Northeast Church Rock 95% Design Report

Appendix D:
Haul Routes

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ATTACHMENTS

LIST OF ACRONYMS / ABBREVIATIONS

AOC	Administrative Settlement Agreement and Order on Consent for Design and Cost Recovery
ARAR	Applicable or Relevant and Appropriate Requirement
BMP	best management practice
CC	Construction Contractor
cfs	cubic feet per second
CSF	construction support facility
CY	cubic yard
GSR	Green and Sustainable Remediation
Mill Site	Church Rock Mill Site
Mine Site	Northeast Church Rock Mine Site
MPH	miles per hour
NMDOT	New Mexico Department of Transportation
PTW	principal threat waste
RAO	remedial action objective or removal action objective
ROD	Record of Decision
SOW	Statement of Work
SWPPP	Stormwater Pollution Prevention Plan
TDA	Tailings Disposal Area
USEPA	US Environmental Protection Agency

D.1 INTRODUCTION

This appendix to the Northeast Church Rock 95% Design Report presents the layout and design of temporary haul and access roads at the Northeast Church Rock Mine Site (Mine Site) and the Church Rock Mill Site (Mill Site). Temporary roads have been designed for three types of use. The first is the haul road to transport mine waste from the Mine Site to the Repository at the Mill Site. The second are haul roads to transport borrow material from designated borrow areas to the Repository at the Mill Site for use in cover construction. The third are access roads to construction support facilities (CSFs). Design of CSFs is discussed in Appendix B of the 95% Design Report.

This appendix:

- Provides 95% design plans, profiles, and design details for access and haul roads.
- Demonstrates attainment of the applicable standards identified in the Record of Decision (ROD) (USEPA, 2013).
- Explains the rationale for the proposed access and haul road alignments.
- Discusses sequencing for site preparation, construction, and reclamation of these roads.
- Presents Green and Sustainable Remediation (GSR) considerations.

D.2 PERFORMANCE STANDARDS

The Performance Standards presented here are defined in the Action Memorandum: Request for a Non-Time-Critical Removal Action at the Northeast Church Rock Site (2011 Action Memo; USEPA, 2011), the ROD, United Nuclear Corporation Site, (USEPA, 2013), and the Administrative Settlement Agreement and Order on Consent for Design and Cost Recovery (AOC; USEPA, 2015) including the Statement of Work (SOW) attached as Appendix D to the AOC, and were developed to define attainment of the Removal Action and Remedial Action Objectives (RAOs) for the Selected Remedy. The Performance Standards include both general and specific standards applicable to the Selected Remedy work elements and associated work components. Table D.2-1 presents performance standards related to the haul roads and explains how the design accomplishes these standards.

Table D.2-1: Task Specific Performance Standards

Identifying Number*	Location of Performance Standard Requirement	Topic	Performance Standard	Comments
2	2015 AOC SOW, Paragraph 17 – Soil Transportation and Management	Soil Transport and Management	In the Design, Respondents shall provide detailed plans and specifications explaining how mine waste from the NECR Site and other materials (including borrow, backfill, and cover materials) will be managed and transported. Respondents shall include details for ensuring that Principal Threat Waste from the NECR Site, as described in the 2011 Action Memo, is not transported to the UNC Site or disposed at the Tailings Disposal Area.	Mine waste and clean borrow materials will be transported by truck along the haul roads described in this appendix. Mine waste excavation is addressed in Appendix C. Principal threat waste (PTW) will be transported off-site for disposal. Appendix B addresses the design and layout of PTW handling facilities.
14	2015 AOC SOW, Paragraph 29 – Green Remediation Best Management Practices	Green Remediation Best Management Practices	Respondents shall incorporate applicable Best Management Practices for Green Remediation listed in ASTM-E2893-13 consistent with USEPA's policy Superfund Green Remediation Strategy (2010), found at http://www.epa.gov/superfund/greenremediation/sf-gr-strategy.pdf.	Addressed in Section D.6

*Refers to identifying numbers listed in Summary of ARARs, Performance Standards and Applicable NRC Design Requirements Table (provided in Attachment 1 to main text of the 95% Design Report)

D.3 ENGINEERING DESIGN DRAWINGS

The relevant engineering design drawings are contained in Volume II – Design Drawings (Section 4). Drawings related to the haul roads are listed in Table D.3-1.

Table D.3-1: Engineering Design Drawings

Drawing No.	Drawing Title
4-01	Haul Road Overall Plan
4-02	Haul Road Plan Index
4-03	Mine Waste Haul Road Plan and Profile (1 of 4)
4-04	Mine Waste Haul Road Plan and Profile (2 of 4)
4-05	Mine Waste Haul Road Plan and Profile (3 of 4)
4-06	Mine Waste Haul Road Plan and Profile (4 of 4)
4-07	Mine Waste Haul Road Spur Plan and Profile
4-08	Clean Access Road Plan and Profile
4-09	Clean Access Ramp Plan and Profile
4-10	Repository Yard Clean Access Road Plan and Profile
4-11	Mine Waste Haul Road Drainage Control Plan (1 of 2)
4-12	Mine Waste Haul Road Drainage Control Plan (2 of 2)
4-13	Borrow Haul Roads
4-14	West Borrow Haul Road Plan and Profile
4-15	East Borrow Haul Road Plan and Profile
4-16	North Borrow Haul Road Plan and Profile
4-17	Jetty Borrow Haul Road Plan and Profile
4-18	Typical Cross Sections and Details (1 of 2)
4-19	Typical Cross Sections and Details (2 of 2)
4-20	Details

D.4 HAUL ROAD DESIGN

D.4.1 Common Design Elements

For the 95% design, it is assumed that 30-cubic-yard capacity articulated dump trucks will be used to transport both mine waste and borrow material. Example trucks of this type include the Caterpillar 745, Terex TA40, and Volvo A40, which are well-suited for variable terrain and space constrained areas such as the Mine Site and the Repository.

A combination of one-lane and two-lane road widths will be used. For this design, the running surface for one-lane haul traffic is sized at twice the haul vehicle width and the running surface for two-lane haul traffic is sized at 3.5 times the haul vehicle width. This is consistent with guidelines for mine haul road design presented by Tannant and Regensburg (2001). Typical haul vehicle width for the example equipment listed above is 11.25 feet, resulting in one-lane and two-lane running surface widths of 22.5 feet and 39.4 feet, respectively. A summary of the haul road design basis is presented in Table D.4-1.

Table D.4-1: Haul and Access Road Design Basis

Road	Design Vehicle	Traveled Way Width	Max. Grade	Prism Detail	Speed Limit
Mine Waste Haul Road (1-lane)	30 CY articulated truck (11.25 ft wide)	22.5 feet	8%	2% cross-slope to ditch, no crown; gravel surfacing	20 MPH
Mine Waste Haul Road (2-lane)	30 CY articulated truck	39.4 feet	8%	2% cross-slope to ditch, no crown, gravel surfacing	20 MPH
Access Roads	30 CY articulated truck	22.5 feet	8%	2% cross-slope to ditch, no crown, gravel surfacing	20 MPH
Borrow Haul Roads	30 CY articulated truck	39.4 feet	9.2%	no-ditch, 2% crown	20 MPH

CY – cubic yard, MPH – miles per hour

Site preparation activities will include an underground utility survey and overhead utility awareness and safety mitigation. A walk-over gamma scan of the mine waste haul routes between the NECR Mine Site and UNC Mill Site will be conducted prior to construction to verify no contamination is present along the haul routes. Best Management Practice (BMP) installations for sediment and stormwater controls will be installed prior to ground disturbing activities such as stripping and stockpiling of topsoil and organics. The Construction Contractor (CC) will be responsible for controlling sediment tracking from access roads onto public roads during construction. BMPs used for sediment tracking control will be determined by the CC, and may include gravel surfacing, mud grates, rock aprons, and sweeping. These measures will be described in the Contractor's Construction Stormwater Pollution Prevention Plan (CSWPPP).

Haul and access roads will be constructed from native materials as a cut-to-fill, with excavated material from the uphill side placed as fill on the downhill side. Shallow native soils consist primarily of sandy clays and sandy silts which are suitable for temporary haul road construction, but are likely to require regular maintenance by the CC. Material needed to fill gully crossings or other low areas will be generated by road cuts in close proximity to the needed fill. Temporary cut and fill slopes are designed at 1.5V:1H. The Technical Specifications (Appendix J) require haul road fills to be compacted to 95 percent standard Proctor density. Additional geotechnical characterization of the native materials for final design is not anticipated, as these are temporary roads that will be maintained regularly during construction operations. During construction, the native materials will be evaluated by the Field Engineer (defined in Appendix V) and slopes may be flattened in areas where highly erodible materials are encountered, or steepened in rock cuts or rocky material. Samples of cut materials will be collected early during construction to determine Proctor densities. Additional sampling and testing may occur during construction if material changes are encountered.

Gravel surfacing is specified for mine waste haul roads, the Repository access road, and the Pipeline Canyon Road temporary realignment. Because aggregate material must be imported from significant distances, gravel surfacing has not been specified for borrow haul roads. Performance standards for dust control and maintenance of a safe and efficient running surface on all roads are included in the Technical Specifications. The CC may elect to include additional gravel surfacing for dust control, and

during construction gravel surfacing may be needed to mitigate areas where soft or muddy conditions develop. Dust control is addressed in separately in Appendix Q (Air Monitoring Plan).

Culverts will be constructed at gully and arroyo crossings to convey flow beneath haul and access roads. Design information specific to temporary construction stormwater controls is presented in Section D.4.6.

Safety berms will be provided and maintained on the banks of haul roads where a drop-off exists of sufficient grade or depth to cause a vehicle to overturn or endanger persons in equipment. Berms will be at least mid-axle height of the largest self-propelled mobile equipment that usually travels the roadway.

D.4.2 Mine Waste Haul Road

The mine waste haul road shown on the Drawings will be used to haul mine waste excavated at the Mine Site to the Repository located at the Mill Site. The haul road will begin at the east end of the Mine Site, immediately adjacent to the existing entrance at the terminus of New Mexico State Highway 566 (NM 566). The haul road will be located roughly parallel to NM 566, until it crosses the highway near the north end of the Mill Site Tailings Disposal Area (TDA). This will be the only point where haul trucks contact NM 566. The typical haul road offset from NM 566 is about 300 feet. Upon crossing NM 566, the haul road will be located on the alignment of an existing access road to the north end of the North Cell of the TDA. Haul trucks will access the Repository at the northwest corner of the TDA. The mine waste and clean borrow haul roads will not intersect.

The mine waste haul road can be described in three segments. Refer to the Drawings for alignments and road stations (STA). Segment 1 (STA 0+00 to 21+00) is a two-lane rolling segment that begins at the Mine Site and runs parallel to NM 566 to an existing rock cut above the approximately 90 degree curve in NM 566. The road transitions from two lanes to one between STA 21+00 and 22+00. Segment 2 (STA 22+00 to 35+50) is a one-lane decline in relatively steep terrain from the intersection of the rock cut to the intersection with NM 566. The road transitions back to two lanes from STA 35+50 to 36+00. Segment 3 (STA 36+00 to 48+89) is a two-lane segment from the intersection with NM 566 to the Repository. The one-lane segment is used to reduce the construction footprint of the haul road in the steeper terrain. This segment is considered one-lane in terms of available width for passing vehicles. Turnouts are included to allow haul trucks to pass each other for efficient haul operation. Gravel surfacing is specified for the mine waste haul road.

Stormwater controls for the mine waste haul road are designed to segregate contact and non-contact runoff. The haul road will be constructed with a ditch and stormwater pond system to collect and contain contact runoff from the haul road surface. Containment will be accomplished with unlined sediment ponds at locations shown on the Drawings (refer to Drawings 4-10 and 4-11). The CC's CSWPPP will require that water and sediment from these ponds will be collected within 48 hours of storm events and hauled to the Mine Site for disposal within the temporary stormwater basin (see Appendix C). It is anticipated that a 3,000 to 4,000 gallon capacity vacuum truck or similar equipment will be used for this purpose. The Drawings include 95% design details for haul road stormwater controls.

Within the footprint of the Repository, the TDA surface cover layer will be removed to expose the radon barrier for moisture conditioning and compaction prior to placement of mine waste. Mine waste haul trucks will not be allowed to operate directly on the surface of the radon barrier. Haul trucks will only be allowed to operate where the TDA surface cover has not yet been removed, or on mine waste that has been placed over the prepared radon barrier.

D.4.2.1 State Highway Crossing

A traffic safety and contamination control system is necessary for the intersection of the mine waste haul road and NM 566. A manually operated temporary traffic light and contamination control system will be employed during working hours for traffic safety at the crossing. These features are presented in in Appendix M.

Coordination with New Mexico Department of Transportation (NMDOT) for approval and operation of this haul road crossing was initiated during the 95% design phase and is ongoing as described in Appendix M.

Upon construction completion, impacted areas of NM 566 will be inspected for structural damage. Any damage to the pavement or underlying road prism resulting from haul operations will be corrected to the satisfaction of NMDOT.

D.4.3 Borrow Haul Roads

Haul roads will be constructed to access each of the four proposed borrow areas, utilizing existing access roads as much as possible. Plans and profiles for the north, east, and west borrow haul roads are shown on the Drawings. Borrow haul roads will have two-lane running widths. These roads will be constructed at existing grade with as little cut-to-fill as practical. Ditches have not been included for these roads. Localized ponding may occur after rainfall events and will be allowed to infiltrate. Gravel surfacing, intermittent ditches, culverts and other BMP's will be field fit by the CC as needed to address intermittent drainage issues along the borrow haul roads.

Haul road construction will be conducted from each borrow area to the edge of the TDA. Once on the TDA, borrow haul trucks will operate directly on the existing cover surface. The current TDA cover surface is a rock mulch suitable for haul traffic. Leaving the existing rock mulch surface in place provides dust control and eliminates the need to use borrow material to construct these road segments.

To maintain the integrity of the existing TDA cover outside the limits of the Repository, the Technical Specifications require the CC to establish and delineate designated haul routes on the TDA cover and to restrict construction traffic to within these designated routes. Within the footprint of the Repository, traffic patterns will be determined by the CC. However, borrow haul trucks will only be allowed to operate where the existing TDA surface cover has not been removed. During cover placement over mine waste, a clean running surface must be maintained at all times to avoid the need to decontaminate borrow haul trucks. As cover construction on the Repository progresses, the CC will be required to establish and maintain designated haul routes on the newly placed cover, similar to the requirements for the existing TDA cover. Upon construction completion, areas of the Repository cover and the TDA cover subjected to haul traffic will be reconstructed to mitigate over-compaction of cover soils, or other damage that may occur from haul traffic.

Temporary haul road crossings will be required where haul trucks must cross existing TDA drainage channels and cover swales. Details for these crossings are shown on the Drawings.

D.4.4 Access Roads

Temporary access roads will be constructed or located to provide access to the CSFs in the Former Mill Site Yard and the Repository Yard(s) (see Appendix B). These roads will have a one-lane running surface width and will be located, to the extent practical, on the alignments of existing or abandoned roads to minimize construction impacts.

The access road to the Former Mill Site Yard connects to the Mine Site, via the mine waste haul road. This road will utilize similar drainage controls as the mine waste haul road for segregation and control of contact runoff.

The access road to the Repository Yard(s) will require construction of a new access point from NM 566, south of the mine waste haul road crossing. A temporary realignment of Pipeline Canyon Road will be constructed at NM 566 immediately north of the mine waste haul road crossing to provide public access to Pipeline Canyon Road. Coordination with NMDOT and other stakeholder agencies for approval of this temporary access road is being conducted. Additional traffic control discussion is presented in Appendix M.

D.4.5 Dust Control

An Air Monitoring Plan is presented in Appendix Q. Appendix Q includes the requirements for CC dust control during construction.

D.4.6 Temporary Stormwater Controls

The Section 4 Drawings show temporary stormwater controls for the haul road. In addition to these temporary stormwater controls, the CC will be responsible for implementing BMPs according to its CSWPPP, as discussed in Appendix E.

The design concept for the haul roads and CSF stormwater controls is to separate non-contact stormwater from contact stormwater through use of roadside ditches, culverts, and stormwater ponds. Contact stormwater from the haul roads will drain into the roadside ditches and then be conveyed in the ditches to one of several stormwater ponds (Drawings Section 4). Culverts are designed to convey stormwater from non-contact catchments under the haul roads and roadside ditches. Stantec designed stormwater controls for the haul road for the 10-year, 24-hour storm event, which is the New Mexico Department of Transportation design standard for roadside ditches (NMDOT, 2007). These stormwater controls are further described in the subsections below and a calculation brief for the stormwater controls is provided in Attachment D.1.

D.4.6.1 Roadside Ditches

The roadside ditches will be constructed along the interior side of the haul road to collect surface runoff and divert water to sediment ponds for controlled collection of contact water during operations. The roadside ditches will be triangular in cross section, with a design depth of 2 feet, which is designed to provide capacity to convey the peak discharge from the 10-year, 24-hour storm event. Since no erosion protection is planned for these temporary ditches, the CC will be required to inspect the ditches for erosion damage within 48 hours of a precipitation event and repair any structural damage that would hinder performance during future precipitation events.

D.4.6.2 Stormwater Ponds

Eleven stormwater ponds will serve as collection points for contact water diverted by the roadside ditches. The required volume of the stormwater ponds varies depending on the drainage area associated with each pond. The required stormwater pond volumes range from 3,000 to over 13,000 cubic feet. The CC will need to collect water and sediment from these ponds within 48 hours of storm events for disposal within the temporary stormwater basin at the Mine Site (see Appendix C). The CC also may need to periodically remove accumulated sediment in the stormwater ponds to maintain the pond capacities.

D.4.6.3 Culverts

Twelve culverts will collect stormwater from non-contact catchments that cross the haul road, convey it under the road, and release it downgradient of the road. The culverts will be 24-inch diameter corrugated metal pipe, or an approved equivalent material. Multiple culverts are required at some locations to convey the 10-year storm peak flow. Where the haul road crosses the Pipeline Arroyo, the design specifies four culverts, with a total capacity of 105 cubic feet per second (cfs). Conveying the 10-year storm peak flow (1,100 cfs) through barrel culverts is not practical at this location. An additional four culverts will convey stormwater across the east borrow and north borrow haul roads. Two culverts convey stormwater flowing in Branch Swale B and Branch Swale C, and two culverts convey stormwater flowing through the Mill Site diversion channels. The branch swale culverts will be 12-inch diameter corrugated metal pipe, or an approved equivalent material, and the Mill Site diversion culverts will be 24-inch diameter corrugated metal pipe, or an approved equivalent material.

Soil excavation and removal is required at some locations within Drainage Basins 0, 1, and 2. For construction sequencing, the haul road and drainage control plan facilities will be constructed prior to soil removal excavation within these basins. Surface water runoff from this area is currently allowed to pass downstream and will be diverted to a culvert as part of the drainage control plan. However, BMPs will need to be implemented according to the CC's CSWPPP during operations in this area to provide intermittent stormwater containment and prevent the uncontrolled release of contact water.

D.4.7 Haul Road Verification and Reclamation

Upon the completion of the Removal Action, roads used for hauling mine waste (including associated ditches, sediment ponds, or other associated features) will be subject to verification and clean up in accordance with Appendix T. Verification will also be conducted on affected portions of NM 566 in accordance with Appendix T.

Upon completion of verification and clean up, the roads will be reclaimed. Reclamation will consist of removal of imported gravel surfacing, removal of culverts, and grading according to the final approved post-reclamation grading plans. Revegetation will be conducted in accordance with Appendix U.

D.5 CONSTRUCTION SEQUENCING

The anticipated sequence for preparation, mobilization, and construction of the haul roads is as follows:

1. Underground utility survey to identify and/or verify the location of subsurface utilities along the alignments.
2. Overhead utility survey and safety mitigation as needed.
3. BMP installations for sediment and stormwater controls along haul routes.
4. Site surface preparation including stripping and stockpiling of topsoil and organics.
5. Construction of roads and associated drainage features.
6. Construction of safety berms where required.
7. Construction of fencing and gates.
8. Continuous implementation of the CSWPPP during the RA.

The anticipated sequence for reclamation and demobilization of the haul roads is as follows:

1. Verification and cleanup in accordance with Appendix T.
2. Removal of temporary fencing and gates.
3. Culvert removal, drainage restoration and surface regarding.
4. Revegetation and BMP installations for sediment and erosion control.
5. Removal of construction related equipment and materials from the site.

D.6 GREEN AND SUSTAINABLE REMEDIATION CONSIDERATIONS

The areas where GSR has been evaluated for the haul roads design relate to: (1) construction materials (characteristics, manufacturing and transportation considerations), (2) construction methods, and (3) low impact/sustainability measures during construction. The 'BMP Process', as outlined in the 'Standard for Greener Cleanups' (ASTM, 2016), has been followed to select and prioritize BMPs for implementation during remedial action. The BMPs relating to Haul Routes are listed below; for a complete description of the BMP Process and list of all GSR BMPs see Section 4 of the 95% Design Report and Appendix A (Section A.5).

D.6.1 Construction Material Considerations

Road lengths will be minimized to the extent possible to reduce the required construction equipment operating time, greenhouse gas emissions, fill material, and habitat disruption. Roads will be constructed from in-situ native soils to reduce material haul distances and use of imported materials.

Use of water for dust suppression will be minimized by utilizing alternate dust suppressant methods and techniques when possible including gravel surfacing, application of magnesium chloride (or other approved suppressants) on main haul and transport routes and minimization of vehicle speed (20 MPH).

Temporary stormwater ditches constructed along haul roads for collection of run-off are designed with no erosion protection (i.e. liners or riprap) in keeping with BMPs, specifically the use of 'less refined materials from local sources in place of refined materials' such as riprap and liners (ASTM, 2016). This will reduce fuel utilization and associated emissions which would result from sourcing riprap on-site or importation and placement of a liner system. When possible, accumulated sediment in the end-point stormwater ponds will be utilized for erosion repairs on temporary ditches along haul roads.

D.6.2 Construction Methods

Construction equipment will be appropriately sized to reduce fuel consumption and greenhouse gas emissions. Dust suppression will be utilized in the area and on the access roads to decrease visible dust related emissions. The primary point of entry/exit to the Exclusion Area will be constructed in line with BMPs for creation of a stabilized construction entrance/exit in order to minimize tracking of dirt/mud onto public roads and to reduce dust. Appendix E identifies BMPs and specific sediment control measures and stabilized entrance/exit construction methods that will be employed during construction for both sediment and stormwater control.

D.6.3 Low Impact Development/Sustainability

Access and haul routes were optimized to minimize site disruption, vehicle mileage, and to protect public health and safety. When possible, existing roads have been used for haul routes and site-wide access roads. Minimizing vehicle mileage and limiting speeds is a high yield action as it limits fuel consumption, minimizes emissions of both greenhouse gasses and dust and increases site safety by reducing likelihood of both minor and serious crashes. Additionally, a primary stabilized point of entry/exit to the work areas will be constructed according to BMPs (Appendix E, Section E.6.4) in order to prevent re-contamination of areas already remediated, prevent contamination of areas that were previously uncontaminated and prevent tracking of site soil onto public roads. This primary point of entry/exit also minimizes the required support facilities and associated infrastructure.

Access and haul roads chosen utilize existing or historical roads to the extent practical to limit additional disturbance and reduce amount of cut/fill and grading required. Access and haul roads will be reclaimed and revegetated as quickly as possible upon completion of construction.

D.7 REFERENCES

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ATTACHMENT D.1
Sizing Calculations for Temporary Stormwater Controls for Mine Waste Haul Road and Construction Support Facilities