the UP material at the bottom of the cell was only considered in the region of expected water buildup.

Because the UNSAT2 version being used is dimensioned for only 6 materials, alluvium was substituted for the minus 1" clean-fill material for cases in which both sand and average (sand/slime) tailings were considered.

FIGURE 11

GRAND JUNCTION DISPOSAL CELL

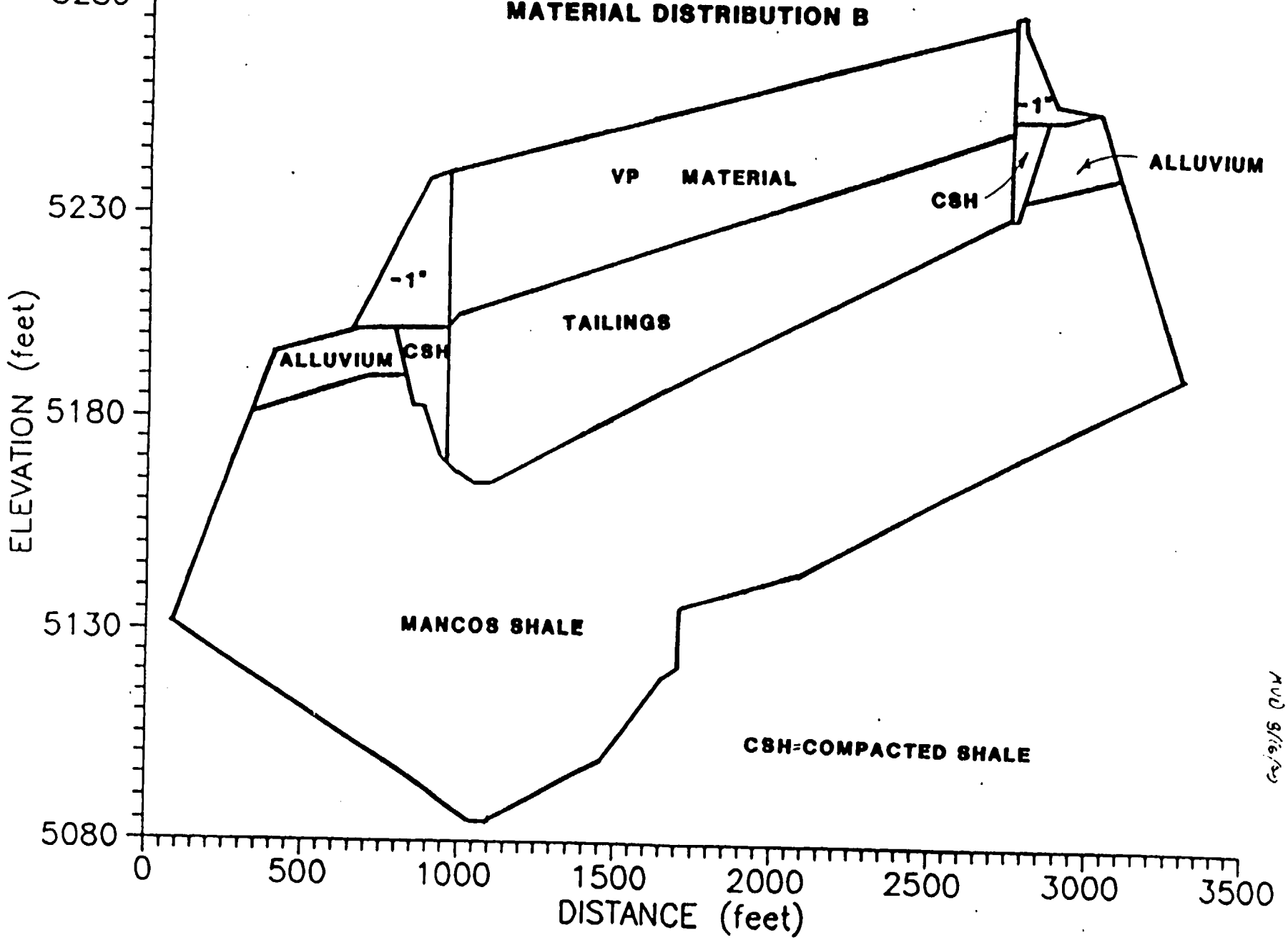
MATERIAL DISTRIBUTION A



A PE 12

GRAND JUNCTION DISPOSAL CELL

MATERIAL DISTRIBUTION B



FIG(. 13

GRAND JUNCTION DISPOSAL CELL

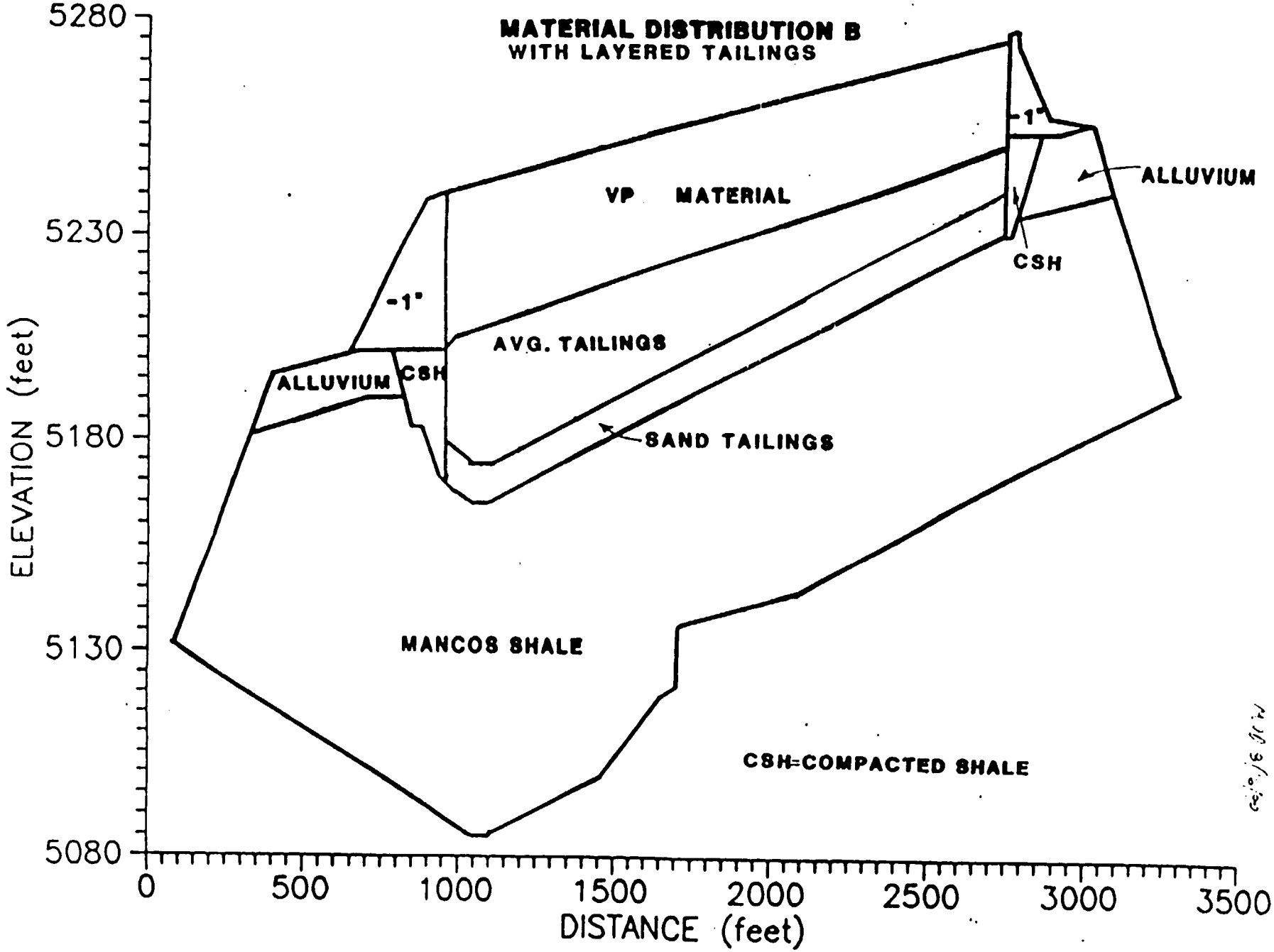
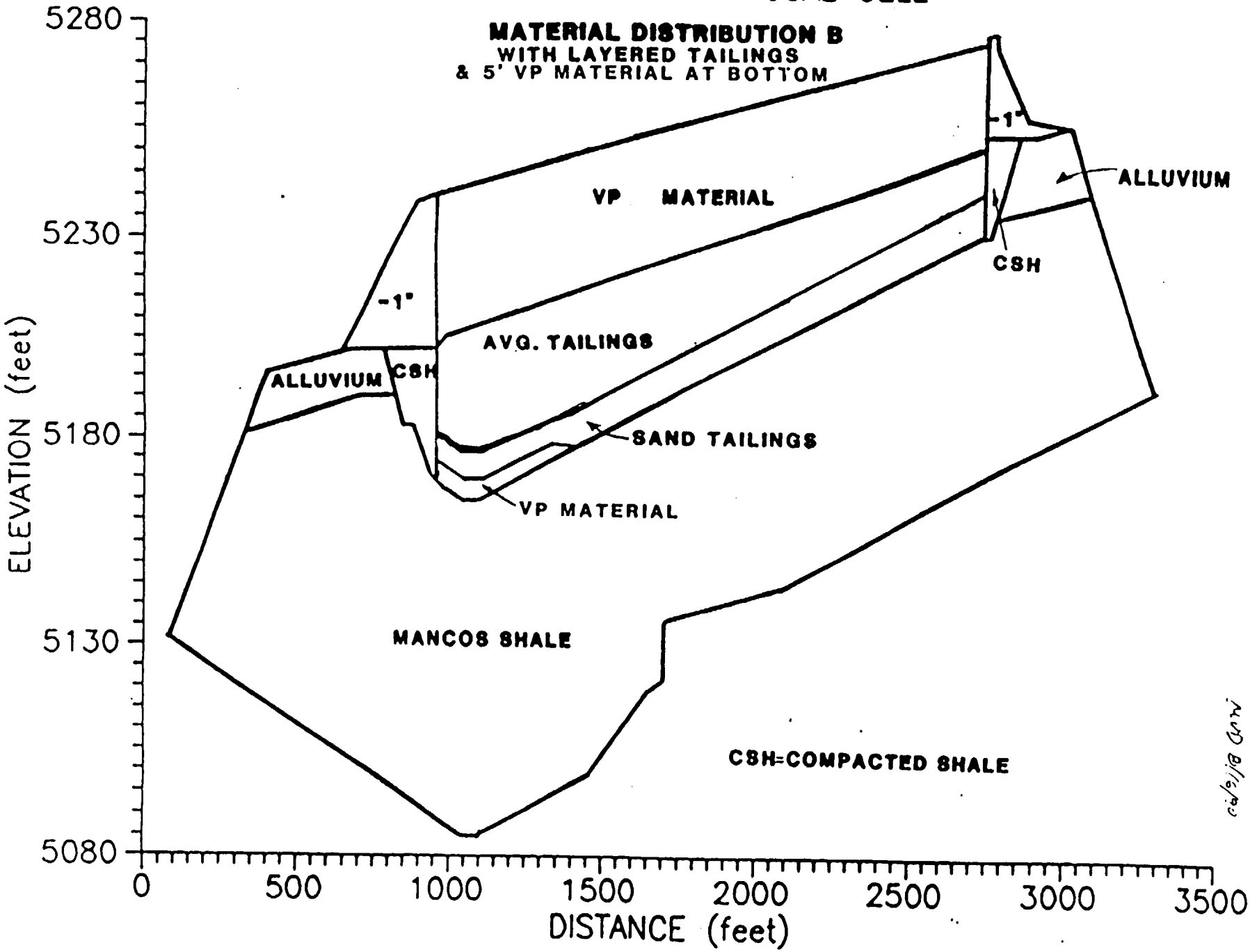


FIG 14

GRAND JUNCTION DISPOSAL CELL



Boundary Conditions

- at the upper boundary – no flow/flux (KODE(n) = 0 w/ Q = 0)

- at lower boundary (also left / right) – prescribed head boundary equal to initial pressure head value (KODE(n) = 1)

Initial Conditions

UNSAT2 requires an initial pressure head at each node, which is related to the assumed initial volumetric moisture content. In general, at interfaces between different materials, the initial pressure head was assumed to be the average pressure head (ie $h_{initial} = \frac{h_1 + \ldots h_n}{n}$).

As a conservative assumption to predict the amount of water buildup within the cell, initial pressure heads at nodes representing interfaces with sand tailings was assumed equal to the tailings initial pressure head (eg. -3.6 feet for sand tailings)

MORRISON-KNUDSEN ENGINEERS, INC.
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Project: GRJ
Feature: Disposal Cell
Item: Industrial Study

Contract No. 2885-34
Designed: ACC
Checked: [illegible]

Sheet: 20
File No.:
Date: 8/10/90
Date: 8/16/90

GRJ - Disposal Cell — Results of UNSATA Runs
2-D model with 533 nodes

Run #	Input File	Mat'l Distribution	Tailings	Simulation Time (yrs)	Comments	Results: Max. Water Depth above shale (ft)*	Results: Time of Max. Depth (yrs)
1)	GRJBTS.dat	B	sand/slime	17.4		no saturation	—
2A)	GRJBSS.dat	B w/ layered tailings	sand/slime 10' sand at bottom	17.1	[illegible]	6.5	10.54
2B)	GRJBSSφ.dat	"	"	3.0	[illegible]	**	
3)	GRJBSSV.dat	B w/ layered tailings and 5' VP at bottom	sand/slime 10' sand	13.5		10.9	9.14
4)	GRJSSSA.dat	A w/ sand on top	[illegible] slime / sand	13.7		no saturation	—

* at node 136
** Run 2B not run to completion, only run as check on boundary condition assumption

RUN #1

Material Distribution B (see Figure 12)

'Average' (sand/slime) tailings only

boundary conditions at upstream / downstream = prescribed boundary (KUCODE = 1)

input file = GRJBTS.dat ; 16
output file = GRJOUT.lst ; 5

Time Step	Time (days)	Time (yrs)	
80	341.48	0.94	no saturation
160	741.48	2.03	"
240	1141.5	3.13	"
320	1566.8	4.29	"
400	2366.8	6.48	"
480	3166.8	8.68	"
560	3966.8	10.87	
640	4766.8	13.06	"
720	5566.8	15.25	"
800	6366.8	17.44	"

RUN # 2A

Material Distribution B with layered tailings (see Figure 13)

10' sand tailings at bottom of cell

KNODE at left & right boundaries = 1 (prescribed head)

input file = GR3SS.dat; 11
output file = B3SOUT.lst

Time Step	Time (days)	Time (yrs)	Pressure Head @ node 136 (ft)
50	232.68	0.77	1.16
160	632.68	1.87	1.85
240	1032.7	2.97	3.50
320	1432.7	4.06	4.91
400	2246.3	6.16	5.31
480	3046.8	8.35	6.05
560	3846.8	10.54	6.55 (pressure 6.5' at node 136)
640	4646.8	12.73	6.50
720	5436.8	14.90	6.44
800	6246.8	17.11	6.47

RUN # 2B (check boundary condition assumption at left & right)

Material Distribution B w/ layered tailings (see Figure 13)

10' sand at bottom of cell

KNODE at left & right boundaries = 0 (no flux)

input file = GRESSØ.dat; 12
output file = BSSØOT. 1st

Time Step	Time (days)	Time (years)	Pressure Head at node 136 (ft)
80	282.68	0.77	1.16
160	652.68	1.57	1.85
240	1022.68	2.97	3.60

RUN # 3

Material Distribution B w/ layered tailings & 5' VP at bottom
(see Figure 14)

input file = GRJBSSV.dat; 4
output file = BSSVOT.lst

Time Step	Time (days)	Time (years)	Pressure Head @ node 136 (ft)	
80	287.96	0.79	4.86	
160	674.8	1.85	5.10	
240	1074.8	2.94	5.51	
320	1474.8	4.04	7.81	
400	1874.8	5.14	9.07	
480	2536.8	6.95	10.51	
560	3336.8	9.14	10.92	(note: 10.98' at node 149)
640	4136.8	11.33	10.86	
720	4936.8	13.53	10.72	

RUN # 4

Material Distribution A (see Figure 11) (sand tailings layer on top, average on bottom)

input file = GRJSSA.dat ; 7
output file = SSAOUT.lst ; 2

Simulation time = 5000 days = 13.7 yrs

No saturation !

RUN # 4 (cont'd)

@ X = 1070 feet

Vol. Moisture Content (%)

Node #	@ t=0	@ t=178.11 hrs	@ t=974.4 hrs	@ t=2330.8 hrs	@ t=4436.8 hrs
131	14.8			> 14.8	14.8
132	14.8			14.8	14.8
133	14.8			14.8	14.8
134	14.8			14.8	14.8
135	14.8			14.8	14.8
136	14.8/25.26	14.8/23.262	14.801/23.264	14.803/23.263	14.803/23.271
137	23.26	23.262	23.262	23.268	23.262
138	23.26	23.262	23.262	23.268	23.264
139	23.26/25.32	23.267/24.123	24.553/25.248	23.801/26.247	23.715/28.135
140	25.32	24.120	31.018	30.633	30.294
141	25.32/25.32	25.243/25.215	31.143/30.551	29.311/23.720	29.201/30.241
142	[illegible]	[illegible]	[illegible]	11.908/25.568	11.751/25.477
143	25.32	25.229	25.223	25.203	25.197

GRJSSA.dat

MORRISON-KNUDSEN ENGINEERS, INC.
A MORRISON KNUDSEN COMPANY

Project GRA
Feature Disposal Cell
Item Infiltration Study

Contract No. 3885-34
Designed ACC
Checked MJD

Sheet 37
File No.
Date 10 Aug 90
Date 8/16/90

Potentiometric Surface Elevation (ft) at Selected Nodes

X (ft)	RUN # 2A GRSBSS.dat time = 10.54 yrs	RUN # 3 GRSBSSV.dat time = 9.14 yrs
940	—	—
960	5171.4	5175.7
985	5171.5	5175.8
1015	5171.5	5175.8
1045	5171.5	5175.9
1070	5171.6	5175.9
1095	5171.6	5176.0
1125	5171.7	5176.1
1155	5171.8	5176.2
1185	5171.9	5176.3
1215	5172.0	5176.5
1245	5172.1	5176.6
1275	5172.6	5176.8
1305	5169.0	5177.0
1335	—	5177.2
1365	—	5177.2
1400	—	5177.3
1460	—	—

Summary of Results

Based on the assumptions described previously, the UNSAT2 results for the Grand Junction Disposal Cell provide the following information:

1) Within the simulation times, the UP material does not appear to release a significant amount of water.

2) The UP material does not appear to create an "impermeable" layer that prevents downward drainage. (RUNS # 4 & # 3)

3) Within the simulation times, the 'average' (sand/slime) tailings does not appear to release a significant amount of water. (RUN # 1)

4) When sand tailings (RUN # 2A) are included in the model, a saturated zone appears at the lowest portion of the cell. Maximum buildup for the consideration time was approximately 6.6 feet above the Morrison Shale (ie cell bottom). The zone of saturation extends down into the shale. Within the simulation time (17.1 yrs) the clean-fill material does not become saturated.

Figure 15 shows depth of water versus time at node 136, which is at the bottom of the cell (tailings - shale interface). Maximum depth above the shale of 6.6 feet occurs in approximately 10.5 years. Figure 16 shows maximum water elevation within the cell.

5) Placement of the VP material within the expected zone of water buildup increased the maximum water level (RUN # 3 vs. RUN # 2A). The maximum depth of water was approximately 10.9 feet at 9.14 years. ~~The VP material apparently does not inhibit drainage.~~ The increased depth of water may be due to a lower storage capacity of the VP material compared to the sand tailings. Figure 15 shows depth versus node 1356 versus time compared with RUN #2A. Figure 17 shows the maximum water elevation within the cell. These results are for the cross-section selected and do not necessarily reflect 3-D nature of the flow that will take place within the cell.

6) When sand tailings were placed above layers of sand/slime tailings and VP material, no buildup of water was observed within the simulation time of 13.5 yrs. The results, however, show that the sand tailings are draining and that the water is moving downwards through the layers of VP material and sand/slime tailings (see Figure 18).

7) Differences between KNODE = 0 (RUN 2B) and KNODE = 1 (RUN 2A) at the left and right boundaries were insignificant with respect to the area of interest (i.e. the boundary conditions did not affect buildup of water within the cell).

Appendix H

Grand Junction, Colorado, Disposal Site
Final Completion Report
Calculation 05-670-05-04, "Material Properties"

QUALITY REQUIREMENTS
BY
QA ENTRY NO.

MKE DOCUMENT NO. 5025-GRJ-C-01-01013- 04

Calculation Cover Sheet

04

Contract No. 5025 Discipline ESCI Calc. No. 05-670-05-00 04

No. of Sheets ~~295~~ 307

Project
UMTRA - Grand Junction

Feature
Embankment Design

Item
Material Properties

Sources of Data

See Attached Sheets

Sources of Formulae & References

See Attached Sheets

Preliminary Calc. ☐ Final Calc. ☒ Supersedes Calc. No. 05-670-05-00

Rev. No.	Revision	Calculation By	Date	Checked By	Date	Approved By	Date
4		P.Y. Li	10/16/91	H. Lubis	10/31/91	[illegible]	10/31/91
3	ADDITIONAL DATA	H. LUBIS	6/21	[illegible]	6-25-90	P. Sircar	6-27-90
2	Additional Data	S.E. Rotelynch	2/9/89	RM Brown	2-9-89	P. Sircar	2/13/89
1	Updated Soils Data	P. Sircar	2/9/88	WYLin	2/5/88	WYL for JL	2/17/88
0		P. Sircar	7-13-87	S.E. Rotelynch	7/13/87	[illegible]	7/13/87

Form 43-710

References

1. US Dept of Energy, "Remedial Action Plan and Site Conceptual Design for Stabilization of the Inactive Uranium Mill Tailings at Grand Junction, Colorado," Draft, June 1986
— MKE Doc. No. 5025-GRJ-R-03-00226-00 (Draft RAP, Vol. 1)

2. Nelson, J.D. and Wardwell, R.E., "Characterization of Inactive Uranium Mill Tailings Sites: Grand Junction, Colorado," prepared for DOE, Albequerque, New Mexico by Colorado State University, Fort Collins, Colorado, July 1980
— MKE Doc. No. 5025-GRJ-R-03-00855-00

3. UMTRA-GRJ, "Evaluation of Borrow Material at Cheney Reservoir Site", IOC from R.W. Hecks to T.R. Walker,
— MKE Doc. No. 5025-GRJ-I-01-00111

4. Grand Junction Soil Tests — IOC from T.G. Myers of MKF to T.R. Walker of MKE, dated October 16, 1986.
— MKE Doc. No. 5025-GRJ-I-02-00355-00
(Chen's results on radon barrier are enclosed

5. UMTRA Design Procedures Manual
— MKE Doc. No. 4005-GEN-Q-01-00571-02

6. Report from Rogers & Associates, Salt Lake City, Utah, dated December 16, 1986 (for radon barrier diffusion coefficients
— MKE Document No. 5025-GRJ-L-09-00436-00

7. "Radon Barrier Design — Thickness",
— MKE Calc. No. 05-670-01-03

8. "Embankment Design — Settlement and Cover Cracking"
— MKE Calc. No. 05-670-06-01

9. "Embankment Design — Slope Stability"
— MKE Calc. No. 05-670-04-00

10. "Erosion Protection, Bedding and Radon Barrier — Availability and Suitability"
— MKE Calc. No. 05-505-03-00

11. Colorado State University Report
(MKE Doc. No. 5025-GRJ-L-09-00052-00)

12. UMTRA Design Procedures Manual, REV. 7, JAN. 1989, MKE DOC. 4005-GEN-Q-01-06596-00

13. "Embankment Cover Design — Vegetative Cover"
MKE Calc. No 05-670-10-00

14. BOWLES, J.E., "FOUNDATION ANALYSIS AND DESIGN", 3RD EDITION, Mc. GRAW HILL COMPANY, 1982

15. WINTERKORN, H.F., FANG, H.Y., "FOUNDATION ENGINEERING HANDBOOK", VAN NOSTRAND REINHOLD COMPANY

16. NAVFAC DM-7.1, "SOIL MECHANICS — DESIGN MANUAL 7.1", DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND, MAY 1982

REFERENCES CONT'D

17. Design Standards Embankment Dams No. 13, Chapter 4 Static Stability Analysis, USBR, Engineering Research Center, Denver, Colorado, Aug. 1987

18. Rock Quality for Erosion Protection - Cheney Disposal Site, MKE Calc. No. 05-505-02-00

19. Embankment Design - Drain layer, MKE Calc. No. 05-670-08-01

20. Laboratory Analysis of Soil Hydraulic Properties of the GRJ main Tailings and Vicinity Properties, Deliv. Order 005, by DBS&A, MKE DOC. 3885-GRJ-R-02-04329-00

21. Mesri, G. and Godlewski, P.M., "Time and Stress-Compressibility for Clays," Journal of the Geotechnical Division, ASCE Vol. 103 No. GT5, pp. 417-430, 1977.

22. Holtz, R.D. & Kovacs, W.D., "An Introduction to Geotechnical Engineering", Prentice-Hall, Inc. 1981.

23. MKES, IOC, Aug 2, 1990 "Re: Manco: Shale Swell Tests - Cheney Disposal site" MKE Doc No. 3885-GRJ-I-02-04507-00

* Foundation: In-situ condition

* Others, such as general fill, select fill: compacted material

O. SUMMARY OF GEOTECHNICAL DESIGN PARAMETERS (cont'd) (SHEET 2 OF 2)

	MATERIAL	ATTERBERG LIMITS LL (%)	ATTERBERG LIMITS PI (%)	% PASSING #200 SIEVE (%)	SPECIFIC GRAVITY Gs	NATURAL MOIST. CONT. W_n (%)	DENSITY γ_d (pcf)	DENSITY γ_t (pcf)	DENSITY γ_{sat} (pcf)	DEGREE OF SATURATION Natural	DEGREE OF SATURATION As Compacted	COMPACTION ASTM D698 W_{opt} (%)	COMPACTION ASTM D698 γ_{dmax} (pcf)	HYDRAULIC CONDUCTIVITY k (cm/sec)	COMPRESSIBILITY C_c / C_r	COMPRESSIBILITY σ_p' (psf)	COMPRESSIBILITY e_o	COMPRESSIBILITY C_v (ft²/sec)	SHEAR STRENGTH SHORT TERM C (psf)	SHEAR STRENGTH SHORT TERM ϕ (deg.)	SHEAR STRENGTH LONG TERM STATIC C' (psf)	SHEAR STRENGTH LONG TERM STATIC ϕ' (deg.)	SHEAR STRENGTH LONG TERM SEISMIC C (psf)	SHEAR STRENGTH LONG TERM SEISMIC ϕ (deg.)
DISPOSAL SITE (UNCONTAMINATED MATERIALS)	LAYER NO. 1																							
	• FOUNDATION (CL)	37	18	65	2.74	11.3	(in-situ) 83.4	92.8	115.4	29.5	—	18.1	102.2	—	—	—	1.05	—	*S_u = 500 psf	*0	30°	*S_u = 500 psf		
	• GENERAL FILL (95% Comp.)	37	18	75	2.74	—	(Compacted) 101.8	120.5	127.0	—	74.2	18.4	107.2	1×10^{-6}	0.24 / 0.017	2.0	0.12	*1×10^{-4}	S_u = 1010 psf	0	30°	0	20°	
	• TOPSOIL	—	—	65	—	*11	(in-place) *87	96	—										*S_u = 250 psf	*0	20°	*S_u = 250 psf		
	LAYER NO. 2																							
	• FOUNDATION	28	11	25	2.52	7.0	*117	*125	*132.8	*51	—	18.0	111.0	7×10^{-5}	—	—	*0.35	—	*0	35	*0	35	*0	35
	• EROSION PROTECTION	NOT APPLICABLE			2.65	—	—	(in-place) *125	—	—	—	—	—	—	—	—	*0.33	—	*0	38 (Toeslope only)	*0	38	*0	38
	• SELECT (SM) FILL (-1") (95% Comp.)	23	4	34	*2.60	—	114	(in-place) 128.8	132.5	—	60.0	13.1	120	7.2×10^{-7}	—	—	0.43	—	*0	27°	*0	30°	*0	30°
	LAYER NO. 3																							
	• FOUNDATION (CL)	37	20	73	2.75	9.7	(in-situ) 109.4	120.0	132.0	47	—	14.7	110.2	3×10^{-6}	0.17 / 0.04	*8.0	0.57	*2.2×10^{-5}	*S_u = 1500 psf	0	29°	0	12.5°	
	• RADON BARRIER (95% - 100% Comp.)	37	20	86	2.75	—	100% Comp. 112.4	129.6	133.9	—	80.0	15.3	112.4	8×10^{-8}	—	—	0.53	—	*S_u = 1300 psf	*200	30°	*200	22°	
							95% Comp. 106.8	123.1	130.4	—	69.3	15.3	112.4	[illegible]	—	—	0.61	—	*S_u = 1000 psf	*0	30°	*0	20°	
	LAYER NO. 5 MANCOS SHALE																							
	• FOUNDATION	33	17	—	*2.75	10.3	(in-situ) *133.7	*145	*145	100	—	—	—	1×10^{-8} to 1×10^{-7}	—	—	*0.28	—	*S_u = 5000 psf	*0	35°	*S_u = 5000 psf		
	• SELECT FILL (SHALE) (95% Comp.)	33	17	—	*2.75	—	(in-place) 104.1	122.2	128.6	—	74	17.4	109.6	1×10^{-6}	—	—	0.65	—	S_u = 175 psf	0	28°	60	20°	

* Assumed value — Not from Tests

Appendix I

Disposal Location Map and Cross Section

THIS PAGE IS AN OVERSIZED DRAWING OR FIGURE,

FILE #: 97075
SHEET NO. 1 OF 1

THAT CAN BE VIEWED AT THE RECORD TITLED: ASBESTOS AND PCB CORNER LOCATIONS- PCC HOLE - CHENEY SITE

WITHIN THIS PACKAGE...OR, BY SEARCHING USING THE DOCUMENT/REPORT

FILE #: 97075
SHEET NO. 1 OF 1

NOTE: Because of this page's large file size, it may be more convenient to copy the file to a local drive and use the Imaging (Wang) viewer, which can be accessed from the Programs/Accessories menu.

NOTES:

1. ALL UNCONTAMINATED MATERIAL EXCAVATED FROM THE SITE DURING CONSTRUCTION WAS PLACED TEMPORARILY WITHIN THE AREAS INDICATED WITH STABLE SLOPES NO STEEPER THAN 2(H) TO 1(V). MAXIMUM HEIGHT OF THE PILE WAS 30 FEET.
2. THE SUBCONTRACTOR PROVIDED SUMP AND PUMP TO DRAIN THE PONDED NON-CONTAMINATED WATER FROM RAINSTORM AND SNOW MELT FROM THE TAILINGS EMBANKMENT AREA INTO THE NATURAL DRAIN.
3. THE LOCATION OF THE INTERFACE OF MANCOS SHALE WITH ALLUVIUM/COLLUVIUM WAS APPROXIMATE ONLY AND WAS BASED ON SOIL BORING LOGS. ACTUAL LOCATION VARIED.
4. A WORKING BENCH APPROXIMATELY 27' WIDE WAS PLACED BELOW THE TRANSITION BETWEEN MANCOS SHALE AND ALLUVIUM. THE SIDESLOPE IN THE MANCOS VARIED AS APPROVED BY THE CONTRACTOR.

REFERENCE DRAWINGS:

LEGEND:

- EXISTING SITE FEATURES AND CONTOURS
- N 12,000 — CONSTRUCTION GRID COORDINATE
- 5250 — CONTOURS OF EXCAVATION
- TEMPORARY CHAIN LINK FENCE AND GATE
- TEMPORARY WIRE FENCE
- ACCESS ROAD
- EXCAVATION
- EMBANKMENT
- MKE-3 — EXISTING PERMANENT SURVEY MONUMENT
- MW-1 — EXISTING WATER SUPPLY WELL

EDWIN S. SMITH REGISTERED PROFESSIONAL ENGINEER 14364 STATE OF COLORADO

QA APPROVED FOR QUALITY MONITORING BY [illegible] 2/12/90

200 0 200 400
SCALE FEET

GRJ/Disposal Site/Vol.1/APP.D/Page 5 of 12

U. S. DEPARTMENT OF ENERGY
ALBUQUERQUE, NEW MEXICO

CHENEY RESERVOIR DISPOSAL SITE
GRAND JUNCTION, COLORADO
PHASE II CONSTRUCTION

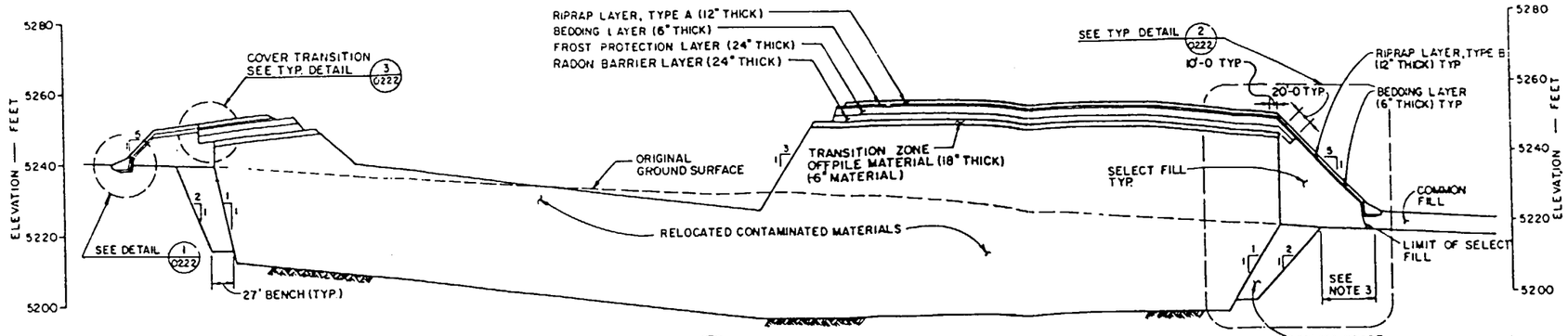
TAILINGS EMBANKMENT AREA EXCAVATION PLAN

DESIGNED [illegible] DRAWN RBC
CHECKED [illegible]
INSPECTED [illegible]
RECOMMENDED [illegible]
APPROVED [illegible] DATE 1/19/90 E.S. Smith 1/19/90 [illegible] DOE PROJECT ENGINEER [illegible] DATE 2-2-90

MORRISON-KNUDSEN ENGINEERS, INC.
A MORRISON-KNUDSEN COMPANY
UNITED 300 KCT
180 HOWARD ST. SAN FRANCISCO, CA 94105

PROJECT NO. DE-AC04-83AL18796
DRAWING NO. GRJ-DS-10-0134
REV. —

4	7-21-95	AS-BUILT	[illegible]	PS	[illegible]	[illegible]	[illegible]	[illegible]
3	8-15-90	REVISED PER R.D.'S 06-S-19 & 20	HL	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2	6-19-90	REVISED WEST SIDE TAILINGS EMBANKMENT EXCAVATION PLAN AND ADDED BENCH.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1	4-20-90	REVISED TAILINGS EMBANKMENT EXCAVATION PLAN. LOCATION OF STAGING AREA B DELETED NOTE 4 ADDED AREA B & NOTE 9	PS	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
0	1-17-90	SUPERSEDED DWG. NO. GRJ-DS-10-0134, REV. 1 AND REVISED SITE LOCATION	1 FOR	SIGNATURES, SEE		SUPERSEDED		
	8-11-88	REVISED TAILINGS EXCAVATION AREA, GRADING, TEMPORARY WIRE FENCE AND STOCKPILE AREA	DWG.	REV. 11				



SECTION A/0230

20 0 20 40 VERTICAL SCALE FEET

100 0 100 200 HORIZONTAL SCALE FEET

NOTES:

1. RELOCATED TAILINGS MATERIALS INCLUDED THE CONTAMINATED MATERIALS FROM THE EXISTING TAILINGS PILE, MILL YARD AND DEMOLISHED MATERIALS AND DEBRIS.
2. ELEVATIONS ARE APPROXIMATE AND ARE DEPENDENT ON ACTUAL VOLUME OF CONTAMINATED MATERIALS RELOCATED
3. CLEAN-FILL DIKE OVERLAPPED EXCAVATION BY 30' MINIMUM

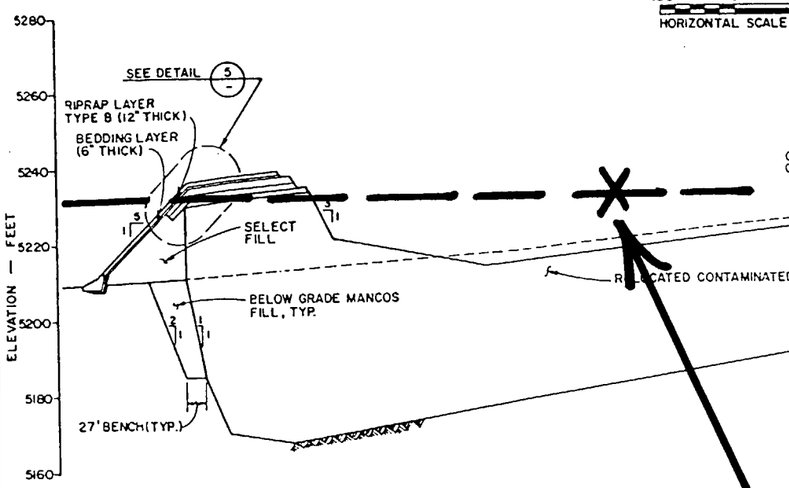
REFERENCE DRAWINGS:

GRJ-DS-10-0134 TAILINGS EMBANKMENT AREA EXCAVATION PLAN

GRJ-DS-10-0222 DITCHES AND MISCELLANEOUS SECTIONS AND DETAILS

GRJ-DS-10-0226 DITCH PROFILE AND MISCELLANEOUS SECTIONS AND DETAILS

GRJ-DS-10-0230 CELL CLOSURE PLAN



SECTION B/0230

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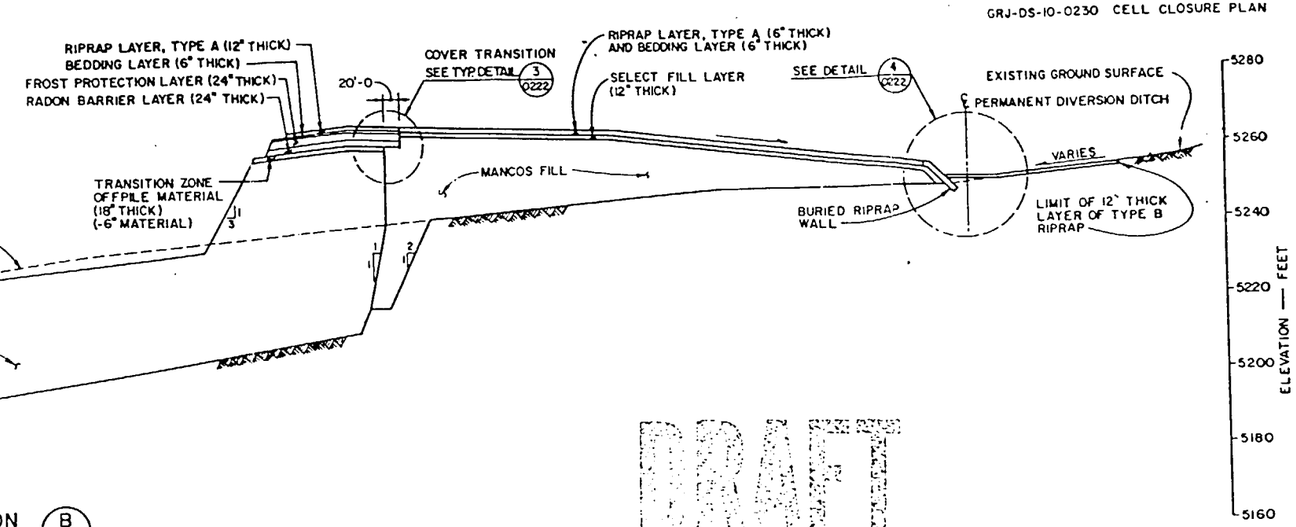
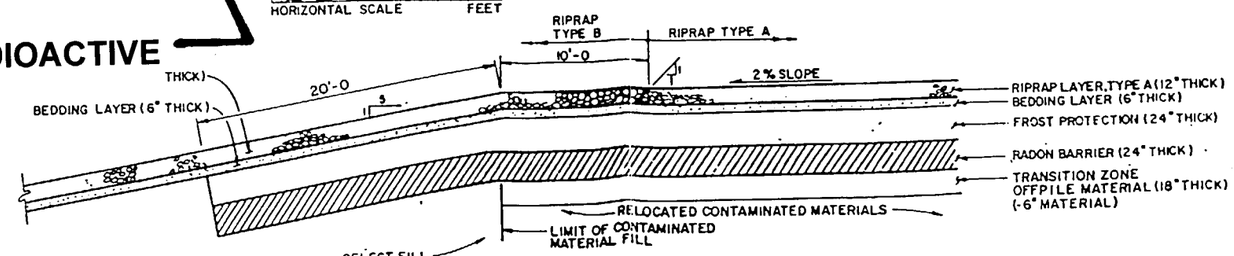


DRAFT

PROBABLE AREA OF PCB/RADIOACTIVE WASTE DISPOSAL



TYP. DETAIL 5/-

5 0 5 10 SCALE FEET

NOTE: THIS SEAL IS NOT VALID IN THE STATE OF COLORADO UNLESS THE ORIGINAL SIGNATURE APPEARS BELOW.

COLORADO REGISTERED PAUL E. LAYE 28171 PROFESSIONAL ENGINEER

QA REVIEW FOR QUALITY RECORDS BY _____

GRJ/Disposal Site/Vol.1/APP.D/Page 6 of 12

QA	NO.	DATE	REVISIONS	BY	CK	LEAD MGR.	CHIEF ENG.	PROJ. MGR.	APP.
	5	7-21-95	AS-BUILT						
	4	9-24-93	REVISED PER P.I.D. 05-S-59						
	3	8-21-93	REVISED PER P.I.D. 05-S-56						
	2	4-24-92	REVISED COVER LAYERS AND ABOVE GRADE DIKE (P.I.D 05-S-41)						
	1	1-16-91	REVISED PER P.I.D. 05-S-25						
	0	8-16-90	REVISED PER P.I.D. 05-S-17, REV. 1						
	1	8-23-88	GENERAL REVISION TO INCLUDE VEGETATIVE COVER						
	0	[illegible]	ISSUED FOR CONSTRUCTION	–	–	–	–	–	–

U. S. DEPARTMENT OF ENERGY
ALBUQUERQUE, NEW MEXICO

CHENEY RESERVOIR DISPOSAL SITE
GRAND JUNCTION, COLORADO
PHASE II CONSTRUCTION

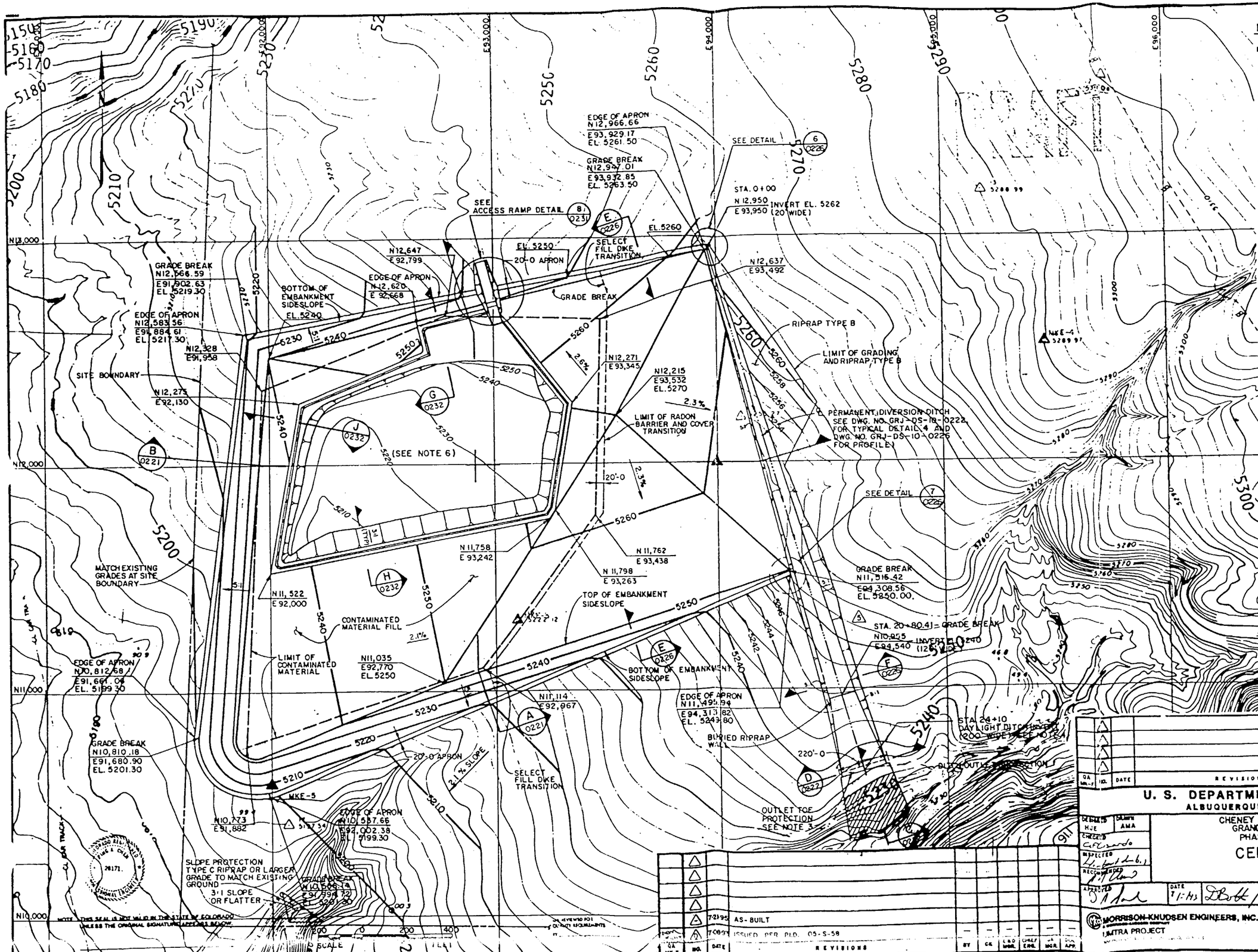
TAILINGS EMBANKMENT SECTIONS AND DETAILS

DESIGNED / DRAWN / CHECKED / INSPECTED / RECOMMENDED / APPROVED F.J. FELIZ — DATE 7/14/88

MORRISON-KNUDSEN ENGINEERS, INC.
UMTRA PROJECT

PROJECT NO. DE-AC04-83AL18796

DRAWING NO. GRJ-DS-10-0231 REV.



NOTES:

1. WHERE CORNER CONTOURS ON THE TAILINGS EMBANKMENT WERE TOO SHARP TO BE CONSTRUCTED, CONTOURS WERE ROUNDED WITH A 50 FOOT RADIUS (APPROXIMATELY) IN THE PLAN VIEW.
2. THE CONTOURS OF THE TOP SLOPE ARE APPROXIMATE AND WERE DEPENDENT ON ACTUAL VOLUME OF CONTAMINATED MATERIALS RELOCATED.
3. THE BURIED RIPRAP WALL EXTENDED TO TIE INTO THE DIVERSION DITCH OUTLET TOE PROTECTION STRUCTURE.
4. LOCATION OF THE DAYLIGHT POINT OF THE DITCH (SHOWN HERE AS STA. 24+10) WAS ADJUSTED TO MEET FIELD CONDITIONS.
5. CELL CLOSURE ACCESS FACILITIES WERE PROVIDED BY THE SUBCONTRACTOR AS DIRECTED AND APPROVED BY THE CONTRACTOR.
6. BOTTOM CONTOURS WERE APPROXIMATE, AND CHANGED AS VICINITY PROPERTY CONTAMINATED MATERIALS WERE PLACED.

REFERENCE DRAWINGS:

GRJ-DS-10-0222	DITCHES AND MISCELLANEOUS-SECTIONS AND DETAILS
GRJ-DS-10-0226	DITCH PROFILE AND MISCELLANEOUS-SECTIONS AND DETAILS
GRJ-DS-10-0231	CELL CLOSURE SECTIONS AND DETAILS (SHEET 1 OF 2)
GRJ-DS-10-0232	CELL CLOSURE SECTIONS AND DETAILS (SHEET 2 OF 2)

LEGEND:

- 5280 — EXISTING SITE FEATURES AND CONTOURS
- PERMANENT DRAINAGE DITCH
- 5270 — FINISHED GRADE CONTOURS
- N10,000 — CONSTRUCTION GRID COORDINATES
- EXISTING PERMANENT SURVEY MONUMENT
- EXCAVATION
- FILL

QA MGR-F	NO.	DATE	REVISIONS	BY	CK	E&D MGR	CHIEF ENG	QA MGR	DOE APP
		7-21-93	AS-BUILT						
		7-08-93	ISSUED PER PLD. 05-S-58						

U. S. DEPARTMENT OF ENERGY
ALBUQUERQUE, NEW MEXICO

DESIGNED HJE | DRAWN AMA | CHECKED | INSPECTED | RECOMMENDED | APPROVED

CHENEY RESERVOIR DISPOSAL SITE
GRAND JUNCTION, COLORADO
PHASE II CONSTRUCTION

CELL CLOSURE PLAN

DATE 7/1/93 | DOE PROJECT ENGINEER | DATE 8/10/93

MORRISON-KNUDSEN ENGINEERS, INC.
UMTRA PROJECT

PROJECT NO. DE-AC04-83AL18796

DRAWING NO. GRJ-DS-10-0230 | REV. -

Appendix J

DOE Paleochannel Report, NRC Concurrence

UGRJ000109

UMTRA GROUND WATER PROJECT

Report on Drilling and Sampling at the Cheney Disposal Cell

April 1998

Prepared by the

U.S. Department of Energy
Grand Junction Projects Office

RECORD COPY

GWGRJ18.03

Report on Drilling and Sampling at the Cheney Disposal Cell

April 1998

U. S. Department of Energy
Grand Junction Office

Work Performed Under DOE Contract No. DE-AC13-96GJ87335

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Purpose and Scope

Uranium, nitrate, and sulfate contamination has been detected in the ground water collected from monitoring wells 731 and 732 at the Cheney repository. The monitoring wells are located downgradient (west) of the disposal cell and are completed in the alluvial sediments overlying the Mancos Shale (see Figure 1). Two hypotheses have been advanced to explain this observation: (1) the disposal cell is leaking, and (2) contamination comes from water contacting the "bedding layer" in the cell's cover. The "bedding layer" consists of 6 inches of graded material derived from the tailings embankment excavation. The bedding layer occurs directly under the riprap layer on the top and sides of the disposal cell.

To determine if the cell is in fact leaking and in need of some corrective action, or if the contaminants are derived from some other source, a limited scope investigation was undertaken. The scope of the investigation included: (1) installing a boring, collecting sediment samples for laboratory analysis, completing a monitoring well in the disposal cell, and performing geophysical logging in the completed well; and (2) collecting samples of bedding and riprap material and analyzing for leachable uranium, nitrate, and sulfate. Sediment samples collected during installation of the borehole were analyzed for moisture content to provide a profile of residual water held within the compacted tailings material.

Background

The concentrations of uranium, nitrate, and sulfate observed in well 731 are increasing with time which is the reason for concern that the repository may be leaking. Data from this well and well 732 are provided in Table 1. The concentrations of uranium, nitrate, and sulfate are increasing in well 731 but have remained nearly constant in well 732.

The UMTRA ground water maximum concentration limits (MCL) for these constituents are: uranium (0.044 mg/L), nitrate (44 mg/L), and sulfate (no MCL).

A small (approximately 10 feet diameter, 3 feet deep) pit (500 Pit) was excavated into the top of the bedding layer at the lowest portion of the riprap slope near well 732. The pit is normally dry but has water standing in it shortly after rain events. The water in the 500 Pit was sampled after a rain event in April 1997 and the analyses are provided in Table 1. Because of the similarity of the uranium, nitrate, and sulfate concentrations in this pit, to the water in wells 731 and 732, it has been suggested that the bedding layer is the source of the elevated concentrations in wells 731 and 732.

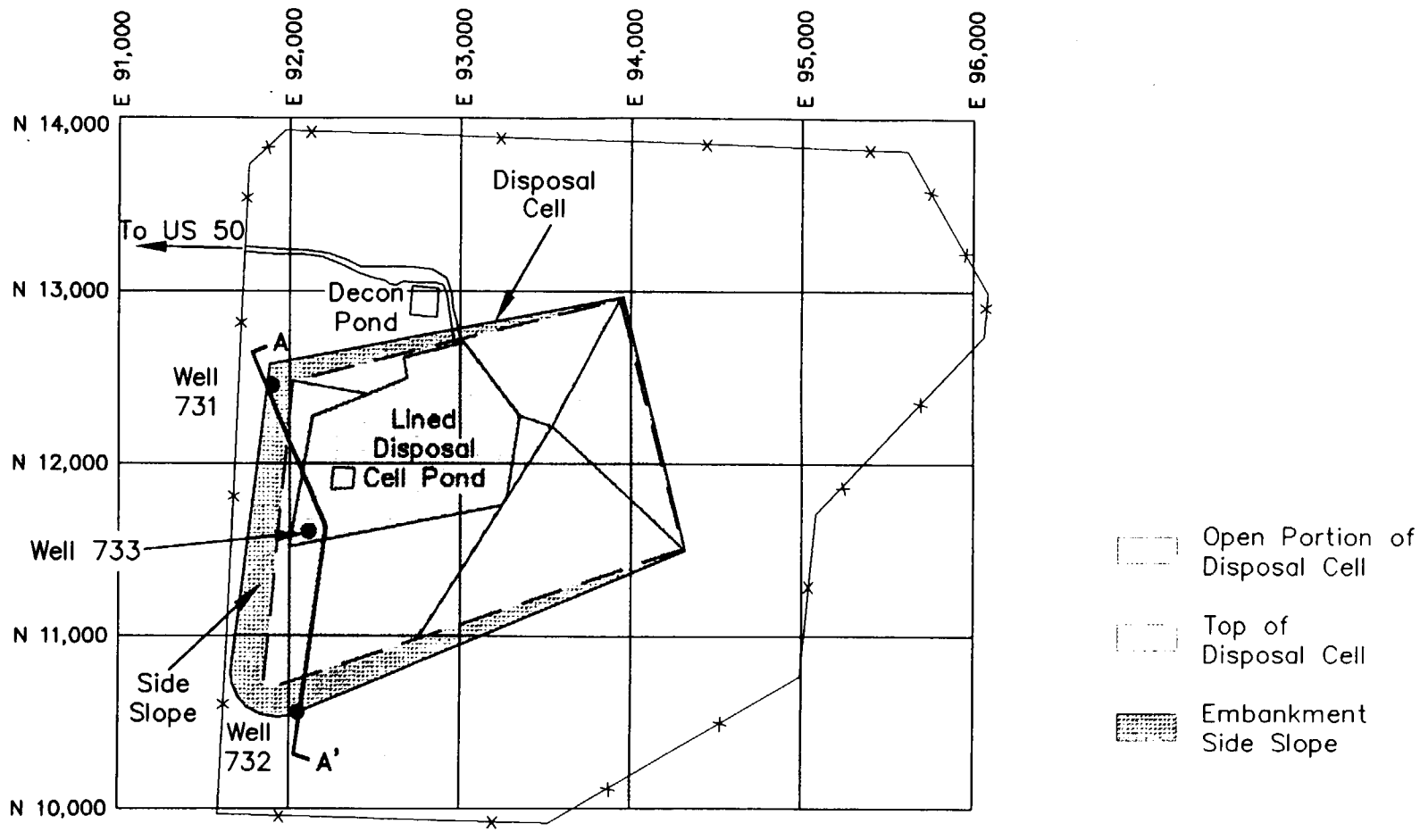

Figure 1. Plan of Cheney Disposal Site

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Table 1. Uranium, Nitrate, and Sulfate Concentrations Observed in Wells 731 and 732, and 500 Pit.

Well Number	Date	Uranium (mg/L)	Nitrate (mg/L)	Sulfate (mg/L)
731	Jun-95	0.019	40.5	3310
731	Jun-96	0.031	118	4900
731	Oct-97	0.0388	223	7470
732	Jun-95	0.024	178	3440
732	Jun-96	0.018	179	3490
732	Oct-97	0.0187	162	3610
500 Pit	Apr-97	0.0243	60	3300

Borehole and Well Installation

To evaluate hydrogeologic conditions within the repository tailings, a borehole was installed through the cell. The borehole was located near the southwest corner of the open portion of the cell. This location placed the borehole in the section of the repository where the bottom of the cell had been excavated to its maximum depth of 5160 ft above mean sea level (amsl) (DOE 1997) and where placement of the cover has been postponed to allow ongoing placement of tailings (see Figure 2). The borehole was installed using a Mobile B-80 6 3/4-inch ODEX rig. Samples were collected every five feet after reaching a depth of 15 feet using a 1.5-inch split-barrel sampler fitted with an inner Lexan sleeve. Samples collected in the Lexan sleeve were inspected for lithologic logging, then the sleeve was sealed and shipped to the laboratory for gravimetric moisture content analysis. The borehole was advanced until Mancos Shale was observed in the split-barrel sampler. A 4-inch diameter PVC well casing was then installed through the outer ODEX casing. The well was installed with 10 feet of machine slotted 0.02-inch well screen surrounded by 10-20 sieve size Colorado silica sand. The well completion log is shown in Appendix A. The completed well is assigned the number 733.

Results

The results of the well installation and lithologic logging (Appendix A) show dry tailings throughout the upper 70 feet of tailings. The only water encountered in the entire borehole was detected between 69 and 70 feet below ground surface (bgs). Mancos Shale was encountered at a depth of 74 feet bgs. A survey of the well after completion revealed ground elevation and top of casing elevation to be 5231.6 ft amsl and 5233.06 ft amsl, respectively. The corresponding logged elevation for the Mancos shale which forms the base of the disposal cell is 5157.6 ft amsl-2.4 feet lower than the reported design elevation. Moisture content analyses are presented in Table 2.

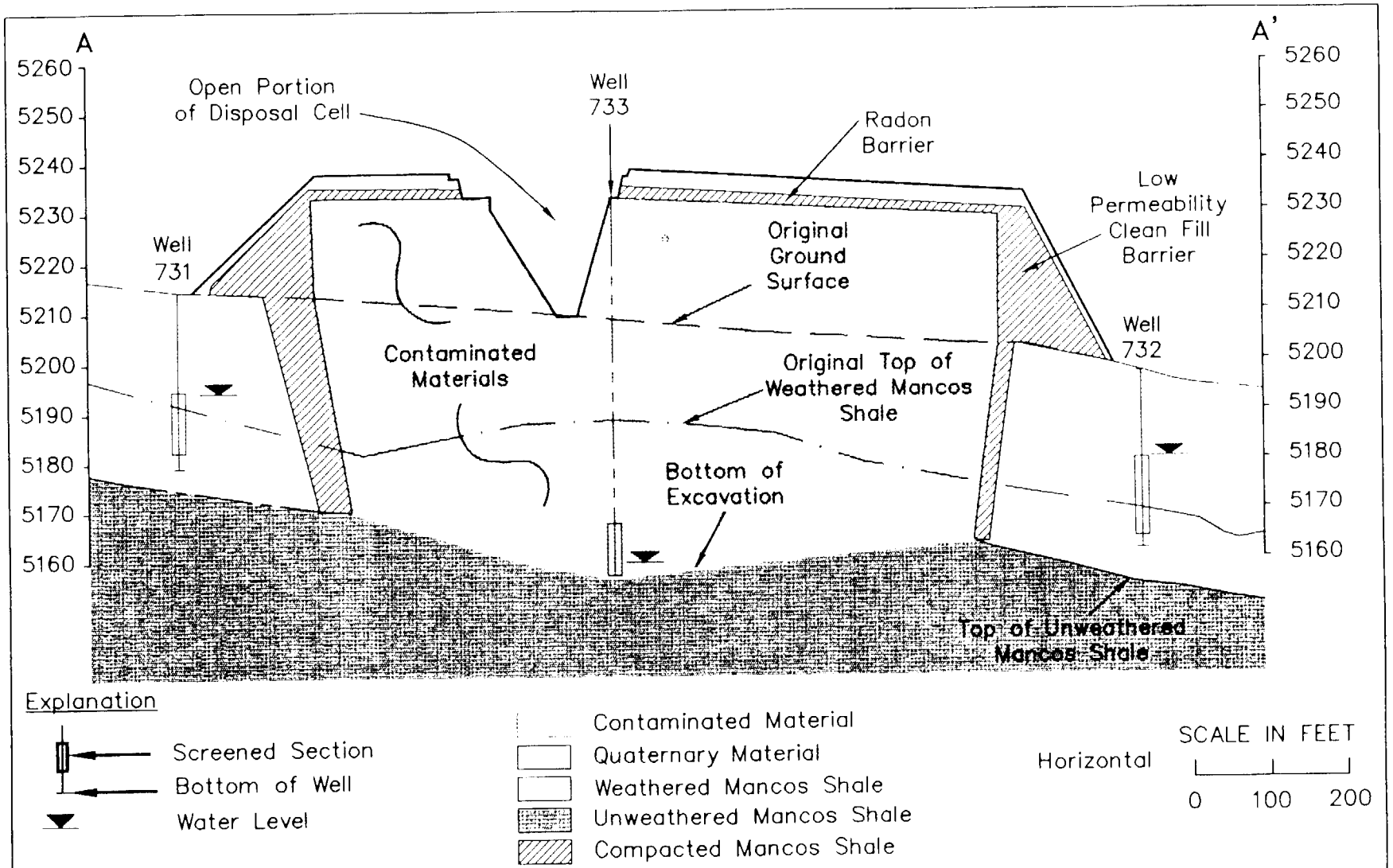

Figure 2. Cross Section A–A' Cheney Disposal Site

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Table 2. Gravimetric Moisture Content of Samples from Cheney Monitoring Well 733.

Sample Number	Depth (ft)	Moisture Content (% dry wt)
CH733-1	14	12.04
CH733-3	29	7.96
CH733-4	34	10.42
CH733-5	39	8.92
CH733-6	44	8.22
CH733-7	49	7.89
CH733-8	54	8.7
CH733-9	59	12.53
CH733-10	64	12.66
CH733-11	69	7.81
CH733-12	74	20.61

Moisture content results indicate that the only significant water present in the cell is at the extreme bottom of the tailings, ponded on top of the low-permeability Mancos Shale. The moisture content results also indicate an absence of any "perched-water" layers within the cell that could contribute to migration within the tailings at elevations above the cell bottom.

The moisture content data become most significant when coupled with depth to water measurements made in well 733 concurrent with measurements made in the two existing wells in which contamination has been detected. Groundwater elevation data for wells 731, 732, and 733 are summarized in Table 3. Survey elevation data were collected on February 5, 1998. The survey was a closed-loop survey with a closure error of 0.02 feet, which was distributed throughout survey measurements as a correction.

Table 3. Groundwater Elevation Data for Cheney Repository Monitoring Wells.

Well	Ground Elevation (ft amsl)	Top of Casing Elevation (ft amsl)	Depth to Water (ft) (below TOC)	Groundwater Elevation (FT amsl)
731	5215.8	5218.73	19.54 to 24.81	5193.92 to 5199.19
732	5200.1	5202.83	21.49 to 23.45	5179.38 to 5181.34
733	5231.6	5233.06	71.47[a]	5161.59

[a] Only one data point available; taken on 2/27/98

Groundwater elevation data in Table 3 show that the saturated tailings thickness is approximately 4 feet, given the cell-bottom elevation of 5157.6 ft amsl determined from the split-barrel sampling. This depth of groundwater in the tailings is consistent with expectations given limited water content within the tailings prior to emplacement and some water added during placement. More importantly, the groundwater elevation at well 733 is 5161.59 ft amsl. This elevation is 18 to 37 feet *lower* than groundwater elevations in monitoring wells 731 and 732 located outside the cell. Given these groundwater elevations, groundwater can not flow from within the cell to outside the cell, and contaminants can not be migrating from within the tailings to the alluvium outside the repository. The relationship between groundwater elevations in the tailings and in the alluvium is shown in Figure 2.

To complete the assessment of groundwater conditions at the site, groundwater samples were collected from all three wells on February 27, 1998. Samples are being analyzed for the following constituents: As, Cd, Ca, Co, Fe, Mg, Mn, Mo, K, Se, Na, Zn, Uranium, Vanadium, Ra-226, Ra-228, Gross Alpha, Cl, F, SO_4, NO_3, TDS, PCBs, U-234, and U-238. Results of these analyses are expected in early April.

Leachability of Bedding Layer and Riprap Samples

Three samples of the bedding layer were collected from three different areas of a large stockpile of bedding-layer material at the Cheney site. The collection sites were approximately at the east (BL1), south (BL2), and west (BL3) compass points of the pile. A dozer was used to scrape away the upper 2 to 3 feet before collecting the sample. Two samples were collected from the repository bedding layer near well 732 by hand excavation. These two samples were collected from about half way up the slope (BL4) and at the top (BL5) of the slope (see Figure 2). One sample (WC1), a white coated piece of basalt riprap boulder, was collected near BL4.

Deionized water was used as a leachate to simulate rain water. Although rain water contains some dissolved ions, the low concentrations would not be significant compared to the ions added by the interaction with the soils. Two batch tests using different ratios of bedding-layer soil to deionized water were conducted on each sample. A sample of well screen sand (S1) was also run as a control. One batch test on each sample was conducted using the highest ratio of soil-to-water that could easily be filtered (one to one by weight). The second used a ratio of one half. The highest soil-to-water ratio should produce the highest concentrations of dissolved species. As the soil-to-water ratio is decreased, the concentrations of soluble salts should decrease.

Total radium-226 concentrations were determined from each of the bedding-layer samples. The results are used to determine if the bedding layer contains any tailings material.

Laboratory Procedure: All samples were air dried and sieved to less than 2 mm. Samples BL1, BL2, BL3, BL4, BL5, and WC1 contained 31, 36.3, 28.6, 49, 65, and 0 percent of less-than-2-mm material, respectively. The less-than-2mm fractions were used in the leaching experiments except for WC1, which was fractured with a hammer. The resulting pieces, of this sample, were used for the leaching experiments.

Fifteen grams of soil and 15 mL of deionized water were placed in plastic vessels. The mixtures were agitated end-over-end for 24 hours and then filtered through a 0.45μm filter. The filtrates were analyzed for U, NO_3, and SO_4 within 4 hours. Nitrate and SO_4 were analyzed by spectrophotometry. Uranium was analyzed by laser-induced fluorescence. The results of the leaching tests are presented in Table 4.

Table 4. Results of Leaching Tests on Cheney "Bedding Layer"

Sample	Location/Description	Soil:Water (g:mL)	Uranium (mg/L)	Nitrate (mg/L)	Sulfate (mg/L)
BL1	Stock Pile	1:1	0.005	9.8	<70
BL1	Stock Pile	1:2	0.003	4.4	<27.5
BL2	Stock Pile	1:1	0.003	3.6	<100
BL2	Stock Pile	1:2	0.002	2.2	55
BL3	Stock Pile	1:1	0.003	5.1	<70
BL3	Stock Pile	1:2	0.002	5.1	<22.5
BL4	Mid Slope of Cover	1:1	0.003	6.6	460
BL4	Mid Slope of Cover	1:2	0.002	2.6	215
BL5	Top of Cover	1:1	0.006	40	3100

BL5	Top of Cover	1:2	0.007	25.5	2650
WC1	White Coating at BL4	1:1	0.001	19.8	220
WC1	White Coating at BL4	1:2	0.005	68.2	1750
S1	Sand Control	1:1	<0.001	0,5	<10
S1	Sand Control	1:2	<0.001	<0.5	<10

Radium-226 concentrations in the less-than-2-mm fractions were measured by alpha-spectrometry. Observed levels of radium-226 suggested that very little tailings, if any, are present in the bedding material. The concentrations of radium-226 in the bedding-layer soils are provided in Table 5.

Table 5. Radium-226 Concentrations in Bedding Layer Samples

Sample	Location	226Ra (pCi/g)
BL1	Stock Pile	0.86
BL2	Stock Pile	0.93
BL3	Stock Pile	1.08
BL4	Mid Slope of Cover	1.03
BL5	Top of Cover	1.31

Interpretation

By comparing Tables 1 and 3 it is seen that the concentrations of uranium, nitrate, and sulfate are higher in wells 731, 732, and the 500 Pit than in the bedding layer leachates. The leachates from the stock pile bedding-layer samples (BL1, BL2, and BL3) have somewhat lower concentrations than the leachates from the in situ bedding layer samples (BL4 and BL5). Bedding-layer sample BL5 collected from the top of the disposal cell also has a slightly higher radium-226 concentration than the other samples.

The concentrations in the leachates are governed by the ratio of soil-to-water used in the experiments. The *ratios* of dissolved constituents should remain nearly constant, however. Therefore, chemical ratios should be useful in identifying sources of contamination. Table 6 shows the nitrate-to-uranium and sulfate-to-nitrate ratios for the wells, the 500 Pit, and the leachates.

There is an insufficient number of samples to draw unambiguous conclusions, however, it appears that the nitrate-to-uranium ratios (5747 and 8663) observed in the two wells are reasonably consistent with the ratios in the in situ bedding layer samples, particularly the ratio (6667) in BL5. Similarly, the range of sulfate-to-nitrate ratios in the wells (22 to 33) is reasonably consistent with the bedding leachates (range 7 to 78).

Table 6. Table 3 Comparison of Chemical Ratios in Recent Sampling of Wells 731 and 732, the 500 Pit, and the 1:1 Leachates.

Sample	Sample Date	Nitrate/Uranium	Sulfate/Nitrate
BL1	Oct-97	1960	7
BL2	Oct-97	1200	28
BL3	Oct-97	1700	14
BL4	Jan-98	2200	70
BL5	Jan-98	6667	78
WC1	Jan-98	19800	11
Well 731	Oct-97	5747	33
Well 732	Oct-97	8663	22
500 Pit	Apr-97	2469	55

The white mineral coating present on some of the basalt boulders is a source of nitrate. The nitrate-to-uranium ratios are much higher than those observed in the wells or in the bedding layer leachates, thus, it cannot be the sole source for the contamination observed in the wells. The amount of white minerals observed on the riprap is relatively small; suggesting that this source may not contribute significantly to the overall nitrate budget in the ground water.

Conclusion

Moisture content analysis of samples taken from the Cheney monitoring well 733 indicate that water is present, in saturated conditions, only at the extreme bottom of the tailings. There was also no evidence of any "perched-water" layers within the cell that could lead to migration of

water within the tailings at elevations above the cell bottom. In addition, groundwater elevation data of wells 731, 732, and 733 show that the elevation of groundwater in well 733 is lower than the groundwater elevations of both 731 and 732. Given moisture content analysis and groundwater elevation data, groundwater can not flow from within the cell to outside the cell. Therefore, the data suggests the cell can not be leaking and contamination can not be migrating from within the cell to the alluvium wells outside the cell repository.

Results from the leaching tests of "bedding layer" material do not conclusively support the hypothesis that contamination is coming from the "bedding layer" in the cell's cover. Uranium concentrations in the wells are higher than in the leachate samples derived from bedding material. Uranium concentrations, from the leachate, would have to be about 5 times greater than the highest observed leachate concentration, to be consistent with the uranium concentration observed in well 731. Although there are nitrates present on the riprap, it is a relatively small amount, which also suggests that this source may not contribute significantly to overall nitrate concentrations in the ground water.

Groundwater elevations in wells 731 and 732 have increased over time suggesting that water harvesting off of the cell has been occurring. Because migration of contaminants due to cell leakage is not indicated, elevated concentrations of these contaminants could be caused by the leaching of the natural soils surrounding the wells, due to water harvesting off of the cell. With time, it is expected that the concentrations of uranium, nitrate, and sulfate in wells 731 and 732 will begin to decrease.

Current concentrations of these contaminants in wells 731 and 732 remain below UMTRA ground water MCL's and as stated above are expected to decrease over time. The wells will continue to be monitored for these constituents but no further investigations are warranted at this time.

References

DOE, 1997. Grand Junction, Colorado Disposal Site, Final Completion Report, Department of Energy Albuquerque Operation Office, Contract No. DE-AC04-83AL18796.

Appendix A

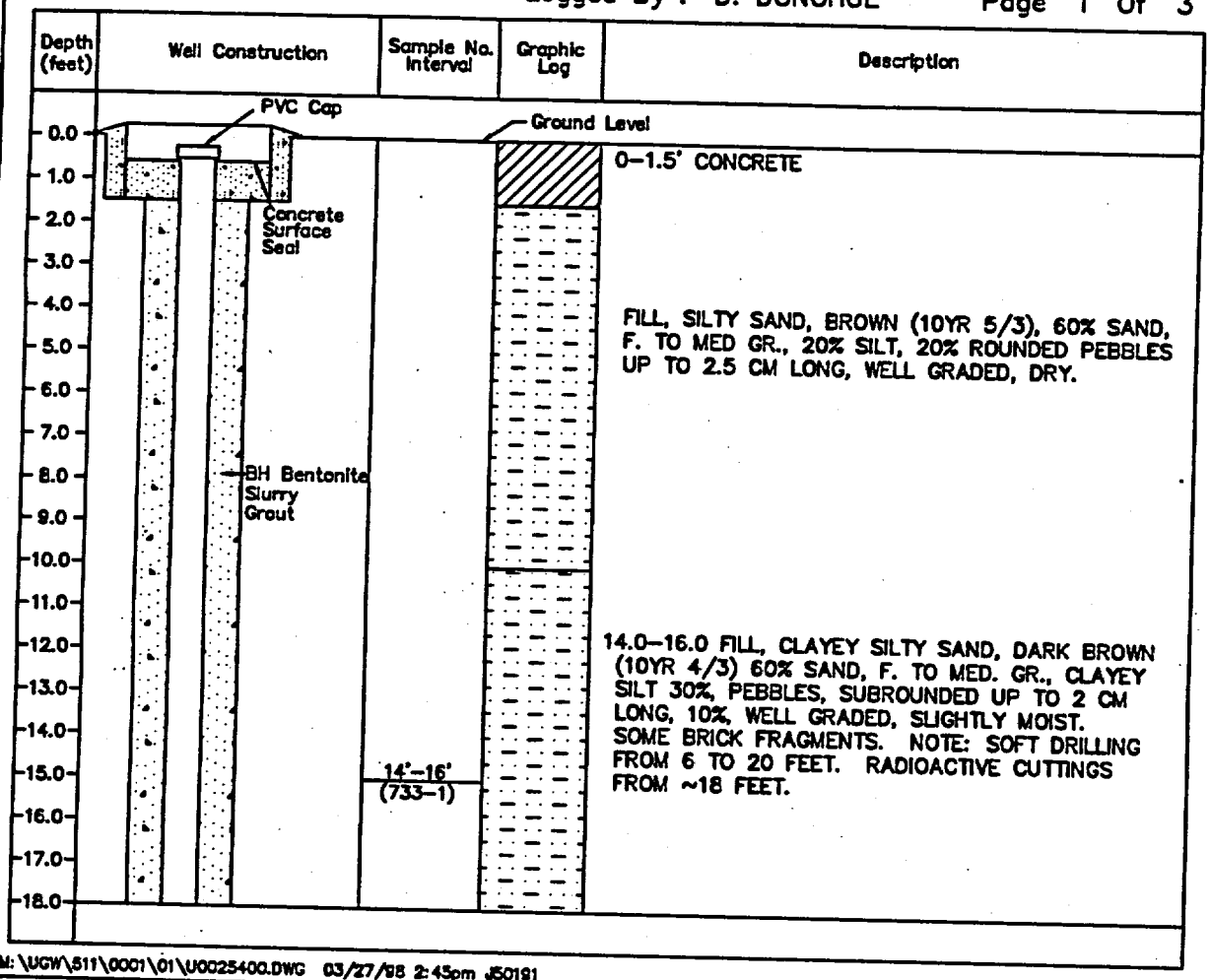
Figure A-1. Monitoring Well Condition Log

Monitoring Well Completion Log CH 733

Project : CHENEY
Location : CHENEY DISPOSAL CELL
Hole No. : CH 733
Location (ft) N : E :
Ground Elevation (ft MSL) : 5231.6
Total Depth (ft) : 74.0
Measuring Point Ht (ft) : 1.46
Slot Size : 0.020 Inches
Hollow-Stem Auger Size (in.) :
Auger Head Size (in.) : 6 3/4" ODEX

	TYPE	DIA. (in. I.D.)	INTERVAL (ft)
Blank Casing :	PVC	4.0	0 To 63.8
Screen :	JOHNSON PVC , SIZE 0.02" MACHINE SLOTTED	4.0	63.8 To 73.8
End Cap :	PVC	4.0	73.8 To 74.0
Filter Pack :	CO. SILICA, SIZE 10-20	10-20 3.0 FT^3	74.0 To 60.8
Sealant :	CO. SILICA	16-40 0.5 FT^3	60.8 To 59.7
	BENTONITE PELLETS	1/4" 0.5 FT^3	59.7 To 56.8
Grout :	BH BENTONITE SLURRY	17.6 FT^3	56.8 To 1.5
	CONCRETE		1.5 To 0

Date Drilled : 1-28-98 Logged By : D. DONOHUE Page 1 Of 3



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Monitoring Well Completion Log CH 733

Hole No. : CH 733

Depth (feet)	Well Construction	Sample No. Interval	Graphic Log	Description
18.0				
19.0				
20.0				
21.0				
22.0				
23.0				24.0–26.0 REFUSAL, LESS THAN 0.1 FEET OF SUBROUNDED GRAVEL IN SPLITSPOON, (NO SAMPLE) NOTED WEAK RED (2.5YR 5/2) SANDS DISCHARGED FROM CUTTINGS TUBE, RADIOACTIVE TAILINGS.
24.0				
25.0		24'–26' (733–2)		
26.0				29.0–30.0 FILL, SILTY QUARTZ SAND, F. TO TO MED. GR., GRAY (10YR 6/1) 95% SAND, 5% SUBROUNDED PEBBLES UP TO 2 1/2 CM. LONG POORLY GRADED, MOIST.
27.0				
28.0				
29.0				
30.0		29'–31' (733–3)		30.0–31.0 NO RECOVERY
31.0				
32.0				34.0–35.2 SILTY SAND, GRAY (10YR 6/1) SAME AS ABOVE.
33.0				35.2–36.0 NO RECOVERY
34.0				
35.0		34'–36' (733–4)		39.0–39.8 GRAVELY SAND, LIGHT GRAY (10YR 7/2) 60% SUBROUNDED GRAVEL UP TO 2 1/2 CM. LONG, 20% F. TO MED. GR. SAND, 20% SILT, WELL GRADED, SLIGHTLY MOIST.
36.0	BH Bentonite Slurry Grout			
37.0				39.8–39.9 CLAYEY SILT, DARK GRAYISH BROWN, (10YR 4/2) WITH ABOUT 10% SAND, SLIGHTLY MOIST.
38.0				
39.0				39.9–41.0 NO RECOVERY
40.0		39'–41' (733–5)		
41.0				44.0–44.7 SILTY SAND, DARK BROWN (10YR 4/3) 70% SAND SUBROUNDED TO SUBANGULAR, 20% SILT, 10% PEBBLES UP TO 2 CM. LONG, CRUMBLY, SLIGHTLY MOIST.
42.0				
43.0				44.7–46.0 NO RECOVERY
44.0				
45.0		44'–46' (733–6)		49.0–49.6 GRAVELY SAND, DARK BROWN (10YR 4/3) 60% GRAVEL UP TO 2 1/2 CM. LONG, SUBROUNDED TO SUBANGULAR, 30% SAND, 10% SILT, WELL GRADED, SLIGHTLY MOIST.
46.0				
47.0				

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Monitoring Well Completion Log CH 733

Hole No. : CH 733

Depth (feet)	Well Construction	Sample No. Interval	Graphic Log	Description
48.0				
49.0				49.6–51.0 NO RECOVERY
50.0		49'–51' (733–7)		
51.0				
52.0				54.0–54.9 SILTY SAND, F. GR., DARK BROWN (10YR 4/3) 60% SAND, 30% SILT, 5% CLAY, 5% PEBBLES, SUBROUNDED UP TO 2 1/2 CM. LONG, WELL GRADED, VERY SLIGHT PLASTICITY, SLIGHTLY MOIST, HEMATITE STAINING AND TINY BITS OF MICA. (40 TO 60 COUNTS RADIOACTIVITY OVER BACKGROUND.
53.0				
54.0				
55.0		54'–56' (733–8)		
56.0				54.9–56.0 NO RECOVERY
57.0				59.0–60.2 SILTY SAND, LIGHT GRAY (10YR 4/1) 80% SAND, 15% SILT, 5% SUBROUNDED PEBBLES UP TO 2 CM. LONG, POORLY GRADED, SLIGHTLY MOIST. SOME TINY PYRITES AND SHINY FLECKS OF MICA. (MODERATELY RADIOACTIVE OVER 500 COUNTS.)
58.0	Bentonite Pellets (1/4")			
59.0				
60.0	Fine Sand (16–40)	59'–61' (733–9)		
61.0				60.2–61.0 NO RECOVERY
62.0				64.0–64.5 SILTY SAND, WEAK RED (2.5YR 5/2) 90% SAND, 10% SILT, POORLY GRADED, SLIGHTLY MOIST. SOME PYRITE BITS AND TINY YELLOW, RED, AND BLACK MINERAL GRAINS, A FEW WOOD FRAGMENTS.
63.0	Filter Sand (10–20)			
64.0				
65.0		64'–66' (733–10)		64.5–66.0 NO RECOVERY
66.0				69.0–70.2 SILTY SAND, QUARTZ, LIGHT BROWNISH GRAY (10YR 0/2) 90% SAND, 5% SILT, 5% GRAVEL AT 69 FEET. A FEW YELLOW, RED, AND BLACK MINERAL GRAINS, POORLY GRADED, MOIST, VERY SLIGHT PLASTICITY.
67.0				
68.0	Screened Interval			
69.0				
70.0		69'–71' (733–11)		
71.0				
72.0				70.2–71.0 NO RECOVERY
73.0				74.0–74.5 SHALE, VERY DARK GRAYISH BROWN (2.5Y 3/2) VERY SLIGHTLY MOIST. MANCOS SHALE
74.0		74'–76' (733–12)		
75.0				
76.0				
77.0				

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

6 1998

June 30, 1998

Mr. Jack B. Tillman
U.S. Department of Energy
Grand Junction Office
2597 B 3/4 Road
Grand Junction, CO 81503

LTSM001962

SUBJECT: REVIEW OF APRIL1998 REPORT ON DRILLING AND SAMPLING AT THE URANIUM MILL TAILINGS REMEDIAL ACTION (UMTRA) PROJECT CHENEY DISPOSAL CELL

Dear Mr. Tillman:

We have completed our review of the April 1998, "Report on Drilling and Sampling at the Cheney Disposal Cell." We have reviewed the subject report and have not found any problems with the approach and conclusions. We concur with the U.S. Department of Energy that increases in uranium, nitrate, and sulfate concentrations have been detected in the ground water collected from monitoring wells 731 and 732 at the Cheney repository. These monitoring wells are located down gradient (west) of the disposal cell and are completed in the alluvial sediments overlying the Mancos Shale. From a monitoring well drilled into and through the Cheney disposal cell, it was learned that water levels in the disposal cell are significantly lower by 20 to 30 ft (6 to 9 m) than the water levels in wells 731 and 732. This means that ground water cannot flow from the disposal cell to wells 731 and 732.

Ground-water elevations in wells 731 and 732 have increased over time. This suggests that surface water runoff from the cell has been recharging the ground water. Because migration of contaminants due to cell leakage is not indicated, elevated concentrations of these contaminants could be caused by the leaching of the natural soils surrounding the wells due to increased water elevations in the ground water around the cell. Current concentrations of uranium and nitrate in wells 731 and 732 remain below UMTRA ground-water maximum concentration limits. Wells 731 and 732 will continue to be monitored for uranium, nitrate, and sulfate.

If you have any questions concerning this subject, please contact the NRC Project Manager, William Ford, at (301) 415-6630.

Sincerely,

Joseph J. Holonich, Chief
Uranium Recovery Branch
Division of Waste Management
Office of Nuclear Material Safety
and Safeguards

cc: D. Metzler, DOE/GJ
Ray Plieness, DOE/GJ
Ed Artiglia, TAC/Alb

Appendix K

Community Acceptance Letters

Mesa County, Colorado
BOARD OF COUNTY COMMISSIONERS
District 1 - James (Jim) R. Baughman (970) 244-1605
District 2 - Kathryn H. Hall (970) 244-1604
District 3 - Doralyn B. Genova (970) 244-1606

P.O. Box 20,000 • 750 Main Street • Grand Junction, Colorado 81502-5010 • FAX (970) 244-1639

May 18, 1998

Jack B. Tilman, Manager
U.S. Department of Energy
Grand Junction Office
2597 B-3/4 Road
Grand Junction, CO 81503

Re: Grand Junction Steel

Dear Mr. Tilman:

We are writing this letter to express our support of the request by Grand Junction Steel to have you write to NRC for a regulatory determination on the Grand Junction Steel contaminated mill tailings material. We also request that you include all of the sampling data. We have received a letter from Jeffrey Deckler with the Colorado Department of Public Health and Environment. They have reviewed the technical merits of disposal of the Grand Junction Steel material at the Cheney cell and believe that this is an environmentally sound option.

Please let us know if we can be of further assistance in expediting this matter.

Sincerely,

James R. Baughman
James R. Baughman, Chairman
Board of Commissioners

Kathryn H. Hall
Kathryn H. Hall,
Commissioner

Doralyn B. Genova
Doralyn B. Genova,
Commissioner

cc: Governor Roy Romer
Senator Tilman Bishop
Wes Harpole, Grand Junction Steel

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STATE OF COLORADO

Roy Romer, Governor
Patti Shwayder, Executive Director
Dedicated to protecting and improving the health and environment of the people of Colorado
HAZARDOUS MATERIALS AND WASTE MANAGEMENT DIVISION
http://www.cdphe.state.co.us/hm/

4300 Cherry Creek Dr. S.
Denver, Colorado 80246-1530
Phone (303) 692-3300
Fax (303) 759-5355

222 S. 6th Street, Room 232
Grand Junction, Colorado 81501-2768
Phone (970) 248-7164
Fax (970) 248-7198

Colorado Department
of Public Health
and Environment

March 3, 1998

Sharon Kercher, Director
Technical Enforcement Program (8-ENF-T)
Environmental Protection Agency
999 18th Street, Ste 500
Denver, Colorado 80202-2466

Re: PCB Mixed Waste

Dear Ms. Kercher:

In 1992, EPA headquarters, in conjunction with Region VIII, issued a letter (dated May 13, 1992) which allowed the disposal of 61 cubic yards of PCB-contaminated radioactive material in the Uranium Mill Tailings Remedial Action (UMTRA) Program Cheney Disposal Cell in Mesa County, Colorado. The letter asserted EPA's jurisdiction over this material, and stated that enforcement action would not be appropriate should the material be disposed of at Cheney. The determination was based on the PCB concentration of the material, the design of the disposal cell, and the fact that there is no disposal facility authorized to take PCB-contaminated radioactive material.

We are seeking similar approval and enforcement discretion for some additional material which has been discovered in our cleanup efforts at the Grand Junction Steel property. The material in question is uranium mill tailings located in a steel fabrication yard. The PCBs in this material are believed to originate from a transformer on a power pole outside the facility, however, there is no definitive proof regarding origination of the PCBs. Results of the original sampling, which occurred several years ago, showed PCBs ranging from 61 to 1500 ppm. While the UMTRA Program was trying to decide what, if anything, could be done with this material, operations at the business continued. These operations resulted in further disturbance and dilution of this material.

In consultation with Dan Bench of Region VIII, it was determined that the material should be containerized pending final disposal. Additional sampling was performed to determine the excavation boundaries, which were set by Region VIII as requiring excavation of any material with greater than 2 ppm PCB. This sampling, which was conducted in 1997, indicated a PCB range of 2 to 93 ppm. Approximately 200 yards of material was excavated and containerized on site, and verification sampling was performed to insure all material was excavated as necessary. Although the material within the containers has not been resampled, a simple area averaging would indicate an average concentration of approximately 15 ppm PCB.

As with the previous material, the initial PCB concentrations clearly show that the material is regulated under TSCA, and that its disposal is subject to the antidilution and disposal provisions of the PCB Rule.. However, as with the previous material, there is no TSCA disposal facility which can accept the material due to the radioactive contamination. We believe that it is in the best interests of public health and safety to provide permanent disposal of this material in the Cheney disposal cell. Since this cell is limited by Federal statute (P.L. 95-604 Sec.112(a)(1)(B)) to accept only UMTRA waste, we do not believe that this opens the door for any widespread disposal of PCB materials in the cell, nor would we expect multiple future requests for special dispensation for UMTRA materials. There is only one other property where we suspect PCB waste containing radioactive contamination exists. Further, based on the disposal cell design, the immobility of PCBs in soil, and the fact that this is material constitutes a thousandth of a percent of the total cell volume (over 5 million cubic yards), we believe that this is a technically sound alternative.

Dan Bench may already have most of the information regarding this site. His assistance to this point has been invaluable in isolating and containerizing the contamination, so that it does not continue to pose an immediate threat to workers at the facility. Grand Junction Steel has been very cooperative in implementing Dan's recommendations. We are now asking for EPA's approval of a permanent solution to this problem. We would be happy to forward more detailed information if required for you to make a determination.

By this letter we are also asking the NRC to concur with this option. Should we receive approvals from EPA, and NRC, we will begin discussions with Mesa County and DOE to accept this material in the Cheney Disposal Cell.

If you have any questions, please contact me at (303) 692-3387.

Sincerely,

Jeffrey Deckler
Remedial Programs Manager

cc: Dan Bench, EPA/Den
Kim Lee, EPA/Den
Jack Tillman DOE/GJ
Dave Mathes, DOE/D.C.
Joseph Holonich, NRC/D.C.
Doralyn Genova, Mesa County
Wes Harpole, Grand Junction Steel