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T-24014

FORM MR-REV

INSTRUCTIONS to REVISE or AMEND MINING OPERATIONS
NOTICE OF INTENTION

When an operator intends to revise or amend a mining operation, a **notice** to Amend or Revise the mining and reclamation plan **must be submitted** to the Division **and approved prior to creating any disturbance beyond what has already been approved.** The notice must include all information, concerning the revision or amendment, that would have been required if it had been included in the original Notice of Intention (NOI).

"REVISION" means a **significant change** to the approved Notice of Intention to Conduct Mining Operations, which will increase the amount of land affected or alter the location and type of onsite surface facilities such that the nature of the reclamation plan will differ substantially from the approved Notice of Intention. Revisions require a formal public notice of tentative approval and may require a change in the amount of reclamation surety.

"AMENDMENT" is an **insignificant change** to the approved Notice of Intention. An amendment requires Division approval, but does not require public notice.

The Division will determine whether a request for change is significant or insignificant on an individual case-by-case basis.

Instructions:

- Changes to the mining and reclamation plan are made by providing a completely new plan or by adding, replacing, or removing pages to the current plan. Detailed instructions for adding or replacing pages and maps must be included (please identify on the attached form MR-REV-att).

- Text changes should be shown in a redline/strikeout format.

- The amended application should be accompanied by a cover letter: referring to the permit number, operator name and mine; describing the contents; and referencing any Division action that initiated the change (i.e. Notice of Violation, previous review, Division Order).

- The submitted revision or amendment must be complete and should not rely on additional materials that will be submitted at a later date.

- Form MR-REV-att, or equivalent, must be submitted with the application for change.

After the Division conditionally approves the change, two clean copies will be requested which will be stamped “approved” and one copy returned for your copy of the mining and reclamation plan. The change is now approved and you may proceed with your plans.

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Identify any changes this modification will have to:

I. General Information (R647-4-104) •

Location of Proposed Activities:

- COUNTY Morgan County
- TOWNSHIP, RANGE, SECTION(S) (Identify to 1/4, 1/4 section)

Morgan County
Township: T 4 N Range R 3 E
Sections:
SE ¼ of Section 13
S ½ of NE ¼ of Section 24
NE ¼ of NE ¼ of Section 24
N ½ of SE ¼ of Section 24

AND

Township: T 4 N Range R 4 E
Sections:
SE ¼ of SE ¼ Section 18
SW ¼ of Section 18
ALL OF Section 19

Ownership of Land Surface:

- Private (Fee) - Identify Owners Name(s)

Amrize Inc.
P.O. Box 122
6211 N Ann Arbor Rd
Dundee, MI 48318

- State of Utah (SITLA) lands, Public Domain BLM), National Forest (USFS) **Ownership of Minerals**:

U.P. Resources — Minerals
Po Box 7
Fort Worth, TX 76101-0007

Utah Bureau of Land Management
440 W 200 S, Ste 500, Salt Lake City, UT 84101

Amrize Inc.
P.O. Box 122
6211 N Ann Arbor Rd
Dundee, MI 48131

- Private (Fee) - Identify Owners Name(s)
- State of Utah (SITLA) lands, Public Domain BLM), National Forest (USFS)

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- **BLM Lease or Project File Number(s) and/or USFS assigned Project Number(s • Utah State Lease Numbers(s)** To be determined later

II. MAPS, DRAWINGS & PHOTOGRAPHS (Rule R647-4-105)

Appropriate maps, drawings, plates, etc. should be provided that are pertinent to the revision, or amendment of mining operations. Please provide a revised map outlining the previously approved and the new proposed disturbed area boundaries. These materials should be prepared according to the requirements of Rule R647-4-105.

III. OPERATION PLAN (Rule R647-4-106)

All appropriate information requirements outlined under Rule R647-4-106 must be addressed in the application. Identify additional proposed surface disturbance. Include the total number of acres to be affected by the revision or amendment.

IV. IMPACT ASSESSMENT (Rule R647-4-109)

Provide information required under Rule R647-4-109 regarding projected potential surface and/or subsurface impacts that may be associated with the proposed change(s) in mining operations.

V. RECLAMATION PLAN (Rule R647-4-110)

Outline any proposed changes to the originally approved reclamation plan. Address all appropriate sections of Rule R647-4-110 as they apply to the proposed change(s) in mining operations.

VI. VARIANCE (Rule R647-4-112)

Identify any requests for variance from the requirements of rules R647-4-107, -108, or -111. A narrative justification and alternate methods or mitigating measures must be included for each variance request.

VII. SURETY (Rule 647-4-113) Reclamation Surety:

Indicate whether the proposed activities will change the amount of work required to reclaim the mine site. If significant changes will result, then an itemized reclamation cost estimate should be provided (and attached) with direct reference to the specifics of the proposed change(s). This information will be used to assist the Division in determining any reclamation surety adjustments required for the operation.

Application for Mineral Mine Plan Revision or Amendment

Operator: Amrize Cement Inc.
Mine Name: Amrize Cement Inc. – Devil's Slide Mine **File Number: M/029/0001**

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Provide a detailed listing of all changes to the mining and reclamation plan that will be required as a result of this change. Individually list all maps and drawings that are to be added, replaced, or removed from the plan. Include changes of the table of contents, section of the plan, pages, or other information as needed to specifically locate, identify and revise or amend the existing Mining and Reclamation Plan. **Include page, section and drawing numbers as part of the description.**

DETAILED SCHEDULE OF CHANGES TO THE MINING AND RECLAMATION PLAN

			DESCRIPTION OF MAP, TEXT, OR MATERIALS TO BE CHANGED
__ ADD	X REPLACE	__ REMOVE	Notice of Intention To Revise Large Mine Operation (NOI). Replace the entire NOI on file.
__ ADD	-- REPLACE	__ REMOVE	
__ ADD	-- REPLACE	__ REMOVE	
__ ADD	-- REPLACE	__ REMOVE	
__ ADD	-- REPLACE	__ REMOVE	
__ ADD	-- REPLACE	__ REMOVE	

I hereby certify that I am a responsible official of the applicant and that the information contained in this application is true and correct to the best of my information and belief in all respects with the laws of Utah in reference to commitments and obligations, herein.

Javier Sosa Ortiz
Print Name

Plant Manager Devil's Slide
Sign Name, Position

12/11/2025
Date

Return to:

State of Utah
Department of Natural Resources
Division of Oil, Gas and Mining
1594 West North Temple, Suite 1210
Box 145801
Salt Lake City, Utah 84114-5801
Phone: (801) 538-5291 Fax: (801) 359-3940

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FOR DOGM USE ONLY:
File #: M/ /
Approved:
Bond Adjustment: from ($)
to $

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NOTICE OF INTENTION TO REVISE LARGE MINING OPERATIONS

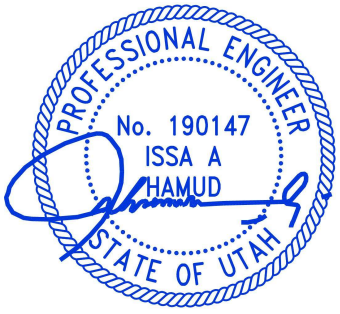
Amrize Cement Inc. – Devil's Slide Plant
Permit No. M/029/0001
Morgan County, Utah

Prepared For:
Amrize Cement Inc. – Devil's Slide Plant
6055 East Croydon Road
Morgan, Utah 84050

Prepared By:
Five Star Engineers LLC
Civil and Environmental Engineering Consultants
220 N 900 E
Hyde Park, Utah 84318
Phone: (435)-881-5339
Email: Issahamud@5starengineers.com

Submitted To:
Utah Division of Oil, Gas and Mining (DOGM)
1594 West North Temple, Suite 1210
Salt Lake City, Utah 84114

Date: December 2025
Prepared By: Issa A. Hamud, P.E.
Licensed Civil Engineer



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Introduction

The Devil's Slide Area, located along the Wasatch Range in Morgan County, Utah, is characterized by prominent vertical limestone beds formed through complex geologic folding and uplift. These limestone formations were found to possess ideal chemical and physical properties for the manufacture of Portland cement. As a result, the original quarry and cement plant were established at this location in 1905, marking the beginning of over a century of continuous industrial activity at the site. Figure 105.1.11 shows the location of Devil's Slide Cement Mine.

The original quarry, situated adjacent to the current crusher location and later designated as Quarry 1, supplied the first generation of cement operations. In the mid-1950s, Quarry 2 was developed near the crest of the same limestone ridge to meet increasing production demands. A similar limestone ridge immediately to the west was later opened as Quarry 3 in 1965. In addition, limited sandstone extraction has occurred from smaller satellite pits west of Quarry 3 to supply the silica component of the Portland cement raw mix.

Since the construction of the original facility, a succession of modernized cement plants has operated on the same property. The current dry-process plant, originally constructed in 1997, is operated by Amrize, Inc. (Amrize), which continues a long line of industrial stewardship at the site. Historical operators have included Union Portland Cement, Ideal Cement, Ideal Basic Industries, Holnam Cement, and most recently Holcim (US) Inc and now Amrize Inc.

Since the initial application, site conditions and operational boundaries have evolved including changes to the plant layout, quarry development, and surrounding environmental baselines. Several portions of the prior application, particularly those referencing the original reclamation and disturbance limits, no longer represent current on ground conditions. For that reason, this Notice of Intention (NOI) has been prepared by Amrize, Inc., with Five Star Engineers LLC (FSE) as the consulting engineer, to submit a newly consolidated NOI to provide a clear, compliant structure following Utah Administrative Code R647-4-103 through R647-4-113, to provide updated facility information and proposed revisions to large mining operations at the Devil's Slide facility. As described in R647-4-103, Notice of Intention to Commence Large Mining Operations, this NOI application will address the following area:

A. R647-4-104 Operator(s), Surface and Mineral Owner(s)
B. R647-4-105 Maps, Drawings and Photographs
C. R647-4-106 Operation Plan
D. R647-4-108 Hole Plugging Requirements
E. R647-4-109 Impact Assessment
F. R647-4-110 Reclamation Plan

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G. R647-4-111 Reclamation Practice
H. R647-4-112 Variance
I. R647-4-113. Surety

Amrize, Inc. respectfully requests the Division's approval of this updated NOI under Permit No. M/029/0001, which includes, but is not limited to, the following revisions and updates:

1. Revision of the current Permit Boundary to include most of all lands owned or leased by Amrize that are presently proposed for use as industrial / mining in connection with the Devil's Slide Plant and quarries, including the proposed Future Expansion Area on Wilde property (see Section 106.3.1), where Amrize holds surface use rights and is coordinating with the Bureau of Land Management for mineral access and environmental clearance.
2. Revision of the current reclamation surety to include all lands that have been disturbed to date and are proposed to be disturbed over the foreseeable life of Plant and Quarry operations
3. Adjust the proposed method of reclamation operations, including waste rock disposal areas
4. Include an updated quarry configuration and operational sequence.
5. An updated estimate of disturbed acreage and reclamation areas, and quarries size, and future impact areas.
6. Reflect current site conditions and ownership boundaries.
7. Incorporate updated site cultural, and biological studies.

As stated above this document follows the format of the Utah DOGM Form MR-REV – Notice of Intention to Revise Large Mining Operations, as required under Utah Administrative Code R647-4. It incorporates by reference the existing 1987 Reclamation Plan submitted by Ideal Cement for the Devil's Slide Plant, as well as the Overburden Dump Area Revision approved by the Division on March 26, 2002. Below is a summary of the this plan and the entire plan is in Appendix A of this NOI.

1987 Devil's Slide Mining Plan – Summary

The 1987 Mining and Reclamation Plan for the Ideal Cement Devil's Slide Plant in Morgan County, Utah, outlines a life of mine permit covering approximately 390 acres, with 148.5 acres disturbed for limestone quarrying operations supporting cement production. The plan details three quarries (Quarries 1–3) extracting near vertical limestone beds, associated sandstone production (~15,000 tons/year), and on site CKD disposal between Quarries 2 and 3. It addresses erosion control, drainage, and hydrology (noting high infiltration and minimal surface runoff), and includes a USDA Soil Conservation Service based revegetation plan emphasizing test plots, native grasses, and fertilization to restore mule deer winter range. Reclamation will proceed progressively, stabilizing 45° or gentler slopes,

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constructing riprapped drainage channels, and re-establishing vegetation using local soil substitutes. The plan commits to periodic surety review and long-term reclamation.

Objective of the Notice of Intention (NOI)

The purpose of this revised Notice of Intention (NOI) is to provide a complete, standalone application for the Devil's Slide mining operations that incorporates all relevant and accurate information from prior submittals while updating and expanding the content to reflect current ground conditions. Although several NOIs have been prepared and submitted in the past, none were formally approved. This new NOI supersedes those earlier versions and addresses all required elements in detail consistent with current regulatory standards. The applicant respectfully requests that the Division review and score this NOI independently of any prior submissions or comment histories, as the last application (April 2020) contains outdated or incomplete information that no longer reflects existing site conditions or operational plans.

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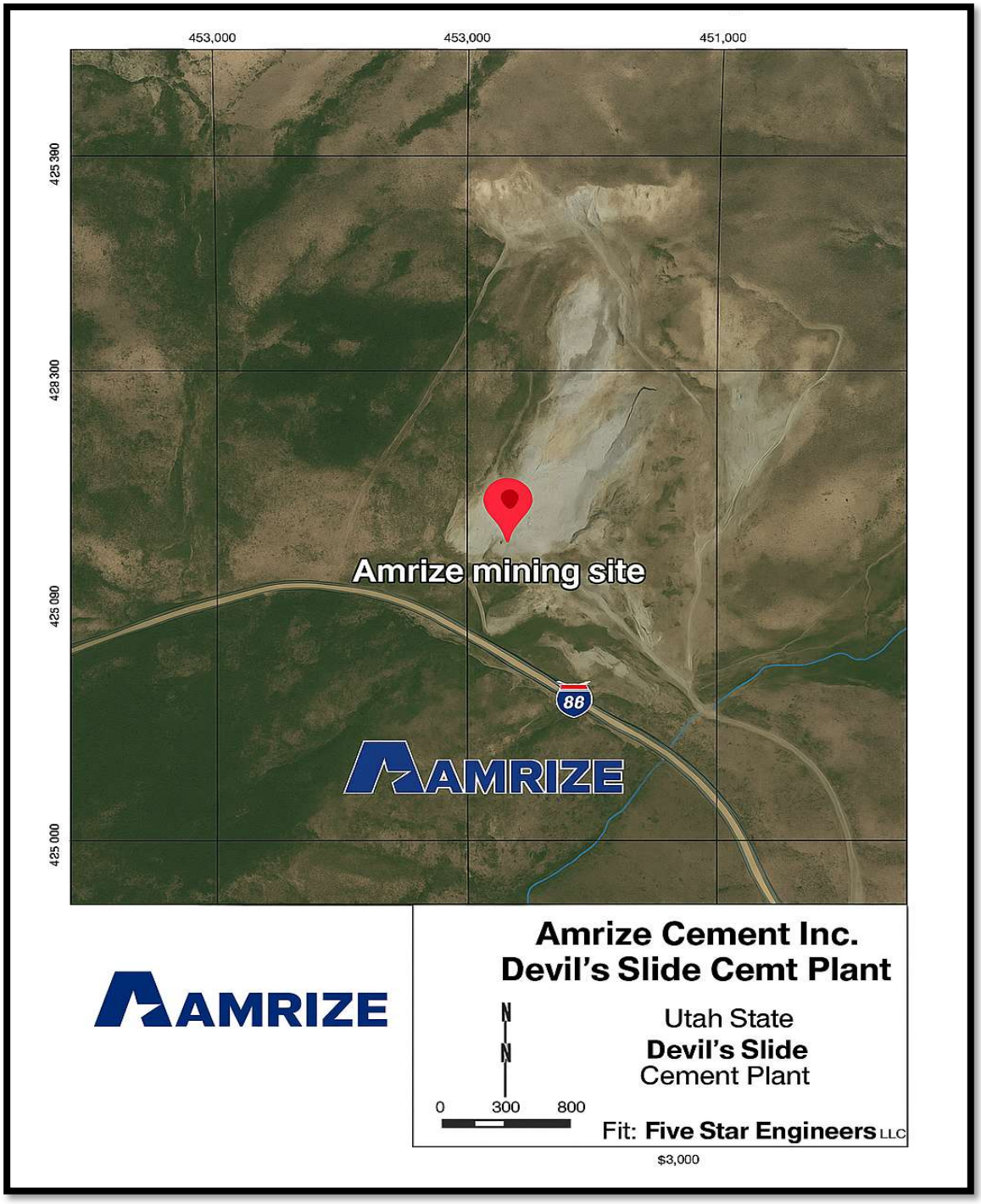

Figure 1: General Site map

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R647-4-104. Operator(s), Surface and Mineral Owner(s).

This section identifies the operator responsible for mining and reclamation activities, as well as the surface and mineral ownership of all lands to be affected by the operation. It includes the name, mailing address, and contact information of the operator; the legal description and location of the proposed activity; and ownership details for both surface and mineral estates within and adjacent to the permit area. Federal and state lease, claim, and permit numbers are also provided where applicable. The information summarized in Table 1 below is also shown on Figure 105.1.11 in Appendix B ensures compliance with Rule R647-4-104 and establishes the responsible parties for the Amrize Inc. Devil's Slide Quarry and Cement Plant.

Table 1: Name of The Operator/Owner/Applicant, Contact Information, and Mineral Ownership

NO	Owner Name/Operator	Address and Contact Information
1	Name of Operator / Applicant	Amrize Inc Devil's Slide Plant
2	Name of the Company/Corporate	Amrize Inc P.O. Box 122 621 1 N Ann Arbor Rd Dundee, MI 48131 (734) 529-2411
3	Responsible Person	Javier Sosa-Ortiz, Plant Manager
4	Address of the Plant	Amrize Inc Devil's Slide Plant 6055 E. Croydon Road Morgan, LIT 84050
5	Phone (801)-829-6821	Fax: (801) 829-2100
6	Name of the Mine/Project	Devil's Slide Quarry and Cement Plant
7	Assigned File Number	M/029/00001
8	Location of the Proposed Activity	Morgan County Township: T 4 N Range R 3 E Sections: SE ¼ of Section 13 S ½ of NE ¼ of Section 24 NE ¼ of NE ¼ of Section 24 N ½ of SE ¼ of Section 24 AND Township: T 4 N Range R 4 E Sections: SE ¼ of SE ¼ Section 18 SW ¼ of Section 18 ALL OF Section 19
9	Ownership of land surface: Private (fee) Owner Name.	Amrize Inc. P.O. Box 122

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	also See Figure 105.1.11 showing property boundaries of surface ownership of all lands which are to be affected by the mining operations Private (fee) Owner Name	6211 N Ann Arbor Rd Dundee, Mi 48131 (734) 529-2411 M.R. Wilde & Sons, LLC 200 North 7000 East Croydon, Utah 84018
10	Ownership of Minerals Private (fee) Owner Name	U.P. Resources — Minerals P O Box 7 Fort Worth, TX 76101-0007 Utah Bureau of Land Management 440 W 200 S, Ste 500, Salt Lake City, UT 84101 Amrize Inc. P.O. Box 122 6211 N Ann Arbor Rd Dundee, MI 48131
11	Adjacent Landowners:	Figure 105.1.11 Land Ownership Map M.R. Wilde & Sons 2200 North 7000 East Croydon UT 84018 Lurene Toone Family Trust Joseph Toone 223 West 2280 North #105 Provo UT 84604-0000 Powder Hollow Ranch c/o Chad Salmon 1116 West 500 South Bountiful UT 84087 B. Randy Pentz 4100 North Lost Creek Rd. Croydon, UT 84018 Bureau of Land Management 440 West 200 South Suite 500 Salt Lake City, UT 84101-1345

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R647-4-105. Maps, Drawings, and Photographs

Maps and Drawings

The report maps are organized in accordance with the requirements of Utah Administrative Code R647-4-105, Maps, Drawings, and Photographs for ease of review and regulatory reference. Each map corresponds to the relevant subsection of the rule to ensure completeness and consistency with Division of Oil, Gas and Mining (DOGM) standards. In addition to the maps specified under R647-4-105(1) through (3), the report may include topographic base map, surface facilities map, and other supporting plans, profiles, and cross-sections, supplementary maps and figures deemed necessary to further clarify site conditions, environmental controls, or operational features beyond the minimum state requirements. Appendix B of this report includes the required maps, accompanied by a declaration noting that the figure scales are not consistently 1 inch = 2,000 feet. The scale varies among the maps to improve clarity and facilitate easier review by the Division.

(1) A topographic base map must be submitted with the notice of intention. The scale should be about 1 inch equals 2,000 feet, preferably a USGS 7.5 minute series or equivalent topographic map where available. The following information shall be included on the map:

105.1.11 Property boundaries of surface ownership of all lands which are to be affected by the mining operations.

105.1.12 Perennial streams, springs and other bodies of water, roads, buildings, landing strips, electrical transmission lines, water wells, oil and gas pipelines, existing wells, boreholes, or other existing surface or subsurface facilities within 500 feet of the proposed mining operations.

105.1.13 Proposed route of access to the mining operations from nearest publicly maintained highway. The map scale will be appropriate to show access.

105.1.14 Known areas which have been previously impacted by mining or exploration activities within the proposed disturbed area.

(2) A surface facilities map shall be provided at a scale of about 1 inch equals 200 feet or other scale as determined necessary by the division. The following information shall be included on the surface facilities map:

105.2.11 Proposed surface facilities, including buildings, stationary mining or processing equipment, roads, utilities, power lines, proposed drainage control structures, and, the location of topsoil storage areas, tailings or processed waste facilities, disposal areas for overburden, solid and liquid wastes and wastewater discharge treatment and containment facilities;

105.2.12 A border clearly outlining the acreage proposed to be disturbed by mining operations.

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(3) The following maps, drawings or cross sections may be required by the division:

105.3.11 Regraded Slopes to be left at steeper than 2h:1v;

105.3.12 Plans, profiles and cross sections of roads, pads or other earthen structures to be left as part of the postmining land use;

105.3.13 Water impounding structures with embankments greater than 20 feet in height from the upstream toe of the embankment or greater than 20 acre feet in storage capacity;

105.3.14 Maps identifying surface areas which will be disturbed by the operator but will not be reclaimed, such as solid rock slopes, cuts, roads, or sites of buildings or surface facilities to be left as part of the postmining land use;

105.3.15 Sediment ponds, diversion channels, culvert size and locations, and other hydrologic designs and features to be incorporated into the mining and reclamation plan;

105.3.16 Baseline information maps and drawings including soils, vegetation, watershed, geologic formations and structure, contour and other such maps which may be required for determination of existing conditions, operations, reclamation and postmining land use;

105.3.17 A reclamation activities and treatment map to identify the location and the extent of the reclamation work to be accomplished by the operator upon cessation of mining operations. This drawing shall be utilized to determine adequate bonding and reclamation practices for the site;

105.3.18 Other maps, plans, or cross sections as may reasonably be required by the division.

(4) 105.4 The operator may submit photographs of the site sufficient to show existing vegetation and surface conditions. These photographs should show the general appearance and condition of the land to be affected and should be clearly marked as to the location, orientation and the date that the pictures were taken.

(5) 105.5 Copies of the underground and surface mine development maps

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R647-4-106. Operation Plan

106.1 Type of Mineral(s) to Be Mined

The Amrize Devil's Slide Plant mines limestone and sandstone as the principal raw materials used in the manufacture of Portland cement. Limestone constitutes the dominant resource, while sandstone is mined in smaller quantities as a silica source to balance the cement raw feed chemistry. Table 106.1 below shows the quantities of Limestone and Sandstone quarried and stripped by year from 2010 to 2024. Figure 2 also shows photo of Devil's Slide quarry 3 North facing stratigraphic Cross Section (2016). Amrize expects the mine to continue operation in the next 10 to 20 years.

Table 2: Quantities of Limestone and Sandstone Quarried, and Stripped by Year from 2010 to 2024

YEAR	LIMESTONE	SANDSTONE	STRIPED
2010	485,169	22,236	1,745,214
2011	615,464	34,324	1,996,247
2012	679,954	18,404	1,725,895
2013	679,954	22,141	1,960,264
2014	676,286	34,212	1,475,646
2015	639,960	24,347	2,045,468
2016	626,800	22,312	2,148,900
2017	689,000	23,418	2,317,700
2018	788,722	34,112	3,481,641
2019	753,789	37,000	3,053,415
2020	865,385	29,000	2,239,463
2021	806,441	29,000	2,133,580
2022	895,125	36,000	2,392,090
2023	763,948	37,000	2,414,450
2024	715,886	30,000	2,034,982

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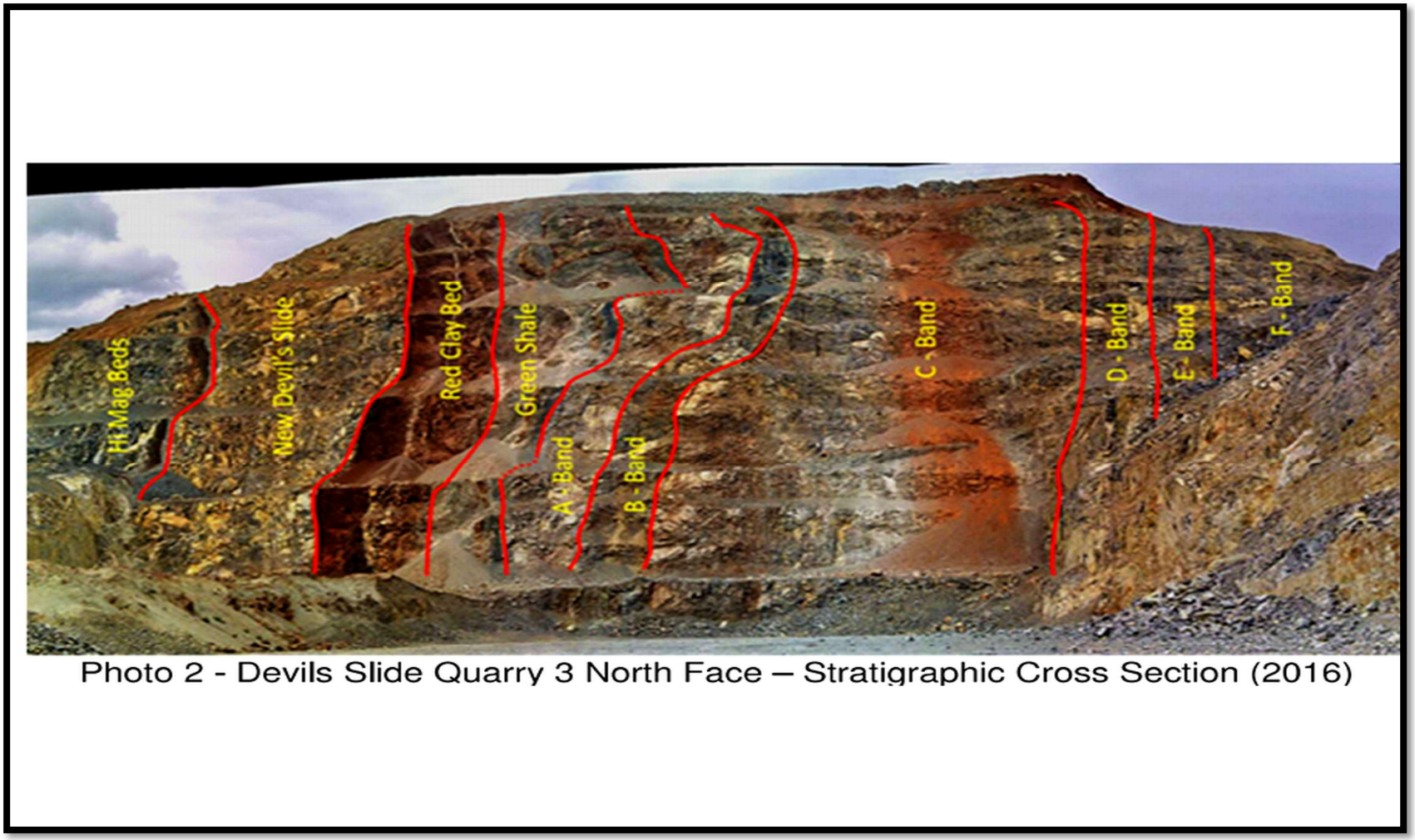

Photo 2 - Devils Slide Quarry 3 North Face – Stratigraphic Cross Section (2016)

Figure 2: Photo of devil's Slide Quarry 3 North Facing Stratigraphic Cross Section (2016)

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106.2 Type of Operations and Processing Methods

Quarry Operations: Quarrying operations include drilling, blasting, dozing, loading, and hauling of blasted material to the primary crusher and raw feed blending area. All operations are conducted in accordance with approved sequencing and mine safety standards under MSHA 30 CFR 56/57 regulations.

Processing: Blasted raw material is crushed and conveyed to the blending hall for proportioning with other raw feed components to achieve the correct chemical balance for clinker production. Chemically inferior limestone (overburden/interburden) is transported to designated overburden disposal areas. The cement making process generated **deleterious material** (Cement Kiln Dust), affects the air quality and site stormwater.

Deleterious Material: All references to Kiln Dust/Cement Kiln Dust/Deleterious Material are all intended to describe Cement Kiln Dust in this NOI. Cement Kiln Dust (CKD) is a fine particulate by-product of the manufacture of Portland cement, consisting primarily of calcium oxide, calcium carbonate, and other trace constituents such as silica, alumina, and iron oxides. CKD is highly alkaline (pH > 12) due to its lime content and may contain low concentrations of metals such as zinc, cadmium, and selenium. CKD is classified as a deleterious material under Rule R647-1-106 and is managed in engineered containment areas to prevent groundwater or surface water contact. The area currently designated as the CKD disposal area is expected to expand with growth. Figure 105.2.11 show the old and the current CKD disposal area, and the proposed expansion area. The CKD laboratory test results are summarized in Appendix C. CKD management follows EPA Region 8's No Further Remedial Action Planned (NFRAP) determination. The majority of CKD is beneficially reused offsite for soil stabilization and pond solidification. Residual CKD is contained within the Boneyard Hollow CKD management area. Appendix C also contains CKD management plan. This facility is regulated under the facility air quality permit NO DAQDE- AN100070027-20.

106.2.1 Air Quality Coordination – CKD Management

This subsection describes coordination between the Utah Division of Oil, Gas & Mining (DOGM) Notice of Intention (NOI) and the Utah Division of Air Quality (UDAQ) permit governing Cement Kiln Dust (CKD) management at the Amrize Devil's Slide Plant.

CKD management and emissions are regulated by the Utah Division of Air Quality under Approval Order (AO) No. DAQE-AN100070032-25 (2025), consistent with Utah Administrative Code R307-165 (Stack Testing) and R307-170 (Continuous Emission Monitoring). The CKD pile, conveyors, and associated material-handling systems are included as permitted sources under this order. Fugitive dust control is achieved through enclosures, baghouses, and surface watering consistent with Best Available Control Technology (BACT) standards.

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Continuous emission monitoring (CEM) for SO_2 and NO_x is conducted on the main kiln stack, with stack testing required every five years for PM_{10} and every two years for CO in accordance with R307-165. These tests follow U.S. EPA Methods 5, 201/201A, 202, and 10. Monthly visible-emission surveys are performed following Method 9, and opacity exceedances trigger follow-up testing within 24 hours. The kiln production limit under the air permit is 930,000 tons per twelve-month period, with ongoing recordkeeping of production, fuel use, and control device performance.

Fuel-related chemical testing is conducted prior to combustion. Used oils and alternative fuels are tested for halogen content by ASTM D-808-81, EPA Method 8240, or Method 8260. Fuels exceeding 1,000 ppm total halogens are classified as hazardous and excluded from kiln use. Diesel fuels are limited to a sulfur content of 15 ppm or less, verified by supplier certification or invoice documentation.

Under federal NESHAP 40 CFR Part 63 Subpart LLL, the facility monitors and controls hazardous air pollutants including mercury, total hydrocarbons, and dioxins/furans. All monitoring, testing, and recordkeeping ensure continuous compliance with Title V permitting standards.

For DOGM purposes, this section confirms that CKD management practices at the Devil's Slide facility are already subject to UDAQ monitoring and regulatory oversight. Future reclamation and closure practices under DOGM will remain consistent with UDAQ permit requirements to prevent airborne particulate releases and ensure continued environmental protection during post-closure monitoring.

Air Quality Compliance: Air quality compliance is maintained under DAQ Permit DAQDE-AN100070027-20, using baghouses and water spray suppression. Appendix D contains the facility's air quality permit, and the most current Air Quality NOI amendment.

Stormwater Management: Amrize Cement Inc. maintains a unified Storm Water Pollution Prevention Plan (SWPPP) and Spill Prevention, Control, and Countermeasure (SPCC) Plan for the Devil's Slide Facility, which together encompass both the Cement Plant and the adjacent Quarry located northwest of the plant. These engineering documents were prepared by Trinity Consultants, Inc. (Salt Lake City, Utah) for Amrize Cement Inc. under document references DS.03.010 (SWPPP, last revised June 2025) and DS.03.009 (SPCC Plan, November 2022). Complete copies of both reports are provided in Appendix E of this Notice of Intention (NOI).

Trinity states that the SWPPP, developed in accordance with Utah Pollutant Discharge Elimination System (UPDES) Permits UTR000664 and UTR273675, defines stormwater management practices and monitoring requirements across the entire Devil's Slide operation.

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Trinity SWPPP states that within the Quarry Area, stormwater is fully retained on site in the Main Quarry Pond southwest side and a Northwest Quarry Pond, both designed to contain a 25 to 50 year storm event. Berms and drainage controls prevent any discharge toward the Weber River. The SWPPP further identifies inspection, monitoring, and Best Management Practice (BMP) procedures overseen by the Environmental Manager and Quarry Manager as part of the facility's Pollution Prevention Team.

The SPCC Plan, also prepared by Trinity Consultants, Inc., complements the SWPPP by establishing detailed spill prevention, containment, and response measures for petroleum storage and mobile equipment fueling systems located at both the plant and quarry—specifically including the two 10,000-gallon diesel ASTs at the Quarry Fuel Tank Area and the Quarry Maintenance Garage. Together, these coordinated plans provide comprehensive stormwater and spill management coverage for all operational areas of the Devil's Slide Facility.

Public access to the facility is restricted by chain-link fencing and controlled gates. Signage and access protocols conform to MSHA standards. Operations are conducted under Amrize's Environmental, Health, and Safety (EHS) Program.

106.3 Estimated Acreages to Be Disturbed and/or Reclaimed

The total permitted disturbance encompasses approximately 710.37 acres, including the active quarry areas (Quarries 1, 2, and 3), CKD management zones, overburden dumps, and haul roads Sequential reclamation will proceed as mining advances, minimizing open disturbed acreage at any given time. See Section 110 – Reclamation Plan for additional detail on reclamation sequencing. Table 3 below shows the active mining areas consisting of quarries 1,2 and 3, CKD management areas, overburden dumps areas, area for expansion, and the total mining area.

Table 3: Areas for Quarries 1, 2, 3, CKD, Overburden and Area for Expansion

Description of The Area	Acres
Quarry, 1, 2, and 3 includes roads and some facilities	357.59
CKD Area	20.15
Overburden Material (dump)	120.77
Future Expansion Area	211.86
Total Area	710.37

106.3.1 Future Expansion Area

The "Future Expansion Area" shown on Figure 105.2.11 and listed in Table 3 represents a portion of land located immediately west of the current Quarry 3 boundary. Surface ownership of this area rests with M.R. Wilde & Sons LLC, with whom Amrize Inc. holds a

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formal surface use agreement allowing access and limited site preparation activities associated with potential future quarry expansion, overburden placement, and stormwater control.

Amrize's near-term plan includes the removal of overburden material located on the adjacent Wilde Property to allow safe access to Amrize owned limestone reserves along the shared property boundary. In coordination with the Bureau of Land Management (BLM), all overburden material removed from the Wilde Property will be temporarily stockpiled within the same property area, consistent with BLM surface use requirements. This work area is situated on the northwest side of the currently designated permit boundary. Amrize is presently conducting a wetland assessment within this area to support environmental compliance and permitting documentation.

The underlying mineral estate for this tract is administered by the U.S. Bureau of Land Management (BLM). Amrize Inc. is currently coordinating with the BLM Salt Lake Field Office to obtain the necessary mineral rights and operational authorization for eventual inclusion of this area in the active mining permit. Coordination to date includes preliminary discussions and written correspondence with BLM confirming procedural steps for mineral leasing, National Environmental Policy Act (NEPA) compliance, and cultural resource clearance. Appendix G contains a copy of the 2019 cultural resource study and the most recent correspondence with BLM.

In support of BLM requirements, Amrize Inc. has committed to complete a Class III Cultural Resource Inventory of the expansion area before the end of 2025, followed by initiation of a site specific Environmental Assessment (EA) under BLM consultation. These studies will evaluate potential impacts to cultural, biological, hydrologic, and visual resources consistent with BLM Manual 8120, NEPA regulations (43 CFR 46), and DOGM Rule R647-4-109.

No mining will occur within the Future Expansion Area until the BLM review process is complete and DOGM has approved a corresponding permit amendment or minor revision. Inclusion of this area within the current NOI provides transparency of Amrize's long-range operational planning and ensures that bonding, environmental, and land use considerations are anticipated in advance of formal expansion.

106.4 Nature and Annual Quantities of Materials to Be Mined or Processed

In 2024 the annual production averages approximately 715,886 short tons of limestone and 30,000 short tons of sandstone, consistent with historical operations. Approximately 10,655 short tons of Cement Kiln Dust (CKD) are produced in 2024.

106.5 Existing Soil Types and Distribution

Baseline soil and vegetation conditions for the Devil's Slide Mine were documented by WP Natural Resource Consulting LLC in the Vegetation and Soil Baseline Assessment prepared

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for Holcim, Inc. (see Appendix H. Soils in the area are derived primarily from limestone, sandstone, and quartzite parent materials and vary with slope and aspect. Six dominant soil map units were identified in the 1981 Morgan County Soil Survey and verified by field sampling at three representative locations analyzed by the Utah State University Analytical Laboratories.

The primary soil types are summarized as follows:

Henefer Loam (HeG) – Deep, well-drained soil on 40–60% north and east-facing slopes; surface layer ~16 inches of dark brown loam underlain by gravelly silty clay loam. Moderate to high available water capacity; high erosion hazard.

1. St. Mary's–Hoskin Cobbly Loams (StG) – Deep, well-drained cobbly loams on 30–50% south and west-facing slopes; surface 10–14 inches thick with cobbly loam and subsoil of reddish brown very cobbly sandy clay loam. Moderate permeability, low available water capacity, high erosion hazard.
2. Kilfoil Rock Outcrop Complex (KrG) – Shallow soils (to 30 inches) of dark clay loam formed from sandstone and shale with exposed bedrock; strongly alkaline and calcareous; moderate water holding capacity, high erosion hazard.
3. Lithic Haploxerolls (LHG) – Shallow stony loams (surface ≈ 6 inches) overlying bedrock at 10–20 inches; strongly calcareous, very low water holding capacity, high erosion hazard.
4. Agassiz Rock Outcrop (AaG) – Shallow (14–19 inches) silt loam and cobbly silt loam over limestone; very low water holding capacity, high erosion hazard.
5. Horrock's Rock Outcrop Complex (HvG) – Gravelly loam surface (~15 inches) underlain by cobbly clay loam to ~45 inches; formed from limestone and shale; low water capacity, high erosion hazard.

Laboratory tests indicate sandy loam textures, pH ≈ 7.8, EC ≤ 0.65 dS/m, SAR < 1.0, and organic matter 2.4–4.0 percent, confirming that site soils are non-saline and non-sodic with moderate fertility and suitable characteristics for reclamation.

Vegetation associated with these soils includes mountain big sagebrush (Artemisia tridentata var. vaseyana), serviceberry (Amelanchier utahensis), big-toothed maple (Acer grandidentatum), and a mixed understory of bluebunch wheatgrass, Sandberg's bluegrass, muttongrass, and native forbs such as lupine and wild onion. Vegetation cover averages 39 percent in sagebrush communities and 75 percent in mountain shrub zones (excluding annuals), with generally good structure and age distribution.

These soils, particularly the deeper Henefer and St. Mary's–Hoskin loams, are suitable for topsoil salvage and reclamation cover due to favorable texture, nutrient content, and native seed propagules. Detailed soil test results and vegetation transects prepared by WP Natural

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Resource Consulting (2005) Vegetation and Soil Baseline Assessment is included in Appendix F. Figure 105.3.16a in Appendix B also shows site soils.

106.6 Plan for Protecting and Redepositing Soils

Topsoil and subsoil materials identified in the WP Natural Resource Consulting (2005) Vegetation and Soil Baseline Assessment (Appendix F) are stripped and stockpiled separately prior to disturbance. The deeper and more productive Henefer Loam and St. Mary's–Hoskin Cobbly Loams are prioritized for salvage, as they provide favorable texture, nutrient content, and native seed propagules for future reclamation.

During active mining, topsoil is stripped to an average depth of 12–16 inches and stored in designated stockpile areas located in accessible, stable locations adjacent to the quarry and plant areas. These stockpiles are maintained to ensure ease of retrieval for later use in reclamation. Each stockpile is stabilized using temporary seeding with approved native grass species, and perimeter berms and drainage controls are installed to minimize erosion and runoff.

Stockpiled soil locations are clearly marked, mapped, and inspected periodically to ensure integrity and compliance with the approved operation plan. During reclamation, salvaged soils will be redeployed following the approved sequencing plan and applied over regraded, scarified surfaces to promote infiltration and root establishment.

Redeployed soil will be redistributed to an average depth sufficient to restore growth medium comparable to baseline soil productivity. Preference will be given to applying salvaged Henefer and St. Mary's–Hoskin loams on flatter regraded areas to maximize revegetation success. Figure 2.11 illustrates the current topsoil stockpiles reserved for reapplication during reclamation.

106.7 Existing Vegetative Communities and Cover Levels

The vegetation study in Appendix F describes three major community types across the permit area:

1. **Sagebrush Perennial Grass Community:** Dominated by Artemisia tridentata, Elymus elymoides, and Pseudoroegneria spicata, with average cover between 20–40%.
2. **Mixed Forb Grassland**: Found on disturbed benches and lower slopes, dominated by Bromus tectorum, Sphaeralcea munroana, and Achillea millefolium.
3. **Riparian Fringe and Drainage Corridors**: Support limited stands of Salix exigua, Poa secunda, and Agropyron smithii along ephemeral drainages.

These baseline data will serve as the reference for future reclamation success criteria under Rule R647-4-111.

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106.8 Depth to Groundwater, Overburden, and Geologic Setting

Depth to Groundwater: Hydrogeologic observations from both Seegmiller studies and UGS (2018) mapping indicate that **groundwater is generally absent within the active quarry walls**, with negligible hydrostatic pressure within the Twin Creek Limestone. Monitoring borehole GT-4, drilled in 2009, recorded no water to a depth of approximately 5,050 feet MSL about 250 feet below the planned quarry floor elevation (≈ 5,300 feet MSL). The Weber River, located roughly 1,000 feet southwest of the quarry, lies near elevation 5,260 feet MSL, confirming that the quarry excavation remains above the regional groundwater table. Both Seegmiller (2010, 2013) concluded that existing slopes are effectively dry, and any sustained groundwater elevation above 5,300 feet MSL would warrant reevaluation of drainage controls.

Overburden: Overburden thickness across the quarry area ranges from 5 to 35 feet, consisting primarily of colluvial clay, weathered limestone rubble, and slope-wash materials derived from the carbonate ridges. No perched or confined aquifers have been detected, and only minor, short-lived surface seeps appear after storm events due to direct infiltration or localized runoff accumulation.

Geology: The geology of the Devil's Slide Mine area has been mapped and described in detail by the Utah Geological Survey (UGS Open File Report 691, 2018 – *Interim Geologic Map of the Devils Slide Quadrangle, Morgan and Summit Counties, Utah*) and evaluated through several site specific geotechnical investigations, including the *Geologic Study for Revision of Large Mining Operations, Quarry 3* (Seegmiller International, 2013; Appendix H). Collectively, these studies indicate that the site lies along the steeply east dipping limb of an east dipping homocline within the Crawford thrust sheet, composed primarily of Jurassic Twin Creek Limestone (Jtw) interbedded with shale, siltstone, and minor sandstone units of the Thaynes and Woodside Formations. The Twin Creek Limestone forms the massive, resistant beds that create the prominent "Devil's Slide" feature, with bedding planes striking northeast–southwest and dipping approximately 80°–90° to the southeast. Thin Quaternary colluvium (Qmc) and alluvial fan deposits (Qafy) mantle the lower slopes adjacent to the Weber River valley. A generalized geologic section through the mine area is provided in Figure 106.3.16 (Appendix B).

The 2010 Seegmiller study provides detailed characterization of the lithologic and structural conditions specific to **Quarry 3**, including rock mass properties, discontinuity orientation, and seismic velocity data derived from field mapping and laboratory testing. The analysis confirmed that the limestone beds exhibit high uniaxial compressive strength, low fracture permeability, and consistent bedding orientation conducive to stable pit wall configurations. Subsequent evaluation by Seegmiller (2013) further validated these findings through slope stability modeling and recommended safe interramp slope angles consistent with the geologic structure and observed bedding attitudes.

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Overall, the Devil's Slide Mine operates under dry geotechnical conditions, with no indication of groundwater influence on slope stability. Ongoing slope depressurization and periodic monitoring ensure that the potentiometric surface remains below 5,300 feet MSL, maintaining factors of safety > 1.25 as documented in Appendix H. The 2010 and 2013 Seegmiller studies therefore remain relevant for Quarry 3 specific slope design, variance justification, and confirmation of the stable geologic setting supporting continued operations. The UGS (2018) map is included in Appendix I to support broader regional interpretation and stratigraphic correlation.

106.9 Ore, Waste, CKD, and Water Management Facilities

Ore: Ore stockpiles are located adjacent to the primary crusher and blending hall. Overburden dumps are positioned north and east of Quarry 2, designed for stability and future reclamation at a final slope of 3H:1V.

Cement Kiln Dust: CKD is contained within the Boneyard Hollow CKD Disposal Area. The facility includes a compacted clay liner (6–10 feet thick) beneath the CKD mass and a French drain to collect and divert stormwater and infiltration. The CKD pile is capped with inert fill and soil cover consistent with EPA and Air Quality permit requirements. Figure 105.211 shows the location of the CKD disposal. No fuels, lubricants, or chemicals are disposed of in the CKD area. Appendix C also contains a proposed CKD management plan.

Stormwater: Stormwater is managed through a network of culverts, basins, and berms designed to route flow to sediment control structures. The site operates under DWQ Storm Water Permit No. UTR000664, with BMPs delineated in the SWPPP and shown on drainage maps. Surface impoundments and treatment ponds are designed to be reclaimed or decommissioned following closure. Appendix E contains site stormwater management plan.

106.10 Material Movement Summary

The most current 2024 material extraction, movement, and placement volumes are as follows:

- Limestone: ~715,886 short tons per year.
- Sandstone: ~30,000 short tons per year.
- CKD generation: ~ 10,655 short tons per year.
- Overburden/interburden stripped: ~2,034,982 short tons per year.

Table 2 Section 106.3 also shows material extraction from 2010 to 2014. All movement and placement are documented in annual reports submitted to DOGM. Sequential mining and concurrent reclamation minimize the disturbed footprint and ensure compliance with R647-4-110. Amrize expects the mine to continue operation in the next 10 to 20 years.

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R647-4-107. Operation Practices

107.1 Public Safety and Welfare

Amrize is committed to the goal of achieving zero accidents and shall minimize hazards to public safety and welfare during operations. Controlled access to the site is maintained through locked gates, perimeter security fencing, and regulatory signage consistent with MSHA 30 CFR 56/57.11001 and 56/57.20010. Warning signs are posted at all quarry faces, haul roads, and CKD management areas.

Open pits, benches, and highwalls are protected by berms or barriers to prevent accidental entry. Any exploratory openings or drill holes are closed or capped in accordance with Rule R647-4-108. Scrap metal, construction debris, and waste materials are promptly removed or stored in designated containment areas for recycling or disposal. All personnel receive annual training in hazard recognition, MSHA safety standards, and emergency procedures.

Routine slope and bench inspections are performed as recommended in the Slope Stability Evaluation – Interim Quarry 3 (Seegmiller International, 2013; Appendix H). Monitoring ensures that groundwater elevations remain below Elevation 5300 ft, maintaining a static slope safety factor ≥ 1.25.

107.2 Drainages

Mining operations are designed to maintain existing drainage patterns and prevent sediment or pollutant discharge to surface waters. The Storm Water Pollution Prevention Plan (SWPPP, Permit No. UTR000664) governs stormwater management and includes engineered culverts, berms, and sediment basins shown on Figure 105.211.

Surface runoff from disturbed areas is directed into sediment control structures or lined diversion ditches to minimize erosion and protect Cottonwood Creek and adjacent drainages. These structures are inspected quarterly and after major storms. The maintenance and inspections of the stormwater management facilities are documented in the SWPPP log. Appendix E includes the detailed Stormwater Management and Spill Prevention Plans prepared by the facility's environmental consultants.

107.3 Erosion Control

Erosion and sedimentation are controlled through site specific Best Management Practices (BMPs) suitable for the steep carbonate terrain and calcareous soils described in Appendix F Soils and Vegetation Report (WP Natural Resource Consulting, 2005). Structural BMPs include rock check dams, wattles, silt fencing, berms, and stabilized stockpiles; vegetative BMPs include temporary and permanent native seeding.

Disturbed surfaces are graded to promote sheet flow and minimize concentrated runoff. Sediment collected in basins is periodically removed and reused as inert fill in reclamation

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areas. Erosion control measures comply with Utah DWQ requirements and are implemented in conjunction with concurrent reclamation.

107.4 Deleterious Materials

All deleterious or potentially deleterious materials are managed to prevent adverse environmental effects. Cement Kiln Dust (CKD) is contained within the engineered Boneyard Hollow CKD Disposal Area, which includes a compacted clay liner and run-on and run-off control system. CKD management follows the procedures outlined in the CKD Management and Disposal Plan (Appendix C).

Fuels, lubricants, and petroleum products are stored within secondary containment per the facility's Spill Prevention, Control, and Countermeasure (SPCC) Plan. No petroleum or chemical materials are disposed of within CKD areas or quarry pits. Scrap metals, used oils, and filters are collected for off-site recycling by licensed contractors.

107.5 Soils

Topsoil and subsoil are salvaged separately to preserve their fertility and structure for reclamation. Soil management follows the procedures outlined in Section 106.5 (Existing Soil Types and Distribution) and Section 106.6 (Plan for Protecting and Redepositing Soils).

Stockpiles are located in accessible, stable areas adjacent to the quarry and plant. Each pile is stabilized with native grass cover, perimeter berms, and surface drainage controls to prevent erosion. Stockpiles are clearly marked and mapped for re-use during reclamation. Salvaged soils derived from Henefer Loam and St. Mary's–Hoskin Cobbly Loams are prioritized for topdressing reclaimed surfaces.

107.6 Concurrent Reclamation

Amrize conducts concurrent reclamation to minimize disturbed acreage. As mining advances, previously mined-out areas are graded, recontoured, and seeded using native species consistent with Appendix F, Soils and Vegetation Report (WP Natural Resource Consulting, 2005). Figure 105.3.17 in Appendix B also shows areas of the mine that will be reclaimed.

Concurrent reclamation includes backfilling overburden dumps to 3H:1V or gentler final slopes, scarifying compacted areas, redistributing salvaged topsoil, and establishing native vegetation. These activities are coordinated with erosion and stormwater management measures described in Appendix E. Reclaimed areas are maintained in a safe, stable, and non-erosive condition until final reclamation is completed.

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R647-4-108. Hole Plugging Requirements

Amrize will properly plug and abandon all exploration, monitoring, or test holes within the permit area in accordance with Rule R647-4-108 and Division approved procedures. No drill hole will remain unplugged for more than thirty (30) days following completion of drilling unless otherwise approved by the Division. The purpose of these practices is to protect groundwater resources, prevent inter-aquifer flow, and maintain long-term surface stability.

108.1 General Requirements

Amrize will plug each drill hole as soon as it is no longer needed for monitoring, sampling, or production. All plugging work will be supervised by a qualified driller or geologist experienced in cementing and sealing techniques. Where alternate methods are proposed, Amrize will provide supporting documentation to demonstrate equivalent protection of groundwater and surface stability for Division review. Dry or non-artesian holes that do not produce significant water may be temporarily capped with a secure surface cover to allow re-entry during active operations.

108.2 Surface Plugging

Amrize will complete surface plugging in a manner that ensures long-term surface integrity and prevents the entry of surface water or debris.

1. **Standard Ground Conditions:** After drilling is completed, Amrize will backfill the hole with native cuttings to approximately five (5) feet below grade. A non-metallic permaplug or tamped seal will be installed at this depth, and the upper five (5) feet will be filled with neat cement. Where cemented casing is left in place, a welded or mechanically sealed permanent cap will be installed to prevent access or water infiltration.
2. **Agricultural or Tilled Areas:** In farmed areas, Amrize will place a five foot cement plug above the tamped seal so that the top of the cement plug is located approximately three (3) feet below final grade. The remaining upper section will be backfilled with soil to match surrounding conditions. If casing is left in place, the top of the capped casing will be buried at least three (3) feet below grade to avoid interference with future tilling.

108.3 Subsurface Plugging

Amrize will seal all holes that encounter groundwater or other potential fluid bearing zones to prevent vertical migration between strata.

1. **Artesian Conditions**: If artesian flow is encountered, Amrize will place a cement plug sufficient to stop flow between geologic formations and at the surface. The cement will consist of API Class A or H cement, weighted to at least 13.5 lb/gal, with

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additives as needed. Plugging will be performed before removing drilling equipment and under the supervision of personnel experienced in artesian sealing. If the surface owner requests conversion of an artesian hole to a water well, Amrize will obtain written notification from the landowner assuming full responsibility for ultimate plugging and abandonment and provide a copy to the Division.

2. **Non-Artesian Groundwater:** When non-artesian water is encountered, Amrize will seal the hole using one of the following methods:
    a. Place a 50-foot cement plug immediately above and below the water bearing interval; or
    b. Backfill the hole from the bottom upward using a high-grade bentonite/water slurry pumped through the drill stem, mixed to a Marsh funnel viscosity of ≥ 50 seconds per quart.

108.4 Documentation

Amrize will maintain detailed records for each hole, including location, depth, lithology, plugging method, and materials used. Plugging data will be recorded on the drill hole completion log and retained in the mine's permanent files. All plugging records will be available for Division inspection upon request.

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R647-4-109. Impact Assessment

Amrize has evaluated potential environmental, geotechnical, and public-safety impacts associated with continued mining operations at the Devil's Slide facility. The following narrative describes potential surface and subsurface impacts and identifies actions that will be taken to avoid, minimize, or mitigate adverse effects. This assessment is consistent with Rule R647-4-109 and based on site specific data, historical monitoring records, and the 2013 Seegmiller International slope stability report.

109.1 Surface and Groundwater Systems

Amrize will maintain best management practices (BMPs) to prevent degradation of surface water and groundwater resources. The site lies within the Weber River drainage, and stormwater from disturbed areas will continue to be directed to engineered collection ditches, sediment basins, and infiltration controls designed in accordance with the Utah Pollutant Discharge Elimination System (UPDES) permit.

Groundwater resources are protected through proper plugging of exploration holes (see Section 108), clay lined containment of CKD storage areas, and implementation of run-on and run-off controls around the CKD facility to intercept and prevent contact with groundwater. According to the 2020 NOI application, the groundwater underneath the mining area operation has not been impacted by exploration or by the mining operation. Hydrogeologic observations from both Seegmiller studies and UGS (2018) mapping indicate that **groundwater is generally absent within the active quarry walls**, with negligible hydrostatic pressure within the Twin Creek Limestone. The 2020 NOI application also indicated that no spring/s have been impacted by the overburden stockpiles.

There are no releases of process water from the plant, nor are there any deleterious materials exposed that may become a potential danger to groundwater. Deleterious material (CKD) stockpiles are situated at elevations well above groundwater that preclude contact with groundwater and will not affect groundwater quality. CKD stockpiles will be capped to eliminate surface water penetration.

Construction and operation of the Overburden Dumps is anticipated to have minimal impact on the Quarry Hollow ephemeral wash. During construction, the ephemeral wash in Quarry Hollow will be impounded in the existing reservoir, described above, for livestock watering and dust abatement during initial overburden dumping operations. At completion of construction of the Overburden Dumps, the surface will be graded to reestablish a natural drainage way to prevent surface water retention and direct surface water off the reclaimed dump surface. In the quarry area, the Quarry Hollow drainage acts very similar to a French drain due to the deposition of strip material from the Quarry and the larger rock at the toe of slope. The "French drain" capacity is approximately 30% of the filled area which varies in depth from 25 to 30 feet. It provides the capacity to handle runoff, decreases velocity, and

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maximizes surface area contact to promote percolation. Drainage calculations are included in the 1987 plan, and it is in Appendix A. These calculations show the theoretical storm runoff quantities and catch basin capacity. These measures have successfully minimized erosion from a recent 100-year storm event. The catch basin adjacent to the Weber River was reconstructed with rock banks and clay lining inside the rock in 2010. A flow monitoring discharge weir was also installed at the outlet point of the basin. There are monitors on the outlet that notify the control room of the plant if any discharge occurs. To date, no discharge or outflow has occurred.

109.2 Threatened and Endangered Species

A review of the U.S. Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPaC Report see Appendix F) database for the Devil's Slide permit area in Morgan County, Utah, identified several federally listed species that may occur in, or migrate through, the region. The project area is predominantly a long-disturbed industrial mining landscape with limited intact native habitat; however, the federal species list includes the following taxa that potentially occur within the broader action area:

Wildlife Concerns: Mammals

Name – Canada Lynx CH Lynx canadensis

Status – Threatened

Name – North American Wolverine Gulo gulo luscus: Wherever found

Status – Threatened

Birds

Name – Yellow-billed Cuckoo CH Coccyzus americanus

Status – Threatened

Insects

Name – Monarch Butterfly CH Danaus plexippus: Wherever found

Status – Proposed Threatened

Flowering Plants

Name Ute Ladies'-tressesSpiranthes diluvialis: Wherever found

Status – Threatened

Regulatory Compliance Statement

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The Devil's Slide permit area does not contain designated critical habitat for any of the species listed above. Nevertheless, Amrize will continue to comply with the Endangered Species Act (ESA) by coordinating with USFWS and the Utah Division of Wildlife Resources (DWR) prior to any new surface disturbance, expansion, or construction that may affect potentially suitable habitat.

If future biological surveys identify the presence of any federally listed species or suitable habitat not previously documented, Amrize will:

1. Immediately notify USFWS and DWR,

2. Implement avoidance, minimization, or mitigation measures approved by the agencies, and

3. Refrain from disturbing affected areas until agency consultation requirements are complete.

These steps ensure that ongoing and future mining activities remain compliant with federal law while protecting sensitive biological resources.

109.3 Soil Resources

Soils within the active quarry and plant areas have been previously disturbed by historic mining and industrial use. Amrize will continue to salvage and stockpile available topsoil from undisturbed areas prior to new disturbance. Stockpiled soils will be used during reclamation to promote vegetative re-establishment. Erosion control measures including silt fencing, straw wattles, and temporary cover crops will be used where necessary to protect exposed soil and prevent sediment transport during operations and reclamation.

109.4 Slope Stability, Erosion Control, Air Quality, and Public Safety

The operation will continue under the mine design parameters confirmed by the 2013 Seegmiller International slope stability evaluation (Appendix H), which demonstrated acceptable factors of safety for planned final slopes in Quarry 2 and Quarry 3. Amrize will maintain slope configurations, drainage benches, and catch berms consistent with that report. Erosion will be minimized through the use of diversion ditches, surface grading, and vegetative stabilization of inactive areas. Air quality impacts will be controlled through compliance with Utah Division of Air Quality (DAQ) permits, which require dust suppression on haul roads, water sprays on crushers and conveyors, and regular maintenance of dust collection systems. Public health and safety will be protected through access control, signage, berms, and fencing of active pits and high-walls.

109.5 Mitigation Actions

Amrize will implement the following actions to avoid or mitigate potential negative impacts:

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1. Maintain compliance with all UPDES, DAQ, and DOGM permit conditions, and SPCC plan.
2. Conduct periodic inspection and maintenance of stormwater and dust control systems.
3. Preserve and properly manage topsoil resources for reclamation use.
4. Continue slope stability monitoring and maintain safe bench geometry.
5. Coordinate with wildlife agencies on any potential species or habitat concerns.
6. Maintain employee training and emergency response procedures to ensure public safety.

These measures, combined with Amrize's established environmental management practices, will ensure that operations at the Devil's Slide site continue to protect natural resources and public welfare.

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R647-4-110. Reclamation Plan

Amrize will conduct reclamation of all disturbed areas associated with the Devil's Slide Cement Plant and Quarry in accordance with Rule R647-4-110 and Division approved procedures. The objective of this plan is to restore a stable post-mining landscape compatible with surrounding land uses, protect surface and groundwater resources, and re-establish long-term vegetative cover consistent with native conditions and site capability. Reclamation will be conducted progressively, where practical, to minimize active disturbance at any one time.

110.1 Current and Post-Mining Land Use

The existing land use within the permit area is industrial and quarry related, including cement production, aggregate stockpiles, CKD disposal, and support areas. Surrounding lands are primarily grazing, industrial, and transportation corridors (I-84 and Union Pacific Railroad). Following reclamation, Amrize will restore the site to a combination of industrial and rangeland uses. The plant essential facilities, and the CKD disposal area will remain in operation, while inactive quarries, and overburden dumps will be regraded, stabilized, and revegetated to blend with natural terrain and surrounding uses.

110.2 Reclamation of Disturbed Features

Amrize will reclaim disturbed features as follows:

Quarry Highwalls and Slopes: Final quarry slopes will conform to the geometry shown in Appendix H. Overall slope configurations of 1H:2V with 38.5-foot safety benches between lifts have been demonstrated to be geotechnically stable per the 2013 Seegmiller International Slope Stability Report (Appendix H). All slopes 3H:1V or gentler will be regraded and reclaimed with topsoil and vegetation. Slopes steeper than 3H:1V that remain stable in accordance with the slope stability study will be left unreclaimed but stabilized to prevent erosion or raveling. Figure 105.3.14 in Appendix B also shows area of the mine with high wall which will not be reclaimed.

Access Roads and Drainages: Temporary haul roads and ancillary access routes not required for ongoing operations will be regraded, ripped, and seeded. Permanent access roads will remain in service but will be kept at minimum width not greater than 20 feet. Drainage channels will be graded to stable slopes and tied into natural drainages with erosion resistant outfalls. Figure 105.1.12a in Appendix B.

Pits, Ponds, and Impoundments: Sediment basins and stormwater impoundments will be maintained or reshaped as needed to function as permanent stormwater controls. Non-functional pits will be backfilled or graded to safe, stable contours.

CKD and Overburden Piles: The existing CKD disposal area in Boneyard Hollow and any future CKD expansion area will be constructed with an engineered low permeability liner

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and integrated stormwater management plan designed to prevent run-on and contain run-off from the site. When the CKD cell reaches capacity, the cell will be capped with compacted clay and a minimum of 2 feet of growth media before revegetation. Overburden and interburden dumps will be regraded to slopes not exceeding 2.5H:1V and covered with salvaged soil.

Drill Holes and Exploration Sites: All holes will be plugged and sealed in accordance with Section 108.

If the Future Expansion Area is subsequently developed under BLM authorization, reclamation will be conducted under the same grading, soil replacement, and revegetation standards established in this plan, and in coordination with BLM and DOGM to ensure consistent post mining land use.

110.3 Facilities to Remain Post Mining

The following facilities will remain as part of the post mining industrial use:

1. Electrical substations, water systems, and internal access roads.
2. Permanent stormwater basins, ditches, and monitoring wells.
3. CKD disposal area

All temporary buildings, laydown areas, and mobile equipment will be removed, and disturbed surfaces will be reclaimed to approved contours.

110.4 Deleterious or Acid Forming Materials

Amrize will continue to manage cement kiln dust (CKD) as a deleterious material under Rule R647-1-106. The CKD generated from the dry-process plant will either be sold for beneficial reuse or placed in the lined Boneyard Hollow disposal facility. The CKD expansion area will be similarly lined up and equipped with a stormwater management system to prevent infiltration and control both run-on and run-off. No acid forming or reactive waste is expected. Figure 105.2.11 in Appendix B identifying CKD and deleterious material locations.

110.5 Revegetation and Soil Treatment

Amrize will implement a comprehensive reclamation and revegetation program designed to stabilize soil, reduce erosion, and restore native vegetation.

Grading and Stabilization: Final reclamation grading will follow the configurations shown on the project maps. Highwalls will remain in place and will *not* be regraded. All other disturbed areas will be regraded only where necessary to achieve stable slopes (generally 3H:1V or flatter), incorporating micro-topography to promote infiltration and minimize erosion.

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Topsoil Replacement: Salvaged topsoil will be redistributed to an average depth of 12 inches, or as available, across regraded surfaces.

Seedbed Preparation: Surfaces will be scarified and roughened to enhance seed retention and moisture infiltration.

Seed Mixture and Timing: A native rangeland seed mix suited to the local elevation and precipitation regime will be applied at specified rates. Fall seeding (October–November) is preferred.

Erosion Control: Where original protective cover is lacking, Amrize will apply mulch, straw crimping, or erosion control fabric to minimize siltation and protect seed establishment.

Monitoring: Vegetation success will be monitored to ensure adequate ground cover and species diversity as required by DOGM standards.

110.6 Commitment to Reclamation

Amrize affirms that all reclamation will be performed in accordance with Rule R647-4-110 and the approved Notice of Intention. Reclamation will be supervised by qualified personnel, conducted progressively, and reported to the Division as required.

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R647-4-111. Reclamation Practices

This section describes the procedures and performance standards that will guide reclamation of the Devil's Slide mining areas following cessation of active operations. In accordance with Rule R647-4-111, Amrize Inc. will conduct reclamation to minimize hazards to public safety and welfare, restore stable drainage and slope conditions, control erosion and deleterious materials, and establish self-sustaining vegetation compatible with the approved post mining land use. Reclamation measures will include removal or stabilization of structures and equipment, sealing of drill holes, regrading and topsoil redistribution, re-establishment of surface drainage, and revegetation using regionally adapted perennial species. The goal is to return the disturbed lands to a condition that is both environmentally stable and capable of supporting the designated post mining land uses, consistent with the requirements of the Utah Division of Oil, Gas and Mining.

During reclamation, Amrize Inc. will implement the following practices to ensure compliance with Rule R647-4-111. The objective is to return all disturbed areas to a condition that is stable, non-polluting, and capable of supporting approved post mining land uses.

111.1 Public Safety and Welfare

Upon completion of mining, Amrize Inc. will minimize hazards to public safety and welfare through the following actions: Permanently seal all drill holes, test borings, and exploratory cores in accordance with Rule R647-4-108. Remove or properly dispose of trash, scrap metal, wood, equipment, buildings, and other extraneous materials related to mining. Post appropriate warning signs and safety barriers in areas where public access may occur. Construct berms, fences, or gates as needed above final highwalls or excavation edges to prevent unauthorized entry. All access control measures will remain in place until the Division determines that hazards have been adequately mitigated.

111.2 Drainages

Natural drainages disturbed by mining will be restored to a stable configuration that safely conveys expected runoff without erosion or sedimentation. Where practical surface contours will be re-established to approximate pre mining drainage patterns while maintaining positive drainage away from highwalls, spoil areas, and CKD management areas. Any constructed channels will be lined or armored as necessary to maintain long-term stability.

111.3 Erosion Control

Regraded surfaces will be stabilized through proper grading, topsoil placement, and revegetation. Best management practices (BMPs) such as silt fencing, straw wattles, or sediment traps will be used as necessary until vegetation is established. Erosion control will be maintained consistent with regional soil, slope, and precipitation conditions.

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111.4 Deleterious Materials

All deleterious or potentially deleterious materials, including cement kiln dust (CKD) or waste concrete, will be either removed from the site or left in an isolated and environmentally stable condition. The existing CKD management area in Boneyard Hollow will remain underlain by a compacted clay liner and internal French drain system to ensure isolation from surface and groundwater. Amrize Cement plan is expected to continue to operate after the active mining activities subsite and the plan will most likely continue to use the existing CKD site for continued disposal if the area still has remaining capacity to accept more CKD material. Upon final closure, the CKD surface will be graded, capped with suitable cover soil, and revegetated to minimize infiltration and wind erosion.

111.5 Land Use

Reclamation will return the site to land uses compatible with the surrounding area, including industrial, rangeland, and wildlife habitat. The reclaimed surface will be left in a condition that can support these uses without ongoing maintenance, consistent with landowner objectives and the post mining use plan.

111.6 Slopes

Waste rock, overburden, and soil stockpiles will be regraded to achieve stable slopes that minimize erosion and allow for successful revegetation. Final slope configurations will generally not exceed 3H:1V unless otherwise approved. Slope surfaces will be scarified prior to topsoil redistribution to prevent compaction and promote root growth.

111.7 Highwalls

Final highwalls in Quarries 2 and 3 will be reclaimed and stabilized consistent with the site specific slope stability evaluation. Where feasible, slopes will be reduced by backfilling or by grading to an overall angle of 45 degrees or less. Permanent benches and catch ditches will be maintained where necessary to ensure long-term stability and safety.

111.8 Roads and Pads

Access roads, haul roads, and plant pads no longer required for operations will be reclaimed. Roads designated for post mining access (see figure 105.3.12 in Appendix B) will be left with stable drainage structures, culverts, and surface conditions suitable for continued use by the landowner or agency. Roads not retained will be ripped, regraded, and revegetated.

111.9 Dams and Impoundments

Any temporary sedimentation or process water impoundments will be reclaimed to a self-draining and mechanically stable condition unless demonstrated to have long-term hydrologic benefit for post mining land use. Abandoned impoundments will be breached or backfilled to prevent standing water and ensure slope stability.

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111.10 Trenches and Pits

Exploratory trenches, small borrow pits, and similar excavations will be backfilled, graded, and blended into adjacent terrain. All reclaimed areas will be covered with topsoil and seeded to establish permanent vegetative cover.

111.11 Structures and Equipment

Upon final reclamation, all temporary buildings, rail lines, conveyors, and utilities not required for post mining use will be dismantled and removed from the site. Foundations and pads will be buried or removed in accordance with Division approval. Salvageable equipment will be removed for reuse or sale. However, facilities like shops and fuel tanks which are necessary for the continued use of the cement plan activities may be downsized and may remain in use during the life of the cement plant. Figure 105.1.12b in Appendix B shows facilities (structure) that are in the permitted area.

111.12 Topsoil Redistribution

Topsoil salvaged during operations will be redistributed uniformly across graded surfaces. Placement will occur under dry conditions to avoid compaction and will be followed by light ripping or harrowing to integrate the soil surface. Topsoil depths will vary depending on local soil availability but will be sufficient to support revegetation and long-term stability.

111.13 Revegetation

Revegetation will employ a native or adapted seed mix designed for local soil and climate conditions and approved by the Division. Seeding will be broadcast or drilled during appropriate seasonal windows to ensure germination and establishment. Revegetation will be considered complete when vegetative ground cover achieves ≥ 70 percent of the pre mining (or adjacent undisturbed) reference area; and vegetation has survived at least three growing seasons following the last seeding, fertilization, or irrigation, unless such practices are part of the approved post mining land use. Ongoing monitoring will be conducted until the Division determines that reclamation objectives have been met within practical limits.

111.13.1 Seed Mix and Implementation Plan

Revegetation will be supported by a native and adapted seed mix suitable for the calcareous-loam soils and semi-arid conditions of the Devil's Slide area. The seed mix has been developed in accordance with the Utah Division of Oil, Gas and Mining (DOGM) recommendations for Northern Utah rangeland and industrial sites and the findings of the Site Soil and Vegetation Report (Appendix F). Areas to be seeded and monitoring transects are shown on the Revegetation Map (Figure 105.3.17 Appendix B).

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Table 4: Proposed Seed (Mix) Type For Revegetation

Common Name	Scientific Name	Type	PLS lbs/acre	Purpose / Notes
Crested Wheatgrass	Agropyron cristatum	Perennial Grass	3.0	Fast cover; erosion control
Thickspike Wheatgrass	Elymus lanceolatus	Perennial Grass	2.0	Long-term stabilization
Western Wheatgrass	Pascopyrum smithii	Perennial Grass	2.0	Saline-tolerant sod former
Bluebunch Wheatgrass	Pseudoroegneria spicata	Native Grass	2.0	Native dominance
Sandberg Bluegrass	Poa secunda	Native Grass	0.5	Early cover
Russian Wildrye	Psathyrostachys juncea	Introduced Grass	1.5	For alkaline soils
Indian Ricegrass	Achnatherum hymenoides	Native Grass	1.0	Deep-rooted; dry-site
Small Burnet	Sanguisorba minor	Perennial Forb	1.0	Pollinator value
Palmer Penstemon	Penstemon palmeri	Native Forb	0.25	Aesthetic diversity
Lewis Flax	Linum lewisii	Native Forb	0.5	Soil aggregation
Fourwing Saltbush	Atriplex canescens	Native Shrub	1.0	Shrub stability
Rubber Rabbitbrush	Ericameria nauseosa	Native Shrub	0.5	Alkaline-tolerant pioneer
Total			≈ 15.25 lbs PLS/acre	

Implementation Notes:

Seeding Method: *Drill seed on flat or gently sloped areas; broadcast with light harrowing on steep slopes.*

Timing: *Conduct seeding in late fall (October–December) or early spring (March–April) to coincide with soil moisture availability.*

Mulching: *Apply 1.5–2 tons/acre of weed-free straw mulch on erosion-prone slopes.*

Fertilization: *Apply only if soil testing indicates nutrient deficiency; most native species establish best without fertilizer.*

Monitoring: *Conduct annual monitoring for at least three growing seasons to confirm ≥70% vegetative cover compared to adjacent undisturbed reference areas.*

Reference: *Seeding units and monitoring transects are shown on the Revegetation Map (Figure 105.3.17 Appendix B).*

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R647-4-112. Variance

In accordance with Rule R647-4-112, Amrize Inc. requests specific variances from selected operational and reclamation requirements due to the unique geologic, geotechnical, and operational conditions at the Devil's Slide Cement Plant and Quarry. The following variances are formally requested for Division review and approval.

1. **Variance Requests**

1.11 Rules for Which Variances Are Requested

Amrize requests variances from:

i. R647-4-107 (Operation Practices) – limited to highwall retention and continued industrial-use areas; and

ii. R647-4-111 (Reclamation Practices) – limited to highwall slopes and stormwater structures retained for post mining drainage management.

1.12 Variance Description and Affected Areas

The following specific areas are included in the variance request:

i. Highwall Retention – Portions of Quarry 2 and Quarry 3 highwalls will remain in place as stable, permanent features. The Geologic Study for Revision of Large Mining Operations, Quarry 3 (Seegmiller International, 2010) and subsequent Slope Stability Evaluation – Interim Quarry 3 (Seegmiller International, 2013; Appendix H) collectively confirm that the rock mass exhibits high compressive strength, low fracture permeability, and bedding geometry conducive to long-term stability. Both analyses demonstrate factors of safety exceeding 1.25 under dry conditions, validating the retention of highwalls without backfilling or regrading.

ii. Stormwater Ponds and Drainage Features – Existing stormwater ponds and diversion channels will remain or be relocated as necessary to manage runoff from the highwall and non-reclaimed plant areas. These features are integral to the post mining drainage system and are covered under the Utah DWQ Industrial Stormwater Permit.

1.13 These variances are necessary to maintain safe, efficient industrial operations while avoiding unnecessary disturbance. Complete backfilling or slope reduction of the stable highwalls would result in additional environmental impact with no safety or hydrologic benefit. The Seegmiller (2013) analyses show that the Twin Creek Limestone units forming the Quarry 3 walls are competent, dry, and structurally sound, with bedding orientation and joint spacing that inherently limit instability. Retaining these slopes and drainage features aligns with the site's geologic setting and

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supports the long-term industrial land use objective consistent with Morgan County zoning.

1.14 Alternate Methods or Measures: To ensure environmental protection equivalent to standard rule requirements:

i. Geotechnical inspections will continue to verify long-term highwall stability in accordance with Seegmiller recommendations;
ii. Stormwater ponds and control structures will remain under DWQ permit coverage and regular maintenance;
iii. Vegetation will be established on all reclaimed areas outside the retained facilities, CKD area, and permanent access roads; and
iv. DOGM will be notified prior to implementation of any approved variance, and the final configuration will be field verified before bond release.

2. Division Approval

A variance shall be granted only if the proposed methods are consistent with the Utah Mined Land Reclamation Act and provide environmental protection equivalent to the intent of the rules. Any variance approved by the Division will be documented in writing and attached to the permanent permit record.

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113. Surety

Upon approval of this Notice of Intention to Revise Large Mining Operations, Five Star Engineers LLC (FSE), on behalf of Amrize, will coordinate with the Utah Division of Oil, Gas and Mining to recalculate the required reclamation surety for the Devil's Slide Mine. Amrize currently maintains two existing reclamation ponds with a combined bond value of **$6,611,400.00**, which remain in effect until a revised surety amount is approved by the Division.

The updated surety calculation are included in Appendix J and will incorporate the recent adjustments to the Minerals Program bonding requirements and the State's memorandum titled *"Cement Plant Secondary Processing Exclusion from Bonding, Amrize Concrete Inc., Devil's Slide Quarry, M/029/0001, Morgan County, Utah."* Consistent with R647-4-113, the revised surety will reflect (a) the technical details of the approved mining and reclamation plan, (b) the proposed post-mining land use, and (c) applicable Division administrative and third-party engineering costs under a potential bond-forfeiture scenario. Amrize will provide a completed Reclamation Contract (Form MR-RC) and the approved form of surety once the recalculation process is completed.

XI. **SIGNATURE REQUIREMENT**

I hereby certify that the foregoing is true and correct. **(Note: This form must be signed by the owner or officer of the company/corporation who is authorized to bind the company/corporation).**

Signature of Permittee / Operator/Applicant: _____

Name (typed or print): Javier Sosa Ortiz

Title/Position (if applicable): Plant Manager Devil's Slide

Date: 12/11/2025

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References

This section provides a complete list of technical, regulatory, and supporting references cited in the Devil's Slide Notice of Intention (NOI) to Revise Large Mining Operations, Permit No. M/029/001, prepared for Amrize, Inc. by Five Star Engineers LLC (FSE). These documents collectively support the geological, operational, and reclamation evaluations presented in the NOI.

Utah Administrative Code

- Utah Division of Oil, Gas and Mining (DOGM). Rules for the Administration of the Mined Land Reclamation Act, Utah Administrative Code R647-4-103 through R647-4-113.
- Utah Division of Air Quality (UDAQ). Utah Administrative Code R307-165 (Stack Testing) and R307-170 (Continuous Emission Monitoring).
- Utah Division of Water Quality (DWQ). Utah Pollutant Discharge Elimination System (UPDES) Permits UTR000664 and UTR273675.

Amrize, Inc. and Five Star Engineers LLC (2025)

- Devil's Slide Mine and Cement Plant – Revised Notice of Intention (NOI) to Revise Large Mining Operations, Permit No. M/029/0001, Morgan County, Utah.
- Stormwater and CKD Management Plan, prepared by Five Star Engineers LLC (2025).
- Air Quality Coordination – CKD Management Subsection, Approval Order DAQE-AN100070032-25, Utah Division of Air Quality.

Trinity Consultants, Inc. (2022 and 2025)

- Spill Prevention, Control and Countermeasure (SPCC) Plan, Document No. DS.03.009, November 2022.
- Storm Water Pollution Prevention Plan (SWPPP), Document No. DS.03.010, June 2025.

Seegmiller International

- Slope Stability Evaluation – Interim Quarry 3, Devil's Slide Quarry, Morgan County, Utah, February 2013.

Utah Geological Survey (UGS)

- Interim Geologic Map of the Devils Slide Quadrangle, Morgan and Summit Counties, Utah, Open-File Report 691, 2018.

WP Natural Resource Consulting LLC (2005)

- Vegetation and Soil Baseline Assessment for Holcim (U.S.) Inc., Devil's Slide Plant, prepared for Holcim (US) Inc., Salt Lake City, Utah.

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Ideal Cement Company (1987)

- Mining and Reclamation Plan for the Ideal Cement Devil's Slide Plant, Morgan County, Utah, covering approximately 390 acres of quarry operations.

U.S. Environmental Protection Agency (EPA)

- 40 CFR Part 63, Subpart LLL – National Emission Standards for Hazardous Air Pollutants from the Portland Cement Manufacturing Industry.
- EPA Region 8 – No Further Remedial Action Planned (NFRAP) Determination for Cement Kiln Dust (CKD) Management Facilities.

U.S. Fish and Wildlife Service (USFWS) and Utah Division of Wildlife Resources (DWR)

- Endangered Species Act (ESA) Coordination Requirements, 16 U.S.C. § 1531 et seq.

Additional Supporting Materials

- Morgan County Soil Survey (1981), U.S. Department of Agriculture – Soil Conservation Service.
- Union Portland Cement Historical Records (1905–1990), Amrize Archives.
- Utah Division of Oil, Gas and Mining (DOGM) Reclamation Plan Amendment Approval – Overburden Dump Area Revision (March 26, 2002).

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Appendix A

1987 Devil's Slide Mining and Reclamation Plan (Summary and Full Plan)

Five Star Engineers LLC
220 N 900 E
Hyde Park, Utah 84318
Tel: 435-881-5339
Issahamud@5starengineers.com

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Ideal Cement - Devil's Slide Plant
A Division of Ideal Basic Industries

Auxiliary Route No. 3
Morgan, Utah 84050
801 829 3421

May 8, 1987

IDEAL

Ms. Susan C. Linner
Reclamation Biologist/Permit Supervisor
State of Utah, Dept. of Natural Resources
Division of Oil, Gas, and Mining
355 West North Temple
3 Triad Center, Suite 350
Salt Lake City, Utah 84180-1203

Reference: Devil's Slide Cement Plant
Morgan County, Utah
ACT/029/001

Dear Ms. Linner,

Attached is the response to your letters of November 19, 1986 and January 15, 1987 with reference to our Notice of Intent to Commence Mining Operation. It is our intent to comply with all requirements of the Mined Land Reclamation Act, Title 40-8 and the rules established by the Board of Oil, Gas, and Mining.

Per your request, this submittal is a completed "stand on its own" plan and includes a completed Form MR-1. The Table of Contents outlines the organization and information contained in this mining plan.

It is our understanding that this is a life of mine permit with the reclamation estimate being revised on five year intervals for the purpose of adjusting the amount of Surety Guarantee (Rule M-5). Please notify as to the acceptable form and the certification distribution.

This response should be complete and have the information you requested. We appreciate the Division's assistance in identifying the required data and information. Please advise should you have any questions or require clarification.

Sincerely,

L. B. Giles
Plant Manager

LBG/y

Attachments

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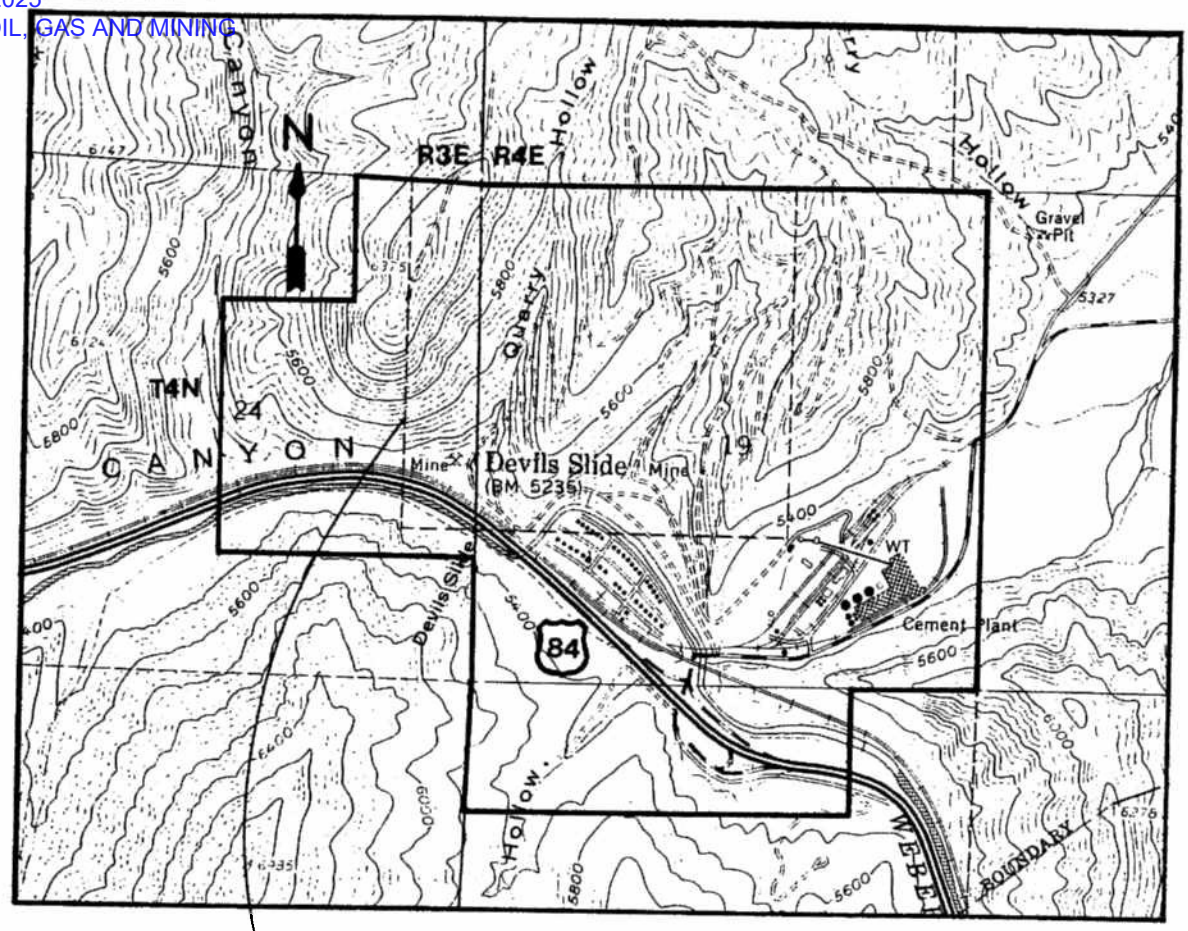

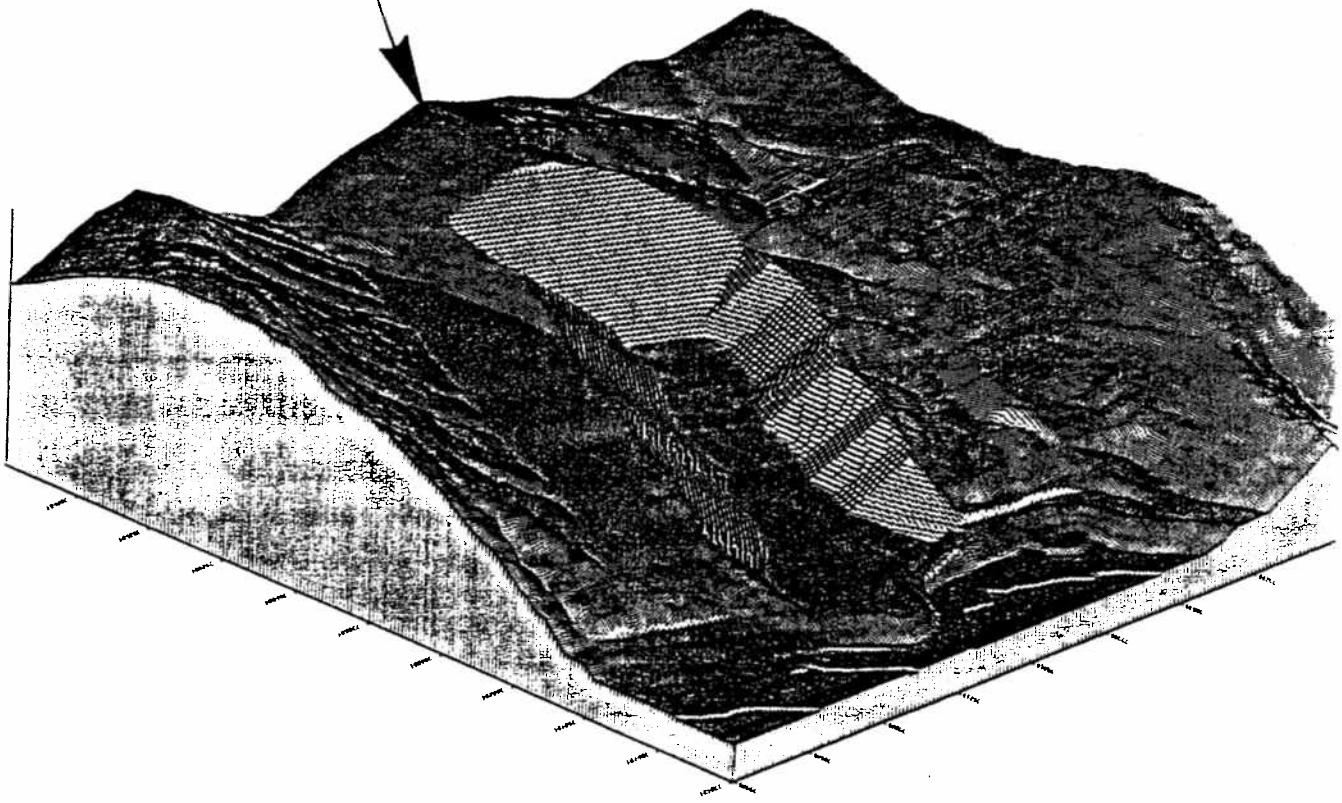

SECTION OF USGS DEVIL'S SLIDE QUADRANGLE SHOWING PROPERTY BOUNDARY

AND COMPUTER MODEL OF QUARRY AREA

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Reclamation Plan #dcc-1340-3	6

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FORM MR-1
(Revised November 1984)

STATE OF UTAH
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING
355 West North Temple
3 Triad Center, Suite 350
Salt Lake City, Utah 84180-1203
Telephone: (801) 538-5340

NOTICE OF INTENTION TO COMMENCE MINING OPERATIONS and MINING AND RECLAMATION PLAN

Based on Provisions of the Mined Land Reclamation Act, Title 40-8, Utah Code Annotated 1953, General Rules and Regulations and Rules of Practice and Procedures, By Order of the Board of Oil, Gas and Mining.

Mine Name: Devil's Slide Mine Plan Date: _____

File No.: ACT/029 / 001 Date Received: _____

Operator: Ideal Basic Industries, Inc. DOGM Lead Reviewer: _____

Mineral(s) to be Mined: Limestone and Sandstone

Please attach other sheets as needed and include cross-reference page numbers when used.

1. Name of Applicant or Company: Ideal Basic Industries, Inc.
   Corporation (X) Partnership ( ) Individual ( )

2. Address: Permanent: Ideal Basic Industries, Inc.
   Devil's Slide Plant
   ~~Temporary~~: Auxiliary Route #3
   Morgan, Utah 84050

3. Company Representative: Name: Mr. L. B. Giles
   Title: Plant Manager
   Address: Same as above Phone: (801) 829-6821

4. Location of Operation: County(ies) Morgan

Township(s):	4N	Range(s):	3E	Section(s):	24
Township(s):	4N	Range(s):	4E	Section(s):	19
Township(s):		Range(s):		Section(s):	

5. Owner(s) of record of the surface area within the land to be affected:

Name:	Ideal Basic Industries, Inc.	Address:	950 - 17th Street P.O. Box 8789
Name:		~~Address~~:	Denver, Colorado 80201-8789
Name:		Address:	
Name:		Address:	

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6. Owner(s) of record of the minerals to be mined:

Name:	Ideal Basic Industries, Inc.	Address:	950 17th St., P.O. Box 8789
Name:		Address:	Denver, CO 80201-8789
Name:		Address:	
Name:		Address:	

7. Owner(s) of record of all other minerals, including oil and gas, within any part of the land to be affected:

Name:	U.P. Railroad (coal & iron)	Address:	
Name:	U.S. Government (precious metals)	Address:	
Name:		Address:	

8. Have the above owners been notified in writing? ( ) Yes, (X) No. If no, why not? Not required - mining has been continously active since 1907.

9. Have you or any other person, partnership or corporation associated with you received an approval of a Notice of Intention to Commence Mining Operations by the State of Utah for operations other than described herein? (X) Yes, ( ) No. If yes, list all approval numbers now under surety:

ACT/045/012

10. Source of Operator's legal right to enter and conduct operations on the land to be covered by this Notice: Fee simple ownership of surface and minerals being mined.

11. Give the names and mailing addresses of every principal Executive, Office, Partner (or person performing a similar function) of Applicant:

	Name	Title	Address
A.	Mr. Thomas E. Bronson	Chairman, President & CEO	950 17th St., Denver, CO 80201-8789
B.	Mr. Fred W. Cohrs	Ex. Vice President	950 17th St., Denver, CO 80201-8789
C.	Mr. T. F. Gamble	Vice Pres. Utah Div.	P.O. Box 477, Salt Lake City, UT 84110
D.			

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12. Has the Applicant, any subsidiary or affiliate or any person, partnership, association, trust or corporation controlled by or under common control with the Applicant, or any person required to be identified by Item 11 ever had an approval of a Notice of Intention to Mine or Explore withdrawn or has surety relating thereto ever been forfeited? ( ) Yes, (XX) No.

If yes, please explain: _____

_____

_____

_____

_____

_____

Please note: Section 40-8-13 of the Act provides that information relating to the location, size or nature of the deposit, and marked confidential by the Operator, shall be protected as confidential information by the Board and the Division and not be a matter of public record in the absence of a written release from the Operator, or until the mining operation has been terminated as provided in Subsection (2) of Section 40-8-21 of the Act. This material should be so marked and included on separate cross-referenced sheets.

13. All maps and plans prepared for submission shall be of adequate scale and detail to show topographic features and clearly indicate the following details:

A. Location and delineation of the extent of the land previously affected, as well as the proposed surface disturbance.
B. Existing active or inactive, underground or surface mined areas.
C. Boundaries of surface properties, including ownership.
D. Names and locations of:
   (1) Lakes, rivers, streams, creeks and springs.
   (2) Roads, highways and buildings.
   (3) Active or abandoned facilities.
   (4) Transmission lines within 500 feet of the exterior limits of land affected.
   (5) Gas and/or oil pipelines.
   (6) Site elevation.
E. Drainage patterns of land affected:
   (1) Overburden or topsoil removal and storage areas.
   (2) Areas susceptible to erosion.
   (3) Natural waterways.
   (4) Constructed drainages, diversions, berms and sediment ponds (design calculations shall be included).
   (5) Receiving waters (State Health classification).
   (6) Directional flow of all surface waters (indicated by arrows).
F. Known drill holes:
   (1) Location.
   (2) Status.

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(3) Depths and thicknesses of:*
   a. Water bearing strata.
   b. Mineral deposits.
   c. Toxic or potentially toxic materials.
   d. Surficial or plant supporting material (topsoil and subsoil).

G. Locations of disposal and stockpile areas:
(1) Topsoil and subsoil storage areas.
(2) Overburden storage area.
(3) Waste, tailings, rejected materials.
(4) Raw ore stockpile(s).
(5) Tailings-ponds and other sediment control structures.
(6) Discharge points, water effluents (see #15[D]).

All maps should have a color code or other suitable legend used in preparation to clearly indicate surface features of the land affected. A general reference map completed on a 7.5 (1:24,000) USGS quadrangle sheet is recommended with additional large scale maps included for practical delineation of individual facilites, (e.g., 1:200, 1:500).

14. Acreage to be disturbed:

A. Minesite (operating, storage, disposal areas, etc.): 148.5
B. Access/haul roads/conveyors: 15.8
C. Associated on-site processing facilities: ~25

15. Describe mining method to be employed, including:

A. Mining sequence:
(1) Map delineating the yearly sequential disturbance (if surface mine) and/or surficial disturbance.
(2) Narrative (including on-site processing or mineral treatment):
See Section II

Attach supplemental sheets and/or diagrams as necessary with cross reference to page number here: See Attachment #3

*Stratigraphic or lithologic logs if correlated to footage depths may be presented when labeled (maps or logs should be labeled confidential, if so desired).

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B. If sedimentary deposit seam(s): See Attachment #2
(1) Thickness(es):
(2) Dip:
(3) Outcrop:

C. Will any underground workings or aquifers be encountered? ( ) Yes, (X) No. If yes, describe potential impacts and protection measures to be taken:

D. Describe any active discharge or proposed discharge of water from mine or site area. Include water quality data and lab test reports. If attached sheets or reports are included, cross reference to page number here: See Appendix J

There is an existing discharge permit #000159 granted by the U. S. Environmental Protection Agency for discharge from the Plant. A recent monitoring report is included as Appendix J

16. Have all necessary water rights been appropriated? (X) Yes, ( ) No. How will water be obtained? Please explain:
Two wells located on Attachment #1. Also see Appendix D

17. Proposed or estimated duration of mining operation: 1907 to ~ 2066
Will the permit term be for a lesser amount of time, subject to review? (e.g., for surety estimate reasons). (X) Yes, ( ) No. If yes, how long?
5 Years

18. Describe the construction and maintenance of access roads including:
A. Procedures (drainage and erosion control methods).
B. Cross section(s).
C. Profile(s) of proposed road grade(s).

All roads are constructed and maintained in accordance with Mine Safety and Health Administration standards 30 CFR Part 56. See II. B

Attach supplemental diagrams and cross reference to page number here: See II. B.

19. Prior land use(s): Winter range for mule deer
Current land use(s): Winter range and mining
Possible projected or prospective future land use(s): Winter range

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20. Describe methods of tree and brush removal:
The minor amounts of brush are removed with the strip material.

Provide estimate of, and method of obtaining existing vegetation cover (%):
See Appendix H

What types of dominant vegetation are present? See Appendix H

Photographs and/or maps may be attached to these forms, cross reference to page number here: See Appendix H .

21. Soils (surficial plant supportive material) and overburden: Except where slope or rocky terrain make it impossible, all surficial materials suitable as a growth medium shall be removed, segregated and stockpiled according to its ability to support vegetation (as determined by soil analysis and/or practial revegetation experience) prior to any major excavation. (Suggested minimum requirements are the top six inches, or the "A" horizon, whichever is larger.)

A. What is the pH range of the soil before mining? 8.0 to 8.5
Name of person or agency and method of determining pH:
U. S. D. A. Soil Conservation Service
Attach lab report if available. Cross reference page number here: Appendix H Page 6

B. Average depth of topsoil and subsoil to be stripped and stockpiled:
See II. C . Calculated volume of soil to be stockpiled:
.

C. Describe the method for removing and stockpiling topsoil and subsoil, including measures to protect topsoil from wind and water erosion, compaction and pollutants: See II. C.

D. Describe the method for removing and stockpiling overburden. Describe and discuss the acidity or alkalinity (pH) or other characteristics which would affect revegetation: See II. A.

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E. Rock subjected to processing such as waste rock, tailings, etc., and which is to be disposed of on- or off-site must be subjected to a toxicity analysis. The method of determination, results and suitable disposal methods must be explained in detail, including means for containment and long range stability*: See II. F.

22. Describe the methods used to minimize public safety and welfare hazards during and after mining operations including:

A. Shaft, tunnel and drill hole closure.
B. Disposal of trash, scrap metal and wood and extraneous debris, waste oil and solvents, unusable buildings and foundations, sewage and other materials incident to mining.
C. Posting of appropriate warning signs and/or fences or berms to act as barriers (e.g., above highwalls) in locations where public access is available.

A. See II. A

B. See II. E.

C. The quarry area is fenced and warning signs are located at entrances.

*"Toxic" means any chemical or biological or adverse characteristic of the material involved which could reasonably be expected to negatively affect ecological or hydrological systems or could be hazardous to the public safety and welfare.

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23. Grading and soil redistribution.

A. Attach pre- and postmining contour cross sections, typical of regrading designs. Cross reference to page number here: See Attachment #3

B. Describe the method(s) of overburden replacement and stabilization and highwall elimination, including: (a) slope factors; (b) lift heights; (c) compaction; (d) terracing, etc., (e) also include testing procedures: See II. A. & II. D.

C. What method of spreading topsoil and subsoil or upper horizon material on the regraded area will be employed?
Some spreading of soil substitute is included in the Reclamation cost estimate. This is estimated using a D9L dozer. See Appendix B.

1. Indicate the approximate depth of soil cover after final surfacing Not yet determined inches.
2. What tests will be performed to adequately evaluate the potential of the soil to successfully support intended revegetation?
Soil tests and 5 test plots will be used to determine final revegetation. See Appendix H
3. What soil amendments or fertilizers will be needed as an aid to revegetation?
Type: Not yet determined Rate:
Type: Rate:
Type: Rate:
4. What additional surface preparations will be used? Describe (a) drainage, erosion and sediment control measures; (b) maximum slope characteristics; and (c) highwall reclamation.
See Section II.

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5. Describe methods which may be particularly applicable to waste disposal areas determined to be potential problem areas.

The kiln dust disposal area may require covering with soil substitute prior to revegetation. This will be determined from results of test plots.

D. Describe plans for either leaving or reclaiming the roads and pads associated with the operation.

Dee II. B.

24. Impoundments: All evaporation, tailings and sediment ponds; spoil piles, fills, pads and regraded areas shall be self-draining and nonimpounding when abandoned unless previously approved as an impounding facility by a lawful state or federal agency. In view of this, please describe the reclamation of all related areas in the operation and include pertinent items enumerated in C, 1-5 above.

All areas associated with the quarry will be regraded to prevent any water retention.

25. Revegetation plans:

A. What organization, agency or person will specifically be performing the revegetation? Not yet determined.

B. Will the affected area be subject to livestock or wildlife grazing? (XX) Yes, ( ) No. Will vegetation protection be needed to allow for a determination of the successful revegetation criteria outlined in the Mined Land Reclamation Act, Rule M-10(12)? ( ) Yes, (XX) No. If yes, what measures will the operator take?

C. Will irrigation be used? ( ) Yes, (XX) No. Type: _____. For how long? _____.

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D. Test plots initiated during the early stages of mine development provide good bases from which a successful revegetation program can be adapted for later implementation. Will test plots be employed? (X) Yes, ( ) No. If yes, describe on an additional sheet(s) and attach. Cross reference page number here and show location on facilities map: Attachment #4.

E. Please attach a revegetation plan and schedule including:
   1. Species to be used.
   2. Rate of seed application/acre.
   3. Season to be planted.
   4. Seedbed preparation techniques.
   5. Planting location, slope face direction, variability, method of application, covering, etc.
   6. Mulch and fertilizer application, if used.

F. Describe any other maintenance procedures which may be used, if needed, to guarantee successful revegetation:

Not yet determined.

26. Please provide a reclamation schedule including:

A. Estimated time for construction.
B. Estimated time for interim reclamation.
C. Estimated duration of the mining operation.
D. A time table for the accomplishment of each major step in the reclamation plans. Attach the schedule and cross reference to the page number here: See IV. B.

27. A surety guarantee must be provided for the mining operation (see Rule M-5 Mined Land Reclamation Act). In calculating this amount, the Division will consider the following major steps based on the information provided in this report:

A. Clean up and removal of structures.
B. Backfilling, grading and contouring.
C. Topsoil and subsoil redistribution and stabilization.
D. Revegetation (i.e., preparation, seeding, mulching, irrigation).
E. Labor.
F. Safety and fencing.
G. Monitoring, and reseeding if necessary.

To assist the Division, the operator may attach a list of costs and factors which would satisfy these areas. Substantiation of these factors, i.e., unit costs and how they are derived, should accompany the list. Cross reference the page number here: Appendix B.

28. A request for a variance from specific commitments to Rule M-10 (Reclamation Standards) of the Mined Land Reclamation Act may be submitted with adequate written justification. If after presentation of information adequately detailing the situation, a determination is made that finds a portion of the rule inapplicable, a variance may be granted by the Division.

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I hereby commit the applicant to comply with Rule M-10, "Reclamation Standards" in its entirety, as adopted by the Board of Oil, Gas and Mining on March 22, 1978.

The applicant will achieve the reclamation standards for the following categories as outlined in Rule M-10 on all areas of land affected by this mine, unless a variance is granted in writing by the Division.

Rule	Category of Commitment	Variance Requested?
M-10(1)	Land Use	
M-10(2)	Public Safety and Welfare	
M-10(3)	Impoundments	
M-10(4)	Slopes	
M-10(5)	Highwalls	
M-10(6)	Toxic Materials	
M-10(7)	Roads and Pads	
M-10(8)	Drainages	
M-10(9)	Structures and Equipment	
M-10(10)	Shafts and Portals	
M-10(11)	Sediment Control	
M-10(12)	Revegetation	See IV. B.
M-10(13)	Dams	
M-10(14)	Soils	

I believe a variance is justified on a site-specific basis for the previous subsections of Rule M-10 as indicated. A narrative statement explaining these concerns is attached.

STATE OF UTAH

COUNTY OF MORGAN

I, L. B. Giles, having been duly sworn depose and attest that all of the representations contained in the foregoing application are true to the best of my knowledge; that I am authorized to complete and file this application on behalf of the Applicant and this application has been executed as required by law.

Signed: L B Giles

Taken, subscribed and sworn to before me the undersigned authority in my said county, this 4th day of May, 1987.

Notary Public: Yvonne C. Sawatt

My Commission Expires: March 9, 1990

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PLEASE NOTE:

Section 40-8-13(2) of the Mined Land Reclamation Act provides for maintenance of confidentiality concerning certain portions of this report. Please check to see that any information desired to be held confidential is so labeled and included on separate sheets or maps.

Only information relating to the location, size or nature of the deposit may be protected as confidential.

Confidential Information Enclosed: ( ) Yes (X) No

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MINE MAPS

1. Maps must be clear and legible contour maps or recent aerial photos. The scale should be 1 inch = 500 feet to adequately show topographic features.

2. Map sheets should be of a reasonable size, not to exceed 48 inches on a side.

3. Maps must have a title block with:

   A. Map title.
   B. Name and address of permittee.
   C. Permit and amendment numbers.
   D. Annual report period.
   E. Scale, north arrow, contour interval, date of photography, etc.

4. All maps must show:

   A. Legal subdivisions.
   B. Permit area boundary clearly shown and labelled.
   C. Amendment areas clearly shown and labelled.
   D. Contour features.

5. The following features should all be clearly identified:

   A. Topsoil stockpiles (numbered and with volumes).
   B. Settling ponds and sediment control structures.
   C. Haul roads.
   D. Pits identified by location, name, number, etc.
   E. Ramps (numbered).
   F. Out-of-pit spoil dumps.
   G. All waste disposal sites including, but not limited to:
      1. Landfill sites.
      2. Carbonaceous waste dumps.
   H. Diversion ditches.
   I. Monitoring sites.

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12 September 1994

To: Mr. Gordon Stephens

From: K. George

Subject: Amendment To Mining Plan

The language in the mining plan, Section II., Part A., Paragraph Five should be amended to include the following language:

A sandstone raw material in quantities usually less than 15,000 tons per year is supplied from an adjacent small, quarry in the NE 1/4 of Section 24. Sandstone is loosened by blasting and dozed downward to a point on the north end of the ridge to a loading point on M.R. Wilde and Son's property adjacent to the quarry property. It is loaded there and transported to the primary crusher.

The language in the mining plan, Section II., Part A., Paragraph Eight should be amended to include the following language:

The primary Quarry 2 and 3 access road climbs up between the ridges at 7% to 9% grade and is also the haul road to the refuse dump. At the north border of the plant property, the road crosses on to M.R. Wilde and Son's property and proceeds to the sandstone loading area north of and adjacent to the plant sandstone property. This road is maintained by plant personnel and equipment and is used by agreement with M.R. Wilde and Sons. Various steeper special purpose minor roads to core drill sites and dozer trails between quarry operations and maintenance areas have been dozed through the years.

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I. INTRODUCTION

A. History

When the Rocky Mountains were formed, limestone beds in the Devil's Slide area were left with the bedding oriented almost vertical. Millions of years of erosion left limestone outcrops along the top of ridges. The variable hardness and quality of the several beds contributed to the exposed shape of the prominent feature called the Devil's Slide, where the Weber River cut through the ridges.

As portions of the exposed limestone were suitable for the manufacture of Portland Cement, a processing plant was provided and a quarry opened in 1907. A larger, modern cement plant was placed in operation in 1948.

The original quarry, later designated as Quarry 1, was opened to supply the plant with limestone. Some limestone reserves remain below the present Quarry 1 floor and will likely be quarried in the future. To improve safety and quality control, another quarry (Quarry 2) was opened in the mid-50's at the top of the same limestone ridge. The ridge to the west is similar, and Quarry 3 was opened on this ridge in 1965.

Enclosed as Attachment 1 is Facility Map #dcc-1340-1. This map shows the location of plant facilities, roads,

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transmission lines, waterways, drill holes, wells, and area topography. This map was developed from aerial photographs taken August 4, 1985 and is the base information for the majority of the maps in this submittal.

B. Geology

Enclosed as Attachment 2 is Geology Map #MF-290, "Geology of the Devil's Slide Quadrangle, Morgan and Summit Counties, Utah", published by the U. S. Geological Survey. This map shows the area geology including faults, fracture zones and stratigraphy.

Limestone 300 to 400 feet thick currently stands almost vertical, comprising the core of both ridges, and is sandwiched between claystones and siltstones on the ridge slopes. Designation of lithology and quarry operation is made more complex by fracturing, faulting, slumping, and folding. Form M-9 (Appendix A) has been completed for all exploratory drilling. The drill hole location is shown on the Facility Map #dcc-1340-1 (Attachment 1). There are no other exploratory drill holes planned at this time.

II. MINING METHOD

A. Mining Plan

The mining plan involves quarrying the limestone by dozing off of staged benches and loading into haul trucks

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for transport to the plant where it is processed into cement. Elevation dictates when quarry operations are required to establish a quarry floor base elevation and grade. This stage in the mining operation will release certain areas to be reclaimed. The sides of the quarry on the South end will be the first ready for reclamation and the Quarry Hollow side will be the first area to be seeded on Quarry 3. The reclamation of the quarry will then follow the mining operation in sequenced stages. See Section IV.

The following quantities are total tons quarried and stripped in 1984, 1985, and 1986. The majority of the stripped material has been placed in Quarry Hollow as shown on the Facility Map #dcc-1340-1 (Attachment 1).

	Limestone	Sandstone	Stripped
1984	491,400	15,700	159,800
1985	530,800	8,200	418,200
1986	487,100	6,500	164,400

The final configuration of Quarry 3 is shown on Quarry 3 Mine Plan #DD 204 (Attachment 3). This is a computer model of the quarry with the limestone removed and the stripped material placed in Quarry Hollow and Bone Yard Hollow. The angle of repose is approximately 35 degrees.

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The present mine plan is for the pit side slopes to be 45 degrees or less. Some areas of solid rock have been quarried to a vertical face. As mining continues and the quarry floor is lowered, slope studies may indicate that slopes steeper than 45 degrees are sufficiently stable. Until that occurs, all slopes will be 45 degrees or less, where possible, and existing slope stability procedures will be continued.

A sandstone raw material in quantities usually less than 15,000 tons per year is supplied from an adjacent small, rugged quarry in the NE 1/4 of Section 24. Sandstone is loosened by blasting and dozed downward to a point on the road system for truck haul to the primary crusher.

Coyote hole blasting is no longer used in the quarry operation. There are no existing holes and no safety problem is present. The mine safety requirements are governed and inspected by MSHA. The quarry operation complies with all requirements of Federal Register Volume 50, Number 19, dated January 29, 1985.

B. Roads

A basic level road system, about one mile in length extends from the primary crusher at the 5,335 ft. level of Quarry 1 floor westward past Quarry 3 to the sandstone

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quarry. This road is topped with crushed limestone and well maintained as an all-weather road. The roadway is 24 to 30 ft. in width, with wider areas where quarry materials are loaded for hauling to the crusher.

The primary Quarry 2 and 3 access road climbs up between the ridges at 7% to 9% grade and is also the haul road to the refuse dump. Minimum width of the haul portion is 15 feet, with individual roads to the quarries somewhat narrower in places. Various steeper special purpose minor roads to core drill sites and dozer trails between quarry operations and maintenance areas have been dozed through the years.

There are approximately 6.5 miles of access roads in the quarry area. All of these roads are in use (some more than others) for quarry operations. As the quarry contours change, the affected roads are relocated or eliminated as access requirements are modified. Nearly all of the roadways will need to remain in service during the life of the quarry and it is not anticipated that there will be a significant increase in the number of roads. The "Reclamation Cost Estimate" (Appendix B) includes the cost of reclamation for the roads.

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C. Top Soil

Very little soil exists in the quarry area. The soil is not recoverable due to the steep slopes and the mining procedures required. Brush cover is also very sparse and is removed with the strip material.

The soil substitute in the waste areas is comprised of fines and clay bands that are stripped during the mining. This soil substitute has been analyzed and will be studied as one of the test plots. This soil substitute, if feasible, will be used as necessary for covering the strip areas prior to revegetation.

D. Erosion Control

All fill areas have been placed and contoured with consideration to safety and erosion. To date, no serious erosion has occurred at any fill area. The kiln dust refuse area is discussed in Section II.

The quarry strip material in Bone Yard and Quarry Hollow is placed on the natural angle of repose (approximately 35 degrees). This has proven to be sufficient to prevent any washing due to the amount of rock and the wide gradation range providing a very stable slope. Additional stabilization is not required prior to

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reclamation due to the integrity of existing slopes and no evidence of washing or erosion.

The catch basins and emergency dams as discussed in Section III.B. are a major part of sediment control. See "Catch Basins and Test Plots" #dcc-1340-2 (Attachment 4). The road berms, as required by MSHA safety regulations, also direct minimal road runoff to a catch basin. Representatives of DOGM have visited the quarry and given recommendations on additions and improvements to the berm system. These suggestions are being implemented.

The existing roads have no culverts, cross-drains, or ditches. Runoff quantities have never occurred to cause any drainage problems. The roads are all built to MSHA regulations and well maintained by quarry operations.

E. Refuse

Trash and debris is removed from the plant area by contract with a private waste disposal company. The material is eventually placed in an approved land fill area.

The plant kiln dust collected by the electrostatic precipitators is being deposited in a refuse area between Quarry 2 and Quarry 3 as shown on the "Facility Map" #dcc-1340-1 (Attachment 1).

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A use for kiln dust to solidify hazardous wastes has recently been developed. A disposal company transports the dust to the disposal site near Knolls, Utah where it is mixed with or used to encase the hazardous material. It is anticipated that this market will grow and demands for kiln dust will increase for this application.

This normally dry, fine material contains partially calcined particles from the plant kilns that cause the whole to set similar to cement. Like cement, rainfall or the application of water is required to start the chemical action called set of hardening. The mass does not become as hard as cement, but does resist erosion. A complete chemical analysis and toxicity analysis of the kiln dust is included as Appendix C.

A small dike was provided immediately below the dust disposal area to assure containment of the material. The site has been so stable that no material has eroded to the emergency dike even during a 1.82 inch rainfall (greater than a 10 year storm) on February 17, 1986 and a 2.20 inch rainfall (a 100 year storm) on August 20, 1986. See Section III.B.

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III. HYDROLOGY

A. Underground

The water rights in Township 4 North, Range 3 East, Section 24, and Township 4 North, Range 4 East, Section 19 are included as Appendix D. The rights are owned by the plant and the sources are two wells located as shown on Attachment 1. The static water level is approximately 10 feet and varies several feet annually. There are no other water rights or known acquifers in the quarry area. To date, no ground water has been encountered in any exploratory drill hole.

B. Surface

The Drainage Plan #dcc-1581 (Attachment 5) shows the boundaries of the Quarry Hollow and Bone Yard drainages. It also shows the different hydrologic soil groups. The "Catch Basins and Test Plots" (Attachment 4) show the catch basins incorporated into the mining plan. The "Drainage Calculations" including catch basin capacity are included as Appendix E. These calculations show the theoretical storm runoff quantities, and catch basin capacity. The Quarry Hollow drainage acts very similar to a french drain due to the deposition of strip material from the Quarry and the larger rock at the toe of slope (see picture #3, Appendix F). The "french drain" capacity is approximately

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30% of the filled area which varies in depth from 25 to 30 feet. It provides the capacity to handle the runoff, decreases velocity and maximizes surface area contact to promote percolation.

The most significant consideration in analyzing the quarry drainage is that no significant runoff has ever occurred during the life of the mine. For example, on February 17, 1986 there was 1.82 inches of rainfall. See "Precipitation Data for Morgan" (Appendix G) by the Utah State Climatologist. This appendix also includes the February and August log sheets for the Morgan Weather Station. The storm lasted for several days, and in addition to the rainfall, the entire snowpack in the quarry area melted during this storm and added to the runoff. Morgan County received $400,000 damage to public facilities due to flooding and was declated a State and National Disaster Area. The ten year storm is 1.4 inches and the theoretical runoff for the two drainages in the quarry area is given in the "Drainage Calculations". This amount of runoff did not occur at anytime during or after the storm. The Bone Yard drainage had standing water (<1 inch) on the loading floors and flat areas during the worst of the storm. The emergency dike (catch basin #6) contained less than .02 acre feet (Approximately 400 sq. ft. of surface area). There was no significant flow and the standing water on the flat areas was absorbed in a very short time after the rain ceased.

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The Quarry Hollow drainage also showed a very high percolation rate. Above the quarry operation there occurred a small channel flow that came into the "french drain". After that point no surface flow occurred and it was evident that the flow was underground in the "french drain". At the bottom of Quarry Hollow on the haul road and the sandstone loading floor there was standing water (<1 inch) during the worst of the storm. It was possible at this time that some of the flow entering the "french drain" was surfacing next to the haul road. This was very slight, if at all, and difficult to determine amounts due to the standing water on the road. The theoretical flow as calculated did not occur and as stated, no flow occurred in Quarry Hollow in the quarry area.

On August 20, 1986, there was another heavy storm that confirmed the results of the February storm. A total of 2.20 inches of rain fell and the runoff conditions were nearly identical to the earlier storm with the exception that no water surfaced at the bottom of the Quarry Hollow "french drain" and no water was retained by the emergency dike in the Bone Yard drainage. This could be due to the different soil conditions than during the February storm when most of the ground was frozen.

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Pictures were taken on August 21, 1986 (approximately 2 hours after the storm) and have been included as Appendix F. Picture #3 shows the actual conditions of the Quarry Hollow "french drain". Picture #4 shows the bottom of Quarry Hollow and fill placed the day before for improvements to an access road. It is evident that the theoretical runoff did not occur as the loose fill was not disturbed. Picture #6 shows catch basin #3 which holds all the runoff from the Boneyard drainage. The amount of water retained was runoff from the haul road and this picture also shows the difference in the amount of sediment in the catch basin versus the amount in the adjacent Weber River upstream of the Quarry.

IV. RECLAMATION

A. Earthwork

Earthwork required for reclamation includes leveling roads, grading strip areas, and construction of peak flow channels from the two watersheds. Grading strip areas should be minimal due to the side slopes being naturally covered with soil substitute as a result of the mining procedure. The re-grading was estimated assuming an an equivalent of 6 inches of material was spread over the area to be revegetated. See Appendix B.

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Peak flow channels will also be constructed as a part of final reclamation. These channels will allow runoff to leave the Quarry Hollow and Bone Yard drainages in a 50 year, 6 hour event and prevent any erosion. The channels will be lined with an 8 inch filter blanket and a 12 inch well sorted mixture of rip rap with a D50 of 7 inches. See Appendix E.

B. Revegetation

The "Revegetation Plan" (Appendix H), was prepared by the Morgan County Office of the USDA Soil Conservation Service. The plan includes a plant survey, seed mixes, rates of seeding, soil analysis, planting techniques, and fertilizer requirements.

The "Revegetation Plan" has analyzed the quarry area by soil types and "Range Sites". The main objective of the reclamation is to return the area to original vegetation with other beneficial introduced species. The pre-mining use of the land was mainly winter range for mule deer. By re-seeding the original grasses and shrubs and adding introduced grasses as recommended, the post-mining use as winter range would be greatly improved. The final analysis of test plots and determination of the best seed mixes and application procedures will determine the final revegetation plan.

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Test plot #2 was prepared and seeded October 31, 1986. See "Test Plot #2 Data Sheet", Appendix I. The results will be analyzed in 1987 and 1988. This data will be used with the data from other test plots to finalize a revegetation plan for reclamation.

Ideal requests exception to revegetation of solid rock outcrops. These outcrops existed before mining began. This area is mainly the pit area and is outlined on the "Reclamation Plan" (Attachment 6). An outline of revegetation areas is also located on this attachment. The following is a list of the area types and acres for each area shown on the "Reclamation Plan":

Area	Acres
Affected Area	390.0
Disturbed Area	148.5
Rock	69.8
Revegetation	78.7

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C. Schedule

The following is an approximate schedule of reclamation milestones:

Test Plots 1 & 2	1986-1988
Test Plots 3 & 4	1995
Start Strip Areas	2000
End Quarry Operations	2080
Complete Quarry Reclamation	2081

D. Demolition

The structures and improvements installed within the affected area will be the responsibility of Ideal to demolish and/or remove prior to abandonment. The quarry garage and powder house are the only major structures presently involved. There is a definite possibility that these facilities will be used after the abandonment of the adjacent quarries and limestone is obtained from other claims.

E. Cost Estimate

The Reclamation Cost Estimate (Appendix B) is an estimate of all costs associated with reclamation of the quarry area assuming quarry operation closed in 1991. This will establish the amount of surety for the next 5 year period as requested. The references used in the estimate are "Means Site Work Cost Data", "Caterpillar Performance

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Handbook", and contractors quotations. The majority of the quarry area is in the Mountain Gravelly Loam (UT32) range site and the recommendations for this site in the Revegetation Plan (Appendix H) were used in estimating revegetation costs.

APPENDIX A

STATE OF UTAH, DEPARTMENT OF NATURAL RESOURCES, DIVISION OF OIL, GAS AND MINING
355 WEST NORTH TEMPLE, 3 TRIAD CENTER, SUITE 350, SALT LAKE CITY, UTAH 84180-1203, TELEPHONE: (801) 538-5340

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MINERAL EXPLORATION DRILL HOLE PERMANENT ABANDONMENT FINAL REPORT FORM MR-9

PURSUANT TO THE TERMS OF RULE M-3(5) OF THE MINED LAND RECLAMATION ACT, ALL INFORMATION PROVIDED IN THIS REPORT SHALL BE PROTECTED AS CONFIDENTIAL INFORMATION BY THE DIVISION. THIS REPORT MUST BE FILED WITH THE DIVISION, AT LEAST ANNUALLY FOR EACH EXPLORATION PROJECT.

PROJECT NAME: Ideal Basic Industries, Devil's Slide

COUNTY: Morgan

DOGM EXPLORATION FILE # EXP/ /

DRILL HOLE ID NUMBER	LOCATION TOWNSHIP & RANGE	SEC.	1/4 SEC.	DRILLING MEDIUM*	HOLE DEPTH	METHOD OF PLUGGING*	DATE DRILLED	DATE RESEEDED
100	T4N,R4E	19	SW	N/A	763 Feet	1	Aug 16, 1966	
101	T4N,R4E	19	NW		431	1	Oct. 5, 1966	
102	T4N,R4E	19	NW		457	1	Jul 17, 1967	
103	T4N,R4E	19	NW		631	1	Sept 14, 1967	
105	T4N,R4E	19	NW		104	1	May 19,1978	
106	T4N,R4E	19	NW		474	1	June 6, 1978	
L-1	T4N,R4E	19	NW		200	1	Oct 3, 1978	
L-2	T4N,R4E	19	NW		60	1	Oct 3, 1978	
L-3	T4N,R4E	19	NW		140	1	Oct 4, 1978	
L-4	T4N,R4E	19	NW		100	1	Oct 4, 1978	
L-9	T4N,R4E	19	NW		200	1	Oct 6, 1978	

*SEE LAST PAGE FOR GENERAL PLUGGING MEDIUM TYPES AND PLUGGING PROCEDURES.

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STATE OF UTAH. DEPARTMENT OF NATURAL RE .CES. DIVISION OF OIL. GAS AND MINING
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MINERAL EXPLORATION DRILL HOLE PERMANENT ABANDONMENT FINAL REPORT FORM MR-9

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PROJECT NAME: Ideal Basic Industries, Devil's Slide

COUNTY: Morgan

DOGM EXPLORATION FILE # EXP/ /

DRILL HOLE ID NUMBER	LOCATION TOWNSHIP & RANGE	SEC.	1/4 SEC.	DRILLING MEDIUM*	HOLE DEPTH	METHOD OF PLUGGING*	DATE DRILLED	DATE RESEEDED
1	T4N,R4E	19	NE	N/A	280 Feet	1	1953	
1A	T4N,R4E	19	SE		1000 Feet	1	1953	
2	T4N,R4E	19	NE		296	1	1953	
3	T4N,R4E	19	SE		196	1	1953	
104	T4N,R4E	19	NE		595	1	May 15, 1969	
L-5	T4N,R4E	19	NE		120	1	Oct 4, 1978	
L-6	T4N,R4E	19	NE		20	1	Oct 4, 1978	
L-6A	T4N,R4E	19	NE		200	1	Oct 5, 1978	
L-7	T4N,R4E	19	NE		100	1	Oct 5, 1978	

*SEE LAST PAGE FOR GENERAL PLUGGING MEDIUM TYPES AND PLUGGING PROCEDURES.

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APPENDIX B

RECLAMATION COST ESTIMATE

	Operation	Amount	Rate	Cost
	A. CLEANUP			
1.	Removal of structures and equipment	Lot		$ 2,000
2.	Removal of trash and debris	Lot		500
3.	Leveling of ancillary facilities, pads, and access roads	51 hrs Dozer	140	7,140
	B. RE-GRADING AND RE-CONTOURING			
1.	Earthwork including haulage & grading of spoils, waste & overburden	129 hrs Dozer	140	18,060
2.	Re-contouring of highwalls and excavations	-		
3.	Spreading of soil or surficial materials	Incl. in B.1.		
	C. STABILIZATION			
1.	Soil Preparation, scarifications, fertilizations, etc.	Incl. in C.2.		
2.	Seeding and planting	78.7 Ac.	600	47,220
3.	Construction of terraces, waterbars, etc.	Lot		11,850
	D. LABOR			
1.	Supervision	120 hrs	30	3,600
2.	Labor exclusive of dozer time	80 hrs	20	1,600
	E. SAFETY			
1.	Erection of fences, portal coverings, etc.	-		
2.	Removal or neutralization of explosive or hazardous mat'ls.	-		
	F. MONITORING			
1.	Continuing or periodic monitoring, sampling, and testing deemed necessary	5 trips	200	1,000
	G. OTHER			
	TOTAL			$92,970

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RECLAMATION COST ESTIMATE CALCULATIONS

A.1. Powderhouse and Garage

(15 X 15 X 8)/27 + (25 X 33 X 12)/27 = 433 cu. yd.

433 cu. yd. X $4.60/cu. yd. = $1,992

A.2. Trash and Debris

100 cu. yd. X $4.85/cu. yd. = $485

A.3. Road Leveling

6.5 miles X 5,280 ft./mi. X 20 ft. X 1 ft./27 = 25,422 cu yd

25,422 cu. yd./494 cu. yd./hr = 51 hrs

B.1.&3. Grading Strip Areas

78.7 acres X 43,560 sq. ft./acre X 0.5 ft./27 = 63,485 cu yd

63,485 cu. yd./494 cu. yd./hr = 128.5 hours

C.1.&2. Preparation, Seeding, and Planting

$600/acre quote by Green Valley Reclamation

C.3. Channels (See Appendix D)

Earthwork 1,154 cu. yd. X $1.50/cu. yd. = $1,730

Rock (Filter & Rip Rap) 920 ton X $11/ton = $10,120

Total Earthwork and Rock = $11,850

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IDEAL

CATERPILLER D9L DOZER
OPERATING COST ESTIMATE

Fuel	17.0 gal./hr. @ $1.00/gal.		
Cost/Hr.			$17.00
Lube, Oil, Filters			$0.54
Undercarriage			
Basic Factor		$12.50	
Impact	0.2		
Abrasiveness	0.1		
"Z"	0.2		
Total	0.5		
Cost/Hr.			$6.25
Repair reserve			
Basic Factor		$10.00	
Extended Life Multiplier	1.10		
Cost/Hr.			$11.00
Special Wear Items			$2.50
Operator Wage			$18.00
Total Operator Cost/Hr.			$55.29
Owning Cost/Hr.			$41.00
Total O & O Cost/Hr.			$96.29
Contractor OH&P @ 45%			$43.33
Total Cost/Hr.			$139.62

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CATERPILLER D9L DOZER PRODUCTION

Production - 250'	690 cu. yd./hr.
Correction Factors	
Operator - Avg.	0.750
50 Min./Hr.	0.830
Favorable Grade	1.150
Total Correction Factor	0.716
CORRECTED PRODUCTION	494.040 cu yd/hr

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APPENDIX C

KILN DUST ANALYSIS

Sample #	86-276	86-277	86-278	87-18
Date of Sample	05/01/86	05/06/86	05/12/86	01/17-18/87
Cement Type	V	II	I	I
% SiO2	15.79	15.49	15.43	16.67
% Al2O3	3.71	3.65	3.53	3.70
% Fe2O3	2.61	2.08	2.08	1.33
% CaO	47.65	45.84	45.59	46.37
% MgO	2.09	2.12	2.09	2.40
% SO3 (Total)	3.06	4.38	3.80	3.75
% Na2O	0.48	0.61	0.58	1.06
% K2O	3.23	4.68	4.24	4.46
% Loss	20.40	20.39	21.76	19.92
% TiO2	0.17	0.19	0.14	0.17
% ZnO	0.04	0.09	0.08	0.03
% Mn2O3	0.04	0.03	0.03	0.03
% SrO	0.03	0.04	0.04	0.03
% P2O5	0.11	0.11	0.11	0.12
Total	99.59	99.70	99.49	100.04
% Free Lime	6.95	5.81	6.04	6.92
% Na2O *	0.28	0.43	0.37	0.58
% K2O *	2.40	3.70	3.27	3.26
% SO3 *	1.55	2.73	3.02	2.31
% Na2O Equivalent *	1.86	2.87	2.52	2.73

EP Toxicity Procedure (ppm)

		EPA Maximum Concentration				
As	ppm	5.0	0.002	0.001	0.002	<0.001
Ba	ppm	100.0	0.930	0.750	1.060	1.070
Cd	ppm	1.0	0.050	0.050	0.050	0.050
Cr	ppm	5.0	0.320	0.210	0.230	0.280
Pb	ppm	5.0	0.790	0.720	0.660	0.700
Hg	ppm	0.2	0.006	0.004	0.008	0.004
Se	ppm	1.0	0.002	0.001	0.001	0.001
Ag	ppm	5.0	0.090	0.090	0.080	0.080

* Note: Water Soluble Extract

March 11, 1987
IBI Production and Quality Services

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APPENDIX D

WATER RIGHTS

WUCNO: 35-8288 APPLICATION/CLAIM NO.: CERT. NO.: RUN DATE: 07/17/86 Page 1

OWNERSHIP**********

NAME: Union Portland Cement Company INTEREST: 100
ADDRESS:
CITY: STATE: UT ZIP CODE:

LAND OWNED BY APPLICANT? Yes

DATES, ETC.**********

Filing: 00/00/0000 Priority: 00/00/1883 Advertise Paper: Date: 00/00/0000 Protested? Approval: 00/00/0000
Proof Due: 00/00/0000 Ext Filed: 00/00/0000 Elec/Proof: Filed: 00/00/0000 Cert. or WUC Issued: 00/00/0000
Rej, Etc.: 00/00/0000

PD Book No. Status/Type of Right: DEC Source of Info: Map: Date Verified: 00/00/0000 Initials:
PD REMARKS REFERENCE -- Name: Interest: Flow: Type of Right: Priority: Source:

LOCATION OF WATER RIGHT**********

FLOW: 0.38 cfs SOURCE: Spring and Lost Creek
TRIBUTARY 1: Weber River TRIBUTARY 2:
COUNTY: Weber COMMON DESCRIPTION: DRAINAGE AREA: Weber River

POINTS OF DIVERSION -- SURFACE:
(1) N 1450 ft. W 1050 ft. from SE corner, Section 19, T 4N, R 4E, SLBM
Diverting Works: Pipeline Source: Lost Creek
(2) N 1800 ft. W 1200 ft. from SE corner, Section 19, T 4N, R 4E, SLBM
Diverting Works: Pipeline Source: Spring and Lost Creek

USES OF WATER RIGHT**********

CLAIMS USED FOR PURPOSE DESCRIBED: 286, 288
Referenced To: Claims Groups: Type of Reference -- Claims: Purpose: Remarks:

###IRRIGATION

	---NORTH EAST QUARTER---				*---NORTH WEST QUARTER---*				*---SOUTH WEST QUARTER---*				*---SOUTH EAST QUARTER---*				Section
Tot Irr. Acrg.: 10.00*	NE	NW	SW	SE *	NE	NW	SW	SE *	NE	NW	SW	SE *	NE	NW	SW	SE *	Totals
or a Total of .00 acres.				Sole Supply:				acres	Diversion Limit:								PERIOD OF USE: 03/01 TO 11/01

Point of diversion is in Secs. 19 & 20 T4N, R4E,SLB&M. Used to irrigate land inDevils Slide. Used for Irr. Dom.Stk. Used to irrigate 10 acs. of lawn.

###STOCKWATERING: 6 Equivalent Livestock Units Diversion Limit: PERIOD OF USE: 01/01 TO 12/31

###DOMESTIC: 400 Persons Diversion Limit: PERIOD OF USE: 01/01 TO 12/31

OTHER COMMENTS**********

Weber River Decree No.288
Not for official Use
Proposed Determination No. 340.5a Pg. 119

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APPENDIX E

DRAINAGE CALCULATIONS

STORM RUNOFF:

Quarry Hollow

	Sq. In.	Sq. In.	Acres	CN	AcxCN
HeG	1.74	278,400	6	80	480
KrG	8.44	1,350,400	31	80	2,480
LHG	20.94	3,350,400	77	80	6,160
StG	54.47	8,715,200	200	70	14,000
Rock	12.81	2,049,600	47	30	1,410
Total	98.40	15,744,000	361	68 *	24,530

Boneyard

HeG	9.60	1,536,000	35	80	2,800
StG	10.97	1,755,200	40	70	2,800
KrG	16.08	2,572,800	59	80	4,720
Refuse	3.59	574,400	13	97	1,261
Rock	27.17	4,347,200	100	30	3,000
Total	67.41	10,785,600	247	59 *	14,581

*Weighted CN

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CATCH BASINS:

Basin #	Depth	Width	Length	Volume Ft 3 X 1,000	Ac. Ft.
Quarry Hollow					
1	5	30	200	30.0	0.69
Bone Yard					
2	3	50	50	7.5	0.17
3	5	100	150	75.0	1.72
4	15	20	50	15.0	0.34
5	20	120	120	24.0	0.55
6	35	350	270	450.0	10.33
7	10	70	110	12.8	0.29
Total				584.3	13.40

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PEAK FLOW:

Assumptions

1. Precipitation 6 hour storm duration

10 year = 1.4"
50 year = 2.0"
100 year = 2.2" From Miller, et. al.

2. Type B Storm Distribution

	Hydraulic Length*	Elevation Change	Time of Concentration**
Quarry Hollow	1.924 miles	1,350 ft.	0.344
Boneyard	1.242 miles	790 ft.	0.255

Discharge***	Q 10 yr. 6 hour	Q 50 yr. 6 hour	Q 100 yr. 6 hour
Quarry Hollow	6.5 cfs	23.0 cfs	35.9 cfs
Bone Yard	<1.0 cfs	5.9 cfs	8.4 cfs

* From Attachment #5
** Kirpitch-s formula
*** SCS CN Methodology as in NEH4

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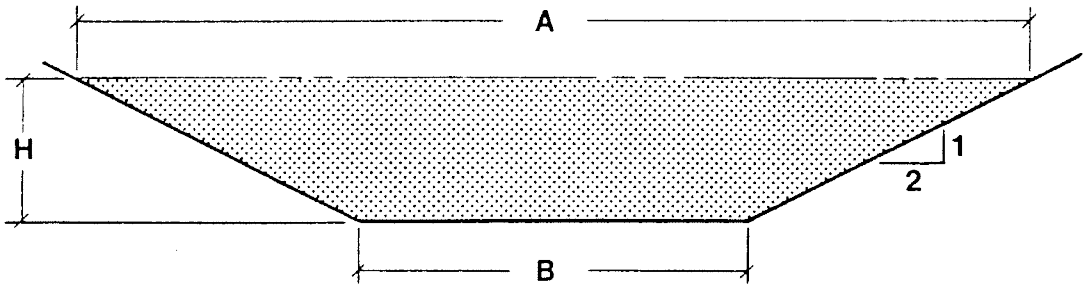
CHANNEL DESIGN:

Assumptions

1. Channel to have trapezoidal cross section with 2:1 side slopes.
2. Slope * S = 80/1,000 Quarry Hollow
   S = 110/400 Bone Yard
3. Roughness Coefficient ** N = 0.04

Quarry Hollow

B	H	A	Area	Wetted Perim.	R**	V**	Q
4'	8"	6.66'	3.56 Sq. Ft.	6.96'	.51	6.74 fps	24 cfs



V = 6.74 fps D50 = 7" Rip Rap plus 8" Filter Blanket

Quarry Hollow Length = 80/Sin Tan -1 0.08 = 1,003 feet

Bone Yard Length = 110/Sin Tan -1 0.275 = 415 feet

Use same design for both watersheds: Total Length = 1,418 feet.

Earthwork: 28/12(57+169)/2/12/27 X 1,418 = 1,154 cu. yd.

Rock: 7 X 20/12/27 X 1,418 = 613 cu. yd. ~920 ton

* From Attachment 1
** Mannings Equation

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Morgan

APPENDIX G
PRECIPITATION DATA FOR MORGAN
UTAH STATE CLIMATOLOGIST

Monthly Precipitation

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1981	.57	.66	2.44	.72	3.36	.77	.20	.11	1.04	3.47	.92	3.04	
1982	2.14	1.19	3.48	2.32	1.00	.55	2.14	.30	7.13	1.34	1.80	1.24	
1983	1.18	2.75	3.04	0.13	2.64	1.56	.75	2.12	1.05	2.25	3.71	5.76	
1984	.37	1.01	.97	2.01	2.40	3.06	1.76	1.44	3.01	3.12	3.03	1.29	
1985	.32	.92	1.99	.58	2.95	.74	.30	t	2.08	1.81	4.33	.98	
1986	1.66	6.88	2.04	4.50									

Greatest 24 hr. Precip. and Date

	Amt	Date	Amt	Date	Amt	Date	Amt	Date	Amt	Date	Amt	Date	Amt	Date	Amt	Date	Amt	Date	Amt	Date	Amt	Date
1981	.24	30	.26	26	.48	30	.23	19	.79	21	.41	3	.08	24+	.04	21+	.55	5	.90	16	.26	25	.64	30
1982	.40	1	.33	23	.33	4	1.02	12	.55	19	.28	7	.81	28	.10	27	1.61	10	.30	5	.85	19	.31	23
1983	.51	28	.87	8	.44	14	.76	25	.82	11	.76	1	1.36	9	.47	19	.82	27	.47	10	.65	13	1.25	7
1984	.10	26+	.52	16	.25	14	.46	9	.80	31	.96	5	.97	25	.87	16	1.32	6	.92	17	1.14	8	.28	19+
1985	.18	8	.25	20	.73	12	.38	22	1.07	10	.50	25	.13	30	.00	31	.58	12	1.02	7	.75	12	.34	3
1986	.52	6	1.87	17	.66	8	1.04	2																

RECORD OF RIVER AND CLIMATOLOGICAL OBSERVATIONS

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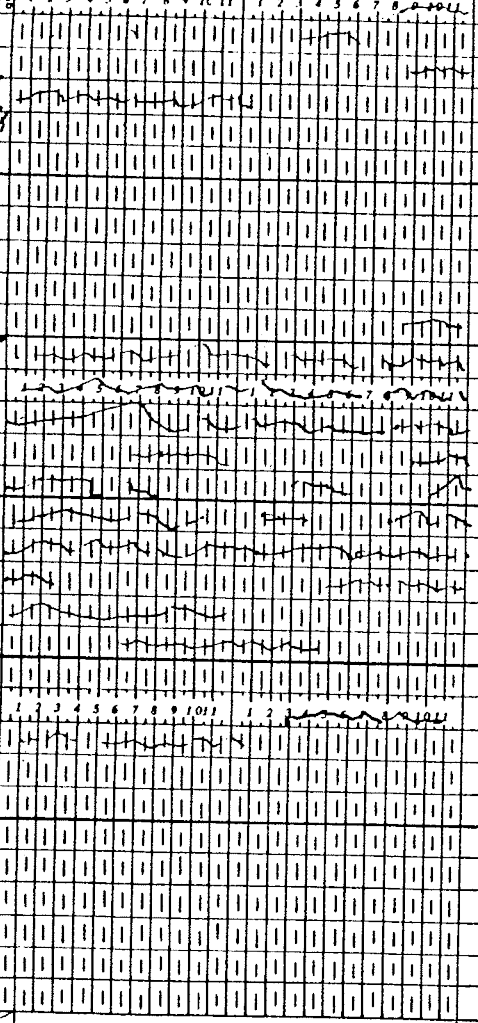
TIME (local) OF OBS: 4PM | TION RIVER | TEMP. 6PM: Morgan | PRECIPITATION 6PM | STANDARD TIME IN USE

TYPE OF RIVER GAGE | ELEVATION OF RIVER GAGE ZERO Ft. | FLOOD STAGE Ft. | NORMAL POOL STAGE Ft.

DATE	TEMPERATURE F. 24 HRS. ENDING AT OBSERVATION MAX.	MIN.	AT OBSN.	PRECIPITATION 24-HR AMOUNTS Rain, melted snow, etc. (inches and hundredths)	Snow, ice pellets, hail (inches and tenths)	At Ob. Snow, ice pellets, hail, ice on ground (inches)
1	39	25	36	.09		
2	45	26	39	T		
3	49	34	37	.47	8"	6"
4	42	32	32	T	T	5"
5	36	9	29			
6	35	17	25			
7	36	7	24			
8	38	12	26			
9	29	-6	24			
10	38	2	33			
11	34	19	29	.11	2"	4"
12	30	3	31	.06	1	4
13	42	20	40	1.49	3	4
14	45	29	41	.03	T	3
15	50	29	49	.23		1
16	48	34	42	.33		1
17	56	35	42	1.82		0
18	55	42	52	.21		0
19	54	33	45	.76		
20	47	33	35	.43	1"	1"
21	43	25	28	.06	2"	0
22	47	32	40	.09		0
23	50	36	45	.29		0
24	65	31	34			
25	65	29	58			
26	69	32	57			
27	63	30	59			
28	62	38	58			
29						
30						
31						
SUM				6.88	17"	
				Greatest		

Draw a straight line (——) through hours precipitation was observed, and a waved line (~~~) through hours precipitation probably occurred unobserved.

A.M. NOON P.M.



WEATHER (Calendar Day) — Mark 'X' for all types occurring each day.

DATE	Fog	Ice Pellets	Glaze	Thunder	Hail	Damaging Winds	Time of observation if different from above
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							
31							
SUM	Fog	Ice Pel.	Glaze	Thund.	Hail	Dam. Winds	

RIVER STAGE

DATE	CONDITION	GAGE READING AT ___ A.M.	TENDENCY
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			

REMARKS (Special observations, etc.)

Rain
Rain
Snow
"

Snow
"
" Rain
" Rain
Rain
Rain
Rain
Rain
Rain
Rain Snow
Snow
Rain
Rain

CONDITION OF RIVER AT GAGE

A. Obstructed by rough ice.
B. Frozen, but open at gage.
C. Upper surface of smooth ice.
D. Ice gorge above gage.
E. Ice gorge below gage.
F. Shore ice.
G. Floating ice.
H. Pool stage.

CHECK BAR (For wire-weight) NORMAL CK. BAR

READING	DATE

OBSERVER: Robert D Brinkley

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STATION INDEX NO.: 42 [illegible]

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TYPE OF RIVER GAGE | ELEVATION OF RIVER GAGE ZERO Ft. 6PM | 6PM | FLOOD STAGE Ft. | NORMAL POOL STAGE Ft.

RECORD OF RIVER AND CLIMATOLOGICAL OBSERVATIONS

TEMPERATURE F.			PRECIPITATION					WEATHER (Calendar Day)								RIVER STAGE			
24 HRS. ENDING AT OBSERVATION			24-HR AMOUNTS		At Ob.	Draw a straight line (——) through hours precipitation was observed, and a waved line (~~~) through hours precipitation probably occurred unobserved.		Mark 'X' for all types occurring each day.							Time of observation if different from above	CONDITION	GAGE READING AT ___A.M.	TENDENCY	REMARKS (Special observations, etc.,)
MAX.	MIN.	AT OBSN.	Rain, melted snow, etc. (ins. and hundredths)	Snow, ice pellets, hail (ins. and tenths)	Snow, ice pellets, hail on ground (ins.)	A.M.	NOON P.M.	Fog	Ice Pellets	Glaze	Thunder	Hail	Damaging Winds						
91	45	85																	
92	47	87																	
92	50	86																	
96	50	88																	
92	50	87																	
93	48	86																	
92	50	88	T																
88	56	83	.16																Rain Rain
91	49	84																	
92	52	86																	
90	45	88																	
89	45	86	.04																Rain
86	47	80																	
85	41	81																	
87	39	82																	
94	40	88																	
95	49	89																	
96	45	87																	
92	58	88																	
90	58	90	.13																
91	55	75	2.30																Rain 1' 11
81	54	77	.04																
87	52	79	.01																
81	53	77																	
86	50	85																	
95	52	84																	
96	50	87																	
89	54	79	.01																
83	53	78																	Rain
85	52	81	.05																
86	53	86																	Rain
		SUM	2.64																
		Greatest																	

CHECK BAR (For wire-weight) NORMAL CK. BAR

READING	DATE

Fog	Ice Pel.	Glaze	Thund.	Hail	Dam. Winds	SUM

OBSERVER Robert Bradley

SUPERVISING OFFICE

STATION INDEX NO. 0

TION OF RIVER AT GAGE

structed by rough ice.
en, but open at gage.
per surface of smooth ice.
gorge above gage.
E. Ice gorge below gage.
F. Shore ice.
G. Floating ice.
H. Pool stage.

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UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

P.O. Box 840 , Morgan , Utah 84050 April 23, 1986

Gordon Stephens, Quarry Supervisor
Ideal Basic Industries, Cement Division
Devils Slide Plant
Auxiliary Route No.3
Morgan , Utah , 84050

Dear Mr. Stephens:

Attached is the original and two copies of the report you requested on the cement plant property at Devils Slide. I talked to James Leatherwood, soil scientist, and Lynn Kunzler, biologist, with the Utah State Department of Natural Resources as to the material needed in the report. They indicated the material should include a plant life survey, recommendations for test plot seed mixes, and a soil sample analysis with fertilizer recommendations. This report should cover these subjects.

I apologize for taking so long to get this material to you. If there is any additional information we can supply let us know.

Sincerely,

Wendell Petterson

Wendell Petterson

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IDEAL BASIC INDUSTRIES, CEMENT DIVISION - DEVILS SLIDE

This report consists of a plant life inventory, a potential plant life community, test plot plant varieties, and fertilizer recommendations for rehabilitation of disturbed areas. There are four soils associated with the area being studied. These soils are delineated on the attached soils map as LHG, Lithic Haploxerolls 40-80% slopes, KrG, Kilfoil Rock Outcrops 40-60% slopes, StG, St. Marys-Hoskins cobbly loam 30-50% slopes, and HeG Henefer loam, 40-60% slopes. Mining operations had been or were being carried out on a portion of the site at the time the soil survey field work was done. These areas were mapped as quarries. It is evident that the quarried portion was either KrG, Kilfoil Rock Outcrop 40-60% slope, or LHG , Lithic Haploxerolls, prior to the beginning of the quarry operations.

Each of the soils shown on the attached Soil Survey Map #46 is also a designated "Range Site". These range sites are range-land ecosystems and are determined by a number of factors including climate, soils, and topography. One range site may include several different soil mapping units. The three range sites described in this report cover the study area for the Ideal Basic Cement Plant at Devils Slide, Morgan County, Utah.

Soils and their assigned "Range Sites" are as follows:

Soil Symbol	Soil Name	Range Site
LHG	Lithic Haploxerolls- Rock Outcrop complex 40-80% slopes	Mountain Shallow Loam UT38
KrG	Kilfoil-Rock outcrop complex 40-60% slopes	Mountain Gravelly Loam UT32
StG	St.Marys-Hoskins cobbly Loam, 30-50% slopes	Mountain Gravelly Loam UT32
HeG	Henefer Loam,40-60% slopes	Mountain Loam UT35

Range Site Description - Mountain Shallow Loam UT38

The climate of this site is cool and quite humid with cold snowy winters and warm dry summers. The average annual precipitation is about 20 inches. Distribution of the precipitation is about 55 to 60% during the plant dormant period (October to March). This is the most dependable supply of moisture for plant growth. Lower precipitation and high evapotranspiration rates during July, August, and September causes slowing down in growth of all plant species and dormancy in most grasses and forbs.

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Plants begin to grow from April to May. The grasses have a dormancy period from July 15 to August 15, but grasses may green up again in September when fall rains occur. Shrub species grow until frost though at a reduced rate during the summer months. Optimum growth period is during June. Frost-free period varies from 70 to 130 days.

The dominant native vegetation aspect of this site is that of shrubs. The composition by annual air dry weight is approximately 50% grasses, 5% forbs, and 45% shrubs.

Plant species not a part of the climax community that are most likely to invade the site if plant cover deteriorates through overgrazing or mechanical disturbance are: cheatgrass, annual forbs, houndstongue, knotweed, mulesear dock, mullein, mustard, musk thistle, big sagebrush , and yellowbrush.

Field evaluation of the range plant community for this range site, using SCS Utah-2 procedures, determined this area to be in "Good" condition. This procedure uses percent of climax vegetation present, current erosion, and stand for the site to determine the condition rating. Based on clippings of 61 plots in this range site in good condition, annual yields of air dry vegetation from 600 to 1400 pounds per acre are produced. The variation depends largely on variable climatic factors.

Dominant plants for this range site are:

Common Name	Percent Composition
Bluebunch Wheatgrass	25%
Antelope Bitterbrush	15%
Muttongrass	10%
Basin Wildrye	5%
Nevada Bluegrass	5%
Big Sagebrush	5%

On-site evaluations noted that on both the Mountain Shallow Loam and Mountain Gravelly Loam range sites areas which had been disturbed were initially invaded by plants of sunflower, Musk thistle, Russian thistle, Ground cloud, and Rubber rabbitbrush.

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Range Site Description - Mountain Gravelly Loam UT32

The climate of this site is cool and quite humid with cold snowy winters and warm dry summers. The average annual precipitation varies from 16 to 22 inches with an average of around 19. Distribution is 55 to 60% during the plant dormant period (October to March) This is the most dependable for plant growth. Lower precipitation and high evapo-transpiration rates during July, August and September causes slowing down in growth of all plant species and dormancy in most of the grasses and forbs.

Plants begin to grow from April 15 to May 1. The grasses have a dormancy period from July 15 to August 15, but grasses may green up again in September when fall rains occur. Shrub species grow until frost though at a reduced rate during summer months. Optimum growth period is during June. Frost free period varies from 80 to 130 days.

The vegetation of this site is a browse aspect and consists of about 25% shrubs, 60% grasses, and 15% forbs. No tree species are present but Gambel oak and curlleaf mountainmahogany become tall shrubs on this site.

Plant species not a part of the climax community that are most likely to invade the site if plant cover deteriotates through overgrazing or mechanical [redacted] disturbance are cheatgrass, annual forbs, houndstounge, flannel mullein, rubber rabbitbrush, and snakeweed.

Field evaluation of the range plant community for this range site determined this area to be in "Good" condition. Based on actual clippings in this range site in "Good" condition, annual yields of air dry vegetation from 500 to 1700 pounds per acre,with an average of 1325 pounds , are produced.

Dominant plants for this range site are:

Common Name	Percent Composition
Bluebunch Wheatgrass	30%
Birchleaf mountainmahogany	15%
Nevada Bluegrass	12%
Muttongrass	10%
Longtongue muttongrass	5%

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Range Site Description - Mountain Loam (Oak) UT35

This site occurs on gentle to steep mountain slopes and ridges with slopes mostly 30-50%. Exposures are predominantly north and east. The climate is cool and quite humid with cold snowy winters and warm dry summers. Average precipitation is about 19 inches with 55 to 60% falling during the plant dormant period (October to March). This is the most dependable supply for plant growth. Lower precipitation and high evapotranspiration rates during July , August and September causes slowing down in growth of all plant species and dormancy in most of the grasses and forbs.

Plants begin to grow from April 15 to May 1. The grasses have a dormancy period from July 15 to August 15, but grasses may green up again in September when fall rains occur. Shrub species grow until frost though at a reduced rate during the summer months. Optimum growth period is during June. Frost free period varies from 70 to 130 days.

The dominant aspect of the plant community is shrubs with Gambel oak being the primary species. The composition is approximately 25% grasses, 10% forbs, and 65% shrubs by annual air dry weight.

Plant species not a part of the climax plant community that are most likely to invade if plant cover deteriorates are:cheatgrass, annual forbs, dandelion, houndstongue, Utah juniper, rubber rabbitbrush, and snakeweed.

Field evaluation of the range plant community for this range site determined this area to be in "Good" condition. Average annual production of air dry vegetation of this range site in "Good" condition is about 1650 pounds per year but may vary from 1,000 to 3,000 pounds per acre because of climatic variables.

Dominant plants for this range site are:

Common Name	Percent Composition
Gamble oak	25%
Bluebunch Wheatgrass	10%
Bearded Wheatgrass	6%
Bigtooth Maple	5%
Mountain Snowberry	5%
Serviceberry	5%
Utah Snowberry	5%

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Seeding Recommendations for Revegetation

The dominant grass species for all three range sites is Bluebunch Wheatgrass. Other native species of grasses include Muttongrass, Nevada Bluegrass, Bearded Wheatgrass, and Basin Wildrye. Major forb species consist of Arrowleaf Balsamroot, Aster, Daisy, and Goldenrod. The dominant shrub species are Antelope Bitterbrush, Birchleaf Mountainmahogany, Mountain Snowberry, Gambel Oak, Serviceberry, and Bog Sagebrush.

Additional species of introduced grasses and forbs are also adapted to these sites and could be used in a revegetation program. These species would include Paiute Orchardgrass, Crested Wheatgrass(Hycrest),Tall Wheatgrass, Small Burnet, Lewis Blue-flax, and Sweetclover.

Adapted Species for Trial Seeding Plots

Species	Seeds per/lb.	Seeding Rate
1. Whitmar Bluebunch Wheatgrass	117,000	Drilled-8# p/a Broadcast- 12# p/a
2. Basin Wildrye	130,000	Drilled-4# p/a Broadcast-6# p/a
3. Tall Wheatgrass	79,000	Drilled - 8# p/a Broadcast- 12# p/a
4. Hycrest-Crested Wheatgrass	175,000	Drilled - 7# p/a Broadcast-10# p/a
5. Pauite Orchardgrass	654,000	Drilled-3# p/a Broadcast - 5#p/a
6.Small Burnet	55,000	Drilled-2# p/a Broadcast-3# p/a
7. Lewis Flax	293,000	Drilled - 1# p/a Broadcast- 1# p/a
8. Sweetclover(yellow)	260,000	Drilled-2# p/a Broadcast-3#p/a
9. Antelope Bitterbrush	15,000	1-2Lbs p/a covered with 1/4" soil -Fall
10.Mountain Snowberry	76,000	Propogate in nursery for field planting
11. Birchleaf Mountainmahogany	59,000	1-2lbs p/a covered with 1/4" soil-Fall

Drilled seedings on the flatter slopes and hydro-seeding on steeper embankments is preferred. If broadcast method is used the seed will need to be covered with some type of mechanical operation.

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Fertilizer Recommendations

Five test plots were sampled and analyzed for phosphorus and potassium content, salinity, and pH. Nitrogen fertilizer recommendations are generally based on crop and fertilizer history of prior years. A valid test for nitrogen content requires special sampling procedures which in this case we do not feel are justified. An application of 20-40 pounds of available nitrogen per acre for all sample areas will assist in establishing new seedings. Potassium content of all five samples appears to be adequate. Phosphorus content in all samples are below recommended levels. The table below indicates fertilizer levels and recommended application rates.

Plot No.	N-Nppm	P-ppm	K-ppm	pH
1.				
Present	-	2.6	122	8.0
Recommend	20-40 lbs.p/a	45lbs.p/a	Adequate	-
2.				
Present	-	7.8	over 400	8.5*
Recommend	20-40 lbs.p/a	25lbs.p/a	Adequate	-
3.				
Present	-	1.8	116	8.2
Recommend	20-40 lbs.p/a	45 lbs.p/a	Adequate	-
4.				
Present	-	5.0	131	8.1
Recommend	20-40 lbs.p/a	40 lbs.p/a	Adequate	-
5.				
Present	-	1.4	132	8.2
Recommend	20-40 lbs.p/a	45 lbs.p/a	Adequate	-

* At this sample salinity level this pH value indicates a probable sodium problem.

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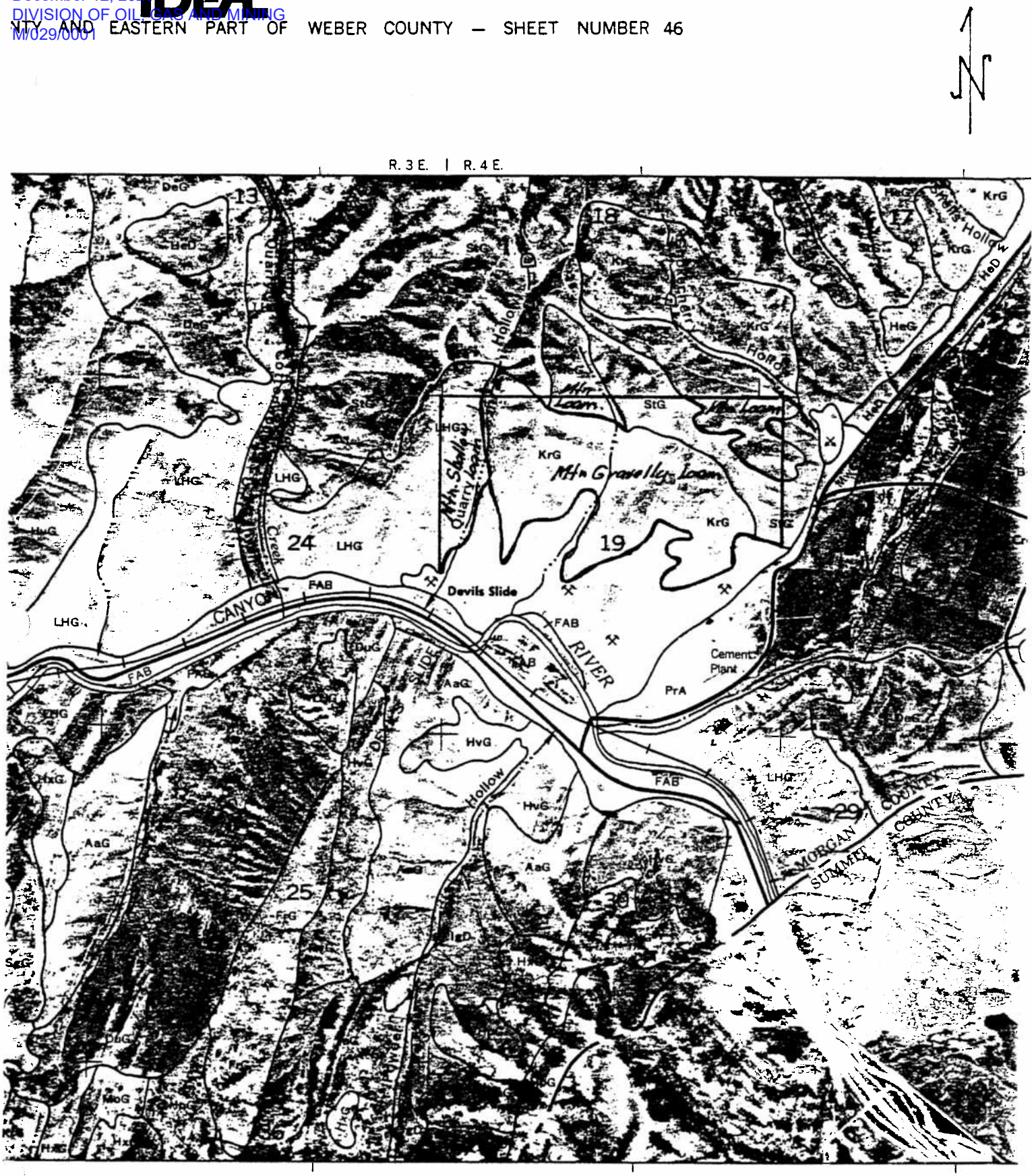
NITY AND EASTERN PART OF WEBER COUNTY — SHEET NUMBER 46



1 2 Miles

5000 10000 Feet

Scale 1:24000

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APPENDIX I

Test Plot #2 Data Sheet

Planting Date:	October 31, 1986
Planting Method:	Hydroseeded
Number of Acres:	1
Planted by:	Green Valley Reclamation
Seed Provided by:	NPI (Small Burnet and Paiute Orch. by SCS)

Seed Mix:

Variety	Pounds PLS
Whitmar Beardless Bunch Wheatgrass	18.74
Tall Wheatgrass	13.33
Nordan Crested Wheatgrass	10.20
Magnar Basin Wildrye	6.52
Paiute Orchard Grass	6.46
Yellow Blossom Sweetclover	3.19
Birchleaf Mt. Mahogany (hand planted)	1.50
Bitterbrush (hand planted)	1.50
Small Burnet	4.00

Additives:

Type	Pounds
Fertilizer:	
IFA 0-44-0	50
IFA 34-0-0	50
Tacifier:	
AZ-Tac	40
Mulch:	
Weyerhauser Silva Fiber	1500

A «Holderbank» Group Company

ITTE[illegible]E/AD[illegible]S (In[illegible] ADDENDUM

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)

DISCHARGE MONITORING REPORT (DMR)

Form Approved
OMB No. 2060-0015

NAME Ideal Basic Industries, Inc.
ADDRESS Auxiliary Route #3
Morgan, Utah 84050

FACILITY Devils Slide
LOCATION

(2-16) PERMIT NUMBER: Utah-0000159
(17-19) DISCHARGE NUMBER: 002

MONITORING PERIOD

	YEAR	MO	DAY		YEAR	MO	DAY
FROM	86 (18-21)	10 (22-23)	01 (24-25)	TO	86 (26-27)	12 (28-29)	31 (30-31)

NOTE: Read instructions before completing this form.

PARAMETER (32-37)		(3 Card Only) QUANTITY OR LOADING (46-53) AVERAGE	(54-61) MAXIMUM	UNITS	(4 Card Only) QUALITY OR CONCENTRATION (38-45) MINIMUM	(46-53) AVERAGE	(54-61) MAXIMUM	UNITS	NO. EX (62-63)	FREQUENCY OF ANALYSIS (64-68)	SAMPLE TYPE (69-70)
Total Flow	SAMPLE MEASUREMENT	.299		MGD						1/90	Inst.
	PERMIT REQUIREMENT		.300								
Total S. S.	SAMPLE MEASUREMENT				1	1	3	mg/L		1/30	Grab
	PERMIT REQUIREMENT					25					
p H	SAMPLE MEASUREMENT				6.7	6.8	7.0	Units		1/90	Grab
	PERMIT REQUIREMENT				6.5		9.0				
Oil and Grease	SAMPLE MEASUREMENT				0	0	0	mg/L		1/30	Grab
	PERMIT REQUIREMENT						10				
Temp	SAMPLE MEASUREMENT				-	15	-	C.		1/90	Grab
	PERMIT REQUIREMENT						21				
Total Res $C/_2$	SAMPLE MEASUREMENT				0	0	0	mg/L		1/90	Grab
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER

L. G. Giles, Plant Manager
TYPED OR PRINTED

I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN; AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION, I BELIEVE THE SUBMITTED INFORMATION IS TRUE, ACCURATE AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT. SEE 18 U.S.C. § 1001 AND 33 U.S.C. § 1319. *(Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between 6 months and 5 years.)*

SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

TELEPHONE: AREA CODE 801, NUMBER 829-6021

DATE: YEAR 87, MO 01, DAY 07

COMMENT AND EXPLANATION OF ANY VIOLATIONS *(Reference all attachments here)*

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DIVISION OF OIL, GAS AND MINING
M/029/0001

2. Cooperative Agreements/Memoranda of Understanding:

The Division of Oil, Gas and Mining (Division) will cooperate with other state agencies, local governmental bodies, agencies of the federal government, and private interests in the furtherance of the purposes of the Utah Mined Land Reclamation Act. The Division is authorized to enter into cooperative agreements and develop memoranda of understanding with agencies in furtherance of the purposes of the Act. The objective is to minimize the need for operators to undertake duplicative, overlapping, excessive, or conflicting procedures.

3. Operator Responsibilities, Compliance with other Local, State and Federal Laws:

The approval or acceptance of a complete notice of intention shall not relieve an operator from his responsibility to comply with the applicable statutes, rules, regulations, and ordinances of all local, state and federal agencies with jurisdiction over any aspect of the operator's mining operations, including, but not limited to: Utah State Division of Water Rights, the Utah Department of Business Regulation, the Utah State Industrial Commission, the Utah Department of Environmental Quality, the Utah Division of State History, the Division of Forestry, Fire and State Lands, The School and Institutional Trust Lands Administration, the Utah Division of Wildlife Resources, the U. S. Fish and Wildlife Service, the United States Bureau of Land Management, the United States Forest Service, the United States Environmental Protection Agency, and local county or municipal governments.

4. Division Guidelines, Operator Assistance in Application Preparation:

Each operator who conducts mining operations on any lands within the state of Utah is responsible for compliance with the following rules. The Division shall provide guidelines to aid the operator in complying with the rules.

R647-1-103. General Rules.

The following are general rules for statewide application.

R647-1-104. Violations and Enforcement.

If after notice and hearing, the Board finds that a violation of the Act, these rules, a notice of intention, or a Board or Division order has occurred, the Board may take any enforcement action authorized by law including requiring: compliance, abatement, mitigation, cessation of operations, a civil suit, forfeiture of surety, reclamation, or any other lawful action.

R647-1-105. Forms.

The attached forms are intended for the convenience of the operator and the Division, and may be changed from time to time. The forms are not part of these rules and use of a particular form, though encouraged, is not required, as long as all of the necessary information is provided in a reasonable manner.

R647-1-106. Definitions.

"Act" means the Utah Mined Land Reclamation Act, enacted in 1975, as amended. (Section 40-8-1, et seq., UCA).

"Adjudicative proceeding" means an agency action or proceeding that determines the legal rights, duties, privileges, immunities, or other legal interests of one or more identifiable persons, including all agency actions to grant, deny, revoke, suspend, modify, annul, withdraw, or amend an authority,

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Appendix B

Maps, Drawings and Photographs (R647-4-105)

Five Star Engineers LLC
220 N 900 E
Hyde Park, Utah 84318
Tel: 435-881-5339
Issahamud@5starengineers.com

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December 12, 2025
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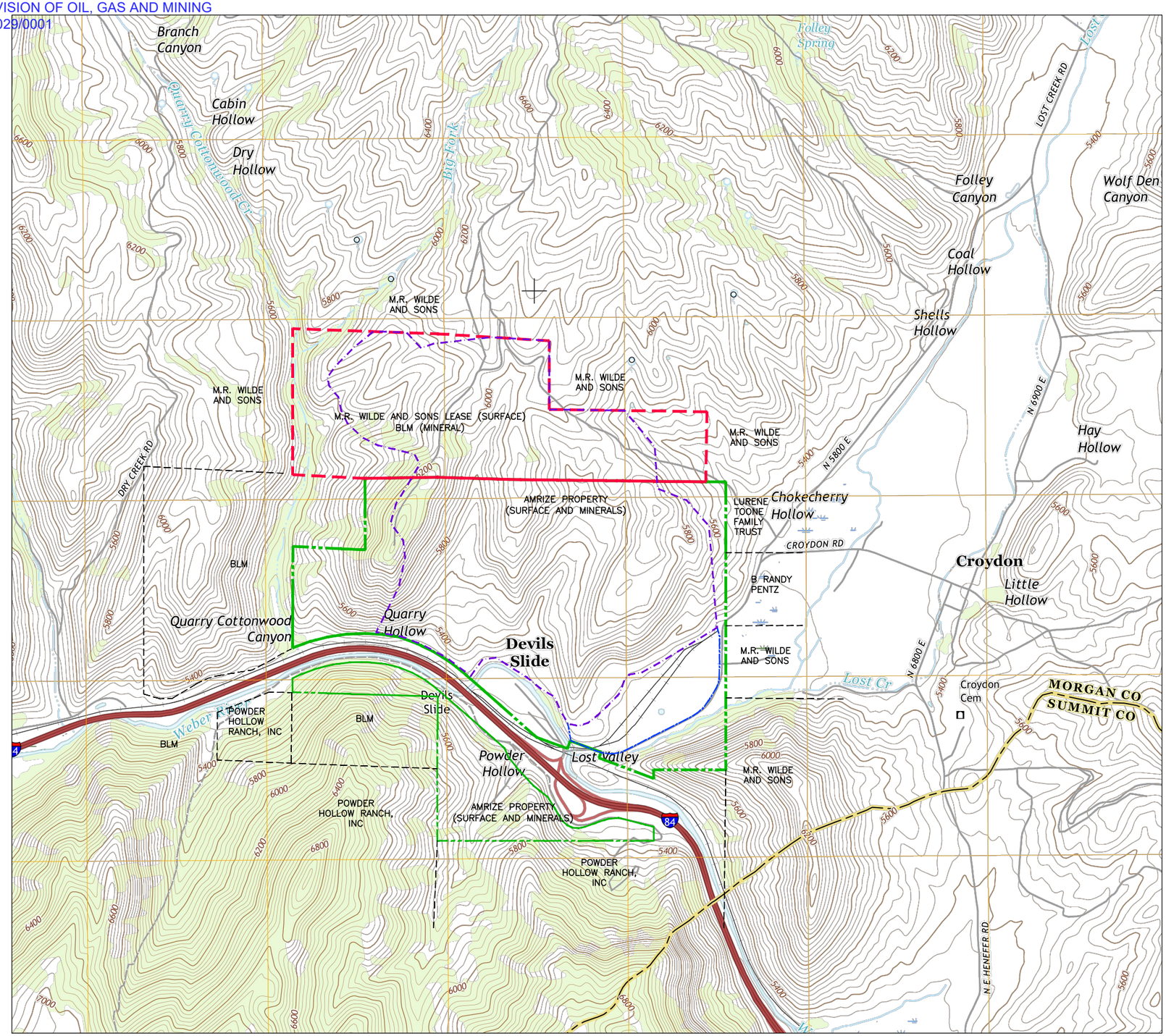
M/029/0001



0 2000 4000
SCALE OF FEET

LEGEND
- LEASE BOUNDARY
- PROPERTY BOUNDARY
- ADJACENT PROPERTY
- MINING BOUNDARY

NOTES:
1. DEVILS SLIDE, UTAH, USGS 7.5' TOPOGRAPHIC QUADRANGLE
2. UTAH 83 STATE PLANE UTAH NORTH US (ft)
3. 3 ALL PARCEL BOUNDARIES ARE APROXIMATE,

REVISIONS NO.	DATE	TITLE	BY
1	12/25	B NELSON & J VILLON	

FIVE STAR ENGINEERS, LLC
220 NORTH 900 EAST
HYDE PARK, UTAH 84318
435-881-5339

AMRIZE
6055 EAST CROYDON ROAD
MORGAN, UT 84050

DEVILS SLIDE UTAH
PROPERTY BOUNDARIES AND ADJACENT LAND OWNERS

DATE 10.13.2025
DESIGN I. Hamud
DRAWN A. Heck
CHECKED I. Hamud

SHEET NO.
105.1.11

PLOTTED DATE: Tuesday, 09 December 2025 - 7:00pm

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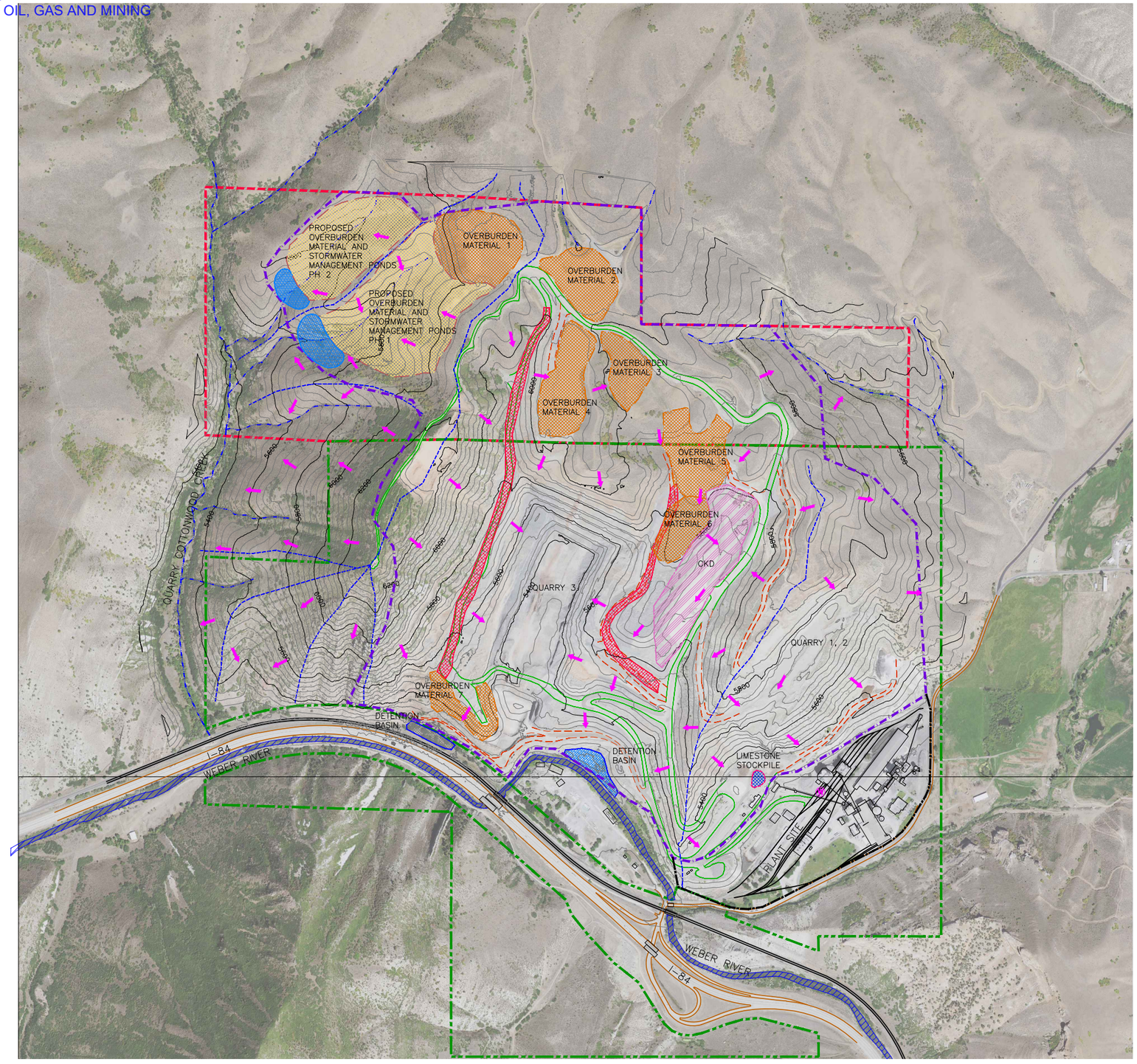
December 12, 2025
DIVISION OF OIL, GAS AND MINING
M/029/0001



0 1200 2400

SCALE OF FEET

LEGEND

- LEASE BOUNDARY
- PROPERTY BOUNDARY
- PLANT BOUNDARY
- MINING EXTENTS
- CKD BOUNDARY
- OVERBURDEN PILES
- STREAMS
- DRAINAGE BOUNDARIES
- DRAINAGE DIRECTION
- WELL
- WEBER RIVER
- PERMANENT CATCH BASIN
- PERMANENT FRENCH DRAINS
- LIMESTONE STOCKPILE

NOTES:

1. DEVILS SLIDE, UTAH, USGS 7.5' TOPOGRAPHIC QUADRANGLE
2. UTAH 83 STATE PLANE UTAH NORTH US (ft)
3. 3 ALL PARCEL BOUNDARIES ARE APROXIMATE,

REVISIONS			
NO.	DATE	TITLE	BY
1	12/25	B NELSON & J VILLON	

FIVE STAR ENGINEERS, LLC
220 NORTH 900 EAST
HYDE PARK, UTAH 84318
435-881-5339

AMRIZE
6055 EAST CROYDON ROAD
MORGAN, UT 84050

DEVILS SLIDE UTAH
EXISTING STREAM AND DRAINAGE FEATURES

DATE 10.13.2025
DESIGN I. Hamud
DRAWN A. Heck
CHECKED I. Hamud

SHEET NO.
105.1.12a

PLOTTED DATE: Tuesday, 09 December 2025 - 8:42pm

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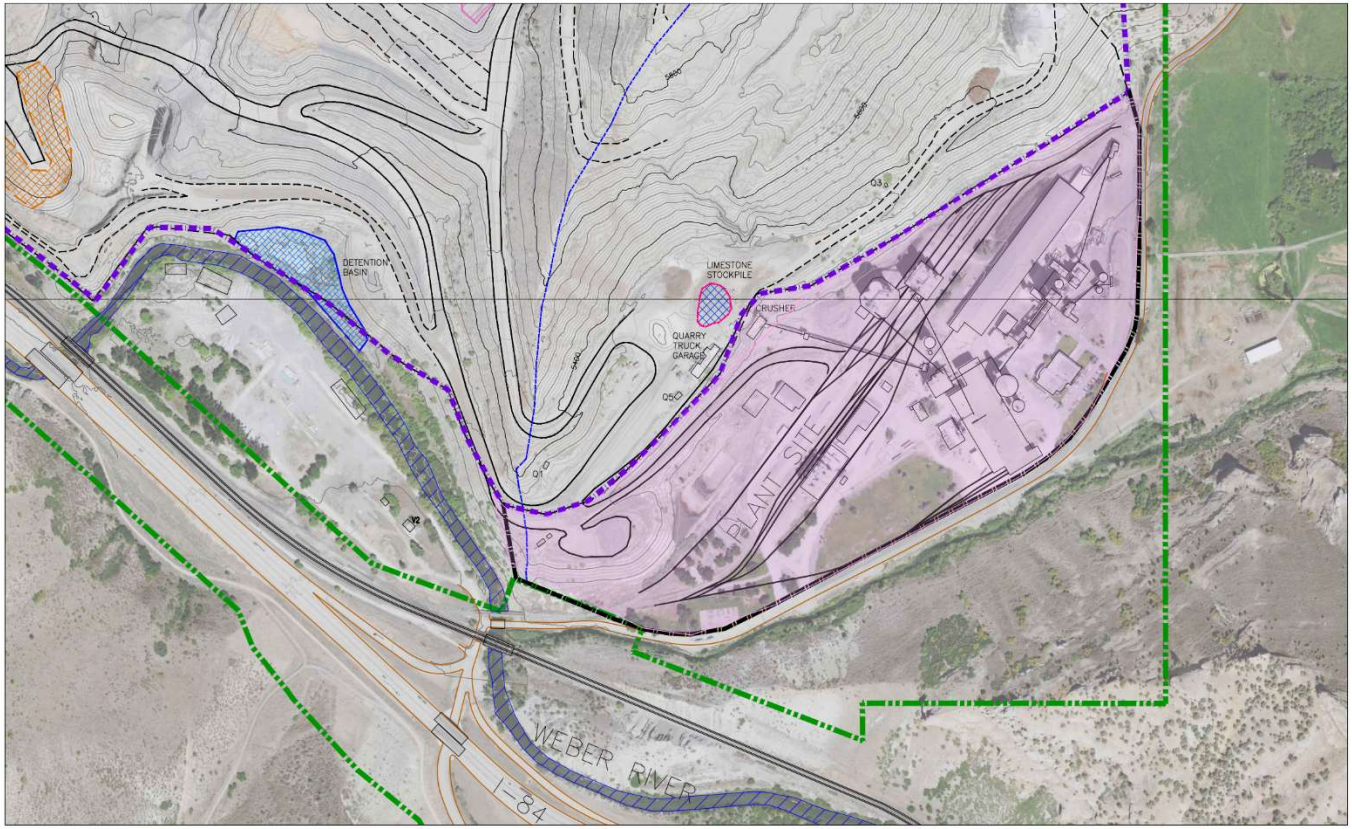
December 12, 2025
DIVISION OF OIL, GAS AND MINING
M/029/0001



Q1 – 36'X 14' Dirt floor
Q3 – 20' X 14' Dirt floor
Q5 – 34' X 22' Concrete floor
AJ – 164' X 44' Truck Shop concrete floor

0 500 1000
SCALE OF FEET

LEGEND
- LEASE BOUNDARY
- PROPERTY BOUNDARY
- MINING EXTENTS
- WEBER RIVER
- MINING FEATURES
- PERMANENT CATCH BASIN
- PLANT SIDE AND VILLAGE SITE
- LIMESTONE STOCKPILE

NOTES:
1. DEVILS SLIDE, UTAH, USGS 7.5' TOPOGRAPHIC QUADRANGLE
2. UTAH 83 STATE PLANE UTAH NORTH US (ft)
3. 3 ALL PARCEL BOUNDARIES ARE APROXIMATE.

REVISIONS

NO.	DATE	TITLE	BY
1	12/25	B NELSON & J VILLON	

FIVE STAR ENGINEERS, LLC
220 NORTH 900 EAST
HYDE PARK, UTAH 84318
435-881-5339

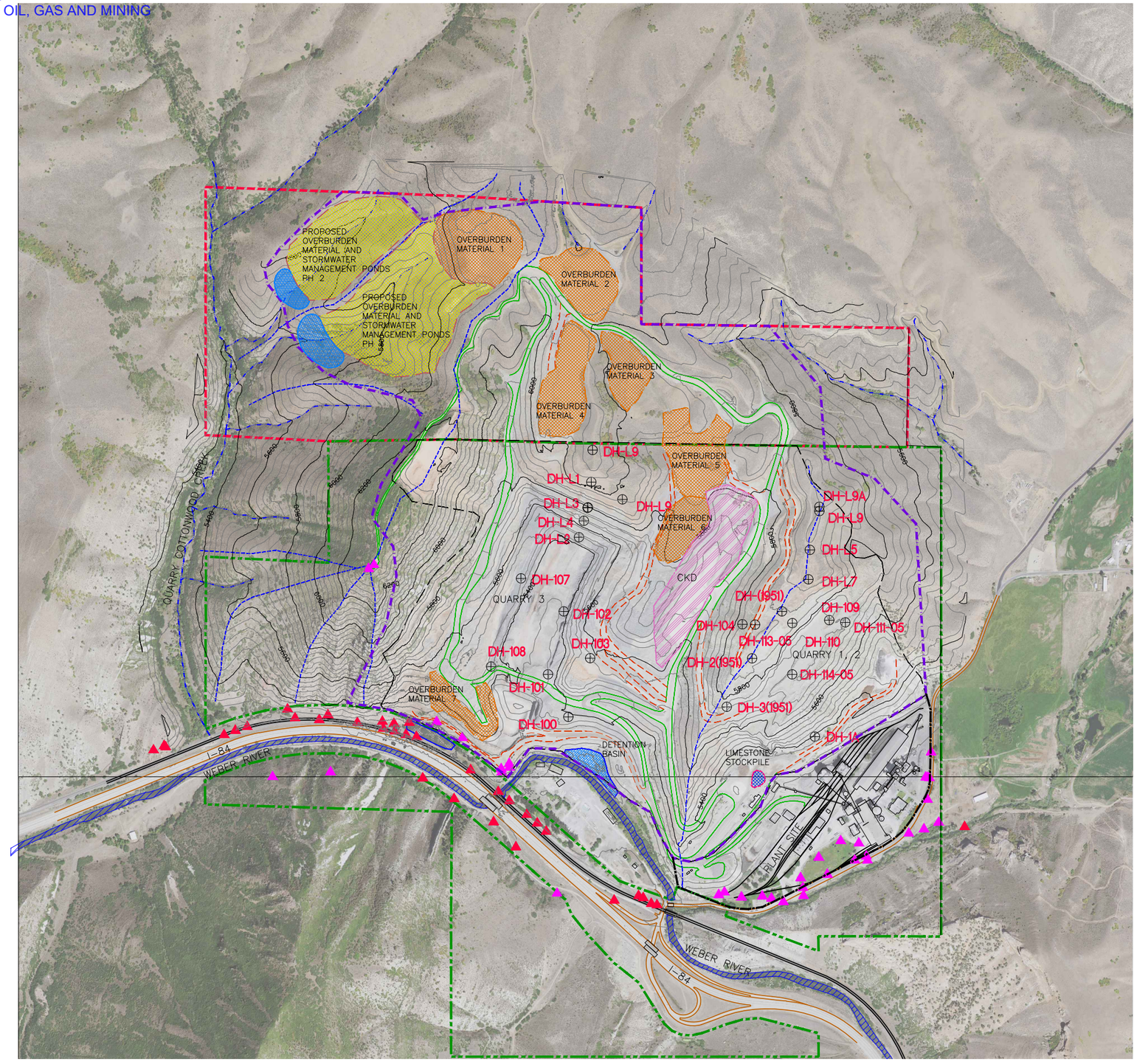
AMRIZE
6055 EAST CROYDON ROAD
MORGAN, UT 84050

DEVILS SLIDE UTAH
DEVIL'S SLIDE MINE
FACILITIES

DATE 10.13.2025
DESIGN I. Hamud
DRAWN A. Heck
CHECKED I. Hamud
SHEET NO.
105.1.12b

PLOTTED DATE: Tuesday, 09 December 2025 - 6:45pm

RECEIVED
December 12, 2025
DIVISION OF OIL, GAS AND MINING
M/029/0001



0 1200 2400

SCALE OF FEET

LEGEND

- LEASE BOUNDARY
- PROPERTY BOUNDARY
- MINING EXTENTS
- STREAMS
- CKD BOUNDARY
- OVERBURDEN PILES
- HIGHWAY (I84)
- MAJOR ROADS (PERMANENT)
- MINOR ROADS
- CKD
- OVERBURDEN MATERIAL
- OVERBURDEN MATERIAL (FUTURE)
- LIMESTONE STOCKPILE
- WEBER RIVER
- OFF SITE UTILITY POLE
- ON SITE UTILITY POLE
- DH-L9 BOREHOLES

NOTES:

1. DEVILS SLIDE, UTAH, USGS 7.5' TOPOGRAPHIC QUADRANGLE
2. UTAH 83 STATE PLANE UTAH NORTH US (ft)
3. 3 ALL PARCEL BOUNDARIES ARE APROXIMATE,

REVISIONS			
NO.	DATE	TITLE	BY
1	12/25	B NELSON & J VILLON	

FIVE STAR ENGINEERS, LLC
220 NORTH 900 EAST
HYDE PARK, UTAH 84318
435-881-5339

AMRIZE
6055 EAST CROYDON ROAD
MORGAN, UT 84050

DEVILS SLIDE UTAH

ROADS, OVERBURDEN, CKD, BOREHOLE LOCATION AND EXISTING UTILITY POLES

DATE 10.13.2025
DESIGN I. Hamud
DRAWN A. Heck
CHECKED I. Hamud

SHEET NO.
105.1.12c

PLOTTED DATE: Thursday, 11 December 2025 - 6:18pm

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December 12, 2025
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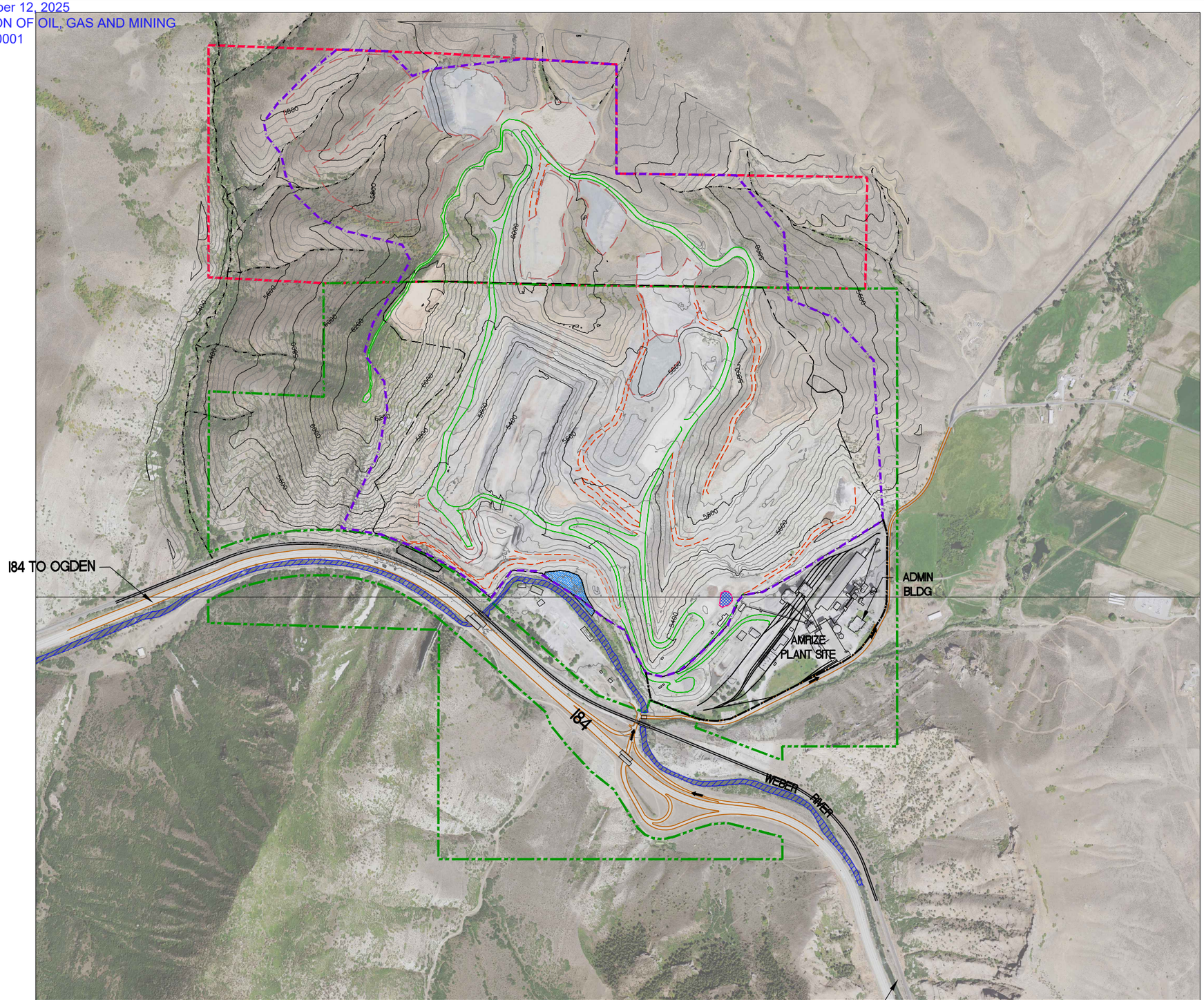

0 1200 2400

SCALE OF FEET

LEGEND

- LEASE BOUNDARY
- PROPERTY BOUNDARY
- MINING BOUNDARY
- HIGHWAY (I84)
- MAJOR ROADS (PERMANENT)
- MINOR ROADS
- WEBER RIVER

NOTES:

1. DEVILS SLIDE, UTAH, USGS 7.5' TOPOGRAPHIC QUADRANGLE
2. UTAH 83 STATE PLANE UTAH NORTH US (ft)
3. 3 ALL PARCEL BOUNDARIES ARE APROXIMATE,

REVISIONS NO.	DATE	TITLE	BY
1	12/25	B NELSON & J VILLON	

FIVE STAR ENGINEERS, LLC
220 NORTH 900 EAST
HYDE PARK, UTAH 84318
435-881-5339

AMRIZE
6055 EAST CROYDON ROAD
MORGAN, UT 84050

DEVILS SLIDE UTAH
ACCESS ROUTE TO MINING OPERATION

DATE 10.13.2025
DESIGN I. Hamud
DRAWN A. Heck
CHECKED I. Hamud

SHEET NO.
105.1.13

PLOTTED DATE: Tuesday, 09 December 2025 - 8:47pm

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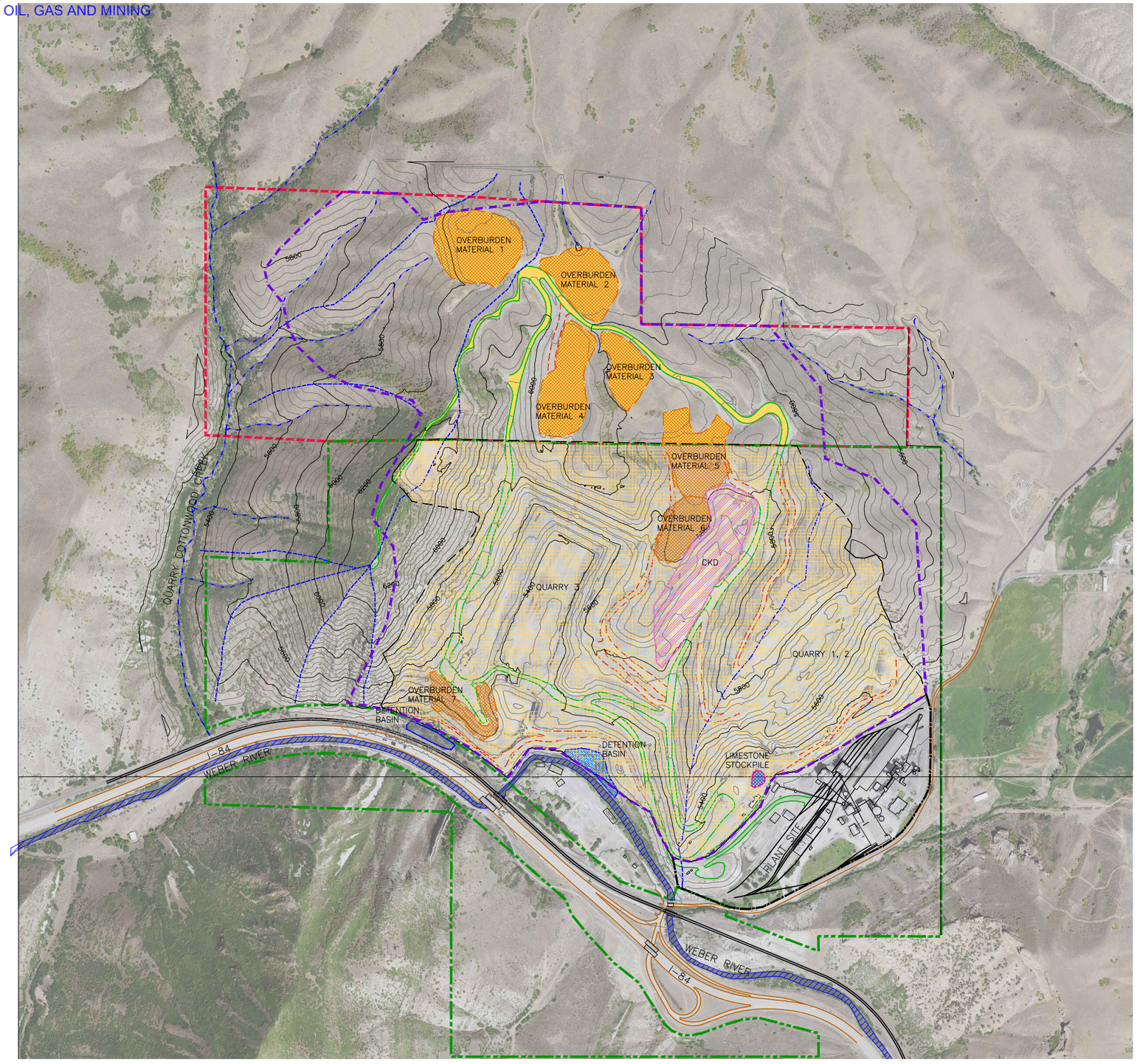

0 1200 2400

SCALE OF FEET

LEGEND

- LEASE BOUNDARY
- PROPERTY BOUNDARY
- MINING EXTENTS
- STREAMS
- CKD BOUNDARY
- OVERBURDEN MATERIAL
- WEBER RIVER
- AREAS IMPACTED BY MINING ACTIVITY
- ROADS AND OVERBURDEN STOCK PILES
- OVERBURDEN STOCK PILES

NOTES:

1. DEVILS SLIDE, UTAH, USGS 7.5' TOPOGRAPHIC QUADRANGLE
2. UTAH 83 STATE PLANE UTAH NORTH US (ft)
3. 3 ALL PARCEL BOUNDARIES ARE APROXIMATE,

REVISIONS			
NO.	DATE	TITLE	BY
1	12/25	B NELSON & J VILLON	

FIVE STAR ENGINEERS, LLC
220 NORTH 900 EAST
HYDE PARK, UTAH 84318
435-881-5339

AMRIZE
6055 EAST CROYDON ROAD
MORGAN, UT 84050

DEVILS SLIDE UTAH

AREAS IMPACTED BY PREVIOUS MINING OPERATIONS

DATE 10.13.2025
DESIGN I. Hamud
DRAWN A. Heck
CHECKED I. Hamud

SHEET NO.
105.1.14

PLOTTED DATE: Tuesday, 09 December 2025 - 8:52pm

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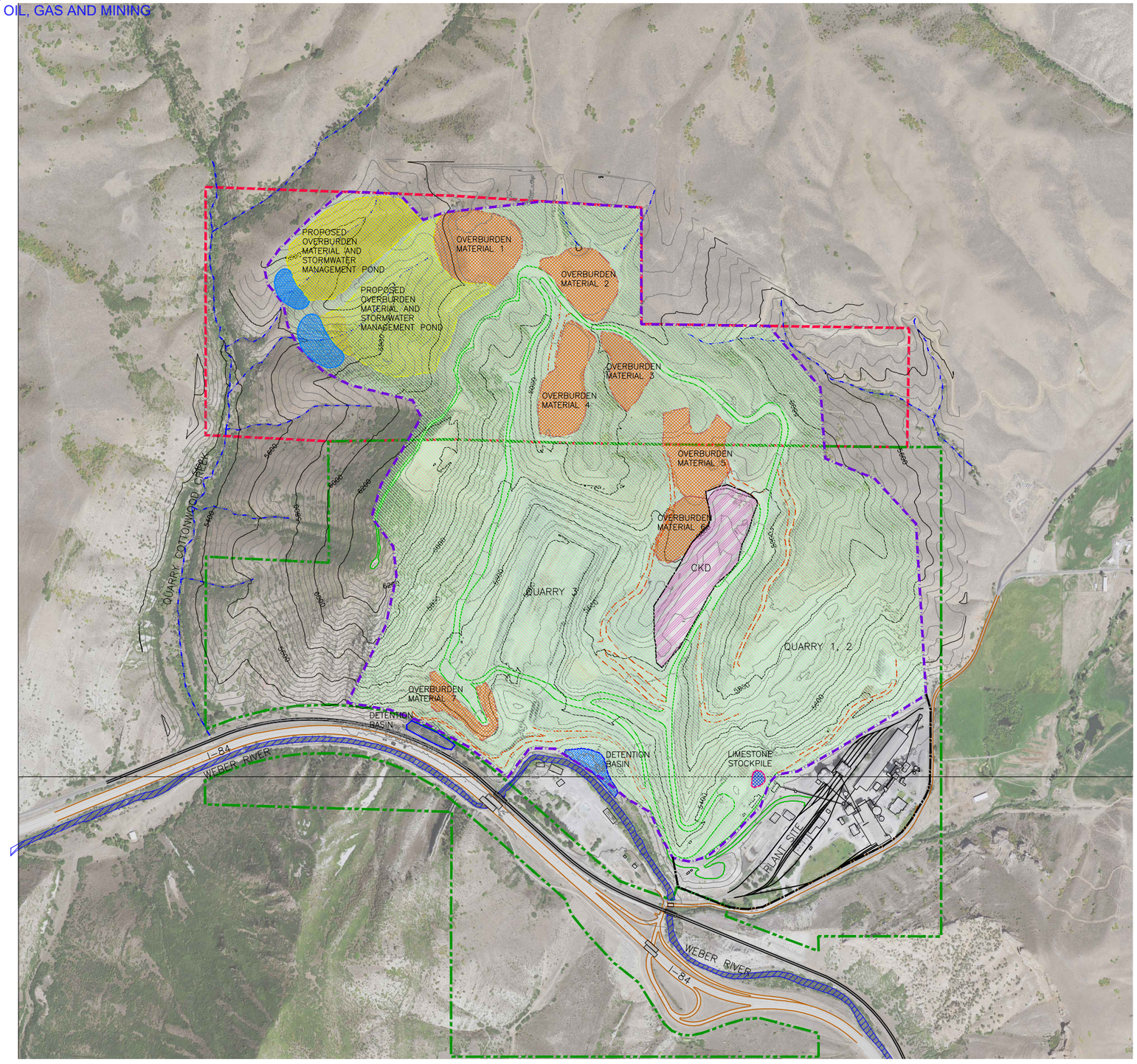
December 12, 2025
DIVISION OF OIL, GAS AND MINING
M/029/0001



0 1200 2400

SCALE OF FEET

LEGEND

- LEASE BOUNDARY
- PROPERTY BOUNDARY
- MINING EXTENTS
- STREAMS
- WEBER RIVER
- OVERBURDEN MATERIAL
- CKD AREA
- WATER DETENTION AREA
- QUARRIES

NOTES:

1. DEVILS SLIDE, UTAH, USGS 7.5' TOPOGRAPHIC QUADRANGLE
2. UTAH 83 STATE PLANE UTAH NORTH US (ft)
3. 3 ALL PARCEL BOUNDARIES ARE APROXIMATE,

Description of the area	Acres
Quarry 1,2 and 3	357.59
CKD	20.15
Overburden Material (dumps)	120.77
future expansion (Wilde)	211.86
Total mine area	710.37

REVISIONS NO.	DATE	TITLE	BY
1	12/25	B NELSON & J VILLON	

FIVE STAR ENGINEERS, LLC
220 NORTH 900 EAST
HYDE PARK, UTAH 84318
435-881-5339

AMRIZE
6055 EAST CROYDON ROAD
MORGAN, UT 84050

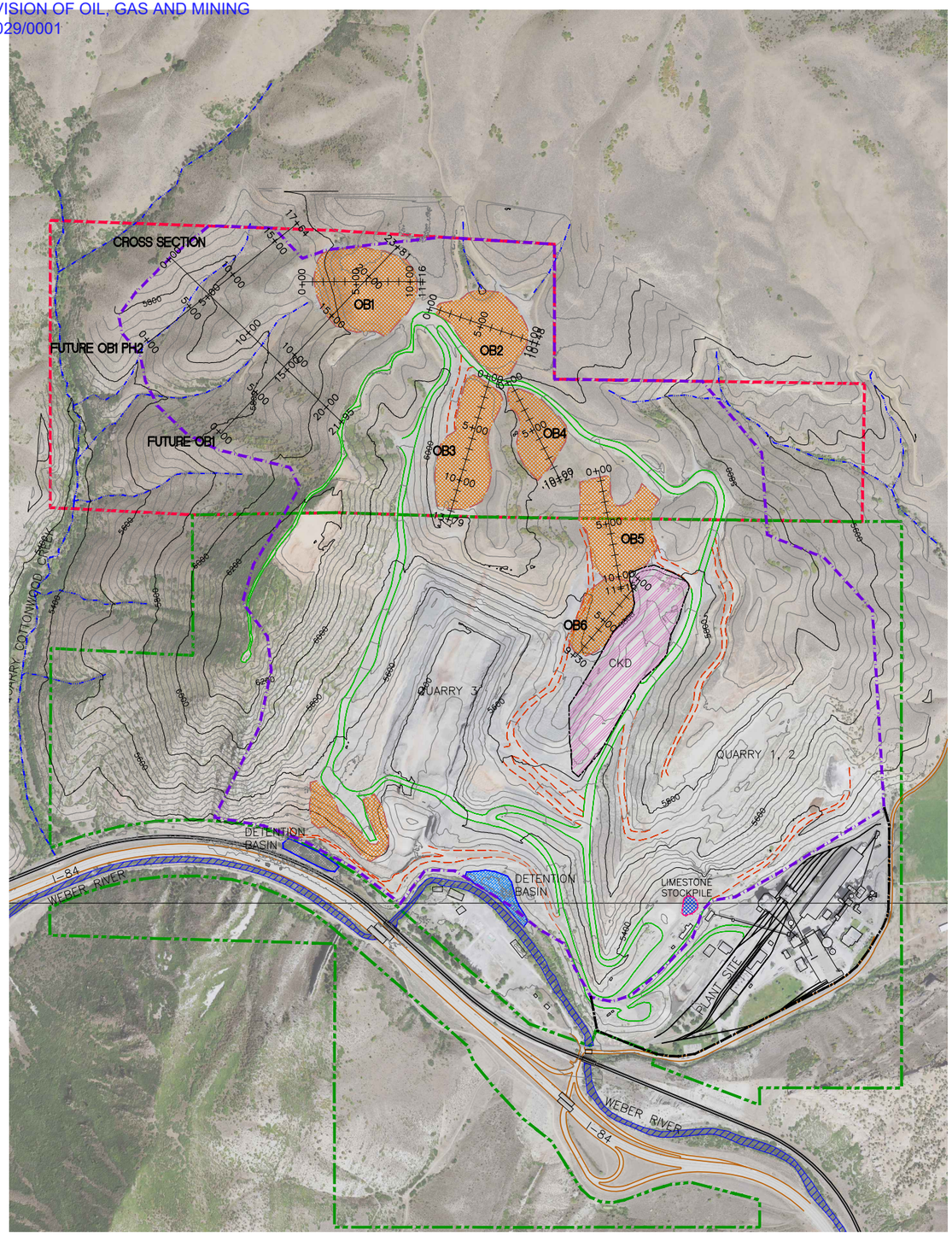
DEVILS SLIDE UTAH
PROPOSED SURFACE FACILITIES

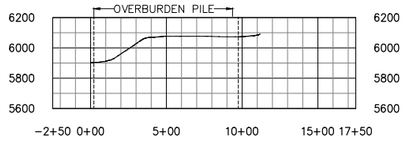
DATE 10.13.2025
DESIGN I. Hamud
DRAWN A. Heck
CHECKED I. Hamud

SHEET NO.
105.2.11

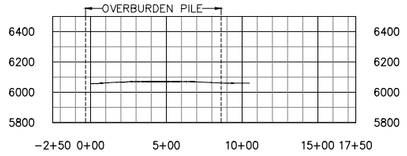
PLOTTED DATE: Tuesday, 09 December 2025 - 8:54pm

RECEIVED
December 12, 2025
DIVISION OF OIL, GAS AND MINING
M/029/0001



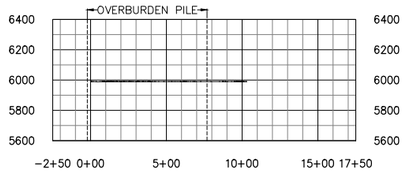


ALIGNMENT OB1
AREA: 617,106 PERIMETER: 2,892

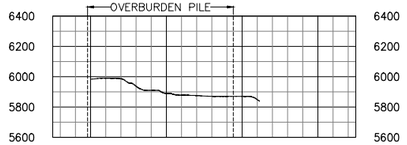


ALIGNMENT OB2
AREA: 415,685 PERIMETER: 2,536

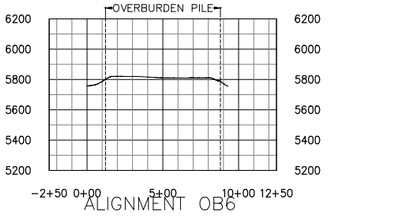
ALIGNMENT OB3
AREA: 415,685 PERIMETER: 3,131



ALIGNMENT OB4
AREA: 276,137 PERIMETER: 2,223



ALIGNMENT OB5
AREA: 493,516 PERIMETER: 3,248



ALIGNMENT OB6
AREA: 271,808 PERIMETER: 2,048

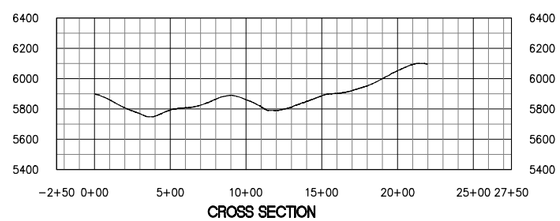
LEGEND

- OVERBURDEN MATERIAL
- CKD AREA
- WATER DETENTION AREA
- QUARRIES
- LEASE BOUNDARY
- PROPERTY BOUNDARY
- MINING EXTENTS
- STREAMS
- WEBER RIVER

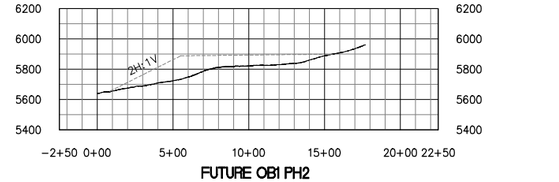
NOTES:

1. DEVILS SLIDE, UTAH, USGS 7.5' TOPOGRAPHIC QUADRANGLE
2. UTAH 83 STATE PLANE UTAH NORTH US (ft)
3. 3 ALL PARCEL BOUNDARIES ARE APROXIMATE,

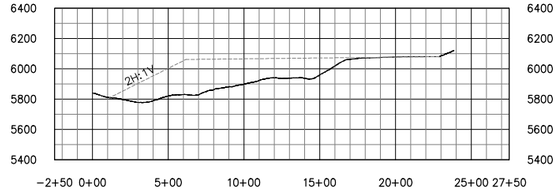
		27 cy	2.2 ston	mton/m3 2.6 mton	1.30795 m3
1	Overburden dump	1,097,809	2,415,181	2,182,273	839,336
2	Overburden dump	675,779	1,486,714	1,343,343	516,670
3	Overburden dump	1,115,518	2,454,139	2,217,475	852,875
4	Overburden dump	2,250,329	4,950,723	4,473,302	1,720,501
5	Overburden dump	531,897	1,170,173	1,057,328	406,664
6	Overburden dump	1,581,240	3,478,729	3,143,259	1,208,946
7	Overburden dump	1,241,463	2,731,218	2,467,834	949,167
			18,686,877	**16,884,812**	



CROSS SECTION



FUTURE OB1 PH2



FUTURE OB1

REVISIONS NO.	DATE	TITLE	BY
1	12/25	B NELSON & J VILLON	

FIVE STAR ENGINEERS, LLC
220 NORTH 900 EAST
HYDE PARK, UTAH 84318
435-881-5339

AMRIZE
6055 EAST CROYDON ROAD
MORGAN, UT 84050

DEVILS SLIDE UTAH
OVERBURDEN MATERIAL
CROSS-SECTIONS

DATE 10.13.2025
DESIGN I. Hamud
DRAWN A. Heck
CHECKED I. Hamud

SHEET NO.
105.2.11a

PLOTTED DATE: Thursday, 11 December 2025 - 6:09pm

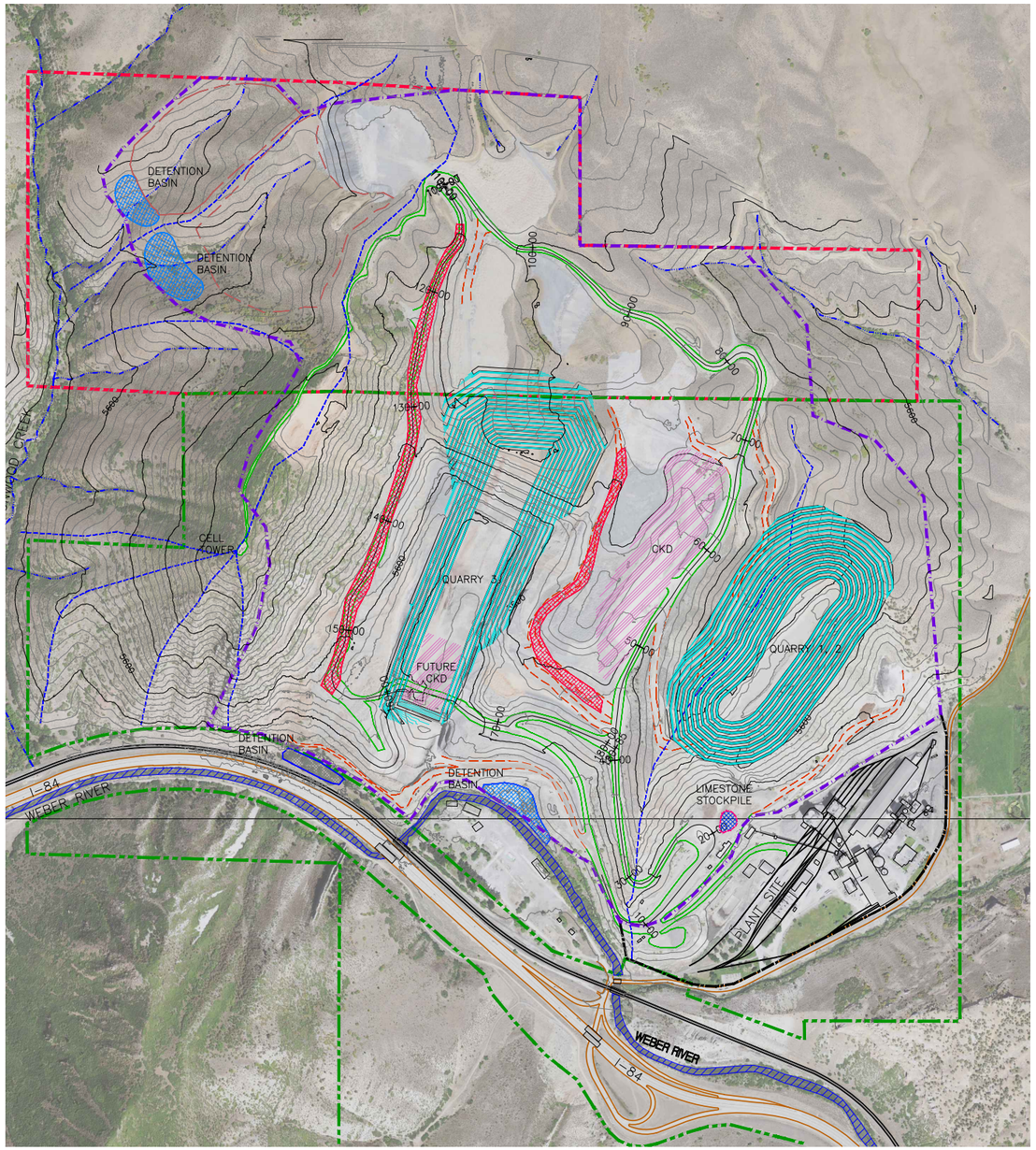
RECEIVED
December 12, 2025
DIVISION OF OIL, GAS AND MINING
M/029/0001

0 1200 2400

SCALE OF FEET

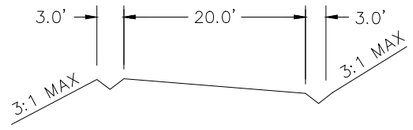
LEGEND

- LEASE BOUNDARY
- PROPERTY BOUNDARY
- MINING EXTENTS
- CKD BOUNDARY
- OVERBURDEN STOCKPILE
- STREAMS
- DRAINAGE BOUNDARIES
- PRIMARY ROADS

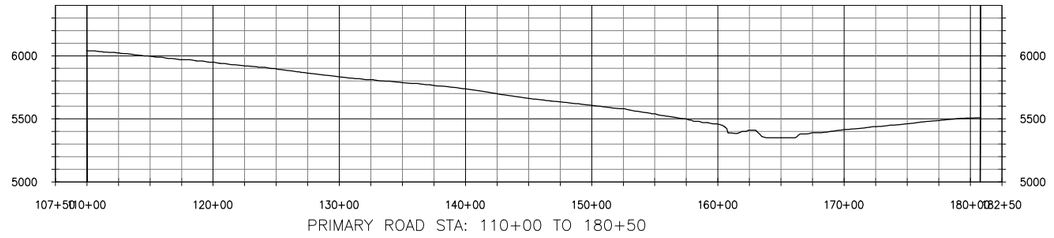


NOTES:

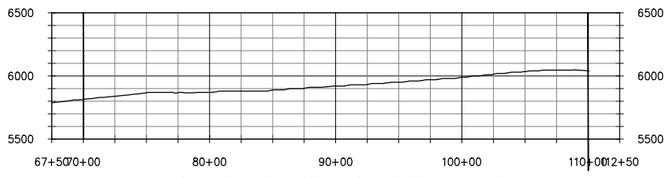
1. DEVILS SLIDE, UTAH, USGS 7.5' TOPOGRAPHIC QUADRANGLE
2. UTAH 83 STATE PLANE UTAH NORTH US (ft)
3. 3 ALL PARCEL BOUNDARIES ARE APROXIMATE.



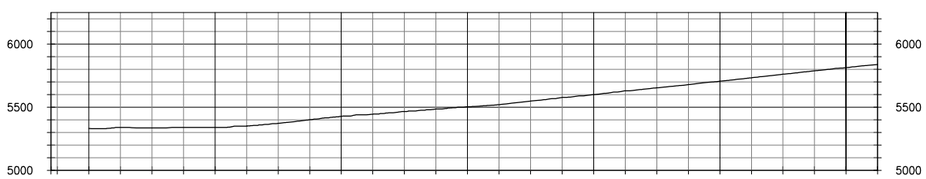
TYPICAL FINAL ROAD CROSS SECTION
NOT TO SCALE



PRIMARY ROAD STA: 110+00 TO 180+50



PRIMARY ROAD STA: 70+00 TO 110+00



PRIMARY ROAD STA: 10+00 TO 70+00

REVISIONS			
NO.	DATE	TITLE	BY
1	12/25	B NELSON & J VILLON	

FIVE STAR ENGINEERS, LLC
220 NORTH 900 EAST
HYDE PARK, UTAH 84318
435-881-5339

AMRIZE
6055 EAST CROYDON ROAD
MORGAN, UT 84050

DEVILS SLIDE UTAH

PERMANENT ROAD PLAN AND PROFILES

DATE 10.13.2025
DESIGN I. Hamud
DRAWN A. Heck
CHECKED I. Hamud

SHEET NO.
105.3.12

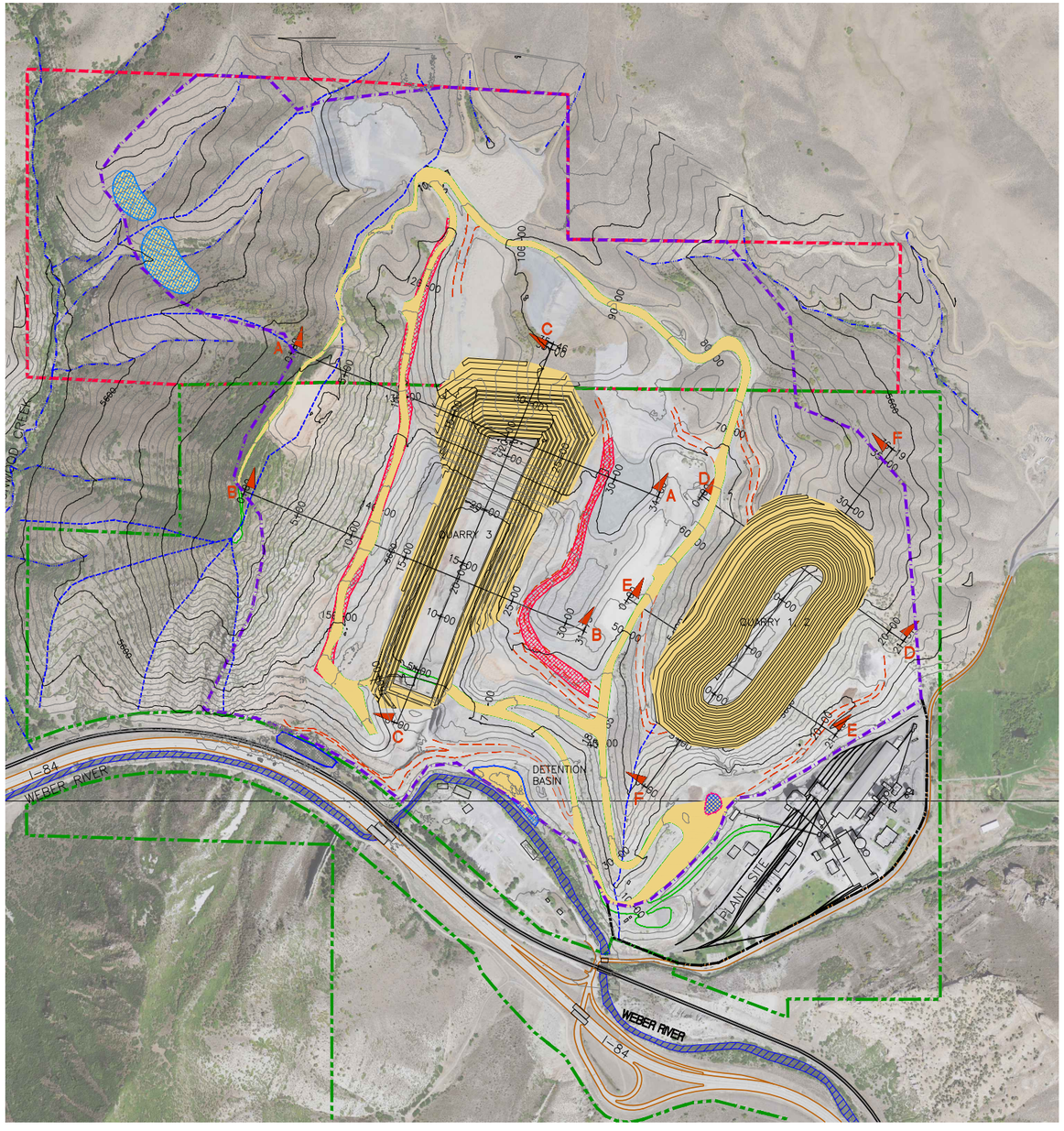
PLOTTED DATE: Thursday, 11 December 2025 - 6:22pm

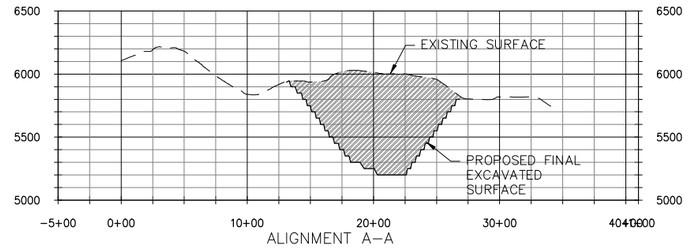
RECEIVED
December 12, 2025
DIVISION OF OIL, GAS AND MINING
M/029/0001

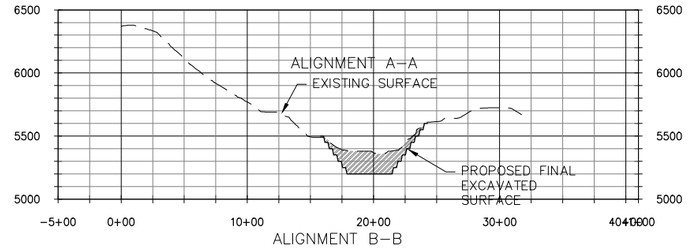
0 1200 2400
SCALE OF FEET

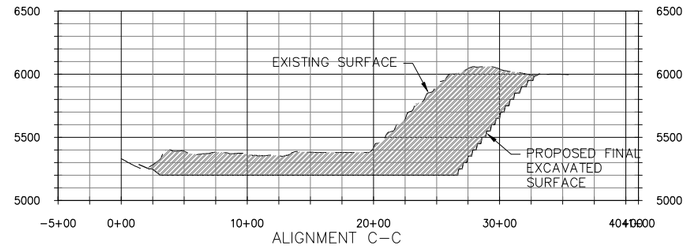
LEGEND

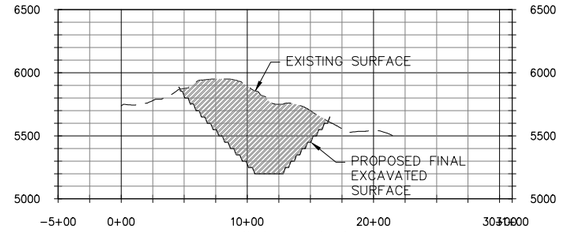
- LEASE BOUNDARY
- PROPERTY BOUNDARY
- MINING EXTENTS
- CKD BOUNDARY
- OVERBURDEN STOCKPILE
- STREAMS
- DRAINAGE BOUNDARIES
- AREAS NOT TO BE RECLAIMED

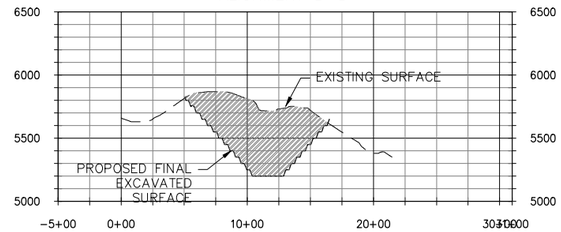


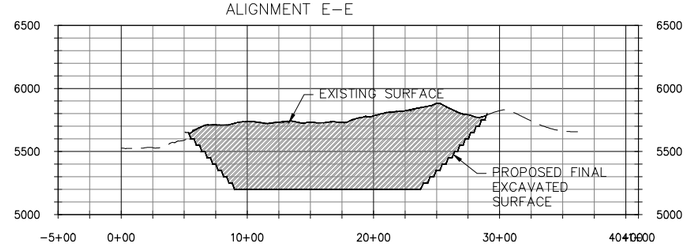












NOTES:

1. DEVILS SLIDE, UTAH, USGS 7.5' TOPOGRAPHIC QUADRANGLE
2. UTAH 83 STATE PLANE UTAH NORTH US (ft)
3. 3 ALL PARCEL BOUNDARIES ARE APROXIMATE.

REVISIONS NO.	DATE	TITLE	BY
1	12/25	B NELSON & J VILLON	

FIVE STAR ENGINEERS, LLC
220 NORTH 900 EAST
HYDE PARK, UTAH 84318
435-881-5339

AMRIZE
6055 EAST CROYDON ROAD
MORGAN, UT 84050

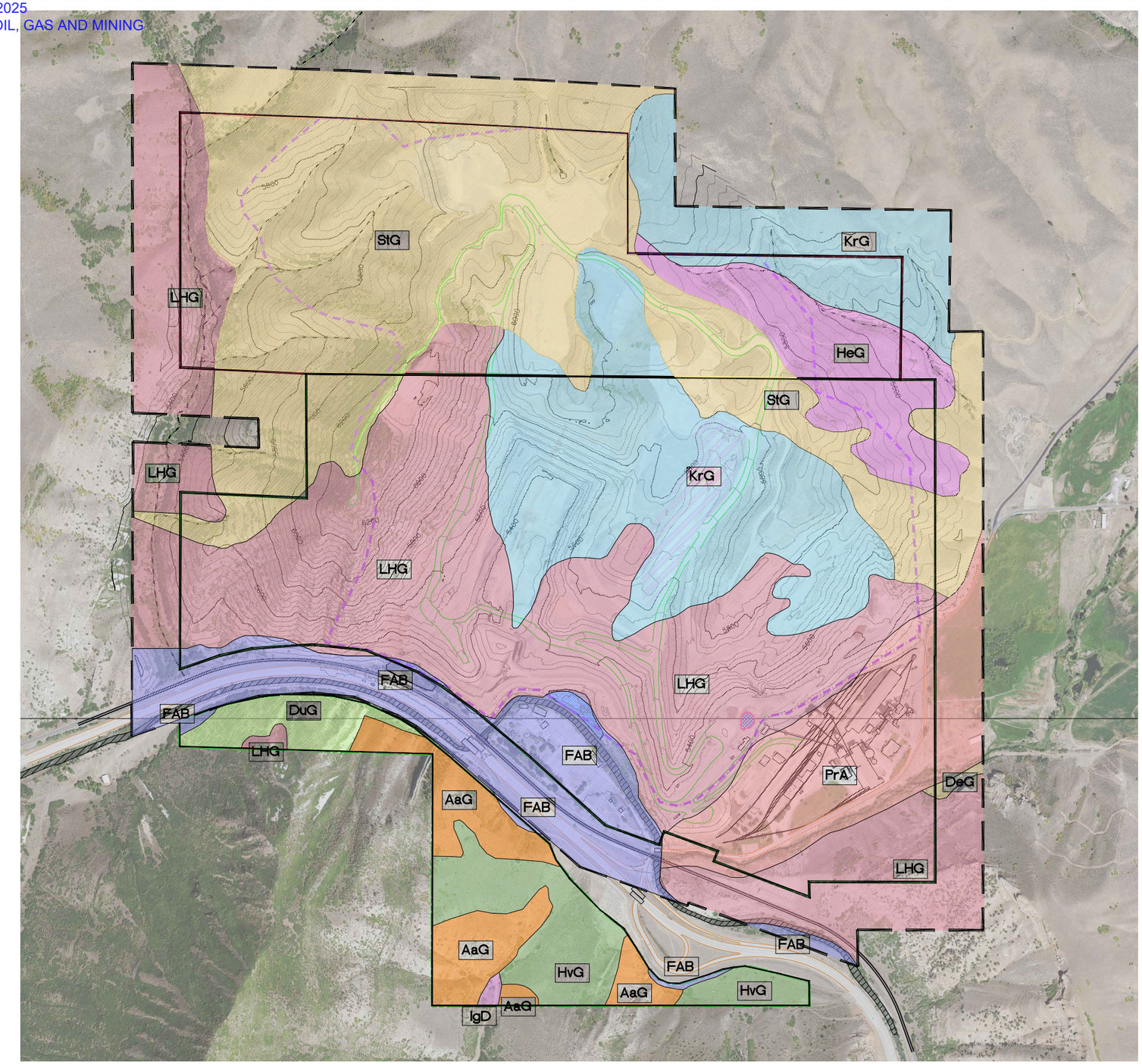
DEVILS SLIDE UTAH
SURFACE AREAS THAT WILL NOT BE RECLAIMED

DATE 10.13.2025
DESIGN I. Hamud
DRAWN A. Heck
CHECKED I. Hamud

SHEET NO.
105.3.14

PLOTTED DATE: Tuesday, 09 December 2025 - 8:23pm

RECEIVED
December 12, 2025
DIVISION OF OIL, GAS AND MINING
M/029/0001



0 1200 2400

SCALE OF FEET

LEGEND

- LEASE BOUNDARY
- PROPERTY BOUNDARY
- MINING BOUNDARY

EXPLANATION

AaG	AGASSIZ-ROCK OUTCROP COMPLEX
Cw	CUMULIC HAPLOBOROLLS, WET
DeG	DURFEE STONY LOAM
DuG	DURST GRAVELLY LOAM
FaB	FLUVAQUENTIC HAPOBOROLLS
HeG	HENEFER LOAM
HvG	HORROCKS-ROCK OUTCROP
IgD	ISBELL LOAM, GRAVELLY SUBSTRATUM
KrG	KILFOIL-ROCK OUTCROP COMPLEX
LHG	LITHIC HAPLOXEROLLIS ROCK OUTCROP COMPLEX
PrA	PRINGLE LOAM
StG	ST. MARY-HOSKIN COBBLY LOAMS

NOTES:

1. DEVILS SLIDE, UTAH, USGS 7.5' TOPOGRAPHIC QUADRANGLE
2. UTAH 83 STATE PLANE UTAH NORTH US (ft)
3. 3 ALL PARCEL BOUNDARIES ARE APROXIMATE,

REVISIONS NO.	DATE	TITLE	BY
1	12/25	B NELSON & J VILLON	

FIVE STAR ENGINEERS, LLC
220 NORTH 900 EAST
HYDE PARK, UTAH 84318
435-881-5339

AMRIZE
6055 EAST CROYDON ROAD
MORGAN, UT 84050

DEVILS SLIDE UTAH

SITE SOILS

DATE 10.13.2025
DESIGN I. Hamud
DRAWN A. Heck
CHECKED I. Hamud

SHEET NO.
105.3.16a

PLOTTED DATE: Tuesday, 09 December 2025 - 8:24pm

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December 12, 2025
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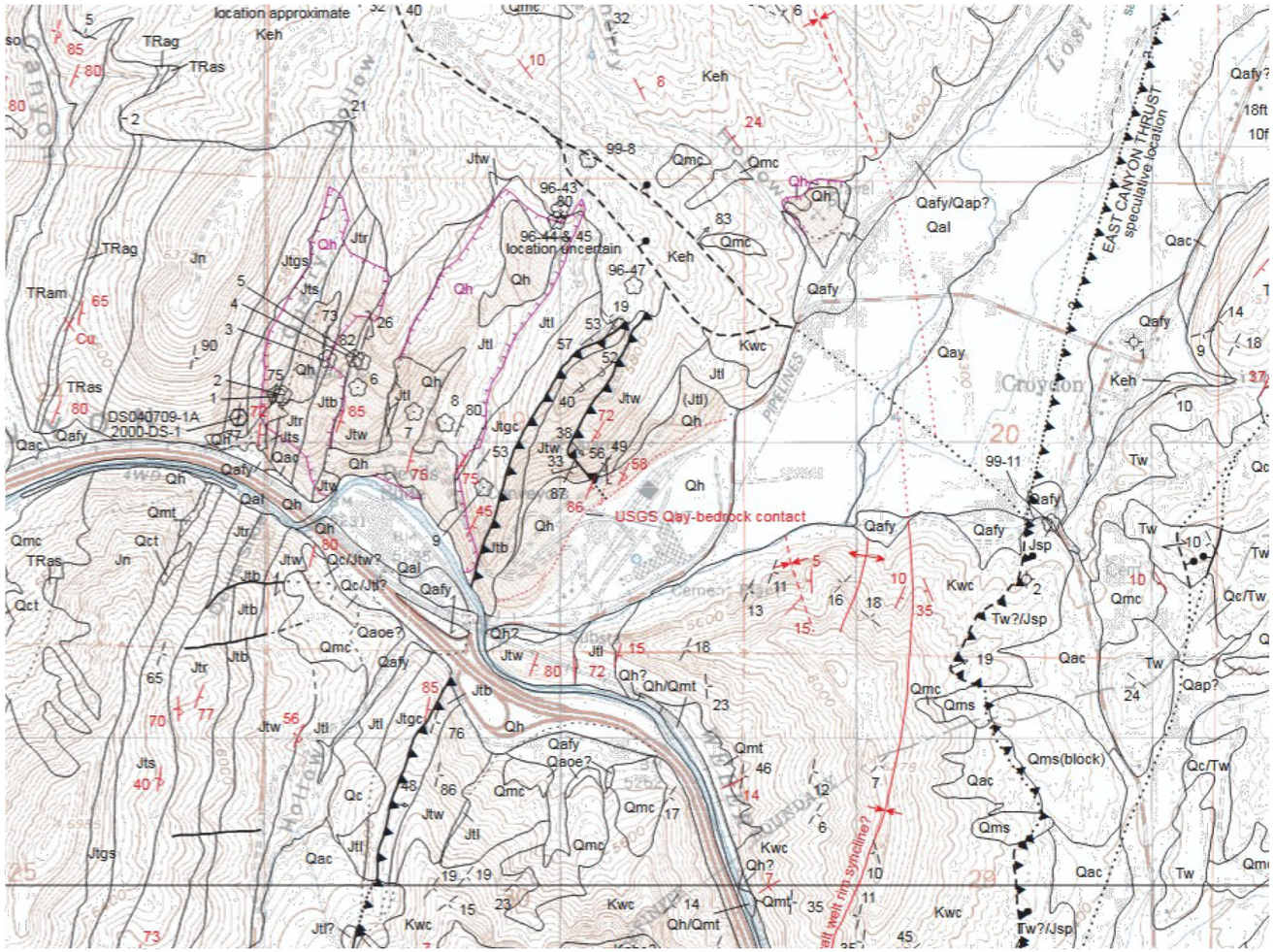

0 2000 4000
SCALE OF FEET

NOTES:

1. DEVILS SLIDE, UTAH, USGS 7.5' TOPOGRAPHIC QUADRANGLE
2. UTAH 83 STATE PLANE UTAH NORTH US (ft)
3. 3 ALL PARCEL BOUNDARIES ARE APROXIMATE.

Figure 105.3.16a – Geologic Unit Legend

Symbol	Unit Name and Description
Jtw	Twin Creek Limestone – Upper Member – Thick-bedded gray limestone with shale partings; principal quarry unit.
Jtb	Twin Creek Limestone – Basal Member – Silty and argillaceous limestone, locally red-green shale.
Jtl	Twin Creek Limestone – Lower Member – Thin-bedded limestone and calcareous shale.
Jts	Twin Creek Limestone – Shaly Member – Calcareous shale and marl interbeds transitional to Thaynes Fm.
Jtgs	Thaynes Formation – Green Shale Unit – Greenish-gray shale, siltstone, thin limestone beds.
Kwc	Weber Canyon Conglomerate – Coarse sandstone and conglomerate with quartzite clasts.
Keh	Evanston Formation (Henefer Mbr.) – Conglomerate, sandstone, and mudstone; caps ridges east of quarry.
TRw/TRas/TRaml/TRtu	Woodside & Ankareh Formations – Red siltstone, mudstone, thin gypsum beds.
Pp/Ppf/Ppg/Ppm	Park City & Phosphoria Formations – Dolomite, limestone, and phosphatic shale; subsurface below Twin Creek.
Qmc	Colluvium – Slope debris of limestone blocks and soil.
Qafy	Younger Alluvial-Fan Deposits – Poorly sorted sand, silt, gravel at canyon mouths and along river terraces.
Qal	Stream Alluvium – Active Weber River and tributary channel deposits.
Qaoe/Qafoe/Qapb	Older Alluvium / Lake Bonneville Age – Stratified sand and gravel terraces 40–100 ft above drainages.
Qh	Human Disturbance – Excavated/backfilled ground, haul roads, plant area.

REVISIONS

NO.	DATE	TITLE	BY
1	12/25	B NELSON & J VILLON	

FIVE STAR ENGINEERS, LLC
220 NORTH 900 EAST
HYDE PARK, UTAH 84318
435-881-5339

AMRIZE
6055 EAST CROYDON ROAD
MORGAN, UT 84050

DEVILS SLIDE UTAH
SITE GEOLOGY

DATE 10.13.2025
DESIGN I. Hamud
DRAWN A. Heck
CHECKED I. Hamud

SHEET NO.
105.3.16b

PLOTTED DATE: Tuesday, 09 December 2025 - 8:26pm

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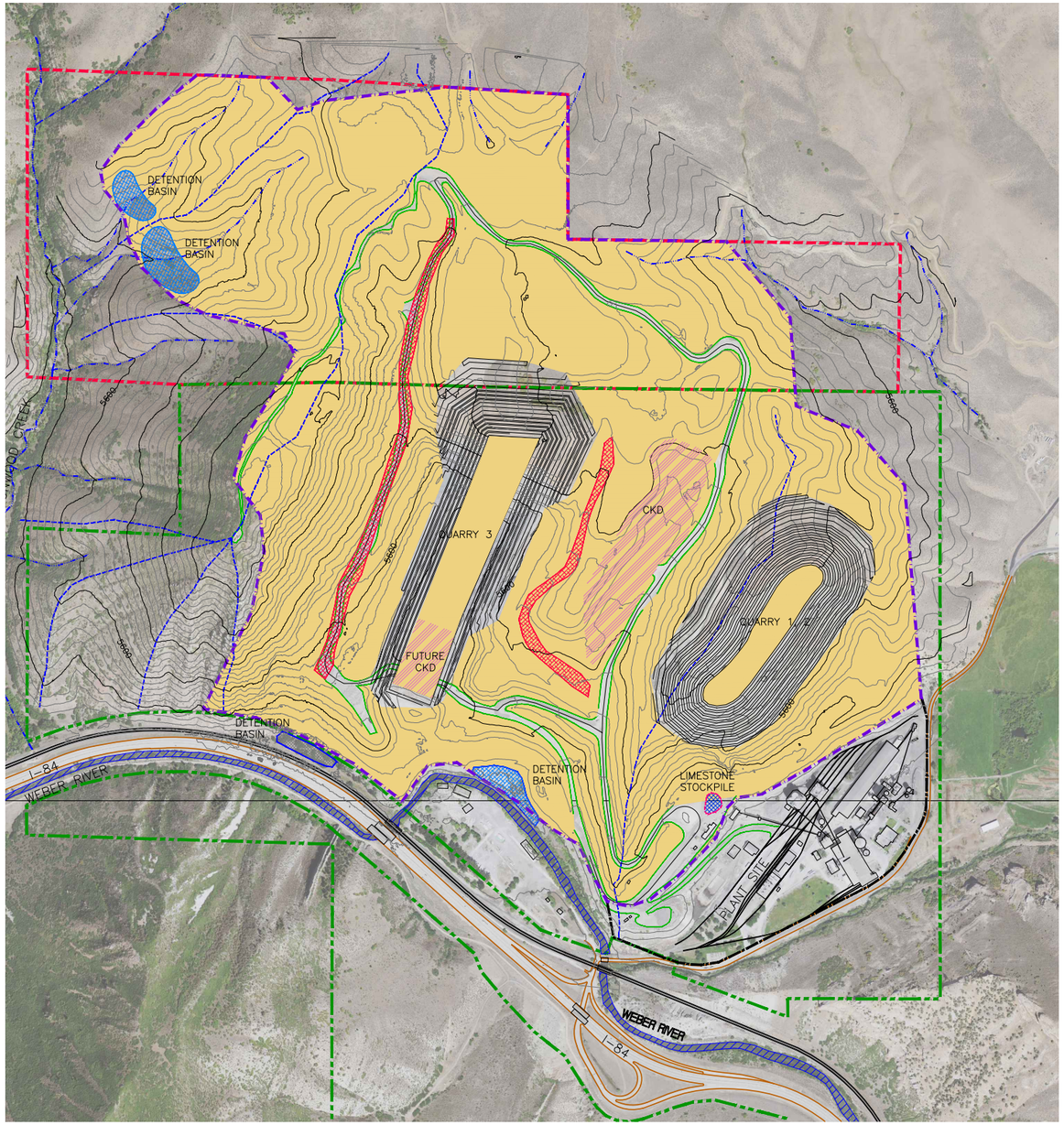


0 1200 2400

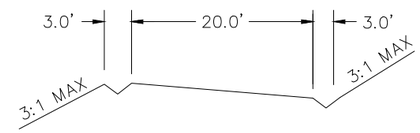
SCALE OF FEET

LEGEND

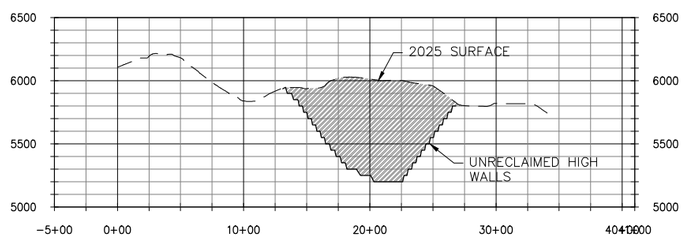
- LEASE BOUNDARY
- PROPERTY BOUNDARY
- MINING EXTENTS
- CKD BOUNDARY
- STREAMS
- DRAINAGE BOUNDARIES
- AREAS RECLAIMED (NOT TO EXCEED 3:1 SLOPES)
- FRENCH DRAINS
- STORMWATER DETENTION
- CKD

NOTES:

1. DEVILS SLIDE, UTAH, USGS 7.5' TOPOGRAPHIC QUADRANGLE
2. UTAH 83 STATE PLANE UTAH NORTH US (ft)
3. 3 ALL PARCEL BOUNDARIES ARE APROXIMATE,



TYPICAL FINAL ROAD CROSS SECTION
NOT TO SCALE



REVISIONS			
NO.	DATE	TITLE	BY
1	12/25	B NELSON & J VILLON	

FIVE STAR ENGINEERS, LLC
220 NORTH 900 EAST
HYDE PARK, UTAH 84318
435-881-5339

AMRIZE
6055 EAST CROYDON ROAD
MORGAN, UT 84050

DEVILS SLIDE UTAH

SURFACE AREAS THAT WILL BE RECLAIMED

DATE 10.13.2025
DESIGN I. Hamud
DRAWN A. Heck
CHECKED I. Hamud

SHEET NO.
105.3.17

PLOTTED DATE: Tuesday, 09 December 2025 - 9:03pm

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Appendix C

CKD Testing, and Management and Disposal Plan

Five Star Engineers LLC
220 N 900 E
Hyde Park, Utah 84318
Tel: 435-881-5339
Issahamud@5starengineers.com

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Material Analysis Report

Material: Cement Kiln Dust

Test Period: 01-Dec-2019 to 31-Dec-2019

Date Issued: 06-Jan-2020

Standard Test Results

General Information

Supplier:	Holcim (US) Inc. d/b/a LafargeHolcim US	Source Location:	Devils Slide Plant
Address:	8700 West Bryn Mawr Ave Chicago, IL 60631		6055 E. Croydon Road Devil's Slide, UT 84050
Contact:		Contact:	Doug Wilde / (801) 829-6821

The following is based on average test data during the test period. The data is typical of product shipped from this source; individual shipments may vary.

Chemical			Physical		
Item	**Limit [1]**	**Result**	**Item**	**Limit [1]**	**Result**
SiO_2 (%)	-	17.4			
Al_2O_3 (%)	-	3.7			
Fe_2O_3 (%)	-	3.0			
CaO (%)	-	54.3			
MgO (%)	-	2.6			
SO_3 (%)	-	7.0			
K_2O (%)	-	3.7			
Na_2O (%)	-	0.6			
TiO_2 (%)	-	0.18			
P_2O_5 (%)	-	0.06			
SrO (%)	-	-			
Mn_2O_3 (%)	-	0.05			
Cl (%)	-	2.75			
F (%)	-	-			
Loss on Ignition (%)	-	-			
Freelime (%)	-	-			

Chemical			Physical		
Item	**Limit [1]**	**Result**	**Item**	**Limit [1]**	**Result**

Notes (*1-9)

1 - Tested using methods as per ASTM D5050 "Standard Guide for Commercial Use of Lime Kiln Dusts and Porland Cement Kiln Dusts". There are no specification limits that exist for CKD.

2 - By providing this information, LafargeHolcim is not making and specifically disclaims any warranties or representations of any kind or character, express or implied, including any implied Warranty of Merchantability and any implied Warranty of Fitness for a particular purpose.

Printed: 1/6/2020 2:28:41 PM

Version: 180412

Doug Wilde,
Quality Manager

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December 12, 2025
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REMEDIAL SITE ASSESSMENT DECISION – EPA Region 08

Site Name: IDEAL BASIC IND/CEMENT DIV
Alias(es): DEVILS SLIDE

City: CROYDON **County or Parish:** MORGAN **State:** UT
Refer to Report Dated: 01/30/2018 **EPA ID:** UTD089320121
Report Developed By: STATE **State ID:**
Report Type: Expanded Site Inspection #001 **Decision Date:** 01/30/2018

☑ **1. Further Remedial Site Assessment Under CERCLA (Superfund) is not required because:**
NFRAP-Site does not qualify for the NPL based on existing information

☐ **2. Further Assessment Needed Under CERCLA.**

☐ **3. Remedial study/cleanup needed.**

Decision/Rationale:

The site is located at 6055 East Croydon Road in Croydon, Utah. There is a cement plant (formerly Ideal Basic Cement Company) currently operating on site. Elevated levels of heavy metals including lead, arsenic, copper, selenium and zinc have been found in process waste (cement-kiln dust) and chromium IV in buried refractory bricks.

In 2015, the Utah Department of Environmental Quality (UDEQ) conducted sampling near the cement plant to evaluate the potential for off-site migration of contaminants. Results from this sampling are documented in the 2017 Ideal Basic Industries – Cement Division Expanded Site Inspection report. The results indicate the presence of heavy metals (primarily arsenic, selenium, copper and zinc) in soil, surface water and drinking water wells above naturally occurring background levels. There are no surface water intakes used for drinking water and the concentrations detected in off-site wells and soil samples are relatively low and below acceptable health-based benchmarks.

Based on the review of the 2017 report, the U.S. Environmental Protection Agency concurs with State of Utah's recommendation of No Further Remedial Action Planned (NFRAP).

The U.S. Environmental Protection Agency (EPA) has determined that no further remedial action by the Federal Superfund program is warranted at the referenced site, at this time. The basis for the no further remedial action planned (NFRAP) determination is provided above. A NFRAP designation means that no additional remedial steps under the Federal Superfund program will be taken at the site unless new information warranting further Superfund consideration or conditions not previously known to EPA regarding the site are disclosed.In accordance with EPA's decision regarding the tracking of NFRAP sites, the referenced site may be removed from EPA's Active site inventory and placed in a separate Archive site inventory as an historical record if no further Superfund interest is warranted.Archived sites may be returned to the Active site inventory if new information necessitating further Superfund consideration is discovered.

Site Decision Made By: Ryan Dunham

Signature: _____ **Decision Date:** 01/30/2018

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Cement Kiln Dust (CKD) Proper Disposal and Management Plan

(Appendix C – Amrize Devil's Slide Mine)

1. Purpose and Applicability

This plan establishes procedures for the safe handling, placement, and long-term management of Cement Kiln Dust (CKD) generated by cement-kiln operations at the Amrize Devil's Slide Plant. Although CKD is not regulated as a solid waste under Utah Administrative Code R315 due to its beneficial reuse potential and on-site control, it remains subject to the Utah Division of Air Quality (UDAQ) permit (DAQE-AN100070032-25, 2025) and DOGM R647-4 reclamation requirements. This plan ensures compliance with both agencies through proper containment, dust control, and closure measures.

2. Generation and Characteristics

CKD is produced from kiln exhaust gas collection through baghouse filters during clinker production. Typical composition (based on national and prior Devil's Slide testing) includes:

- Calcium oxide (CaO) 35–55 %
- Silica (SiO_2) 10–20 %
- Alumina (Al_2O_3) 3–8 %
- Iron (Fe_2O_3) 1–4 %
- Trace elements (K_2O, Na_2O, Cl, SO_3, and minor Hg, Pb, Cr at < 1 ppm).

The material is alkaline (pH ≈ 12) and non-reactive when kept dry.

3. Regulatory Coordination

Air Quality Oversight: Fugitive dust emissions and stack controls are managed under the UDAQ Approval Order and NESHAP Subpart LLL. Continuous SO_2 and NO_x monitoring and periodic PM_{10}/CO testing confirm compliance.

Mining Oversight: Placement, grading, and reclamation of CKD within the permit boundary are administered by DOGM under R647-4-110 and R647-4-111.

Exemptions: CKD is not a RCRA Subtitle D waste per 40 CFR 261.4(b)(8); therefore, Utah's Division of Waste Management and Radiation Control (DWMRC) does not issue separate disposal permits.

4. Disposal Area and Facility Design

Location: The CKD disposal area (Boneyard Hollow) lies within the approved disturbance boundary north-east of the quarry.

Base Liner: Existing clay-based "Red Bed" material provides low permeability ($< 1 \times 10^{-6}$ cm/s). Future expansions will incorporate a synthetic geomembrane + compacted clay liner where practicable.

Leachate Control: A French-drain underdrain system directs any incidental seepage to a monitored sump; no discharge to surface water occurs.

Stormwater Control: Run-on diversion berms and perimeter channels prevent external inflow. Run-off is contained in on-site detention basins and handled under the facility

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M/029/0001

UPDES Storm Water Permit UTR000000.
Dust Control: Surface watering and/or crusting agents are applied during placement and grading; slopes will be maintained at 3H:1V or gentler where feasible.

5. Operating Practices
Transport & Placement: CKD is conveyed pneumatically or by truck to the lined disposal cell. Placement occurs in thin lifts (< 2 ft) compacted by track dozer to minimize voids and dusting.
Inspection & Maintenance: The Plant Environmental Manager conducts weekly visual inspections for erosion, seeps, or dust emissions; results logged in the Air Quality Compliance Log.
Recordkeeping: Annual CKD tonnage, disposal cell coordinates, and dust-control actions are recorded and retained for five years.
Emergency Response: In the event of slope failure or wind erosion, immediate wetting, re-grading, and covering will be implemented.

6. Chemical Testing and Monitoring
Air Testing: As required by the UDAQ permit—PM_{10} and CO stack tests, continuous SO_2/NO_x CEM data, and opacity checks (EPA Method 9).
Material Testing: Periodic CKD sampling for total CaO, SO_3, Cl, and trace metals to verify stability and non-hazardous characteristics.
Water Monitoring: If drainage occurs from the CKD cell, pH and total dissolved solids will be measured quarterly to confirm isolation of alkaline leachate.

7. Reclamation and Closure
Final CKD surfaces will be graded to positive drainage (< 5 % slope) and covered with ≥ 2 ft of native soil and seeded with the approved reclamation mix. Long-term stability will be verified through inspection after major storm events. Closure documentation will reference both DOGM bond release and confirmation of continued air-quality compliance.

8. References
1. Utah DAQ Approval Order No. DAQE-AN100070032-25 (2025)
2. Utah Admin. Code R307-165 and R307-170
3. NESHAP 40 CFR Part 63 Subpart LLL
4. DOGM Rules R647-4-110 and R647-4-111

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December 12, 2025
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M/029/0001

Appendix D

Air Quality Permit and Associated Documents

Utah Division of Air Quality – Approval Order DAQE-AN100070032-25 (2025)

Five Star Engineers LLC
220 N 900 E
Hyde Park, Utah 84318
Tel: 435-881-5339
Issahamud@5starengineers.com

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DIVISION OF OIL, GAS AND MINING
M/029/0031

State of Utah

SPENCER J. COX
Governor

DEIDRE HENDERSON
Lieutenant Governor

Department of
Environmental Quality

Kimberly D. Shelley
Executive Director

DIVISION OF AIR QUALITY
Bryce C. Bird
Director

DAQE-AN100070031-22

March 10, 2022

Paul Rogers
Holcim (US) Incorporated
6055 East Croydon Road
Morgan, UT 84050
nina.astillero@lafargeholcim.com

Dear Mr. Rogers:

Re: Approval Order:
R307-401-12 Amendment of DAQE-AN100070027-20 to Install Selective Non-Catalytic Reduction System on a Kiln
Project Number: N100070031

The attached Approval Order (AO) is issued pursuant to the Notice of Intent (NOI) received on October 4, 2021. Holcim (US) Inc. must comply with the requirements of this AO, all applicable state requirements (R307), and Federal Standards.

The project engineer for this action is **John Jenks**, who can be contacted at (385) 306-6510 or jjenks@utah.gov. Future correspondence on this AO should include the engineer's name as well as the DAQE number shown on the upper right-hand corner of this letter. No public comments were received on this action.

Sincerely,

Bryce C. Bird
Director

BCB:JJ:jg

cc: Weber-Morgan Health Department

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December 12, 2025
DIVISION OF OIL, GAS AND MINING
M/029/0001

STATE OF UTAH
Department of Environmental Quality
Division of Air Quality

APPROVAL ORDER
DAQE-AN100070031-22
R307-401-12 Amendment of DAQE-AN100070027-20 to Install Selective Non-Catalytic Reduction System on a Kiln

Prepared By
John Jenks, Engineer
(385) 306-6510
jjenks@utah.gov

Issued to
Holcim (US) Incorporated- Devil's Slide Plant

Issued On
March 10, 2022

Issued By

Bryce C. Bird
Director
Division of Air Quality

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GENERAL INFORMATION

CONTACT/LOCATION INFORMATION

Owner Name
Holcim (US) Incorporated

Mailing Address
6055 East Croydon Road
Morgan, UT 84050

Source Contact
Name Nina Astillero
Phone (801) 829-2122
Email nina.astillero@lafargeholcim.com

SIC code 3241 (Cement, Hydraulic)

Source Name
Holcim (US) Incorporated- Devil's Slide Plant

Physical Address
6055 East Croydon Road
Morgan, UT 84050

UTM Coordinates
455,500 m Easting
4,545,500 m Northing
Datum NAD27
UTM Zone 12

SOURCE INFORMATION

General Description
Holcim (US) Incorporated (Holcim) operates the Devil's Slide cement manufacturing plant near Morgan, Utah. This plant has been in operation since 1947, with recent major modifications made to most of the process during 1996 and 1997. At the Devil's Slide plant, cement is made when raw materials such as limestone & sandstone (quarried on-site), iron ore, and gypsum are proportioned, ground, mixed and then fed into a rotating kiln. The heat of the kiln alters the materials and recombines them into small stones called cement clinker. The clinker is cooled and ground with gypsum into a fine powdered cement. The final product is stored on site for later packaging and shipping. The sources of air emissions are the combustion of fuels for the kiln operation and from the kiln and clinker cooling process.

NSR Classification
Administrative Amendment

Source Classification
Located in
Morgan County
Airs Source Size: A

Applicable Federal Standards
NSPS (Part 60), A: General Provisions
NSPS (Part 60), F: Standards of Performance for Portland Cement Plants
NSPS (Part 60), Y: Standards of Performance for Coal Preparation and Processing Plants
NSPS (Part 60), OOO: Standards of Performance for Nonmetallic Mineral Processing Plants
MACT (Part 63), A: General Provisions

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MACT (Part 63), LLL: National Emission Standards for Hazardous Air Pollutants From the Portland Cement Manufacturing Industry
MACT (Part 63), ZZZZ: National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines
Title V (Part 70) Major Source

Project Description
Holcim submitted a R307-401-12 exemption notification on October 4, 2021, for the permanent installation of a selective non-catalytic reduction (SNCR) system on the kiln. On July 21, 2021, Devil's Slide received permission to temporarily operate a SNCR system on the kiln to reduce NO_x emissions. This project covers the permanent installation of this system.

SUMMARY OF EMISSIONS

The emissions listed below are an estimate of the total potential emissions from the source. Some rounding of emissions is possible.

Criteria Pollutant	Change (TPY)	Total (TPY)
Carbon Monoxide	0	1820.00
Nitrogen Oxides	0	1825.00
Particulate Matter - PM_{10}	0	221.00
Particulate Matter - $PM_{2.5}$	0	50.00
Sulfur Dioxide	0	457.00
Volatile Organic Compounds	0	151.00

Hazardous Air Pollutant	Change (lbs/yr)	Total (lbs/yr)
Arsenic (TSP) (CAS #7440382)	0	11
Benzene (Including Benzene From Gasoline) (CAS #71432)	0	14880
Formaldehyde (CAS #50000)	0	430
Generic HAPs (CAS #GHAPS)	0	6400
Hydrochloric Acid (Hydrogen Chloride) (CAS #7647010)	0	130200
Mercury (TSP) (CAS #7439976)	0	51
Metal HAPs (CAS #MHAPS)	0	4800
Naphthalene (CAS #91203)	0	1582
Phenanthrene (CAS #85018)	0	362
	Change (TPY)	**Total (TPY)**
Total HAPs	0	79.36

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SECTION I: GENERAL PROVISIONS

I.1	All definitions, terms, abbreviations, and references used in this AO conform to those used in the UAC R307 and 40 CFR. Unless noted otherwise, references cited in these AO conditions refer to those rules. [R307-101]
I.2	The limits set forth in this AO shall not be exceeded without prior approval. [R307-401]
I.3	Modifications to the equipment or processes approved by this AO that could affect the emissions covered by this AO must be reviewed and approved. [R307-401-1]
I.4	All records referenced in this AO or in other applicable rules, which are required to be kept by the owner/operator, shall be made available to the Director or Director's representative upon request, and the records shall include the two-year period prior to the date of the request. Unless otherwise specified in this AO or in other applicable state and federal rules, records shall be kept for a minimum of five years. [R307-401-8]
I.5	At all times, including periods of startup, shutdown, and malfunction, owners and operators shall, to the extent practicable, maintain and operate any equipment approved under this AO, including associated air pollution control equipment, in a manner consistent with good air pollution control practice for minimizing emissions. Determination of whether acceptable operating and maintenance procedures are being used will be based on information available to the Director which may include, but is not limited to, monitoring results, opacity observations, review of operating and maintenance procedures, and inspection of the source. All maintenance performed on equipment authorized by this AO shall be recorded. [R307-401-4]
I.6	The owner/operator shall comply with UAC R307-107. General Requirements: Breakdowns. [R307-107]
I.7	The owner/operator shall comply with UAC R307-150 Series. Emission Inventories. [R307-150]
I.8	The owner/operator shall submit documentation of the status of construction or modification to the Director within 18 months from the date of this AO. This AO may become invalid if construction is not commenced within 18 months from the date of this AO or if construction is discontinued for 18 months or more. To ensure proper credit when notifying the Director, send the documentation to the Director, attn.: NSR Section. [R307-401-18]

SECTION II: PERMITTED EQUIPMENT

II.A THE APPROVED EQUIPMENT

II.A.1	**Permitted Source** Source-wide
II.A.2	**Raw Materials: Quarry Operations & Stockpiles** Drilling operations, rock blasting, truck loading, rock fall from dozer push, haul roads, limestone & sand storage piles and Cement Kiln Dust (CKD) storage pile. The drill rig is equipped with a baghouse.

II.A.3	**Raw Materials: Impact Crusher & Conveying** Dump pocket/feeder (#211-AF1), impact crusher, conveyors and associated transfer points, with emissions controlled by baghouses (#291-BFx) or enclosures.
II.A.4	**Raw Materials: Pre-blending Hall** Limestone & sandstone are pre-blended in an enclosed blending hall. No unit-specific applicable requirements.
II.A.5	**Raw Materials: Raw Meal Preparation System** Equipment used in preparation of kiln feed (raw meal), including material transfer points, conveyors, bag filters, bins. (HAC #31x-xxx to 39x-xxx excluding #361-RM1)
II.A.6	**Coal Ops: Milling, Processing & Conveying** Equipment for the handling, conveying, storage and milling of coal. Emissions are controlled by baghouses: HAC #L61-BF1 (mill discharge) and #L91-BF1 (bin vent). Equipment does not include conveying system used to convey coal from the mill to the kiln.
II.A.7	**Coal Ops: Transfer Equipment** Equipment in the clinker manufacturing system for transfers from coal mill to the kiln (HAC #L91-xxx).
II.A.8	**Kiln System: Clinker Manufacture - MHO** Equipment for the calcination of raw material, including material transfer points, conveyors, bag filters, bins (HAC #411-xxx, 431-xxx, 4A1-xxx except 4A1-BFx).
II.A.9	**Kiln System: In-Line Kiln/Raw Mill** Emissions from five-stage kiln system (HAC #441-xxx, 461-xxx) and raw mill (#361-RM1) are controlled by main baghouse (#421-BF1). Alkali bypass emissions are controlled by baghouse (#4A1-BF1). Both baghouses exit through the main stack.
II.A.10	**Selective Non-catalytic Reduction system** One SNCR unit used for the control of NO_x emissions from the main kiln stack. No unit specific requirements.
II.A.11	**Cooler System: Clinker Cooler** Grate cooler (#417-GQ1) for cooling clinker, controlled by baghouse (#471-BF1).
II.A.12	**Cooler System: Clinker Cooler System - MHO** Transfer equipment and dust control for clinker cooler system. (HAC #47x-xxx to 49x-xxx excluding 471-BF1, 471-GQ1).
II.A.13	**Cooler System: Finish Mill Operations** Equipment for grinding of clinker and additive addition, including material transfer points, conveyors, bag filters, bins. (HAC #52x-xxx to 59x-xxx, K93-xxx & T93-xxx)
II.A.14	**Supplemental: Packing & Distribution System** Equipment for shipping of cement products: conveyor transfer points, bins, bag filters and other miscellaneous transfer points. (HAC #61x-xxx to 6Ex-xxx)
II.A.15	**Supplemental: Material Handling - Group 1** All totally-enclosed storage bins, conveying system transfer points, bagging systems, and bulk loading/unloading systems identified in 40 CFR 63.1340, Subpart LLL as affected sources.

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II.A.16	**Supplemental: Material Handling - Group 2** All partially-enclosed or unenclosed storage bins, conveying system transfer points, bagging systems, and bulk loading/unloading systems identified in 40 CFR 63.1340, Subpart LLL as affected sources. This unit also includes partially- or totally-enclosed storage bins, conveying system transfer points, bagging systems, and bulk loading/unloading systems identified in 40 CFR 63.1340, Subpart LLL as affected sources and that are equipped with a control device (PMCD).
II.A.17	**Supplemental: Emergency Generators** Two diesel-powered emergency backup generators, approx. 755 HP and 166 HP. The 166 HP unit is subject to 40 CFR 63 Subpart ZZZZ requirements.

SECTION II: SPECIAL PROVISIONS

II.B REQUIREMENTS AND LIMITATIONS

II.B.1	**Conditions on Permitted Source**
II.B.1.a	Emissions to the atmosphere at all times from the indicated emission point shall not exceed the following rates and concentrations: Source: Kiln Main Stack Exhaust PM_{10}: 14 lb/hr SO_2: 475 lb/hr on a rolling 24-hr average and 457 tons per rolling 12-month period CO: 438 lb/hr NO_x: 1,817 tons rolling 12-month period. [R307-401-8(1)(a)]
II.B.1.a.1	Compliance with the NO_x and SO_2 emission limitations will be through use of a CEM. The owner/operator shall install, calibrate, maintain, and continuously operate a CEM on the kiln main stack. The owner/operator shall record the output of the system, which shall measure the NO_x and SO_2 emissions. The monitoring system shall comply with all applicable sections of R307-170, UAC and 40 CFR 60, Appendix B. Except for system breakdown, repairs, calibration checks, and zero and span adjustments required under paragraph (d) 40 CFR 60.13, the owner/operator of an affected source shall continuously operate all required continuous monitoring devices and shall meet minimum frequency of operation requirements as outlined in 40 CFR 60.13 and Section UAC R307-170. [R307-170]

II.B.1.a.2	Compliance Demonstration To demonstrate compliance with the PM_{10} and CO emission limitations above, the owner/operator shall perform stack testing on the kiln exhaust stack according to the stack testing conditions contained in this AO. Test Frequency PM_{10}: a stack test shall be performed within five years after the date of the most recent stack test. The Director may require the owner/operator to perform a stack test at any time. CO: a stack test shall be performed within two years after the date of the most recent stack test. The Director may require the owner/operator to perform a stack test at any time. [R307-165-2, R307-401-8]
II.B.1.b	The owner/operator shall adhere to the following: A. No more than 930,000 tons of clinker shall be produced per rolling 12-month period Production shall be determined by maintenance of a supervisor log. Compliance with this annual limitation shall be determined on a rolling 12-month total. Based on the twentieth day of each month a new 12-month total shall be calculated using the previous 12 months of kiln production. Records of production shall be kept for all periods when the plant is in operation. B. Mining operations and transporting of materials from the mine to the plant shall be limited to between 5:00 AM and 8:00 PM each day. Mining and transporting operations shall be determined by maintenance of a supervisor log. Records shall be kept in the log when mining operations and transporting of materials from the mine to the plant occur outside of the schedule listed above. [R307-401-8(1)(a)]
II.B.1.c	Visible emissions from the following emission points shall not exceed the listed values: A. Crushers - 15% opacity B. Coal milling, processing, conveying - 20% opacity C. All other point sources, except the kiln main stack and the clinker cooler - 10% opacity Opacity observations of emissions from stationary sources shall be conducted according to 40 CFR 60, Appendix A, Method 9. All PM_{10} stack emission releases shall be vented vertically without any restriction to upward momentum at or beyond the stack opening. [40 CFR 60 Subpart OOO, 40 CFR 60 Subpart Y, R307-401-8(1)(a)]

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II.B.1.d	All paved/unpaved roads and other operational areas that are used by mobile equipment shall be water sprayed, and/or chemically treated, and/or swept using a mobile sweeper to control fugitive dust. The application of water or chemical treatment shall be used for unpaved roads and unpaved operational areas. Treatment shall be of sufficient frequency and quantity to maintain the surface material in a damp/moist condition unless it is below freezing. The mobile sweeper shall operate as necessary to control visible fugitive dust emissions from paved surfaces. The opacity shall not exceed 20% during all times the areas are in use. Records of water, and/or chemical treatment, and/or mobile sweeping shall be kept for all periods when the plant is in operation. The records shall include the following items as applicable: A. Date B. Number of treatments made, dilution ratio, and quantity C. Precipitation received, if any, and approximate amount D. Time of day treatments were made E. Records of temperature, if the temperature is below freezing. [R307-205]
II.B.1.e	Visible fugitive dust emissions from haul-road traffic and mobile equipment in operational areas shall not exceed 20% opacity at any point. Visible emission determinations shall use procedures similar to Method 9. The normal requirement for observations to be made at 15-second intervals over a six-minute period, however, shall not apply. Visible emissions shall be measured at the densest point of the plume but at a point not less than 1/2 vehicle length behind the vehicle and not less than 1/2 the height of the vehicle. [R307-205]
II.B.1.f	A dust suppression system shall be installed at the following points to control fugitive emissions: A. Impact crusher dump pocket (II.A.3) - water spray B. Conveyor transfer points (II.A.3, II.A.5, II.A.6) - baghouse dust collectors The system shall operate whenever dry conditions warrant or as determined necessary by the Director. Visual inspections shall be made monthly to demonstrate compliance with this condition. A log of the visual inspections including the date and time of each inspection and the name of the person making the inspection shall be maintained. [R307-401-8(1)(a)]
II.B.2	**Stack Testing Requirements**
II.B.2.a	Notification At least 30 days prior to conducting a stack test, the owner/operator shall submit a source test protocol to the Director. The source test protocol shall include the items contained in R307-165-3. If directed by the Director, the owner/operator shall attend a pretest conference. [R307-165-3, R307-401-8]
II.B.2.b	Access The owner/operator shall provide Occupational Safety and Health Administration (OSHA)- or Mine Safety and Health Administration (MSHA)-approved access to the test location. [R307-401-8]

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II.B.2.c	Reporting No later than 60 days after completing a stack test, the owner/operator shall submit a written report of the results from the stack testing to the Director. The report shall include validated results and supporting information. [R307-165-5, R307-401-8]
II.B.2.d	Filterable PM_{10} 40 CFR 60, Appendix A, Method 5; 40 CFR 51, Appendix M, Method 201; Method 201A; or other EPA-approved testing method as acceptable to the Director. If other approved testing methods are used which cannot measure the PM_{10} fraction of the filterable particulate emissions, all of the filterable particulate emissions shall be considered PM_{10}. Condensable PM 40 CFR 51, Appendix M, Method 202 or other EPA-approved testing method as acceptable to the Director. The back-half condensables shall not be used for compliance demonstration but shall be used for inventory purposes. [R307-401-8]
II.B.2.e	CO 40 CFR 60, Appendix A, Method 10 or other EPA-approved testing method as acceptable to the Director. [R307-401-8]
II.B.3	**Fuel Requirements**
II.B.3.a	The owner/operator shall only use diesel fuel (e.g. fuel oil #1, #2, or diesel fuel oil additives) as fuel in the emergency generators (II.A.17). [R307-401-8]
II.B.3.a.1	The owner/operator shall only combust diesel fuel in the emergency engines that meets a sulfur content of 15 ppm or less. [R307-401-8(1)(a)]
II.B.3.a.2	To demonstrate compliance with the fuel requirement, the owner/operator shall maintain records of diesel fuel purchase invoices or obtain certification of sulfur content from the diesel fuel supplier. The diesel fuel purchase invoices shall indicate that the diesel fuel meets the fuel requirements. [R307-401-8]

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II.B.3.b	The owner/operator shall use only the following fuels in the kiln: A. Coal B. Diaper Derived Fuel (DDF) C. Tire Derived Fuel (TDF) D. Natural Gas E. Coke F. Fuel Oil G. Used Oil H. Synthetic Fuel I. Wood J. Any Non-Recyclable plastics, paper, and fibers from Municipal Solid Waste, Commercial or Industrial Waste recycling centers; or as byproducts from manufacturing facilities that meet the definition of Non-Hazardous Secondary materials under 40 CFR part 241. Examples include but are not limited to manufactured waste plastics, cellulose products, poly scrap and plastic films from the recycling of paperboard materials. K. Coal Additives as defined in Condition II.B.3.b.1. [R307-401-8(1)(a)]
II.B.3.b.1	The coal additives listed above shall consist of alternative fuels approved by the Director. Prior to burning any proposed coal additive, the owner/operator shall obtain approval from the Director. To obtain approval, the owner/operator shall submit Material Safety Data Sheets (MSDS) or the results of suitable tests giving data similar to a Proximate and Ultimate analysis of the proposed coal additive. Approval by the Director shall consist of a letter approving the use of the proposed coal additive. Approval is not required to change from one previously approved coal additive to another previously approved coal additive. The average quantity of coal additives burned shall not be greater than 15% of the total daily heat input of the kiln and precalciner. The owner/operator may increase the average quantity of coal additives up to 25% of the total daily heat input of the kiln and precalciner upon approval by the Director in accordance with the approval process described herein. [R307-401-8(1)(a)]

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II.B.3.c	The sulfur content of any coal or mixture of coals burned in the kiln shall not exceed 1.0 pound of sulfur per million BTUs of heat input. The sulfur content of any fuel oil burned in the kiln shall not exceed 0.85 pounds sulfur per million gross BTUs heat input. If any type of fuel is desired to be used that has a higher sulfur content, an AO shall be required in accordance with R307-401, UAC. Methods for determining sulfur content of coal and fuel oil shall be those methods of the American Society for Testing and Materials, UAC R307-203-1 (4) A. For determining sulfur content in coal, ASTM Method D4239-2018 is to be used. B. For determining sulfur content in oil, ASTM Methods D2880-71 or D4294-89 are to be used. C. For determining the gross calorific (or BTU) content of coal, ASTM Methods D5865/D5865M are to be used. If these methods are superseded, the approved method put forth by ASTM shall be used. [R307-401-8(1)(a)]
II.B.3.d	The concentration/parameters of contaminants in any used oil fuel shall not exceed the following levels: 1) Arsenic: 5 ppm by weight 2) Cadmium: 2 ppm by weight 3) Chromium: 10 ppm by weight 4) Lead: 100 ppm by weight 5) Total halogens: 1,000 ppm by weight 6) Sulfur: 0.5 percent by weight A. The flash point of all used oil to be burned shall not be less than 100°F. B. The owner/operator shall provide test certification for each load of used oil fuel received. Certification shall be either by their own testing or test reports from the used oil fuel marketer. Records of used oil fuel consumption and the test reports shall be kept for all periods when the plant is in operation. C. Used oil that does not exceed any of the listed contaminants content may be burned. The owner/operator shall record the quantities of oil burned on a daily basis. D. Any used oil fuel that contains more than 1000 ppm by weight of total halogens shall be considered a hazardous waste and shall not be burned in the kiln. The oil shall be tested for halogen content by ASTM Method D-808-81, EPA Method 8240 or Method 8260 before used oil fuel is transferred to the day tank and burned. E. Sources utilizing used oil as a fuel shall comply with the State Division of Solid and Hazardous Waste in accordance with R315-15, UAC. [R307-401-8]

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II.B.4	**Emergency Engine Requirements**
II.B.4.a	The owner/operator shall not operate each emergency engine on site for more than 100 hours per calendar year for maintenance checks and readiness testing. Each emergency engine may be operated for up to 50 hours per calendar year in non-emergency situations. Any operation in non-emergency situations shall be counted as part of the 100 hours per calendar year for maintenance and testing. There is no time limit on the use of the engines during emergencies. [40 CFR 60 Subpart ZZZZ, R307-401-8]
II.B.4.a.1	To determine compliance with the annual operation limitation, records documenting the operation of each emergency engine shall be kept in a log and shall include the following: a. The date the emergency engine was used b. The duration of operation in hours c. The reason for the emergency engine usage. [40 CFR 60 Subpart ZZZZ, R307-401-8]
II.B.4.a.2	To determine the duration of operation, the owner/operator shall install a non-resettable hour meter for each emergency engine. [R307-401-8, 40 CFR 63 Subpart ZZZZ]

PERMIT HISTORY

This Approval Order shall supersede (if a modification) or will be based on the following documents:

Is Derived From	Source Submitted R307-401-12 Notification dated October 4, 2021
Incorporates	DAQE-GN100070028-21 dated July 21, 2021
Supersedes	DAQE-AN100070027-20 dated December 24, 2020

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ACRONYMS

The following lists commonly used acronyms and associated translations as they apply to this document:

40 CFR	Title 40 of the Code of Federal Regulations
AO	Approval Order
BACT	Best Available Control Technology
CAA	Clean Air Act
CAAA	Clean Air Act Amendments
CDS	Classification Data System (used by Environmental Protection Agency to classify sources by size/type)
CEM	Continuous emissions monitor
CEMS	Continuous emissions monitoring system
CFR	Code of Federal Regulations
CMS	Continuous monitoring system
CO	Carbon monoxide
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent - Title 40 of the Code of Federal Regulations Part 98, Subpart A, Table A-1
COM	Continuous opacity monitor
DAQ/UDAQ	Division of Air Quality
DAQE	This is a document tracking code for internal Division of Air Quality use
EPA	Environmental Protection Agency
FDCP	Fugitive dust control plan
GHG	Greenhouse Gas(es) - Title 40 of the Code of Federal Regulations 52.21 (b)(49)(i)
GWP	Global Warming Potential - Title 40 of the Code of Federal Regulations Part 86.1818-12(a)
HAP or HAPs	Hazardous air pollutant(s)
ITA	Intent to Approve
LB/YR	Pounds per year
MACT	Maximum Achievable Control Technology
MMBTU	Million British Thermal Units
NAA	Nonattainment Area
NAAQS	National Ambient Air Quality Standards
NESHAP	National Emission Standards for Hazardous Air Pollutants
NOI	Notice of Intent
NO_x	Oxides of nitrogen
NSPS	New Source Performance Standard
NSR	New Source Review
PM_{10}	Particulate matter less than 10 microns in size
$PM_{2.5}$	Particulate matter less than 2.5 microns in size
PSD	Prevention of Significant Deterioration
PTE	Potential to Emit
R307	Rules Series 307
R307-401	Rules Series 307 - Section 401
SO_2	Sulfur dioxide
Title IV	Title IV of the Clean Air Act
Title V	Title V of the Clean Air Act
TPY	Tons per year
UAC	Utah Administrative Code
VOC	Volatile organic compounds

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State of Utah

SPENCER J. COX
Governor

DEIDRE HENDERSON
Lieutenant Governor

Department of
Environmental Quality

Tim Davis
Executive Director

DIVISION OF AIR QUALITY
Bryce C. Bird
Director

RN100070032

September 3, 2025

Javier Ortiz
Amrize Cement Inc.
8700 West Bryn Mawr Avenue
Chicago, IL 60631
Javier.Sosa@amrize.com

Dear Javier Ortiz,

Re: Engineer Review:
Modification to Approval Order (AO) DAQE-AN100070031-22 to Incorporate Alternative Fuel Processing and Feed System Operations and Inclusion of a New Finish Mill
Project Number: N100070032

Please review and sign this letter and attached Engineer Review (ER) within **10 business days**. For this document to be considered as the application for a Title V administrative amendment, a Title V Responsible Official must sign the next page.

Please contact **John Jenks** at (385) 306-6510 if you have any questions or concerns about the ER. If you accept the contents of this ER, please email this signed cover letter to John Jenks at **jjenks@utah.gov.** After receipt of the signed cover letter, the DAQ will prepare an Intent to Approve (ITA) for a 30-day public comment period. When the public comment period ends, the DAQ will consider any comments received and will issue the Approval Order.

If you do not respond to this letter within **10 business days,** the project will move forward without your approval. If you have concerns that we cannot resolve, the DAQ Director may issue an Order prohibiting construction.

Approval Signature _____
(Signature & Date)

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OPTIONAL: In order for this Engineer Review and associated Approval Order conditions to be considered as an application to administratively amend your Title V Permit, the Responsible Official, as defined in R307-415-3, must sign the statement below. **THIS IS STRICTLY OPTIONAL.**

If you do not want the Engineer Review to be considered as an application to administratively amend your Operating Permit only the approval signature above is required.

Failure to have the Responsible Official sign below will not delay the Approval Order, but will require submittal of a separate Operating Permit Application to revise the Title V permit in accordance with R307-415-5a through 5e and R307-415-7a through 7i. A guidance document: *Title V Operating Permit Application Due Dates* clarifies the required due dates for Title V operating permit applications and can be viewed at:

https://deq.utah.gov/air-quality/permitting-guidance-and-guidelines-air-quality

"Based on information and belief formed after reasonable inquiry, I certify that the statements and information provided for this Approval Order are true, accurate and complete and request that this Approval Order be considered as an application to administratively amend the Operating Permit."

Responsible Official _____
(Signature & Date)

Print Name of Responsible Official _____

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UTAH DIVISION OF AIR QUALITY
ENGINEER REVIEW

SOURCE INFORMATION

Project Number	N100070032
Owner Name	Amrize Cement Inc.
Mailing Address	8700 West Bryn Mawr Avenue Chicago, IL, 60631
Source Name	Amrize Cement Inc. - Devil's Slide Plant
Source Location	6055 E. Croydon Rd. Morgan, UT 84050
UTM Projection	455,500 m Easting, 4,545,500 m Northing
UTM Datum	NAD27
UTM Zone	UTM Zone 12
SIC Code	3241 (Cement, Hydraulic)
Source Contact	Clinton Badger
Phone Number	(801) 829-6821
Email	Clinton.Badger@holcim.com
Billing Contact	Clinton Badger
Phone Number	(801) 829-6821
Email	Clinton.Badger@holcim.com
Project Engineer	John Jenks, Engineer
Phone Number	(385) 306-6510
Email	jjenks@utah.gov
Notice of Intent (NOI) Submitted	March 17, 2025
Date of Accepted Application	May 17, 2025

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SOURCE DESCRIPTION

General Description
Amrize Cement Inc. (Amrize), formerly known as Holcim (US) Inc., owns and operates the Devil's Slide cement manufacturing plant near Morgan, Utah. At the Devil's Slide plant, cement is made when raw materials such as limestone & sandstone (quarried on-site), iron ore, and gypsum are proportioned, ground, mixed and then fed into a rotating kiln. The heat of the kiln alters the materials and recombines them into small stones called cement clinker. The clinker is cooled and ground with gypsum into a fine powdered cement. The final product is stored on site for later packaging and shipping. The sources of air emissions are the combustion of fuels for the kiln operation and from the kiln and clinker cooling process.

NSR Classification:
Minor Modification at Major Source

Source Classification
Located in
Morgan County
Airs Source Size: A

Applicable Federal Standards
NSPS (Part 60), A: General Provisions
NSPS (Part 60), F: Standards of Performance for Portland Cement Plants
NSPS (Part 60), Y: Standards of Performance for Coal Preparation and Processing Plants
NSPS (Part 60), OOO: Standards of Performance for Nonmetallic Mineral Processing Plants
MACT (Part 63), A: General Provisions
MACT (Part 63), LLL: National Emission Standards for Hazardous Air Pollutants From the Portland Cement Manufacturing Industry
MACT (Part 63), ZZZZ: National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines
Title V (Part 70) Major Source

Project Proposal
Modification to Approval Order (AO) DAQE-AN100070031-22 to Incorporate Alternative Fuel Processing and Feed System Operations and Inclusion of a New Finish Mill

Project Description
Amrize Cement Inc. (Amrize) submitted a a series of requests to update operations at its existing Devil's Slide Plant. These included a name change from "Holcim (US) Inc." to Amrize Cement Inc. as well as two applications: one for the installation of a new finish mill and associated ancillary equipment, and another for upgrading the fuel processing and feed system. These requests have been combined into a single permitting project for convenience.

EMISSION IMPACT ANALYSIS

All emission increases are below the modeling thresholds in R307-410-4 and R307-410-5. No modeling is required for this project. [Last updated August 27, 2025]

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SUMMARY OF EMISSIONS

The emissions listed below are an estimate of the total potential emissions from the source. Some rounding of emissions is possible.

Criteria Pollutant	Change (TPY)	Total (TPY)
CO_2 Equivalent		25644.00
Carbon Monoxide	18	1838.00
Nitrogen Oxides	11	1836.00
Particulate Matter - PM_{10}	14.65	235.65
Particulate Matter - $PM_{2.5}$	10.76	60.76
Sulfur Dioxide	0.13	457.13
Volatile Organic Compounds	1.18	152.18

Hazardous Air Pollutant	Change (lbs/yr)	Total (lbs/yr)
Arsenic (TSP) (CAS #7440382)	0	11
Benzene (Including Benzene From Gasoline) (CAS #71432)	0	14880
Formaldehyde (CAS #50000)	0	430
Generic HAPs (CAS #GHAPS)	800	7200
Hydrochloric Acid (Hydrogen Chloride) (CAS #7647010)	0	130200
Mercury (TSP) (CAS #7439976)	0	51
Metal HAPs (CAS #MHAPS)	0	4800
Naphthalene (CAS #91203)	0	1582
Phenanthrene (CAS #85018)	0	362
	Change (TPY)	**Total (TPY)**
Total HAPs	0.40	79.76

Note: Change in emissions indicates the difference between previous AO and proposed modification.

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Review of BACT for New/Modified Emission Units

1. **BACT review regarding new finish mill and alternative fuel feed system upgrades**
There are two planned changes at the Devil's Slide Plant: alternative fuel processing and feed system upgrades (GEOCYCLE), and the addition of a new finish mill and associated equipment:

The GEOCYCLE system takes nonhazardous alternative fuels and secondary materials (NHSMs) and prepares them for use in the kiln. As the bulk of this material is sized 35-40 mm, there is little generation of particulate matter emissions outside of the shredding and feeder process steps. The use of baghouse and bin vents for control of the particulates generated is best practice in this case.

The new finish mill also generates particulate emissions. In addition, the finish mill system is equipped with a heater to generate hot air gas. This new heater is rated at 50 MMBtu and is fired exclusively on natural gas. It is equipped with a low-NO_x burner to reduce NO_x emissions. More stringent control options such as ultra-low-NO_x burners and flue gas recirculation have been eliminated as technically infeasible due to high turbulence. The use of SCR is also technically infeasible as the chemistry of the materials in the mill must be controlled and the addition of ammonia from an SCR unit would affect these materials.

Increased traffic emissions on the paved and unpaved haul roads will be controlled through dust suppression. A vacuum sweeper will be used on the paved roads, while water application will be used on the unpaved roads.

UDAQ has reviewed the suggested controls included above and agrees that they represent BACT for this project.
[Last updated August 28, 2025]

SECTION I: GENERAL PROVISIONS

The intent is to issue an air quality AO authorizing the project with the following recommended conditions and that failure to comply with any of the conditions may constitute a violation of the AO. **(New or Modified conditions are indicated as "New" in the Outline Label):**

I.1	All definitions, terms, abbreviations, and references used in this AO conform to those used in the UAC R307 and 40 CFR. Unless noted otherwise, references cited in these AO conditions refer to those rules. [R307-101]
I.2	The limits set forth in this AO shall not be exceeded without prior approval. [R307-401]
I.3	Modifications to the equipment or processes approved by this AO that could affect the emissions covered by this AO must be reviewed and approved. [R307-401-1]

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I.4	All records referenced in this AO or in other applicable rules, which are required to be kept by the owner/operator, shall be made available to the Director or Director's representative upon request, and the records shall include the two-year period prior to the date of the request. Unless otherwise specified in this AO or in other applicable state and federal rules, records shall be kept for a minimum of five years. [R307-401-8]
I.5	At all times, including periods of startup, shutdown, and malfunction, owners and operators shall, to the extent practicable, maintain and operate any equipment approved under this AO, including associated air pollution control equipment, in a manner consistent with good air pollution control practice for minimizing emissions. Determination of whether acceptable operating and maintenance procedures are being used will be based on information available to the Director which may include, but is not limited to, monitoring results, opacity observations, review of operating and maintenance procedures, and inspection of the source. All maintenance performed on equipment authorized by this AO shall be recorded. [R307-401-4]
I.6	The owner/operator shall comply with UAC R307-107. General Requirements: Breakdowns. [R307-107]
I.7	The owner/operator shall comply with UAC R307-150 Series. Emission Inventories. [R307-150]
I.8	The owner/operator shall submit documentation of the status of construction or modification to the Director within 18 months from the date of this AO. This AO may become invalid if construction is not commenced within 18 months from the date of this AO or if construction is discontinued for 18 months or more. To ensure proper credit when notifying the Director, send the documentation to the Director, attn.: NSR Section. [R307-401-18]

SECTION II: PERMITTED EQUIPMENT

The intent is to issue an air quality AO authorizing the project with the following recommended conditions and that failure to comply with any of the conditions may constitute a violation of the AO. **(New or Modified conditions are indicated as "New" in the Outline Label):**

II.A THE APPROVED EQUIPMENT

II.A.1	**Permitted Source** Source-wide
II.A.2	**Raw Materials: Quarry Operations & Stockpiles** Drilling operations, rock blasting, truck loading, rock fall from dozer push, haul roads, limestone & sand storage piles and Cement Kiln Dust (CKD) storage pile. The drill rig is equipped with a baghouse.
II.A.3	**Raw Materials: Impact Crusher & Conveying** Dump pocket/feeder (#211-AF1), impact crusher, conveyors and associated transfer points, with emissions controlled by baghouses (#291-BFx) or enclosures.
II.A.4	**Raw Materials: Preblending Hall** Limestone & sandstone are pre-blended in an enclosed blending hall. No unit-specific applicable requirements.

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II.A.5	**Raw Materials: Raw Meal Preparation System** Equipment used in preparation of kiln feed (raw meal), including material transfer points, conveyors, bag filters, bins. (HAC #31x-xxx to 39x-xxx excluding #361-RM1)
II.A.6	**Coal Ops: Milling, Processing & Conveying** Equipment for the handling, conveying, storage and milling of coal. Emissions are controlled by baghouses: HAC #L61-BF1 (mill discharge) and #L91-BF1 (bin vent). Equipment does not include conveying system used to convey coal from the mill to the kiln.
II.A.7	**Coal Ops: Transfer Equipment** Equipment in the clinker manufacturing system for transfers from coal mill to the kiln (HAC #L91-xxx).
II.A.8 NEW	**Fuel Processing and Feed System (GEOCYCLE)** Consists of fuel preprocessing (enclosed) - controlled with 1 baghouse and 2 bin vent filters
II.A.9	**Kiln System: Clinker Manufacture - MHO** Equipment for the calcination of raw material, including material transfer points, conveyors, bag filters, bins (HAC #411-xxx, 431-xxx, 4A1-xxx except 4A1-BFx).
II.A.10	**Kiln System: In-Line Kiln/Raw Mill** Emissions from five-stage kiln system (HAC #441-xxx, 461-xxx) and raw mill (#361-RM1) are controlled by main baghouse (#421-BF1). Alkali bypass emissions are controlled by baghouse (#4A1-BF1). Both baghouses exit through the main stack.
II.A.11	**Selective Non-catalytic Reduction system** One SNCR unit used for the control of NO_x emissions from the main kiln stack. No unit specific requirements.
II.A.12	**Cooler System: Clinker Cooler** Grate cooler (#417-GQ1) for cooling clinker, controlled by baghouse (#471-BF1).
II.A.13	**Cooler System: Clinker Cooler System - MHO** Transfer equipment and dust control for clinker cooler system. (HAC #47x-xxx to 49x-xxx excluding 471-BF1, 471-GQ1).
II.A.14	**Cooler System: Finish Mill Operations** Equipment for grinding of clinker and additive addition, including material transfer points, conveyors, bag filters, bins. (HAC #52x-xxx to 59x-xxx, K93-xxx & T93-xxx) New equipment: one vertical finish mill (Finish Mill 4) one 50 MMBtu/hr heater for production of hot air gas ancillary material handling and storage (baghouse control)
II.A.15	**Supplemental: Packing & Distribution System** Equipment for shipping of cement products: conveyor transfer points, bins, bag filters and other miscellaneous transfer points. (HAC #61x-xxx to 6Ex-xxx)
II.A.16	**Supplemental: Material Handling - Group 1** All totally-enclosed storage bins, conveying system transfer points, bagging systems, and bulk loading/unloading systems identified in 40 CFR 63.1340, Subpart LLL as affected sources.
II.A.17	**Supplemental: Material Handling - Group 2** All partially-enclosed or unenclosed storage bins, conveying system transfer points, bagging systems, and bulk loading/unloading systems identified in 40 CFR 63.1340, Subpart LLL as affected sources. This unit also includes partially- or totally-enclosed storage bins, conveying system transfer points, bagging systems, and bulk loading/unloading systems identified in 40 CFR 63.1340, Subpart LLL as affected sources and that are equipped with a control device (PMCD).

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II.A.18	**Supplemental: Emergency Generators** Two diesel-powered emergency backup generators, approx 755 HP and 166 HP. The 166 HP unit is subject to 40 CFR 63 Subpart ZZZZ requirements.

SECTION II: SPECIAL PROVISIONS

The intent is to issue an air quality AO authorizing the project with the following recommended conditions and that failure to comply with any of the conditions may constitute a violation of the AO. **(New or Modified conditions are indicated as "New" in the Outline Label):**

II.B REQUIREMENTS AND LIMITATIONS

II.B.1	**Conditions on Permitted Source**
II.B.1.a	Emissions to the atmosphere at all times from the indicated emission point shall not exceed the following rates and concentrations: Source: Kiln Main Stack Exhaust PM_{10}: 14 lb/hr SO_2: 475 lb/hr on a rolling 24-hr average and 457 tons per rolling 12-month period CO: 438 lb/hr NO_x: 1,817 tons rolling 12-month period. [R307-401-8(1)(a)]
II.B.1.a.1	Compliance with the NO_x and SO_2 emission limitations will be through use of a CEM. The owner/operator shall install, calibrate, maintain, and continuously operate a CEM on the kiln main stack. The owner/operator shall record the output of the system, which shall measure the NO_x and SO_2 emissions. The monitoring system shall comply with all applicable sections of R307-170, UAC and 40 CFR 60, Appendix B. Except for system breakdown, repairs, calibration checks, and zero and span adjustments required under paragraph (d) 40 CFR 60.13, the owner/operator of an affected source shall continuously operate all required continuous monitoring devices and shall meet minimum frequency of operation requirements as outlined in 40 CFR 60.13 and Section UAC R307-170. [R307-170]
II.B.1.a.2	Compliance Demonstration To demonstrate compliance with the PM_{10} and CO emission limitations above, the owner/operator shall perform stack testing on the kiln exhaust stack according to the stack testing conditions contained in this AO. Test Frequency PM_{10}: a stack test shall be performed within five years after the date of the most recent stack test. The Director may require the owner/operator to perform a stack test at any time. CO: a stack test shall be performed within two years after the date of the most recent stack test. The Director may require the owner/operator to perform a stack test at any time. [R307-165-2, R307-401-8]
II.B.1.b	The owner/operator shall adhere to the following:

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	A. No more than 930,000 tons of clinker shall be produced per rolling 12-month period Production shall be determined by maintenance of a supervisor log. Compliance with this annual limitation shall be determined on a rolling 12-month total. Based on the twentieth day of each month a new 12-month total shall be calculated using the previous 12 months of kiln production. Records of production shall be kept for all periods when the plant is in operation. B. Mining operations and transporting of materials from the mine to the plant shall be limited to between 5:00 AM and 8:00 PM each day. Mining and transporting operations shall be determined by maintenance of a supervisor log. Records shall be kept in the log when mining operations and transporting of materials from the mine to the plant occur outside of the schedule listed above. [R307-401-8(1)(a)]
II.B.1.c	Visible emissions from the following emission points shall not exceed the listed values: A. Crushers - 15% opacity B. Coal milling, processing, conveying - 20% opacity C. All other point sources, except the kiln main stack and the clinker cooler - 10% opacity Opacity observations of emissions from stationary sources shall be conducted according to 40 CFR 60, Appendix A, Method 9. All PM_{10} stack emission releases shall be vented vertically without any restriction to upward momentum at or beyond the stack opening. [40 CFR 60 Subpart OOO, 40 CFR 60 Subpart Y, R307-401-8(1)(a)]
II.B.1.d	All paved/unpaved roads and other operational areas that are used by mobile equipment shall be water sprayed, and/or chemically treated, and/or swept using a mobile sweeper to control fugitive dust. The application of water or chemical treatment shall be used for unpaved roads and unpaved operational areas. Treatment shall be of sufficient frequency and quantity to maintain the surface material in a damp/moist condition unless it is below freezing. The mobile sweeper shall operate as necessary to control visible fugitive dust emissions from paved surfaces. The opacity shall not exceed 20% during all times the areas are in use. Records of water, and/or chemical treatment, and/or mobile sweeping shall be kept for all periods when the plant is in operation. The records shall include the following items as applicable: A. Date B. Number of treatments made, dilution ratio, and quantity C. Precipitation received, if any, and approximate amount D. Time of day treatments were made E. Records of temperature, if the temperature is below freezing. [R307-205]
II.B.1.e	Visible fugitive dust emissions from haul-road traffic and mobile equipment in operational areas shall not exceed 20% opacity at any point. Visible emission determinations shall use procedures similar to Method 9. The normal requirement for observations to be made at 15-second intervals over a six-minute period, however, shall not apply. Visible emissions shall

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	be measured at the densest point of the plume but at a point not less than 1/2 vehicle length behind the vehicle and not less than 1/2 the height of the vehicle. [R307-205]
II.B.1.f	A dust suppression system shall be installed at the following points to control fugitive emissions: A. Impact crusher dump pocket (II.A.3) - water spray B. Conveyor transfer points (II.A.3, II.A.5, II.A.6) - baghouse dust collectors The system shall operate whenever dry conditions warrant or as determined necessary by the Director. Visual inspections shall be made monthly to demonstrate compliance with this condition. A log of the visual inspections including the date and time of each inspection and the name of the person making the inspection shall be maintained. [R307-401-8(1)(a)]
II.B.2	**Stack Testing Requirements**
II.B.2.a	Notification At least 30 days prior to conducting a stack test, the owner/operator shall submit a source test protocol to the Director. The source test protocol shall include the items contained in R307-165-3. If directed by the Director, the owner/operator shall attend a pretest conference. [R307-165-3, R307-401-8]
II.B.2.b	Access The owner/operator shall provide Occupational Safety and Health Administration (OSHA)- or Mine Safety and Health Administration (MSHA)-approved access to the test location. [R307-401-8]
II.B.2.c	Reporting No later than 60 days after completing a stack test, the owner/operator shall submit a written report of the results from the stack testing to the Director. The report shall include validated results and supporting information. [R307-165-5, R307-401-8]
II.B.2.d	Filterable PM_{10} 40 CFR 60, Appendix A, Method 5; 40 CFR 51, Appendix M, Method 201; Method 201A; or other EPA-approved testing method as acceptable to the Director. If other approved testing methods are used which cannot measure the PM_{10} fraction of the filterable particulate emissions, all of the filterable particulate emissions shall be considered PM_{10}. Condensable PM 40 CFR 51, Appendix M, Method 202 or other EPA-approved testing method as acceptable to the Director. The back-half condensables shall not be used for compliance demonstration but shall be used for inventory purposes. [R307-401-8]
II.B.2.e	CO 40 CFR 60, Appendix A, Method 10 or other EPA-approved testing method as acceptable to the Director. [R307-401-8]
II.B.3	**Fuel Requirements**
II.B.3.a	The owner/operator shall only use diesel fuel (e.g. fuel oil #1, #2, or diesel fuel oil additives) as fuel in the emergency generators (II.A.17). [R307-401-8]
II.B.3.a.1	The owner/operator shall only combust diesel fuel in the emergency engines that meets a

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	sulfur content of 15 ppm or less. [R307-401-8(1)(a)]
II.B.3.a.2	To demonstrate compliance with the fuel requirement, the owner/operator shall maintain records of diesel fuel purchase invoices or obtain certification of sulfur content from the diesel fuel supplier. The diesel fuel purchase invoices shall indicate that the diesel fuel meets the fuel requirements. [R307-401-8]
II.B.3.b	The owner/operator shall use only the following fuels in the kiln: A. Coal B. Diaper Derived Fuel (DDF) C. Tire Derived Fuel (TDF) D. Natural Gas E. Coke F. Fuel Oil G. Used Oil H. Synthetic Fuel I. Wood J. Any Non-Recyclable plastics, paper, and fibers from Municipal Solid Waste, Commercial or Industrial Waste recycling centers; or as byproducts from manufacturing facilities that meet the definition of Non-Hazardous Secondary materials under 40 CFR part 241. Examples include but are not limited to manufactured waste plastics, cellulose products, poly scrap and plastic films from the recycling of paperboard materials. K. Coal Additives as defined in Condition II.B.3.b.1. [R307-401-8(1)(a)]
II.B.3.b.1	The coal additives listed above shall consist of alternative fuels approved by the Director. Prior to burning any proposed coal additive, the owner/operator shall obtain approval from the Director. To obtain approval, the owner/operator shall submit Material Safety Data Sheets (MSDS) or the results of suitable tests giving data similar to a Proximate and Ultimate analysis of the proposed coal additive. Approval by the Director shall consist of a letter approving the use of the proposed coal additive. Approval is not required to change from one previously approved coal additive to another previously approved coal additive. The average quantity of coal additives burned shall not be greater than 15% of the total daily heat input of the kiln and precalciner. The owner/operator may increase the average quantity of coal additives up to 25% of the total daily heat input of the kiln and precalciner upon approval by the Director in accordance with the approval process described herein. [R307-401-8(1)(a)]
II.B.3.c	The sulfur content of any coal or mixture of coals burned in the kiln shall not exceed 1.0 pound of sulfur per million BTUs of heat input. The sulfur content of any fuel oil burned in the kiln shall not exceed 0.85 pounds sulfur per million gross BTUs heat input. If any type of fuel is desired to be used that has a higher sulfur content, an AO shall be required in accordance with R307-401, UAC. Methods for determining sulfur content of coal and fuel oil shall be those methods of the American Society for Testing and Materials, UAC R307-203-1 (4) A. For determining sulfur content in coal, ASTM Method D4239-2018 is to be used.

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	B. For determining sulfur content in oil, ASTM Methods D2880-71 or D4294-89 are to be used. C. For determining the gross calorific (or BTU) content of coal, ASTM Methods D5865/D5865M are to be used. If these methods are superseded, the approved method put forth by ASTM shall be used. [R307-401-8(1)(a)]
II.B.3.d	The concentration/parameters of contaminants in any used oil fuel shall not exceed the following levels: 1) Arsenic: 5 ppm by weight 2) Cadmium: 2 ppm by weight 3) Chromium: 10 ppm by weight 4) Lead: 100 ppm by weight 5) Total halogens: 1,000 ppm by weight 6) Sulfur: 0.5 percent by weight A. The flash point of all used oil to be burned shall not be less than 100°F. B. The owner/operator shall provide test certification for each load of used oil fuel received. Certification shall be either by their own testing or test reports from the used oil fuel marketer. Records of used oil fuel consumption and the test reports shall be kept for all periods when the plant is in operation. C. Used oil that does not exceed any of the listed contaminants content may be burned. The owner/operator shall record the quantities of oil burned on a daily basis. D. Any used oil fuel that contains more than 1000 ppm by weight of total halogens shall be considered a hazardous waste and shall not be burned in the kiln. The oil shall be tested for halogen content by ASTM Method D-808-81, EPA Method 8240 or Method 8260 before used oil fuel is transferred to the day tank and burned. E. Sources utilizing used oil as a fuel shall comply with the State Division of Solid and Hazardous Waste in accordance with R315-15, UAC. [R307-401-8]
II.B.4	**Emergency Engine Requirements**
II.B.4.a	The owner/operator shall not operate each emergency engine on site for more than 100 hours per calendar year for maintenance checks and readiness testing. Each emergency engine may be operated for up to 50 hours per calendar year in non-emergency situations. Any operation in non-emergency situations shall be counted as part of the 100 hours per calendar year for maintenance and testing. There is no time limit on the use of the engines during emergencies. [40 CFR 60 Subpart ZZZZ, R307-401-8]
II.B.4.a.1	To determine compliance with the annual operation limitation, records documenting the operation of each emergency engine shall be kept in a log and shall include the following: a. The date the emergency engine was used b. The duration of operation in hours

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	c. The reason for the emergency engine usage. [40 CFR 60 Subpart ZZZZ, R307-401-8]
II.B.4.a.2	To determine the duration of operation, the owner/operator shall install a non-resettable hour meter for each emergency engine. [R307-401-8, 40 CFR 63 Subpart ZZZZ]

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PERMIT HISTORY

When issued, the approval order shall supersede (if a modification) or will be based on the following documents:

Replaces	DAQE_AN100070021-22 dated March 10, 2022
Is Derived From	Source Submitted NOI dated March 17, 2025
Incorporates	Additional Information Received dated June 11, 2025
Incorporates	Additional Information Received dated July 15, 2025

REVIEWER COMMENTS

1. **Comment regarding combined projects:**
Amrize submitted three separate rpermitting requests: the addition of the GEOCYCLE alternative fuel processing and feed system, the addition of a new finish mill and hot air gas system, and a name change request to reflect the new name of the facility. These three projects have been combined into a single project for ease of processing and to combine comment periods. [Last updated August 28, 2025]

2. **Comment regarding change in equipment:**
The following changes were made to the equipment list:
A new listing was made for the GEOCYCLE system, this is found at II.A.8 (with all subsequent items renumbered) in order to locate it properly in the process flow. The entry details the purpose of the equipment and the add-on controls.

   Item II.A.14 (previously II.A.13) was expanded to include the new Finish Mill 4, the Hot Air Gas heater and the associated ancillary equipment. [Last updated August 28, 2025]

3. **Comment regarding no changes in section II.B:**
Although this project involves the addition of new equipment, there is no change in the amount of material processed, the total amount of clinker produced, or the calculation of emissions from the kiln and clinker cooler. There is a small increase in particulate emissions from the new GEOCYCLE system and an increase in both particulate and combustion emissions from the new finish mill operations.

   No changes in section II.B conditions are required as a result of this project. [Last updated August 28, 2025]

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ACRONYMS

The following lists commonly used acronyms and associated translations as they apply to this document:

40 CFR	Title 40 of the Code of Federal Regulations
AO	Approval Order
BACT	Best Available Control Technology
CAA	Clean Air Act
CAAA	Clean Air Act Amendments
CDS	Classification Data System (used by EPA to classify sources by size/type)
CEM	Continuous emissions monitor
CEMS	Continuous emissions monitoring system
CFR	Code of Federal Regulations
CMS	Continuous monitoring system
CO	Carbon monoxide
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent - 40 CFR Part 98, Subpart A, Table A-1
COM	Continuous opacity monitor
DAQ/UDAQ	Division of Air Quality
DAQE	This is a document tracking code for internal UDAQ use
EPA	Environmental Protection Agency
FDCP	Fugitive dust control plan
GHG	Greenhouse Gas(es) - 40 CFR 52.21 (b)(49)(i)
GWP	Global Warming Potential - 40 CFR Part 86.1818-12(a)
HAP or HAPs	Hazardous air pollutant(s)
ITA	Intent to Approve
LB/HR	Pounds per hour
LB/YR	Pounds per year
MACT	Maximum Achievable Control Technology
MMBTU	Million British Thermal Units
NAA	Nonattainment Area
NAAQS	National Ambient Air Quality Standards
NESHAP	National Emission Standards for Hazardous Air Pollutants
NOI	Notice of Intent
NO_x	Oxides of nitrogen
NSPS	New Source Performance Standard
NSR	New Source Review
PM_{10}	Particulate matter less than 10 microns in size
$PM_{2.5}$	Particulate matter less than 2.5 microns in size
PSD	Prevention of Significant Deterioration
PTE	Potential to Emit
R307	Rules Series 307
R307-401	Rules Series 307 - Section 401
SO_2	Sulfur dioxide
Title IV	Title IV of the Clean Air Act
Title V	Title V of the Clean Air Act
TPY	Tons per year
UAC	Utah Administrative Code
VOC	Volatile organic compounds

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State of Utah

SPENCER J. COX
Governor

DEIDRE HENDERSON
Lieutenant Governor

Department of
Environmental Quality

Tim Davis
Executive Director

DIVISION OF AIR QUALITY
Bryce C. Bird
Director

RN100070032

September 15, 2025

Javier Ortiz
Amrize Cement Inc.
8700 West Bryn Mawr Avenue
Chicago, IL 60631
Javier.Sosa@amrize.com

Dear Javier Ortiz,

Re: Engineer Review:
Modification to Approval Order DAQE-AN100070031-22 to Incorporate Alternative Fuel Processing and Feed System Operations and Inclusion of a New Finish Mill
Project Number: N100070032

Please review and sign this letter and attached Engineer Review (ER) within **10 business days**. For this document to be considered as the application for a Title V administrative amendment, a Title V Responsible Official must sign the next page.

Please contact **John Jenks** at (385) 306-6510 if you have any questions or concerns about the ER. If you accept the contents of this ER, please email this signed cover letter to John Jenks at **jjenks@utah.gov.** After receipt of the signed cover letter, the DAQ will prepare an Intent to Approve (ITA) for a 30-day public comment period. When the public comment period ends, the DAQ will consider any comments received and will issue the Approval Order.

If you do not respond to this letter within **10 business days,** the project will move forward without your approval. If you have concerns that we cannot resolve, the DAQ Director may issue an Order prohibiting construction.

Approval Signature _____ September 12, 2025
(Signature & Date)

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OPTIONAL: In order for this Engineer Review and associated Approval Order conditions to be considered as an application to administratively amend your Title V Permit, the Responsible Official, as defined in R307-415-3, must sign the statement below. **THIS IS STRICTLY OPTIONAL.**

If you do not want the Engineer Review to be considered as an application to administratively amend your Operating Permit only the approval signature above is required.

Failure to have the Responsible Official sign below will not delay the Approval Order, but will require submittal of a separate Operating Permit Application to revise the Title V permit in accordance with R307-415-5a through 5e and R307-415-7a through 7i. A guidance document: *Title V Operating Permit Application Due Dates* clarifies the required due dates for Title V operating permit applications and can be viewed at:

https://deq.utah.gov/air-quality/permitting-guidance-and-guidelines-air-quality

"Based on information and belief formed after reasonable inquiry, I certify that the statements and information provided for this Approval Order are true, accurate and complete and request that this Approval Order be considered as an application to administratively amend the Operating Permit."

Responsible Official _____ 9/18/2025
(Signature & Date)

Print Name of Responsible Official Javier Josa Ortiz

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UTAH DIVISION OF AIR QUALITY
ENGINEER REVIEW

SOURCE INFORMATION

Project Number	N100070032
Owner Name	Amrize Cement Inc.
Mailing Address	8700 West Bryn Mawr Avenue Chicago, IL, 60631
Source Name	Amrize Cement Inc. - Devil's Slide Plant
Source Location	6055 E. Croydon Rd. Morgan, UT 84050
UTM Projection	455,500 m Easting, 4,545,500 m Northing
UTM Datum	NAD27
UTM Zone	UTM Zone 12
SIC Code	3241 (Cement, Hydraulic)
Source Contact	Clinton Badger
Phone Number	(801) 829-6821
Email	Clinton.Badger@amrize.com
Billing Contact	Clinton Badger
Phone Number	(801) 829-6821
Email	Clinton.Badger@amrize.com
Project Engineer	John Jenks, Engineer
Phone Number	(385) 306-6510
Email	jjenks@utah.gov
Notice of Intent (NOI) Submitted	March 17, 2025
Date of Accepted Application	May 17, 2025

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SOURCE DESCRIPTION

General Description
Amrize Cement Inc. (Amrize), formerly known as Holcim (US) Inc., owns and operates the Devil's Slide cement manufacturing plant near Morgan, Utah. At the Devil's Slide plant, cement is made when raw materials such as limestone & sandstone (quarried on-site), iron ore, and an alumina source are proportioned, ground, mixed and then fed into a rotating kiln. The heat of the kiln alters the materials and recombines them into small stones called cement clinker. The clinker is cooled and ground with gypsum into a fine powdered cement. The final product is stored on site for later packaging and shipping. The sources of air emissions are the combustion of fuels for the kiln operation and from the kiln and clinker cooling process.

NSR Classification:
Minor Modification at Major Source

Source Classification
Located in
Morgan County
Airs Source Size: A

Applicable Federal Standards
NSPS (Part 60), A: General Provisions
NSPS (Part 60), F: Standards of Performance for Portland Cement Plants
NSPS (Part 60), Y: Standards of Performance for Coal Preparation and Processing Plants
NSPS (Part 60), OOO: Standards of Performance for Nonmetallic Mineral Processing Plants
MACT (Part 63), A: General Provisions
MACT (Part 63), LLL: National Emission Standards for Hazardous Air Pollutants From the Portland Cement Manufacturing Industry
MACT (Part 63), ZZZZ: National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines
Title V (Part 70) Major Source

Project Proposal
Modification to Approval Order DAQE-AN100070031-22 to Incorporate Alternative Fuel Processing and Feed System Operations and Inclusion of a New Finish Mill

Project Description
Amrize Cement Inc. (Amrize) submitted a series of requests to update operations at its existing Devil's Slide Plant. These included a name change from "Holcim (US) Inc." to Amrize Cement Inc. as well as two applications: one for the installation of a new finish mill and associated ancillary equipment, and another for upgrading the fuel processing and feed system. These requests have been combined into a single permitting action for convenience.

EMISSION IMPACT ANALYSIS

All emission increases are below the modeling thresholds in R307-410-4 and R307-410-5. No modeling is required for these projects. [Last updated September 15, 2025]

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SUMMARY OF EMISSIONS

The emissions listed below are an estimate of the total potential emissions from the source. Some rounding of emissions is possible.

Criteria Pollutant	Change (TPY)	Total (TPY)
CO_2 Equivalent		25644.00
Carbon Monoxide	18	1838.00
Nitrogen Oxides	11	1836.00
Particulate Matter - PM_{10}	14.65	235.65
Particulate Matter - $PM_{2.5}$	10.76	60.76
Sulfur Dioxide	0.13	457.13
Volatile Organic Compounds	1.18	152.18

Hazardous Air Pollutant	Change (lbs/yr)	Total (lbs/yr)
Arsenic (TSP) (CAS #7440382)	0	11
Benzene (Including Benzene From Gasoline) (CAS #71432)	0	14880
Formaldehyde (CAS #50000)	0	430
Generic HAPs (CAS #GHAPS)	800	7200
Hydrochloric Acid (Hydrogen Chloride) (CAS #7647010)	0	130200
Mercury (TSP) (CAS #7439976)	0	51
Metal HAPs (CAS #MHAPS)	0	4800
Naphthalene (CAS #91203)	0	1582
Phenanthrene (CAS #85018)	0	362
	Change (TPY)	**Total (TPY)**
Total HAPs	0.40	79.76

Note: Change in emissions indicates the difference between previous AO and proposed modification.

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Review of BACT for New/Modified Emission Units

1. **BACT review regarding new finish mill and alternative fuel feed system upgrades**
There are two planned changes at the Devil's Slide Plant: alternative fuel processing and feed system upgrades (GEOCYCLE), and the addition of a new finish mill and associated equipment:

The GEOCYCLE system takes nonhazardous alternative fuels and secondary materials (NHSMs) and prepares them for use in the kiln. As the bulk of this material is sized 35-40 mm, there is little generation of particulate matter emissions outside of the shredding and feeder process steps. The use of baghouse and bin vents for controlling the particulates generated is best practice in this case.

The new finish mill also generates particulate emissions. In addition, the finish mill system is equipped with a heater to generate hot air gas. This new heater is rated at 50 MMBtu and is fired exclusively on natural gas. It is equipped with a low-NO_x burner to reduce NO_x emissions. More stringent control options such as ultra-low-NO_x burners and flue gas recirculation have been eliminated as technically infeasible due to high turbulence. The use of SCR is also technically infeasible as the chemistry of the materials in the mill must be controlled and the addition of ammonia from an SCR unit would affect these materials.

Increased traffic emissions on the paved and unpaved haul roads will be controlled through dust suppression. A vacuum sweeper will be used on the paved roads, while water application will be used on the unpaved roads.

UDAQ has reviewed the suggested controls included above and agrees that they represent BACT for this project.
[Last updated September 15, 2025]

SECTION I: GENERAL PROVISIONS

The intent is to issue an air quality AO authorizing the project with the following recommended conditions and that failure to comply with any of the conditions may constitute a violation of the AO. **(New or Modified conditions are indicated as "New" in the Outline Label):**

I.1	All definitions, terms, abbreviations, and references used in this AO conform to those used in the UAC R307 and 40 CFR. Unless noted otherwise, references cited in these AO conditions refer to those rules. [R307-101]
I.2	The limits set forth in this AO shall not be exceeded without prior approval. [R307-401]
I.3	Modifications to the equipment or processes approved by this AO that could affect the emissions covered by this AO must be reviewed and approved. [R307-401-1]

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I.4	All records referenced in this AO or in other applicable rules, which are required to be kept by the owner/operator, shall be made available to the Director or Director's representative upon request, and the records shall include the two-year period prior to the date of the request. Unless otherwise specified in this AO or in other applicable state and federal rules, records shall be kept for a minimum of five years. [R307-401-8]
I.5	At all times, including periods of startup, shutdown, and malfunction, owners and operators shall, to the extent practicable, maintain and operate any equipment approved under this AO, including associated air pollution control equipment, in a manner consistent with good air pollution control practice for minimizing emissions. Determination of whether acceptable operating and maintenance procedures are being used will be based on information available to the Director which may include, but is not limited to, monitoring results, opacity observations, review of operating and maintenance procedures, and inspection of the source. All maintenance performed on equipment authorized by this AO shall be recorded. [R307-401-4]
I.6	The owner/operator shall comply with UAC R307-107. General Requirements: Breakdowns. [R307-107]
I.7	The owner/operator shall comply with UAC R307-150 Series. Emission Inventories. [R307-150]
I.8	The owner/operator shall submit documentation of the status of construction or modification to the Director within 18 months from the date of this AO. This AO may become invalid if construction is not commenced within 18 months from the date of this AO or if construction is discontinued for 18 months or more. To ensure proper credit when notifying the Director, send the documentation to the Director, attn.: NSR Section. [R307-401-18]

SECTION II: PERMITTED EQUIPMENT

The intent is to issue an air quality AO authorizing the project with the following recommended conditions and that failure to comply with any of the conditions may constitute a violation of the AO. **(New or Modified conditions are indicated as "New" in the Outline Label):**

II.A THE APPROVED EQUIPMENT

II.A.1	**Permitted Source** Source-wide
II.A.2	**Raw Materials: Quarry Operations & Stockpiles** Drilling operations, rock blasting, truck loading, rock fall from dozer push, haul roads, limestone & sand storage piles and Cement Kiln Dust (CKD) storage pile. The drill rig is equipped with a baghouse.
II.A.3	**Raw Materials: Impact Crusher & Conveying** Dump pocket/feeder (#211-AF1), impact crusher, conveyors and associated transfer points, with emissions controlled by baghouses (#291-BFx) or enclosures.
II.A.4	**Raw Materials: Preblending Hall** Limestone & sandstone are pre-blended in an enclosed blending hall. No unit-specific applicable requirements.

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II.A.5	**Raw Materials: Raw Meal Preparation System** Equipment used in preparation of kiln feed (raw meal), including material transfer points, conveyors, bag filters, bins. (HAC #31x-xxx to 39x-xxx excluding #361-RM1)
II.A.6	**Coal Ops: Milling, Processing & Conveying** Equipment for the handling, conveying, storage and milling of coal. Emissions are controlled by baghouses: HAC #L61-BF1 (mill discharge) and #L91-BF1 (bin vent). Equipment does not include conveying system used to convey coal from the mill to the kiln.
II.A.7	**Coal Ops: Transfer Equipment** Equipment in the clinker manufacturing system for transfers from coal mill to the kiln (HAC #L91-xxx).
II.A.8 NEW	**Fuel Processing and Feed System (GEOCYCLE)** Consists of fuel preprocessing (enclosed) - controlled with 1 baghouse and 2 bin vent filters
II.A.9	**Kiln System: Clinker Manufacture - MHO** Equipment for the calcination of raw material, including material transfer points, conveyors, bag filters, bins (HAC #411-xxx, 431-xxx, 4A1-xxx except 4A1-BFx).
II.A.10	**Kiln System: In-Line Kiln/Raw Mill** Emissions from five-stage kiln system (HAC #441-xxx, 461-xxx) and raw mill (#361-RM1) are controlled by main baghouse (#421-BF1). Alkali bypass emissions are controlled by baghouse (#4A1-BF1). Both baghouses exit through the main stack.
II.A.11	**Selective Non-catalytic Reduction system** One SNCR unit used for the control of NO_x emissions from the main kiln stack. No unit specific requirements.
II.A.12	**Cooler System: Clinker Cooler** Grate cooler (#417-GQ1) for cooling clinker, controlled by baghouse (#471-BF1).
II.A.13	**Cooler System: Clinker Cooler System - MHO** Transfer equipment and dust control for clinker cooler system. (HAC #47x-xxx to 49x-xxx excluding 471-BF1, 471-GQ1).
II.A.14 NEW	**Cooler System: Finish Mill Operations** Equipment for grinding of clinker and additive addition, including material transfer points, conveyors, bag filters, bins. (HAC #52x-xxx to 59x-xxx, K93-xxx & T93-xxx) New equipment: one vertical finish mill (Finish Mill 4) one 50 MMBtu/hr natural gas heater with low-NO_x burner for production of hot air gas ancillary material handling and storage (baghouse control)
II.A.15	**Supplemental: Packing & Distribution System** Equipment for shipping of cement products: conveyor transfer points, bins, bag filters and other miscellaneous transfer points. (HAC #61x-xxx to 6Ex-xxx)
II.A.16	**Supplemental: Material Handling - Group 1** All totally-enclosed storage bins, conveying system transfer points, bagging systems, and bulk loading/unloading systems identified in 40 CFR 63.1340, Subpart LLL as affected sources.
II.A.17	**Supplemental: Material Handling - Group 2** All partially-enclosed or unenclosed storage bins, conveying system transfer points, bagging systems, and bulk loading/unloading systems identified in 40 CFR 63.1340, Subpart LLL as affected sources. This unit also includes partially- or totally-enclosed storage bins, conveying system transfer points, bagging systems, and bulk loading/unloading systems identified in 40 CFR 63.1340, Subpart LLL as affected sources and that are equipped with a control device (PMCD).

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II.A.18	**Supplemental: Emergency Generators** Two diesel-powered emergency backup generators, approx 755 HP and 166 HP. The 166 HP unit is subject to 40 CFR 63 Subpart ZZZZ requirements.

SECTION II: SPECIAL PROVISIONS

The intent is to issue an air quality AO authorizing the project with the following recommended conditions and that failure to comply with any of the conditions may constitute a violation of the AO. **(New or Modified conditions are indicated as "New" in the Outline Label):**

II.B REQUIREMENTS AND LIMITATIONS

II.B.1	**Conditions on Permitted Source**
II.B.1.a	Emissions to the atmosphere at all times from the indicated emission point shall not exceed the following rates and concentrations: Source: Kiln Main Stack Exhaust PM_{10}: 14 lb/hr SO_2: 475 lb/hr on a rolling 24-hr average and 457 tons per rolling 12-month period CO: 438 lb/hr NO_x: 1,817 tons rolling 12-month period. [R307-401-8(1)(a)]
II.B.1.a.1	Compliance with the NO_x and SO_2 emission limitations will be through use of a CEM. The owner/operator shall install, calibrate, maintain, and continuously operate a CEM on the kiln main stack. The owner/operator shall record the output of the system, which shall measure the NO_x and SO_2 emissions. The monitoring system shall comply with all applicable sections of R307-170, UAC and 40 CFR 60, Appendix B. Except for system breakdown, repairs, calibration checks, and zero and span adjustments required under paragraph (d) 40 CFR 60.13, the owner/operator of an affected source shall continuously operate all required continuous monitoring devices and shall meet minimum frequency of operation requirements as outlined in 40 CFR 60.13 and Section UAC R307-170. [R307-170]
II.B.1.a.2	Compliance Demonstration To demonstrate compliance with the PM_{10} and CO emission limitations above, the owner/operator shall perform stack testing on the kiln exhaust stack according to the stack testing conditions contained in this AO. Test Frequency PM_{10}: a stack test shall be performed within five years after the date of the most recent stack test. The Director may require the owner/operator to perform a stack test at any time. CO: a stack test shall be performed within two years after the date of the most recent stack test. The Director may require the owner/operator to perform a stack test at any time. [R307-165-2, R307-401-8]

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II.B.1.b	The owner/operator shall adhere to the following: A. No more than 930,000 tons of clinker shall be produced per rolling 12-month period Production shall be determined by maintenance of a supervisor log. Compliance with this annual limitation shall be determined on a rolling 12-month total. Based on the twentieth day of each month a new 12-month total shall be calculated using the previous 12 months of kiln production. Records of production shall be kept for all periods when the plant is in operation. B. Mining operations and transporting of materials from the mine to the plant shall be limited to between 5:00 AM and 8:00 PM each day. Mining and transporting operations shall be determined by maintenance of a supervisor log. Records shall be kept in the log when mining operations and transporting of materials from the mine to the plant occur outside of the schedule listed above. [R307-401-8(1)(a)]
II.B.1.c	Visible emissions from the following emission points shall not exceed the listed values: A. Crushers - 15% opacity B. Coal milling, processing, conveying - 20% opacity C. All other point sources, except the kiln main stack and the clinker cooler - 10% opacity Opacity observations of emissions from stationary sources shall be conducted according to 40 CFR 60, Appendix A, Method 9. All PM_{10} stack emission releases shall be vented vertically without any restriction to upward momentum at or beyond the stack opening. [40 CFR 60 Subpart OOO, 40 CFR 60 Subpart Y, R307-401-8(1)(a)]
II.B.1.c.1 NEW	GEOCYCLE monitoring/recordkeeping: a) Except as noted in b) below, a visual opacity survey of each affected emission unit shall be performed on a monthly basis while the unit is operating by an individual trained on the observation procedures of 40 CFR 60, Appendix A, Method 9. If visible emissions other than steam are observed from an emission unit, an opacity determination of that emission unit shall be performed by a certified observer within 24 hours of the initial survey. The opacity determination shall be performed while the unit is operating in accordance with 40 CFR 60, Appendix A, Method 9. b) For emission units located within a building, the requirements of paragraph a) apply to each affected emission unit located within a building or to the building itself. If visible emissions from a building are monitored, the requirements of paragraph a) apply to each side, roof, and vent of the building. The affected emission unit(s) shall be operating when monitoring is performed on the unit located within a building or on the building itself. c) The permittee shall record the date of each visual opacity survey and a list of the emission points checked during the visual opacity survey. The permittee shall maintain all records required by this provision and all data required by 40 CFR 60, Appendix A, Method 9. [40 CFR 60 Subpart A]

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II.B.1.d	All paved/unpaved roads and other operational areas that are used by mobile equipment shall be water sprayed, and/or chemically treated, and/or swept using a mobile sweeper to control fugitive dust. The application of water or chemical treatment shall be used for unpaved roads and unpaved operational areas. Treatment shall be of sufficient frequency and quantity to maintain the surface material in a damp/moist condition unless it is below freezing. The mobile sweeper shall operate as necessary to control visible fugitive dust emissions from paved surfaces. The opacity shall not exceed 20% during all times the areas are in use. Records of water, and/or chemical treatment, and/or mobile sweeping shall be kept for all periods when the plant is in operation. The records shall include the following items as applicable: A. Date B. Number of treatments made, dilution ratio, and quantity C. Precipitation received, if any, and approximate amount D. Time of day treatments were made E. Records of temperature, if the temperature is below freezing. [R307-205]
II.B.1.e	Visible fugitive dust emissions from haul-road traffic and mobile equipment in operational areas shall not exceed 20% opacity at any point. Visible emission determinations shall use procedures similar to Method 9. The normal requirement for observations to be made at 15-second intervals over a six-minute period, however, shall not apply. Visible emissions shall be measured at the densest point of the plume but at a point not less than 1/2 vehicle length behind the vehicle and not less than 1/2 the height of the vehicle. [R307-205]
II.B.1.f	A dust suppression system shall be installed at the following points to control fugitive emissions: A. Impact crusher dump pocket (II.A.3) - water spray B. Conveyor transfer points (II.A.3, II.A.5, II.A.6) - baghouse dust collectors The system shall operate whenever dry conditions warrant or as determined necessary by the Director. Visual inspections shall be made monthly to demonstrate compliance with this condition. A log of the visual inspections including the date and time of each inspection and the name of the person making the inspection shall be maintained. [R307-401-8(1)(a)]
II.B.2	**Stack Testing Requirements**
II.B.2.a	Notification At least 30 days prior to conducting a stack test, the owner/operator shall submit a source test protocol to the Director. The source test protocol shall include the items contained in R307-165-3. If directed by the Director, the owner/operator shall attend a pretest conference. [R307-165-3, R307-401-8]
II.B.2.b	Access The owner/operator shall provide Occupational Safety and Health Administration (OSHA)- or Mine Safety and Health Administration (MSHA)-approved access to the test location. [R307-401-8]

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II.B.2.c	Reporting No later than 60 days after completing a stack test, the owner/operator shall submit a written report of the results from the stack testing to the Director. The report shall include validated results and supporting information. [R307-165-5, R307-401-8]
II.B.2.d	Filterable PM_{10} 40 CFR 60, Appendix A, Method 5; 40 CFR 51, Appendix M, Method 201; Method 201A; or other EPA-approved testing method as acceptable to the Director. If other approved testing methods are used which cannot measure the PM_{10} fraction of the filterable particulate emissions, all of the filterable particulate emissions shall be considered PM_{10}. Condensable PM 40 CFR 51, Appendix M, Method 202 or other EPA-approved testing method as acceptable to the Director. The back-half condensables shall not be used for compliance demonstration but shall be used for inventory purposes. [R307-401-8]
II.B.2.e	CO 40 CFR 60, Appendix A, Method 10 or other EPA-approved testing method as acceptable to the Director. [R307-401-8]
II.B.3	**Fuel Requirements**
II.B.3.a	The owner/operator shall only use diesel fuel (e.g. fuel oil #1, #2, or diesel fuel oil additives) as fuel in the emergency generators (II.A.17). [R307-401-8]
II.B.3.a.1	The owner/operator shall only combust diesel fuel in the emergency engines that meets a sulfur content of 15 ppm or less. [R307-401-8(1)(a)]
II.B.3.a.2	To demonstrate compliance with the fuel requirement, the owner/operator shall maintain records of diesel fuel purchase invoices or obtain certification of sulfur content from the diesel fuel supplier. The diesel fuel purchase invoices shall indicate that the diesel fuel meets the fuel requirements. [R307-401-8]
II.B.3.b	The owner/operator shall use only the following fuels in the kiln: A. Coal B. Diaper Derived Fuel (DDF) C. Tire Derived Fuel (TDF) D. Natural Gas E. Coke F. Fuel Oil G. Used Oil H. Synthetic Fuel I. Wood J. Any Non-Recyclable plastics, paper, and fibers from Municipal Solid Waste, Commercial or Industrial Waste recycling centers; or as byproducts from manufacturing facilities that meet the definition of Non-Hazardous Secondary materials under 40 CFR part 241. Examples include but are not limited to manufactured waste plastics, cellulose products, poly scrap and plastic films from the recycling of paperboard materials. K. Coal Additives as defined in Condition II.B.3.b.1. [R307-401-8(1)(a)]

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II.B.3.b.1	The coal additives listed above shall consist of alternative fuels approved by the Director. Prior to burning any proposed coal additive, the owner/operator shall obtain approval from the Director. To obtain approval, the owner/operator shall submit Material Safety Data Sheets (MSDS) or the results of suitable tests giving data similar to a Proximate and Ultimate analysis of the proposed coal additive. Approval by the Director shall consist of a letter approving the use of the proposed coal additive. Approval is not required to change from one previously approved coal additive to another previously approved coal additive. The average quantity of coal additives burned shall not be greater than 15% of the total daily heat input of the kiln and precalciner. The owner/operator may increase the average quantity of coal additives up to 25% of the total daily heat input of the kiln and precalciner upon approval by the Director in accordance with the approval process described herein. [R307-401-8(1)(a)]
II.B.3.c	The sulfur content of any coal or mixture of coals burned in the kiln shall not exceed 1.0 pound of sulfur per million BTUs of heat input. The sulfur content of any fuel oil burned in the kiln shall not exceed 0.85 pounds sulfur per million gross BTUs heat input. If any type of fuel is desired to be used that has a higher sulfur content, an AO shall be required in accordance with R307-401, UAC. Methods for determining sulfur content of coal and fuel oil shall be those methods of the American Society for Testing and Materials, UAC R307-203-1 (4) A. For determining sulfur content in coal, ASTM Method D4239-2018 is to be used. B. For determining sulfur content in oil, ASTM Methods D2880-71 or D4294-89 are to be used. C. For determining the gross calorific (or BTU) content of coal, ASTM Methods D5865/D5865M are to be used. If these methods are superseded, the approved method put forth by ASTM shall be used. [R307-401-8(1)(a)]

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II.B.3.d	The concentration/parameters of contaminants in any used oil fuel shall not exceed the following levels: 1) Arsenic: 5 ppm by weight 2) Cadmium: 2 ppm by weight 3) Chromium: 10 ppm by weight 4) Lead: 100 ppm by weight 5) Total halogens: 1,000 ppm by weight 6) Sulfur: 0.5 percent by weight A. The flash point of all used oil to be burned shall not be less than 100°F. B. The owner/operator shall provide test certification for each load of used oil fuel received. Certification shall be either by their own testing or test reports from the used oil fuel marketer. Records of used oil fuel consumption and the test reports shall be kept for all periods when the plant is in operation. C. Used oil that does not exceed any of the listed contaminants content may be burned. The owner/operator shall record the quantities of oil burned on a daily basis. D. Any used oil fuel that contains more than 1000 ppm by weight of total halogens shall be considered a hazardous waste and shall not be burned in the kiln. The oil shall be tested for halogen content by ASTM Method D-808-81, EPA Method 8240 or Method 8260 before used oil fuel is transferred to the day tank and burned. E. Sources utilizing used oil as a fuel shall comply with the State Division of Solid and Hazardous Waste in accordance with R315-15, UAC. [R307-401-8]
II.B.4	**Emergency Engine Requirements**
II.B.4.a	The owner/operator shall not operate each emergency engine on site for more than 100 hours per calendar year for maintenance checks and readiness testing. Each emergency engine may be operated for up to 50 hours per calendar year in non-emergency situations. Any operation in non-emergency situations shall be counted as part of the 100 hours per calendar year for maintenance and testing. There is no time limit on the use of the engines during emergencies. [40 CFR 60 Subpart ZZZZ, R307-401-8]
II.B.4.a.1	To determine compliance with the annual operation limitation, records documenting the operation of each emergency engine shall be kept in a log and shall include the following: a. The date the emergency engine was used b. The duration of operation in hours c. The reason for the emergency engine usage. [40 CFR 60 Subpart ZZZZ, R307-401-8]
II.B.4.a.2	To determine the duration of operation, the owner/operator shall install a non-resettable hour meter for each emergency engine. [R307-401-8, 40 CFR 63 Subpart ZZZZ]

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PERMIT HISTORY

When issued, the approval order shall supersede (if a modification) or will be based on the following documents:

Replaces	DAQE_AN100070031-22 dated March 10, 2022
Is Derived From	Source Submitted NOI dated March 17, 2025
Incorporates	Additional Information Received dated June 11, 2025
Incorporates	Additional Information Received dated July 15, 2025

REVIEWER COMMENTS

1. **Comment regarding combined projects:**
Amrize submitted three separate permitting requests: the addition of the GEOCYCLE alternative fuel processing and feed system, the addition of a new finish mill and hot air gas system, and a name change request to reflect the new name of the facility. These three projects have been combined into a single action for ease of processing and to combine comment periods. [Last updated September 15, 2025]

2. **Comment regarding change in equipment:**
The following changes were made to the equipment list:
A new listing was made for the GEOCYCLE system, this is found at II.A.8 (with all subsequent items renumbered) in order to locate it properly in the process flow. The entry details the purpose of the equipment and the add-on controls.

   Item II.A.14 (previously II.A.13) was expanded to include the new Finish Mill 4, the Hot Air Gas heater and the associated ancillary equipment. [Last updated August 28, 2025]

3. **Comment regarding no changes in section II.B:**
Although this project involves the addition of new equipment, there is no change in the amount of material processed, the total amount of clinker produced, or the calculation of emissions from the kiln and clinker cooler. There is a small increase in particulate emissions from the new GEOCYCLE system and an increase in both particulate and combustion emissions from the new finish mill operations.

   No changes in section II.B conditions are required as a result of this project. [Last updated August 28, 2025]

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ACRONYMS

The following lists commonly used acronyms and associated translations as they apply to this document:

40 CFR	Title 40 of the Code of Federal Regulations
AO	Approval Order
BACT	Best Available Control Technology
CAA	Clean Air Act
CAAA	Clean Air Act Amendments
CDS	Classification Data System (used by EPA to classify sources by size/type)
CEM	Continuous emissions monitor
CEMS	Continuous emissions monitoring system
CFR	Code of Federal Regulations
CMS	Continuous monitoring system
CO	Carbon monoxide
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent - 40 CFR Part 98, Subpart A, Table A-1
COM	Continuous opacity monitor
DAQ/UDAQ	Division of Air Quality
DAQE	This is a document tracking code for internal UDAQ use
EPA	Environmental Protection Agency
FDCP	Fugitive dust control plan
GHG	Greenhouse Gas(es) - 40 CFR 52.21 (b)(49)(i)
GWP	Global Warming Potential - 40 CFR Part 86.1818-12(a)
HAP or HAPs	Hazardous air pollutant(s)
ITA	Intent to Approve
LB/HR	Pounds per hour
LB/YR	Pounds per year
MACT	Maximum Achievable Control Technology
MMBTU	Million British Thermal Units
NAA	Nonattainment Area
NAAQS	National Ambient Air Quality Standards
NESHAP	National Emission Standards for Hazardous Air Pollutants
NOI	Notice of Intent
NO_x	Oxides of nitrogen
NSPS	New Source Performance Standard
NSR	New Source Review
PM_{10}	Particulate matter less than 10 microns in size
$PM_{2.5}$	Particulate matter less than 2.5 microns in size
PSD	Prevention of Significant Deterioration
PTE	Potential to Emit
R307	Rules Series 307
R307-401	Rules Series 307 - Section 401
SO_2	Sulfur dioxide
Title IV	Title IV of the Clean Air Act
Title V	Title V of the Clean Air Act
TPY	Tons per year
UAC	Utah Administrative Code
VOC	Volatile organic compounds

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Governor

DEIDRE HENDERSON
Lieutenant Governor

Department of
Environmental Quality

Tim Davis
Executive Director

DIVISION OF AIR QUALITY
Bryce C. Bird
Director

RN100070032

September 15, 2025

Javier Ortiz
Amrize Cement Inc.
8700 West Bryn Mawr Avenue
Chicago, IL 60631
Javier.Sosa@amrize.com

Dear Javier Ortiz,

Re: Engineer Review:
Modification to Approval Order DAQE-AN100070031-22 to Incorporate Alternative Fuel Processing and Feed System Operations and Inclusion of a New Finish Mill
Project Number: N100070032

Please review and sign this letter and attached Engineer Review (ER) within **10 business days**. For this document to be considered as the application for a Title V administrative amendment, a Title V Responsible Official must sign the next page.

Please contact **John Jenks** at (385) 306-6510 if you have any questions or concerns about the ER. If you accept the contents of this ER, please email this signed cover letter to John Jenks at **jjenks@utah.gov.** After receipt of the signed cover letter, the DAQ will prepare an Intent to Approve (ITA) for a 30-day public comment period. When the public comment period ends, the DAQ will consider any comments received and will issue the Approval Order.

If you do not respond to this letter within **10 business days,** the project will move forward without your approval. If you have concerns that we cannot resolve, the DAQ Director may issue an Order prohibiting construction.

Approval Signature _____ September 12, 2025
(Signature & Date)

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OPTIONAL: In order for this Engineer Review and associated Approval Order conditions to be considered as an application to administratively amend your Title V Permit, the Responsible Official, as defined in R307-415-3, must sign the statement below. **THIS IS STRICTLY OPTIONAL.**

If you do not want the Engineer Review to be considered as an application to administratively amend your Operating Permit only the approval signature above is required.

Failure to have the Responsible Official sign below will not delay the Approval Order, but will require submittal of a separate Operating Permit Application to revise the Title V permit in accordance with R307-415-5a through 5e and R307-415-7a through 7i. A guidance document: *Title V Operating Permit Application Due Dates* clarifies the required due dates for Title V operating permit applications and can be viewed at:

https://deq.utah.gov/air-quality/permitting-guidance-and-guidelines-air-quality

"Based on information and belief formed after reasonable inquiry, I certify that the statements and information provided for this Approval Order are true, accurate and complete and request that this Approval Order be considered as an application to administratively amend the Operating Permit."

Responsible Official _____ 9/18/2025
(Signature & Date)

Print Name of Responsible Official Javier Josa Ortiz

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Response Summary:

Q2. Owner/Company Information

	Previous	Updated
Name	Holcim (US) Inc.	Amrize Cement Inc.
Address	8700 West Bryn Mawr Avenue	8700 West Bryn Mawr Avenue
City	Chicago	Chicago
State	IL	IL
Zip	60631	60631
Phone	801-829-6821	801-829-6821
Environmental Contact	Clinton Badger	Clinton Badger
Email Address	Clinton.Badger@holcim.com	Clinton.Badger@holcim.com

Q3. Sites Impacted:

	AO Number	Site Name
1	DAQE-AN100070031-22	Devils Slide
2	DAQE-AN106760028-22	Utelite
3	DAQE-GN2074003-03	Lehi
4	N/A	N/A
5	N/A	N/A
6	N/A	N/A
7	N/A	N/A
8	N/A	N/A

Q1. Reason for Ownership/Company Name Change:
Holcim is going through a business name change process. The ownership and details remain the same.
For the Devils Slide and L Site, the current name should be Holcim (US) Inc. The new name will be Amrize Cement Inc.
For the Utelite Site, the the current name should be Holcim - SWR, Inc. The new name will be Amrize Southwest Inc.

Q4. Note: If the name change is the result of a sale or acquisition, both the buyer and the seller signature is required as proof of the closure and agreement. Please attach proof of acquisition documentations or the previous owner's signature.
N/A

Q5. Applicant Information:

Name	Clinton Badger
Email	clinton.badger@holcim.com
Title	Area Manager, Environment and Public Affairs
Date	6/6/2025

Q6. The undersigned, as an authorized representative of the company, acknowledges that the above information is correct and requests the company change be made in all the DAQ records listed.
[Click here]

Embedded Data:

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NOTICE OF INTENT AIR PERMIT APPLICATION

Holcim (US) Inc. / Devil's Slide, UT

To Modify Approval Order: DAQE-AN100070031-22

Prepared By:
TRINITY CONSULTANTS
4525 Wasatch Boulevard
Suite 150
Salt Lake City, Utah 84124
(801) 272-3000

March 2025

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1. EXECUTIVE SUMMARY

Holcim (US) Inc. (Holcim) owns and operates the Devil's Slide Portland cement manufacturing plant (Devil's Slide Plant) near Morgan City, Utah in Morgan County. Holcim is submitting this notice of intent (NOI) air permit application to the Utah Division of Air Quality (UDAQ) to modify the Devil's Slide Plant's current approval order (AO) DAQE-AN100070031-22 for the reconfiguration of the alternative fuel processing and feed system operations (GEOCYCLE pre-processing project). The GEOCYCLE pre-processing project will include the following emission sources:

- One baghouse dust collector to control the primary and secondary shredders;
- Two cartridge style dust collectors to control the gravimetric feeders; and
- Increased paved road emissions.

The alternative fuels replace traditional nonrenewal fuels and also mitigate net carbon dioxide (CO_2) emissions and landfill disposition.

Morgan County is designated as an attainment area for all criteria pollutants with respect to the National Ambient Air Quality Standards (NAAQS).[1]

Emission from this project will consist of particulate matter (PM) with an aerodynamic diameter of 10 and 2.5 microns or less (PM_{10} and $PM_{2.5}$, respectively). The proposed increase in emissions for criteria pollutants given in tons per year (tpy), are as follows: PM_{10} = 2.28 and $PM_{2.5}$ = 2.14. As such, this project constitutes a minor modification at a major source.

This NOI air permit application has been developed pursuant to Utah Administrative Code (UAC) R307-401-5 and Utah's application guidance. It includes, but is not limited to:

- NOI Forms and Fees;
- Process Description;
- Site Plan;
- Potential Emission Calculations;
- Best Available Control Technology (BACT) Analysis;
- Applicable Requirements; and
- Emission Impact Analysis.

[1] United States Protection Agency (U.S. EPA) Green Book, https://www3.epa.gov/airquality/greenbook/ancl.html, accessed in March 2025.

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2. GENERAL INFORMATION

The following section contains the information requested under the "Source Identification Information" section of UDAQ *Form 1 Notice of Intent (NOI) Application Checklist*.

2.1 Source Identification Summary

- Company Name: Holcim (US) Incorporated
- Site Address: 6055 East Croydon Road Morgan, UT 84050
- County: Morgan
- UTM Coordinates: 455,500 m Easting, 4,545,500 m Northing, UTM Zone 12
- Primary SIC Code: 3241 (Cement, Hydraulic)
- Area Designation: Attainment for all pollutants
- Source Size Determination: Major Source
- Current AO: DAQE-AN100070031-22

All correspondence regarding this submission should be addressed to:

Mark Miller
Director of Land and Environment
15900 Dooley Road
Addison, TX 75001
Mark.Miller@holcim.com
702-358-7280

Clinton Badger
Area Manager, Environment and Public Affairs - Devil's Slide
6055 East Croyden Road
Morgan, Utah 84050
clint.badger@holcim.com
385-243-8867

2.2 Area Designation

The Devil's Slide Plant is located at 6055 East Croydon Road, Morgan, UT, within Morgan County. Morgan County is designated an attainment area of the NAAQS for all criteria pollutants.

2.3 Source Size Determination

As presented in Appendix B, Table B-1, the project emissions at the Devil's Slide Plant are less than the significant emission rates (SERs) for all criteria pollutants. As such, this project constitutes a minor modification at an existing major source.

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2.4 Notice of Intent Forms

The following UDAQ forms have been included with the NOI Air Permit Application:

- Form 1 - Notice of Intent Application Checklist
- Form 2 – Source Identification Information
- Form 4 – Project Information
- Form 5 – Emissions Information Criteria/GHGs/HAPs
- Form 10 – Fabric Filter (Bag House)

2.5 Notice of Intent Fees

Holcim will use UDAQ's Payment Portal to prepay the following UDAQ NOI air permit application fees associated with this submittal:

- "Application Filing Fee" for the "New Minor Source or Minor Modification at Minor or Major Source" category = $575
- "Application Review Fee" for the "New Minor Source or Minor Modification at Minor or Major Source" category = $2,500
- Total UDAQ Fees = $3,075

Holcim understands that the total permit review fee is based on the total actual time spent by UDAQ staff processing this NOI air permit application. Upon issuance of the AO, if the total review time is more than 20 standard hours, UDAQ will invoice Holcim at $125 per hour for the additional time above 20 standard hours.

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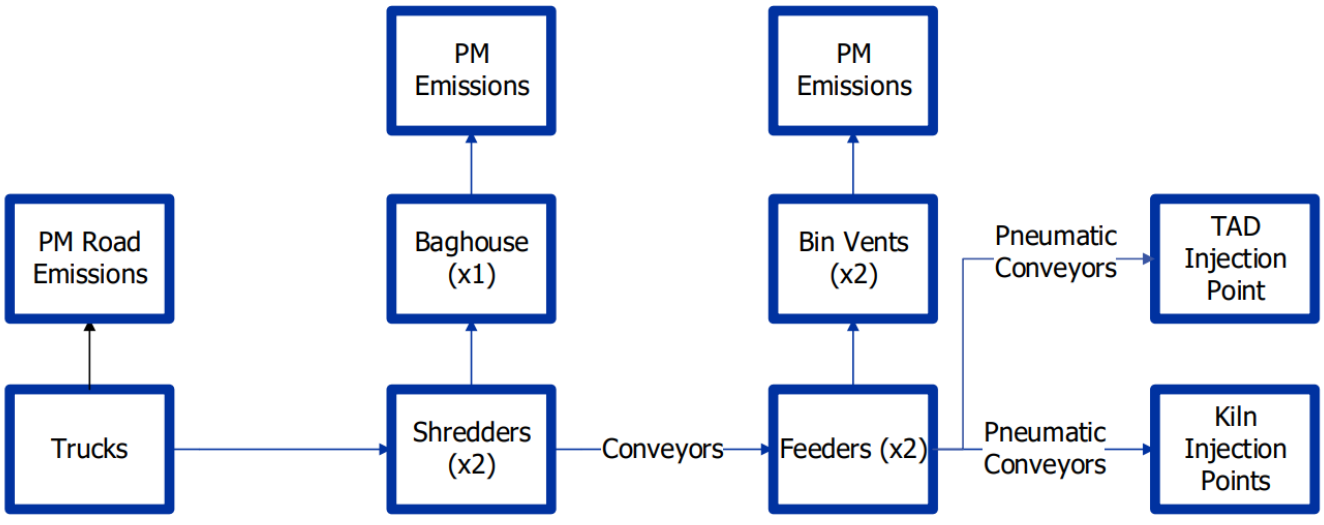
3. DESCRIPTION OF PROJECT AND PROCESS

Holcim's Devil's Slide Plant produces cement using limestone and sandstone, iron ore, and gypsum that are fed to a rotating kiln where the materials combine to make cement clinker. Cement clinker is then ground into a fine powder and stored in enclosed cement silos before being shipped offsite by rail and/or pneumatic trucks. Various traditional and non-traditional materials are used as fuel for the kiln including nonhazardous alternative fuel materials as authorized in Condition II.B.2.b of the AO and 40 CFR Part 241. The nonhazardous alternative fuel materials are primarily shredded bulk diaper derived fuel and other similar nonhazardous secondary materials (NHSMs) that are sized 35 – 40 mm and therefore do not generate significant quantities of PM_{10} and $PM_{2.5}$ emissions outside of the shredding and feeder process steps. With this project, Holcim is proposing to reconfigure the alternative fuel processing and feed system operations, which includes material shredders, material handling system, and pneumatic conveying system. One baghouse and two bin vent filters will be utilized to control PM emissions resulting from the GEOCYCLE pre-processing operations. Additionally, truck traffic and its associated PM emissions will increase as part of this project.

The nonhazardous alternative fuel materials will be delivered by truck to the Devil's Slide Plant, where the trucks will transfer the alternative fuel materials into the GEOCYCLE pre-processing system (enclosed building) described above. After proper sizing, the processed nonhazardous alternative fuel materials will be introduced to the kiln through both the existing tertiary air duct (TAD) located in the precalciner, and now directly into the kiln in order to optimize combustion efficiency. The use of this fuel will offset fossil fuels and will not increase the throughput of the kiln or change the amount of air supplied to the kiln. As such, this project will not result in any changes in emissions from the kiln itself. The NHSM itself is already authorized per Condition II.B.2.b of the AO and Condition II.B.6.e of the Devil's Slide Plant's Title V Operating Permit 2900001004 (OP).

Figure 3.1 below provides a high-level overview of the GEOCYCLE pre-processing operations.

Figure 3-1. General Process Flow Diagram (see Appendix C)



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4. EMISSIONS RELATED INFORMATION

This section details the methodology used to calculate PM_{10} and $PM_{2.5}$ emissions resulting from the non-hazardous alternative fuel material pre-processing project. Detailed emissions calculations tables are included in Appendix B.

4.1 Baghouse and Bin Vents

One baghouse and two bin vent cartridge filters will be used to control emissions from the shredders and feeders, respectively. The PM_{10} and $PM_{2.5}$ emissions generated from the shredders and feeders are estimated using the baghouse and bin vent filter outlet grain loading and flow rate as shown in the equation below.

$$\text{Emission Rate (tpy)} = \text{EF}\left(\frac{\text{grain}}{\text{dscf}}\right) \times \text{Q (dscfm)} \times \frac{60 \text{ min}}{\text{hr}} \times \frac{1 \text{ lb}}{7000 \text{ grains}} \times \text{Annual Operating Time}\left(\frac{\text{hr}}{\text{yr}}\right) \times \frac{1 \text{ ton}}{2000 \text{ lbs}}$$

Where:

EF = Emission factor (grain/dscf)
Q = Flow rate (dscfm)

4.2 Roads

Increased fugitive emissions of PM_{10} and $PM_{2.5}$ will result from increased vehicle traffic on paved roads associated with the nonhazardous material pre-processing operations. Resultant PM_{10} and $PM_{2.5}$ emissions are derived using the guidance found in UDAQ's January 12th, 2015 memorandum regarding emission factors for paved and unpaved haul roads.[2] Emissions from these roads are calculated using the following equation:

$$\text{PM} = \text{k} \times \left(\frac{\text{s}}{12}\right)^{\text{a}} \times \left(\frac{\text{W}}{3}\right)^{\text{b}} \times \text{D} \times \frac{1 \text{ ton}}{2000 \text{ lb}} \times (1 - \eta)$$

Where:

PM = $PM/PM_{10}/PM_{2.5}$ emissions (tpy)
k = empirical constant, particle size multiplier (lb/VMT)
s = surface material average silt content (%)
a = empirical constants (unitless)
W = mean vehicle weight (ton)
b = empirical constants (unitless)
D = distance traveled (VMT/yr)
η = control efficiency (%)

[2] Per memorandum issued by UDAQ; "Emission Factors for Paved and Unpaved Haul Roads" dated January 12, 2015.

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The empirical constants k, a, and b are retrieved from AP-42.[3] The average silt content used in this equation is given per UDAQ's guidance on paved and unpaved haul roads.[4] Parameter (W) is determined for each vehicle type by taking the average of the mean loaded and unloaded weights of the different types of vehicles; in this case, only haul trucks. Parameter (D) is determined by using the product throughput divided by the difference in full and empty vehicle weight to determine the total number of hauls required. This value is multiplied by the round-trip distance traveled by the haul trucks associated with nonhazardous material pre-processing at the Devil's Slide Plant.

As a means of control, the paved haul route is vacuum swept and watered to suppress fugitive PM emissions. Therefore, using guidance from the memorandum issued by UDAQ regarding emission factors for paved and unpaved haul roads, a control factor of 95% for vacuum sweeping and water application is used for fugitive emissions related to vehicular traffic on the paved haul route, which is reflected in the control efficiency parameter (η).[5] Emissions are projected based on the Devil's Slide road layouts, vehicle weights, and hauling capacity.

[3] US EPA AP-42, Fifth Edition, Volume I Chapter 13.2.2, Table 13.2.2: AP42, Section 13.2.2 Unpaved Roads - Updated November 2006
[4] Default surface material silt content value from memorandum issued by UDAQ; "Emission Factors for Paved and Unpaved Haul Roads" dated January 12, 2015.
[5] Per memorandum issued by UDAQ; "Emission Factors for Paved and Unpaved Haul Roads" dated January 12, 2015.

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5. BEST AVAILABLE CONTROL TECHNOLOGY ANALYSIS

In the State of Utah, under R307-401-5(2)(d), Notice of Intent, every facility, operation, or process that proposes any activity that would emit an air contaminant must consider BACT for the proposed activity. The BACT analysis below was performed pursuant to this rule. It only addresses units which will be modified, installed, or otherwise altered according to this NOI air permit application.

5.1 Material Handling - Nonhazardous Material Pre-processing

The following equipment will produce PM_{10} and $PM_{2.5}$ emissions from the nonhazardous material pre-processing operations:

- Shredders; and
- Feeders.

5.1.1 Material Handling PM_{10} and $PM_{2.5}$ Step 1 – Identify All Control Technologies

Control technologies identified for PM_{10} and $PM_{2.5}$ emissions from material handling operations are as follows, based on a February 24, 2025 review of relevant entries in the Environmental Protection Agency's (EPA's) RACT/BACT/LAER Clearinghouse (RBLC), the Texas Commission on Environmental Quality (TCEQ) BACT Guidelines for Mechanical, Agricultural and Construction Sources, and the California Air Resources Board (CARB) BACT Guidelines Tool:

- Baghouse/Fabric Filter
- Cyclone
- Electrostatic Precipitator (ESP)
- Enclosures
- Management/Operation Practices
- Watering and Material Moisture Content
- Wet Scrubber

5.1.2 Material Handling PM_{10} and $PM_{2.5}$ Step 2 – Eliminate Technically Infeasible Options

Baghouse/Fabric Filter

Baghouses/fabric filters are used for medium and low gas-flow streams with high particulate concentrations. The typical baghouse/fabric filter has a control efficiency between 95% to 99.9%.[6] This is generally accomplished through the installation of ductwork, capture hoods, fans, motors, starters, stacks, and other stationary equipment. The use of baghouses/fabric filters is technically feasible.

Cyclone

A cyclone separator (cyclone) operates on the principle of centrifugal separation. A high-efficiency cyclone designed specifically for PM_{10} removal is likely to achieve between 20% to 70% removal for PM_{10}.[7] Cyclones are less efficient at removing $PM_{2.5}$. Like a baghouse, cyclone feasibility is based on routing emissions to a stationary control system via ductwork, capture hoods, fans, etc. The use of cyclones is technically feasible.

[6] From EPA Air Pollution Control Technology Fact Sheet for baghouses, EPA-452/F-03-025.
[7] From Air Pollution Control Technology Fact Sheet for cyclones, EPA-452/F-03-005

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ESP

A dry ESP is a particle control device that uses electrical forces to move coarse particles at high concentrations out of a gas stream and onto collector plates, and then into a hopper. This removal efficiency is typically between 90-99.9%.[8] The use of ESP is technically feasible.

Enclosures

Enclosures confine emissions to the enclosed area, prohibiting PM from reaching ambient air. Enclosures are typically able to achieve a control efficiency of 50-90% of fugitive emissions.[9] Enclosures are technically feasible.

Management/Operation Practices

Management practices will minimize $PM_{2.5}$ and PM_{10} emissions and will be implemented as part of this project. Best operating practices, such as regular inspection and maintenance, will be implemented as well.

Watering and Material Moisture Content

The shredders and feeders are part of nonhazardous material pre-processing operations that prepare fuel to be combusted in the kiln. Watering or increasing the material moisture content would adversely affect the material's combustion properties and subsequent kiln operation. This control measure is technically infeasible.

Wet Scrubber

Wet scrubbers use sorbents, slurries, or liquid solvents to capture and remove PM from exhaust gases and can achieve 50-95% control of PM emissions.[10] This control technology is technically feasible.

5.1.3 Material Handling PM_{10} and $PM_{2.5}$ Step 3 – Rank Remaining Control Technologies by Control Effectiveness

Table 5-1. PM_{10} and $PM_{2.5}$ Control for Material Handling

Control Technologies	Rank	Percent Control
Baghouse/Fabric Filter	1	95-99.9%
ESP	2	90-99.9%
Wet Scrubber	3	50-95%
Enclosures	4	50-90%
Cyclone	5	20-70%
Best Management/Operational Practices	6	Variable

[8] EPA Air Pollution Control Technology Fact Sheets for Electrostatic Precipitators, EPA-452/F-03-027, EPA-452/F-03-028, EPA-452/F-03-029, and EPA-452/F-03-030.
[9] Texas Commission on Environmental Quality, Material Handling: Source Types, Controls, Emission Calculations for mechanical conveyance, p 10.
[10] EPA Air Pollution Control Technology Fact Sheet for Packed-Bed/Packed-Tower Wet Scrubber, EPA-452/F-03-015

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5.1.4 Material Handling PM_{10} and $PM_{2.5}$ Step 4 – Evaluate Most Effective Controls and Document Results

A baghouse and two bin vent cartridge type filters will be installed to control the shredders and feeders, respectively. As this is the highest available control technology, no economic, energy, or environmental impact evaluations are considered.

5.1.5 Material Handling PM_{10} and $PM_{2.5}$ Step 5 – Select BACT

Holcim proposes that BACT for nonhazardous material pre-processing operations consists of the installation of one baghouse and two bin vent cartridge type filters.

5.2 Roads

Increased fugitive emissions of PM will result from increased vehicle traffic on paved roads associated with the nonhazardous material pre-processing operations.

5.2.1 Roads PM_{10} and $PM_{2.5}$ Step 1 – Identify All Control Technologies

Control technologies identified for PM_{10} and $PM_{2.5}$ emissions from roads are as follows, based on a January 28, 2025 review of relevant entries in the EPA's RBLC and a February 27, 2025 review of the TCEQ BACT Guidelines for Mechanical, Agricultural and Construction Sources and the CARB BACT Guidelines Tool and the WRAP Fugitive Dust Handbook (2006):

- Street Sweeping
- Watering and Material Moisture Content

5.2.2 Roads PM_{10} and $PM_{2.5}$ Step 2 – Eliminate Technically Infeasible Options

Street Sweeping

Street sweeping is a method of PM control that utilizes a mobile street sweeping unit to remove loose material from paved road surfaces. This control technology is technically feasible on the paved haul road. The Devil's Slide Plant utilizes a vacuum sweeper on the paved haul road to the nonhazardous material pre-processing operations.

Watering and Material Moisture Content

Watering of haul roads reduces fugitive PM emissions by binding soil particles together, preventing them being picked up by wind or vehicles. Water is applied on a scheduled basis and supplemented as needed based on observation of dust conditions. Basic watering results in a dust control efficiency of up to 70%.[11] This control technology is considered technically feasible and will be used at the Devil's Slide Plant.

[11] UDAQ Guidelines: Emission Factors for Paved and Unpaved Haul Roads, January 2015

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5.2.3 Roads PM_{10} and $PM_{2.5}$ Step 3 – Rank Remaining Control Technologies by Control Effectiveness

Table 5-2. Fugitive PM_{10} and $PM_{2.5}$ Control Technologies and Efficiencies for Roads.

Control Method	Control Efficiency (%)
Paved Road, Vacuum-Sweeping, and Watering	95%
Paved Road, Sweeping, and Watering	90%
Basic Watering	70%

5.2.4 Roads PM_{10} and $PM_{2.5}$ Step 4 – Evaluate Most Effective Controls and Document Results

For the paved haul road vacuum-sweeping and watering will be implemented to control fugitive dust emissions from truck traffic. As this is the highest available control technology, no economic, energy, or environmental impact evaluations are considered.

5.2.5 Roads PM_{10} and $PM_{2.5}$ Step 5 – Select BACT

BACT for the paved haul roads is considered to consist of paving, vacuum sweeping, and water application.

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6. EMISSIONS IMPACT ANALYSIS

6.1 Comparison to Modeling Thresholds

Appendix Table B-1 compares the total proposed emissions for each criteria pollutant to the applicable modeling thresholds contained in R307-403-4 through 7, and R307-410-4. As shown in Table B-1, the total emissions are not exceeded for any criteria pollutant. Additionally, the PTE of hazardous air pollutants (HAPs) will not increase from this project. As such, no air dispersion modeling was completed as part of this application.

6.2 Source Size Determination

As shown in Appendix Table B-1, the proposed emissions increase at the Devil's Slide Plant are less than the SER thresholds. As such, the proposed project constitutes a minor modification at a major source.[12]

[12] UDAQ Emissions Impact Assessment Guidelines under Section XIII Visibility Modeling

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7. NONATTAINMENT/MAINTENANCE AREAS - OFFSETTING

Per UDAQ's Form 1 for NOI, R307-403, R307-420, and R307-421, this section should include offset requirements for nonattainment and maintenance areas.

7.1 Offset Applicability

$PM_{2.5}$ Offsets

Per UAC R307-403, $PM_{2.5}$ offsets are applicable to new major sources or major modifications located within or impacting a $PM_{2.5}$ nonattainment area of the NAAQS. Holcim's Devil's Slide is not located in a $PM_{2.5}$ nonattainment area, nor does this project constitute a major modification, and it is therefore not subject to the $PM_{2.5}$ offset requirements.

PM_{10} Offsets

PM_{10} offset requirement applicability is described in UAC R307-421-2. PM_{10} offsets apply to new or modified sources of sulfur dioxide (SO_2) or nitrogen oxides (NO_X) that are located in or impact Salt Lake County or Utah County. Holcim's Devil's Slide Plant is located in Morgan County and is therefore not subject to the PM_{10} offset requirements of R307-421.

Ozone Offsets

Ozone offsets requirements recorded in UAC R307-420-3(2) are applicable to significant sources located within or impacting an ozone nonattainment area of the NAAQS. In summary, significant sources located in Davis County or Salt Lake County shall offset the proposed increase in volatile organic compounds (VOCs) or NO_X emissions before the Director may issue an AO to construct, modify, or relocate under R307-401. As Holcim's Devil's Slide Plant is located in Morgan County, ozone offsets are not applicable.

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8. APPLICABLE REGULATIONS

8.1 Utah Regulations

Holcim has evaluated the applicability of each rule under the UAC Title R307. Rules that are generally applicable to Holcim's Devil's Slide Plant, but not directly associated with the proposed changes described in this NOI will not be discussed in this section. All applicable rules associated with this project will be discussed in the subsequent subsections.

Table 8-1. Evaluation of UDAQ Air Quality Rules

Reference	Regulation Name	Applicability	
		Yes	No
R307-101	General Requirements	X	
R307-102	[1] General Requirements: Broadly Applicable Requirements	X	
R307-103	[1] Administrative Procedures	X	
R307-104	Conflict of Interest		X
R307-105	General Requirements: Emergency controls		X
R307-107	General Requirements: Breakdowns	X	
R307-110	[1] General Requirements: State Implementation Plan	X	
R307-115	[1] General Conformity	X	
R307-120	General Requirements: Tax Exemption for Air Pollution Control Equipment		X
R307-121	General Requirements: Clean Air and Efficient Vehicle Tax Credit		X
R307-122	General Requirements: Heavy Duty Vehicle Tax Credit		X
R307-123	General Requirements: Clean Fuels and Vehicle Technology Grant and Loan Program		X
R307-124	General Requirements: Conversion to Alternative Fuel Grant Program		X
R307-125	Clean Air Retrofit, Replacement, and Off-Road Technology Program		X
R307-130	General Penalty Policy		X
R307-135	Enforcement Policy for Asbestos Hazard Emergency Response Act		X
R307-150	Emission Inventories	X	
R307-165	Stack Testing		X
R307-170	Continuous Emission Monitoring Program		X

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Reference	Regulation Name	Applicability	
		Yes	No
R307-201	Emission Standards: General Emission Standards	X	
R307-202	Emission Standards: General Burning		X
R307-203	[1] Emission Standards: Sulfur Content of Fuels	X	
R307-204	Emission Standards: Smoke Management		X
R307-205	Emission Standards: Fugitive Emissions and Fugitive Dust	X	
R307-206	Emission Standards: Abrasive Blasting		X
R307-207	Residential Fireplaces and Solid Fuel Burning Devices		X
R307-208	Outdoor Wood Boilers		X
R307-210	[2] Standards of Performance for New Stationary Sources	X	
R307-214	[2] National Emission Standards for Hazardous Air Pollutants	X	
R307-220	Emission Standards: Plan for Designated Facilities		X
R307-221	Emission Standards: Emission Controls for Existing Municipal Solid Waste Landfills		X
R307-222	Emission Standards: Existing Incinerator for Hospital, Medical, Infectious Waste		X
R307-223	Emission Standards: Existing Small Municipal Waste Combustion Units		X
R307-224	Mercury Emission Standards: Coal Fired Electric Generating Units		X
R307-230	NO_X Emission Limits for Natural Gas-Fired Water Heaters		X
R307-240	Prescribed Burning		X
R307-250	Western Backstop Sulfur Dioxide Trading Program		X
R307-301	Utah and Weber Counties: Oxygenated Gasoline Program as a Contingency Measure		X
R307-302	Solid Fuel Burning Devices		X
R307-303	Commercial Cooking		X
R307-304	Solvent Cleaning		X
R307-305	Nonattainment and Maintenance Areas for PM_{10}: Emission Standards		X
R307-306	PM_{10} Nonattainment and Maintenance Areas: Abrasive Blasting		X
R307-307	Road Salting and Sanding		X

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Reference	Regulation Name	Applicability	
		Yes	No
R307-309	Nonattainment and Maintenance Areas for PM_{10} and $PM_{2.5}$: Fugitive Emissions and Fugitive Dust		X
R307-310	Salt Lake County: Trading of Emission Budgets for Transportation Conformity		X
R307-311	Utah County: Trading of Emission Budgets for Transportation Conformity		X
R307-312	Aggregate Processing Operations for $PM_{2.5}$ Nonattainment Areas		X
R307-320	Ozone Maintenance Areas and Ogden City: Employer Based Trip Reduction		X
R307-325	Ozone Nonattainment and Maintenance Areas: General Requirements		X
R307-326	Ozone Nonattainment and Maintenance Areas: Control of Hydrocarbon Emissions in Petroleum Refineries		X
R307-327	Ozone Nonattainment and Maintenance Areas: Petroleum Liquid Storage		X
R307-328	Gasoline Transfer and Storage		X
R307-335	Degreasing		X
R307-341	Ozone Nonattainment and Maintenance Areas: Cutback Asphalt		X
R307-342	Adhesives and Sealants		X
R307-343	Wood Furniture Manufacturing Operations		X
R307-344	Paper, Film, and Foil Coatings		X
R307-345	Fabric and Vinyl Coatings		X
R307-346	Metal Furniture Surface Coatings		X
R307-347	Large Applicable Surface Coatings		X
R307-348	Magnet Wire Coatings		X
R307-349	Flat Wood Panel Coating		X
R307-350	Misc. Metal Parts and Product Coating		X
R307-351	Graphic Arts		X
R307-352	Metal Container, Closure, and Coil Coatings		X
R307-353	Plastic Parts Coatings		X
R307-354	Automotive Refinishing Coatings		X
R307-355	Aerospace Manufacture and Rework Facilities		X

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Reference	Regulation Name	Applicability	
		Yes	No
R307-356	Appliance Pilot Light		X
R307-357	Consumer Products		X
R307-361	Architectural Coatings		X
R307-401	Permit: New and Modified Sources	X	
R307-403	Permits: New and Modified Sources in Nonattainment and Maintenance Areas		X
R307-405	Permits: Major Sources in Attainment or Unclassified Areas (PSD)		X
R307-406	Visibility		X
R307-410	Permits: Emission Impact Analysis		X
R307-414	Permits: Fees for Approval Orders	X	
R307-415	Permits: Operating Permit Requirements		X
R307-417	Permits: Acid Rain Sources		X
R307-420	Permits: Ozone Offset Requirements in Davis and Salt Lake Counties		X
R307-421	Permits: PM_{10} Offset Requirements in Salt Lake County and Utah County		X
R307-424	Permits: Mercury Requirements for Electric Generating Units		X
R307-501 to 511	Oil and Gas Industry		X
R307-801	Utah Asbestos Rule		X
R307-840	Lead-Based Paint Program Purpose, Applicability, and Definitions		X
R307-841	Residential Property and Child-Occupied Facility Renovation		X
R307-842	Lead-Based Paint Activities		X

1. The subject rule is or could be applicable to Holcim's Devil's Slide Plant; however, this rule is not specific to this project and is therefore not discussed in this NOI air permit application.
2. Applicable NSPS and NESHAP regulations are detailed under appropriate project headings.

8.1.1 UAC R307-101 General Requirements

Holcim's Devil's Slide Plant will comply and conform to the definitions, terms, abbreviations, and references used in the UAC R307-101 and 40 CFR.

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8.1.2 UAC R307-107 General Requirements: Breakdowns

Holcim's Devil's Slide Plant will report breakdowns within 24 hours via telephone, electronic mail, fax, or other similar method and provide detailed written description within 14 days of the onset of the incident to UDAQ.

8.1.3 UAC R307-150 Emission Inventories

For every third year, Holcim's Devil's Slide Plant will report its emissions inventory in accordance with R307-150-6. The emissions inventory shall include all criteria pollutants, including filterable and condensable PM, hazardous air pollutants not exempted in R307-150-8 and chargeable pollutants in accordance with R307-150-6.

8.1.4 UAC R307-201 Emission Standards: General Emission Standards

All rules applicable to Holcim's Devil's Slide Plant are incorporated by reference from 40 CFR Part 60. Applicability and requirements for these rules are outlined in Section 8.2 of this submittal.

8.1.5 UAC R307-205 Emission Standards: Fugitive Emissions and Fugitive Dust

8.1.5.1 UAC R307-205-4 Emission Standards – Fugitive Emissions

Holcim's Devil's Slide Plant is located in Morgan County, which is an attainment area for $PM_{2.5}$ and PM_{10}. Fugitive emissions from sources shall not exceed 20% opacity.

8.1.5.2 UAC R307-205-5 Emission Standards - Fugitive Dust

Owning, operating, or maintaining a new or existing material storage, handling, or hauling operation shall take measures to minimize fugitive dust from such activities. Such control may include enclosures, covers, stabilization or other equivalent methods or techniques as approved by the director.

Holcim's Devil's Slide Plant will comply with minimization techniques as described in R307-205-5. Steps will be taken to minimize fugitive dust.

8.1.5.3 UAC R307-205-7 Emission Standards – Roads

Holcim's Devil's Slide Plant will supply traffic count information as determined necessary and clean any deposited materials that may create fugitive dust.

8.1.5.4 UAC R307-205-7 Emission Standards – Mining Activities

The subject rule is or could be applicable to Holcim's Devil's Slide Plant; however, this rule is not specific to this project and is not discussed in this NOI air permit application.

8.1.6 UAC R307-401-8: Approval Order

(1) The director will issue an AO if all conditions and regulations have been met.

a. The degree of pollution control for emissions, to include fugitive emissions and fugitive dust, is at least best available control technology. When determining best available control technology for a new or modified source in an ozone nonattainment or maintenance area that will emit VOC or NO_X, best available control technology shall be at least as stringent as

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any Control Technique Guidance document that has been published by EPA that is applicable to the source.

b. The Devil's Slide Plant will meet the applicable requirements of:
   i. R307-403, Permits: New and Modified Sources in Nonattainment Areas and Maintenance Areas;
   ii. R307-405, Permits: Major Sources in Attainment or Unclassified Areas (PSD);
   iii. R307-406, Visibility;
   iv. R307-410, Emissions Impact Analysis;
   v. R307-421, Permits: PM10 Offset Requirements in Salt Lake County and Utah County;
   vi. R307-210, National Standards of Performance for New Stationary Sources;
   vii. National Primary and Secondary Ambient Air Quality Standards;
   viii. R307-214, National Emission Standards for Hazardous Air Pollutants;
   ix. R307-110, Utah State Implementation Plan; and
   x. All other provisions of R307.

(2) The AO requires that all pollution control equipment be adequately and properly maintained.

(3) Receipt of an AO does not relieve any owner or operator of the responsibility to comply with the provisions of R307 or the State Implementation Plan.

Holcim's Devil's Slide Plant will establish and maintain compliance through the following:

(1) All pollution control equipment will be properly maintained; and

(2) Provisions of R307 or SIP will be followed.

BACT provisions specified in UAC R307-401 have been applied through control equipment installed and monitoring conditions.

8.1.7 UAC R307-410 Permits: Emission Impact Analysis

Emission impacts are not applicable with the proposed modification of Holcim's Devil's Slide Plant.

8.1.8 UAC R307-414 Permits: Fees for Approval Orders

Fees associated with the submission of this NOI air permit application are addressed in Section 2 of this submittal.

8.2 Federal Regulations

8.2.1 NSPS Subpart A: General Provisions

All affected sources subject to an NSPS are also subject to the general provisions of NSPS Subpart A unless specifically excluded by the source-specific NSPS. NSPS Subpart A requires the following items of facilities subject to a source specific NSPS:

- Initial construction/reconstruction notification
- Initial startup notification
- Performance tests
- Performance test date initial notification
- General monitoring requirements
- General recordkeeping requirements

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- Semiannual monitoring system and/or excess emission reports

8.2.2 NSPS Subpart F (Standards of Performance for Portland Cement Plants)

NSPS Subpart F, Standards of Performance for Portland Cement Plants, provides standards of performance for affected facilities including:

- Kilns;
- Clinker coolers;
- Raw mill systems;
- Finish mill systems;
- Raw mill dryers;
- Raw material storage;
- Clinker storage;
- Finished product storage;
- Conveyor transfer points; and
- Bagging and bulk loading and unloading systems.[13]

The GEOCYCLE project only affects the processing of nonhazardous alternative fuel materials for the kiln. The GEOCYCLE facility is a stand-alone plant that is not associated with NSPS Subpart F.

8.2.3 NSPS Subpart OOO (Standards of Performance for Nonmetallic Mineral Processing Plants)

NSPS Subpart OOO, Standards of Performance for Nonmetallic Mineral Processing Plants, provide standards of performance for affected facilities located at fixed or portable nonmetallic mineral processing plants that are constructed, modified, or reconstructed after August 31, 1983. The GEOCYCLE pre-processing project only affects processing of nonhazardous alternative fuel materials for the kiln. As such, NSPS Subpart OOO is not applicable to this project.

8.2.4 MACT LLL (National Emission Standards for Hazardous Air Pollutants from the Portland Cement Manufacturing Industry)

MACT Subpart LLL did not contemplate fuel handling for coarse GEOCYCLE materials. Therefore, Holcim does not consider the GEOCYCLE emission sources to be subject to MACT Subpart LLL.

[13] 40 CFR 60.60(a)

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APPENDIX A. FORMS

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Form 1
Notice of Intent (NOI) Application Checklist

Date March 2025

Company Holcim (US) Inc.

Utah Division of Air Quality
New Source Review Section

Source Identification Information [R307-401-5]

1.	Company name, mailing address, physical address and telephone number	☑
2.	Company contact (Name, mailing address, and telephone number)	☑
3.	Name and contact of person submitting NOI application (if different than 2)	☑
4.	Source Universal Transverse Mercator (UTM) coordinates	☑
5.	Source Standard Industrial Classification (SIC) code	☑
6.	Area designation (attainment, maintenance, or nonattainment)	☑
7.	Federal/State requirement applicability (NAAQS, NSPS, MACT, SIP, etc.)	☑
8.	Source size determination (Major, Minor, PSD)	☑
9.	Current Approval Order(s) and/or Title V Permit numbers	☑

NOI Application Information: [R307-401]

1.	Detailed description of the project and source process	☑
2.	Discussion of fuels, raw materials, and products consumed/produced	☑
3.	Description of equipment used in the process and operating schedule	☑
4.	Description of changes to the process, production rates, etc.	☑
5.	Site plan of source with building dimensions, stack parameters, etc.	☑
6.	Best Available Control Technology (BACT) Analysis [R307-401-8]	
	A. BACT analysis for all new and modified equipment	☑
7.	Emissions Related Information: [R307-401-2(b)]	
	A. Emission calculations for each new/modified unit and site-wide (Include PM_{10}, $PM_{2.5}$, NO_x, SO_2, CO, VOCs, HAPs, and GHGs)	☑
	B. References/assumptions, SDS, for each calculation and pollutant	☑
	C. All speciated HAP emissions (list in lbs/hr)	☑
8.	Emissions Impact Analysis – Approved Modeling Protocol [R307-410]	
	A. Composition and physical characteristics of effluent (emission rates, temperature, volume, pollutant types and concentrations)	☑
9.	Nonattainment/Maintenance Areas – Major NSR/Minor (offsetting only) [R307-403]	
	A. NAAQS demonstration, Lowest Achievable Emission Rate, Offset requirements	☐ N/A ■
	B. Alternative site analysis, Major source ownership compliance certification	☐ N/A ■
10.	Major Sources in Attainment or Unclassified Areas (PSD) [R307-405, R307-406]	
	A. Air quality analysis (air model, met data, background data, source impact analysis)	☐ N/A ■
	B. Visibility impact analysis, Class I area impact	☐ N/A ■
11.	Signature on Application	☑

Note: The Division of Air Quality will not accept documents containing confidential information or data. Documents containing confidential information will be returned to the Source submitting the application.

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AIR QUALITY

Form 2
Company Information/Notice of Intent (NOI)

Date March 2025

Utah Division of Air Quality
New Source Review Section

Application for: ☐ Initial Approval Order ☑ Approval Order Modification

General Owner and Source Information

1. Company name and mailing address:
Holcim (US) Inc.
6055 East Croyden Road
Morgan, UT 84050
Phone No.: (801) 829-2122
Fax No.: ( )

2. Company** contact for environmental matters:
Clinton Badger
Phone no.: (385) 243-8867
Email: clinton.badger@holcim.com
** *Company contact only; consultant or independent contractor contact information can be provided in a cover letter*

3. Source name and physical address (if different from above):
Phone no.: ( )
Fax no.: ( )

4. Source Property Universal Transverse Mercator coordinates (UTM), including System and Datum:
UTM: 12
X: 455,500 m Easting
Y: 4,545,500 m Northing

5. The Source is located in: Morgan County

6. Standard Industrial Classification Code (SIC)
3241

7. If request for modification, AO# to be modified: DAQE # DAQE-AN100070031-22 DATED: 03 / 10 / 2022

8. Brief (50 words or less) description of process.
Reconfiguration of the alternative fuel processing and feed system operations (GEOCYCLE pre-processing project). The GEOCYCLE pre-processing project will include the following emission sources: one baghouse dust collector to control the primary and secondary shredders, two cartridge style dust collectors to control the gravimetric feeders, and increased paved road emissions.

Electronic NOI
9. A complete and accurate electronic NOI submitted to DAQ Permitting Mangers Jon Black (*jlblack@utah.gov*) or Alan Humpherys (ahumpherys@utah.gov) can expedite review process. Please mark application type.

Hard Copy Submittal ☐ Electronic Copy Submittal ☑ Both ☐

Authorization/Signature

I hereby certify that the information and data submitted in and with this application is completely true, accurate and complete, based on reasonable inquiry made by me and to the best of my knowledge and belief.

Signature: Title: Plant Manager

Javier Sosa Ortiz Name (Type or print)	Telephone Number: (801) 829-2138 Email: javier.sosa@holcim.com	Date: 3/17/2025

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Form 4
Project Information

Company Holcim (US) Inc.

Site Devil's Slide

Utah Division of Air Quality
New Source Review Section

AIR QUALITY

Process Data - For Modification/Amendment ONLY

1. Permit Number DAQE-AN100070031-22

If submitting a new permit, then use Form 3

Requested Changes

2. Name of process to be modified/added:

Non-hazardous material/Alternative Fuel preprocessing

End product of this process:

alternative fuels kiln feed

3. Permit Change Type:

	New	Increase*
Equipment	☑	☐
Process	☐	☐

Condition Change II. A

Other

Other

Other

4. Does new emission unit affect existing permitted process limits?

Yes ☐ No ☑

5. Condition(s) Changing:

II. A

6. Description of Permit/Process Change**

Reconfiguration of the alternative fuel processing and feed system operations (GEOCYCLE pre-processing project). The GEOCYCLE pre-processing project will include the following emission sources: one baghouse dust collector to control the primary and secondary shredders, two cartridge style dust collectors to control the gravimetric feeders, and increased paved road emissions.

7. New or modified materials and quantities used in process. **

Material	Quantity Annually
See Appendix B	

8. New or modified process emitting units **

Emitting Unit(s)	Capacity(s)	Manufacture Date(s)
See Appendix B		

*If the permit being modified does not include CO_2e or $PM_{2.5}$, the emissions need to be calculated and submitted to DAQ, which may result in an emissions increase and a public comment period.

**If additional space is required, please generate a document to accommodate and attach to form.

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Form 5
Emissions Information
Criteria/GHGs/ HAP's
Utah Division of Air Quality
New Source Review Section

Company Holcim (US) Inc.

Site Devil's Slide

Potential to Emit* Criteria Pollutants & GHGs			
Criteria Pollutants	**Permitted Emissions (tons/yr)**	**Emissions Increases (tons/yr)**	**Proposed Emissions (tons/yr)**
PM_{10} Total			
PM_{10} Fugitive			
$PM_{2.5}$			
NO_x			
SO_2			
CO			
VOC			
VOC Fugitive			
NH_3			
Greenhouse Gases	**CO_2e**	**CO_2e**	**CO_2e**
CO_2			
CH_4			
N_2O			
HFCs			
PFCs			
SF_6			
Total CO2e			

See Appendix B

See Appendix B

**Potential to emit to include pollution control equipment as defined by R307-401-2.*

Hazardous Air Pollutants** *(**Defined in Section 112(b) of the Clean Air Act)*				
Hazardous Air Pollutant***	**Permitted Emissions (tons/yr)**	**Emission Increase (tons/yr)**	**Proposed Emission (tons/yr)**	**Emission Increase (lbs/hr)**
Total HAP				

See Appendix B

**** Use additional sheets for pollutants if needed*

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Utah Division of Air Quality
New Source Review Section

Form 10
Fabric Filters (Baghouses)

Company Holcim (US) Inc.
Site/Source Devil's Slide
Date March 2025

Baghouse Description

1. Briefly describe the process controlled by this baghouse:
Baghouse dust collector on alternative fuel shredding process

Gas Stream Characteristics

2. Flow Rate (acfm): 12000		3. Water Vapor Content of Effluent Stream (lb. water/lb. dry air)	4. Particulate Loading (grain/scf)	
Design Max	Average Expected		Inlet	Outlet
5. Pressure Drop (inches H_2O) High 12 Low _____		6. Gas Stream Temperature (°F): Ambient	7. Fan Requirements (hp) (ft^3/min)	

Equipment Information and Filter Characteristics

8. Manufacturer and Model Number: Camfil, Gold Series X-flo Dust Collector

9. Bag Material:	10. Bag Diameter (in.)	11. Bag Length (ft.)	12. Number of Bags:	13. Stack Height
☐ Nomex nylon ☐ Polyester ☐ Acrylics ☐ Fiber glass ☒ Cotton ☐ Teflon ☐ _____				_____ feet Stack Inside Diameter _____ inches
	14. Filtering Efficiency Rating: _____%	15. Air to Cloth Ratio: 2.67 : 1	16. Hours of Operation: Max Per day _____ Max Per year _____	17. Cleaning Mechanism: ☒ Reverse Air ☐ Shaker ☐ Pulse Jet ☐ Other: _____

Emissions Calculations (PTE)

18. Calculated emissions for this device

PM_{10} _____Lbs/hr_____ Tons/yr $PM_{2.5}$ _____Lbs/hr_____ Tons/yr
NO_x _____Lbs/hr_____ Tons/yr SO_x _____Lbs/hr_____ Tons/yr
CO _____Lbs/hr_____ Tons/yr VOC _____Lbs/hr_____ Tons/yr
HAPs_____Lbs/hr (speciate)_____Tons/yr (speciate)
Submit calculations as an appendix.

See Appendix B

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Utah Division of Air Quality
New Source Review Section

Form 10
Fabric Filters (Baghouses)

Company Holcim (US) Inc.
Site/Source Devil's Slide
Date March 2025

Baghouse Description

1. Briefly describe the process controlled by this baghouse:
Bin vent on Feeder 1

Gas Stream Characteristics

2. Flow Rate (acfm): 600		3. Water Vapor Content of Effluent Stream (lb. water/lb. dry air)	4. Particulate Loading (grain/scf)	
Design Max	Average Expected		Inlet	Outlet
5. Pressure Drop (inches H_2O) High _____ Low _____		6. Gas Stream Temperature (°F): Ambient	7. Fan Requirements (hp) (ft^3/min)	

Equipment Information and Filter Characteristics

8. Manufacturer and Model Number:

9. Bag Material:	10. Bag Diameter (in.)	11. Bag Length (ft.)	12. Number of Bags:	13. Stack Height
☐ Nomex nylon ☐ Polyester ☐ Acrylics ☐ Fiber glass ☐ Cotton ☐ Teflon ☐ _____				_____ feet Stack Inside Diameter _____ inches
	14. Filtering Efficiency Rating: _____%	15. Air to Cloth Ratio: _____: 1	16. Hours of Operation: Max Per day _____ Max Per year _____	17. Cleaning Mechanism: ☐ Reverse Air ☐ Shaker ☐ Pulse Jet ☐ Other: _____

Emissions Calculations (PTE)

18. Calculated emissions for this device

PM_{10} _____Lbs/hr_____ Tons/yr $PM_{2.5}$ _____Lbs/hr_____ Tons/yr
NO_x _____Lbs/hr_____ Tons/yr SO_x _____Lbs/hr_____ Tons/yr
CO _____Lbs/hr_____ Tons/yr VOC _____Lbs/hr_____ Tons/yr
HAPs_____Lbs/hr (speciate)_____Tons/yr (speciate)
Submit calculations as an appendix.

See Appendix B

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Utah Division of Air Quality
New Source Review Section

Form 10
Fabric Filters (Baghouses)

Company Holcim (US) Inc.
Site/Source Devil's Slide
Date March 2025

Baghouse Description

1. Briefly describe the process controlled by this baghouse:
Bin vent on Feeder 2

Gas Stream Characteristics

2. Flow Rate (acfm): 600		3. Water Vapor Content of Effluent Stream (lb. water/lb. dry air)	4. Particulate Loading (grain/scf)	
Design Max	Average Expected		Inlet	Outlet
5. Pressure Drop (inches H_2O) High _____ Low _____		6. Gas Stream Temperature (°F): Ambient	7. Fan Requirements (hp) (ft^3/min)	

Equipment Information and Filter Characteristics

8. Manufacturer and Model Number:

9. Bag Material:	10. Bag Diameter (in.)	11. Bag Length (ft.)	12. Number of Bags:	13. Stack Height
☐ Nomex nylon ☐ Polyester ☐ Acrylics ☐ Fiber glass ☐ Cotton ☐ Teflon ☐ _____				_____ feet Stack Inside Diameter _____ inches
	14. Filtering Efficiency Rating: _____%	15. Air to Cloth Ratio: _____: 1	16. Hours of Operation: Max Per day _____ Max Per year _____	17. Cleaning Mechanism: ☐ Reverse Air ☐ Shaker ☐ Pulse Jet ☐ Other: _____

Emissions Calculations (PTE)

18. Calculated emissions for this device

PM_{10} _____Lbs/hr_____ Tons/yr $PM_{2.5}$ _____Lbs/hr_____ Tons/yr
NO_x _____Lbs/hr_____ Tons/yr SO_x _____Lbs/hr_____ Tons/yr
CO _____Lbs/hr_____ Tons/yr VOC _____Lbs/hr_____ Tons/yr
HAPs_____Lbs/hr (speciate)_____Tons/yr (speciate)
Submit calculations as an appendix.

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APPENDIX B. EMISSION CALCULATIONS

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Table B-1. Annual Potential Emission Summary

Operations	Annual Emission Rates (tpy)						
	PM_{10}	$PM_{2.5}$	NO_X	CO	SO_2	VOC	Total HAP
Baghouse & Bin Vents	2.12	2.12	-	-	-	-	-
Roads	0.16	0.02	-	-	-	-	-
Project Emissions	2.28	2.14	0.00	0.00	0.00	0.00	0.00
Current Permitted PTE[1]	221.00	50.00	1,825	1,820	457.00	151.00	79.36
New PTE	223.28	52.14	1,825	1,820	457.00	151.00	79.36
Fugitive Modeling Limit[2]	5	-	-	-	-	-	-
Point Modeling Limit[2]	15	10	40	100	40	-	-
Modeling Required?	No	No	No	No	No	No	No
SER[3,4]	15	10	40	100	40	40	10/25
Exceeding Major Source Thresholds?	No	No	No	No	No	No	No

1. AO DAQE-AN100070031-22.
2. UDAQ Emissions Impact Assessment Guidelines, Table 1: Total Controlled Emission Rates for New Sources (June, 2024).
3. 40 CFR 52.21(b)(23)(i).
4. 40 CFR 63.2 definition of a “Major Source”.

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Table B-2: Equipment Emissions - PTE Emissions

Location/Source Description	Equipment	Outlet Grain Loading (grain/dscf)[1]	Flow Rate (dscfm)[1]	Operating Hours per Year	Hourly PTE Emissions (lb/hr)		Annual PTE Emissions (tpy)	
					PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
Shredder 1 & 2	Baghouse	0.005	12,000	7,500	0.51	0.51	1.93	1.93
Gravimetric Feeder	Bin Vent 1	0.005	600	7,500	0.03	0.03	0.10	0.10
Gravimetric Feeder	Bin Vent 2	0.005	600	7,500	0.03	0.03	0.10	0.10
				Total	**0.57**	**0.57**	**2.12**	**2.12**

1. Manufacturer specification.

2. Conversion factors:

7,000 grain/lb

60 min/hr

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Table B-3. Roads Emissions - Emission Factors

Road Surface	Controls [1]	Control Efficiency (%) [1]	Vehicle Emission Factors [2]	
			PM_{10}	$PM_{2.5}$
Paved or Unpaved	None	0%	1.42	0.14
Paved	Paved Road Surface with Vacuum Sweeping and Watering	95%	0.07	7.08E-03

1. Emission controls and control efficiency for vehicular traffic on paved and unpaved roads per UDAQ guidelines: Emission Factors for Paved and Unpaved Haul Roads, January 2015

2. Emission factors calculated per UDAQ guidelines: Emission Factors for Paved and Unpaved Haul Roads, January 2015, in conjunction with U.S. EPA AP-42 Section 13.2.2 Unpaved Roads.

using: $E = k(s/12)^a(W/3)^b(1-\eta)$

where:

E = Size-specific emission factor (lb/VMT)

k, a, b = Constants

	PM	PM_{10}	$PM_{2.5}$
k =	4.9	1.5	0.15
a =	0.7	0.9	0.9
b =	0.45	0.45	0.45

s = surface material silt content (%)

s =	4.8	Per UDAQ guidance given in Emission Factors for Paved and Unpaved Haul Roads, January 2015.
W =	16.500	Mean weight of all vehicles (tons), per UDAQ guidance given in Emission Factors for Paved and Unpaved Haul Roads, January 2015.
η =	Control Efficiency	

Table B-4. Roads Emissions - Traveling Parameters (Supporting Operations)

Vehicle Type	Road Source	Max Hourly Product Throughput	Annual Product Throughput	Mean Vehicle Weighs (tons)[1]		Vehicle Haul Capacity	Maximum Hauls per Hour	Hauls per Year	Total Travel Distance per Haul (miles/haul)	Total Vehicle Miles Traveled	
				Empty Vehicle	Loaded Vehicle					Hourly	Annual
		(tph)	(tpy)	(ton)	(ton)	(ton/haul)			Paved	(VMT/hr) Paved	(VMT/yr) Paved
Truck	Haul Trucks to Material Processing	12	80,000	13	20	7	1.71	11,429	0.39	0.67	4,459

1. Paved haul route distance one-way (ft): 1,030

Table B-5. Roads Emissions - PTE Emissions

Vehicle Type	Road Source	Controlled Emissions					
		Hourly PTE Emissions (lb/hr)[1]		Daily PTE Emissions (lb/day)		Annual PTE Emissions (tpy)	
		PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
Truck	Paved	0.05	4.74E-03	1.14	0.11	0.16	0.02
Total		**0.05**	**4.74E-03**	**1.14**	**0.11**	**0.16**	**0.02**

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APPENDIX C. PROCESS FLOW DIAGRAMS

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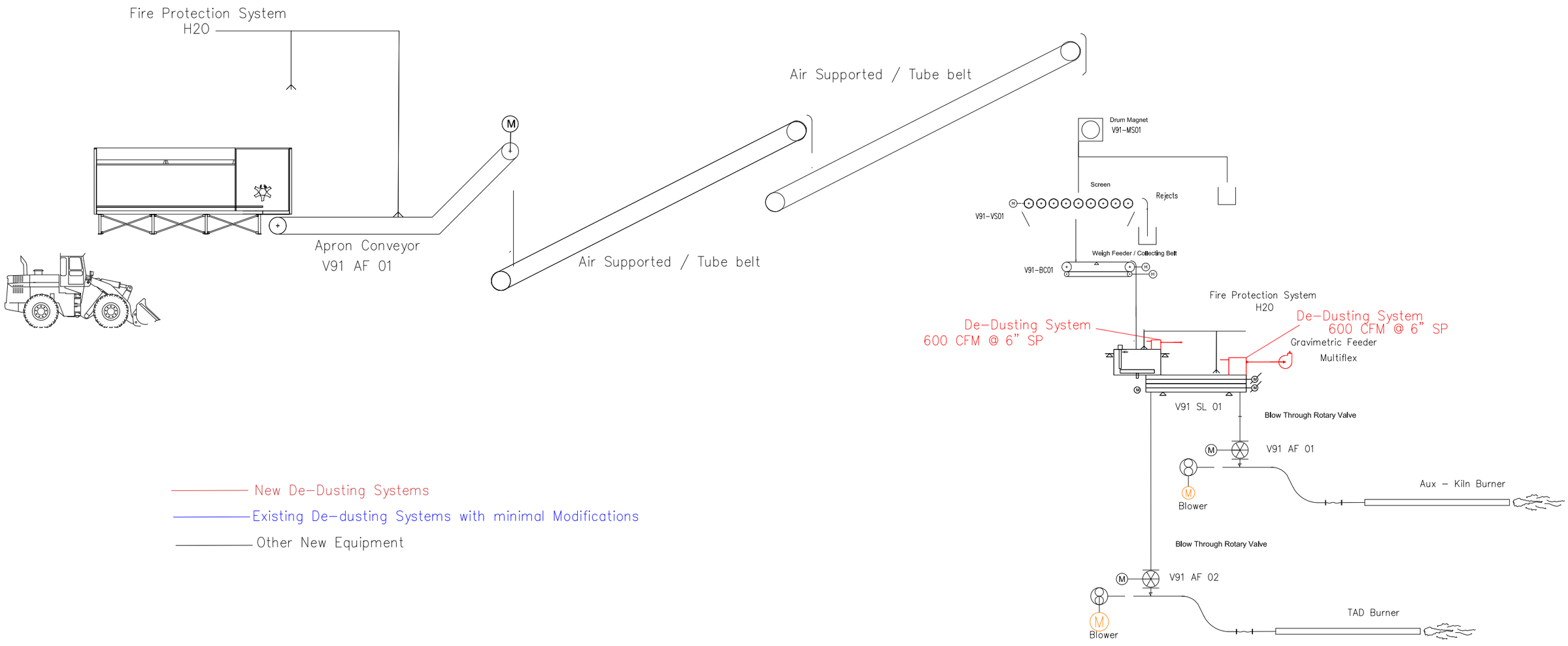

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H	03/22/2024	Update to new Air conveyor concept	Raju	

REV.	DATE:	DESCRIPTION:	REVISED BY:	CH'D.
	05 08 2022	DC info for Permit	Raju	
D	05/08/2022	Unloading Location Options # 3 : Unloading station at TAD unloading station	Raju	
C	05/01/2022	Options # 1 and 2 Added	Raju	
B	04/29/2022	Eq Added	Raju	
A	04/28/2022	First issue for review	Raju	

REFERENCE

Scale NTS
Drawn Raju
Date 04/28/2022
Reviewed
Date – –

geocycle

Devil's Slide UT
AF Solids to Kiln Burner
Altranative Fuel : Solids
AF Solids to Kiln Burner & TAD
FLOWSHEET AF Solids to Kiln Burner & TAD

DRAWING FORMAT:	B	DRAWING NUMBER:	DS V91 L003	REV	H

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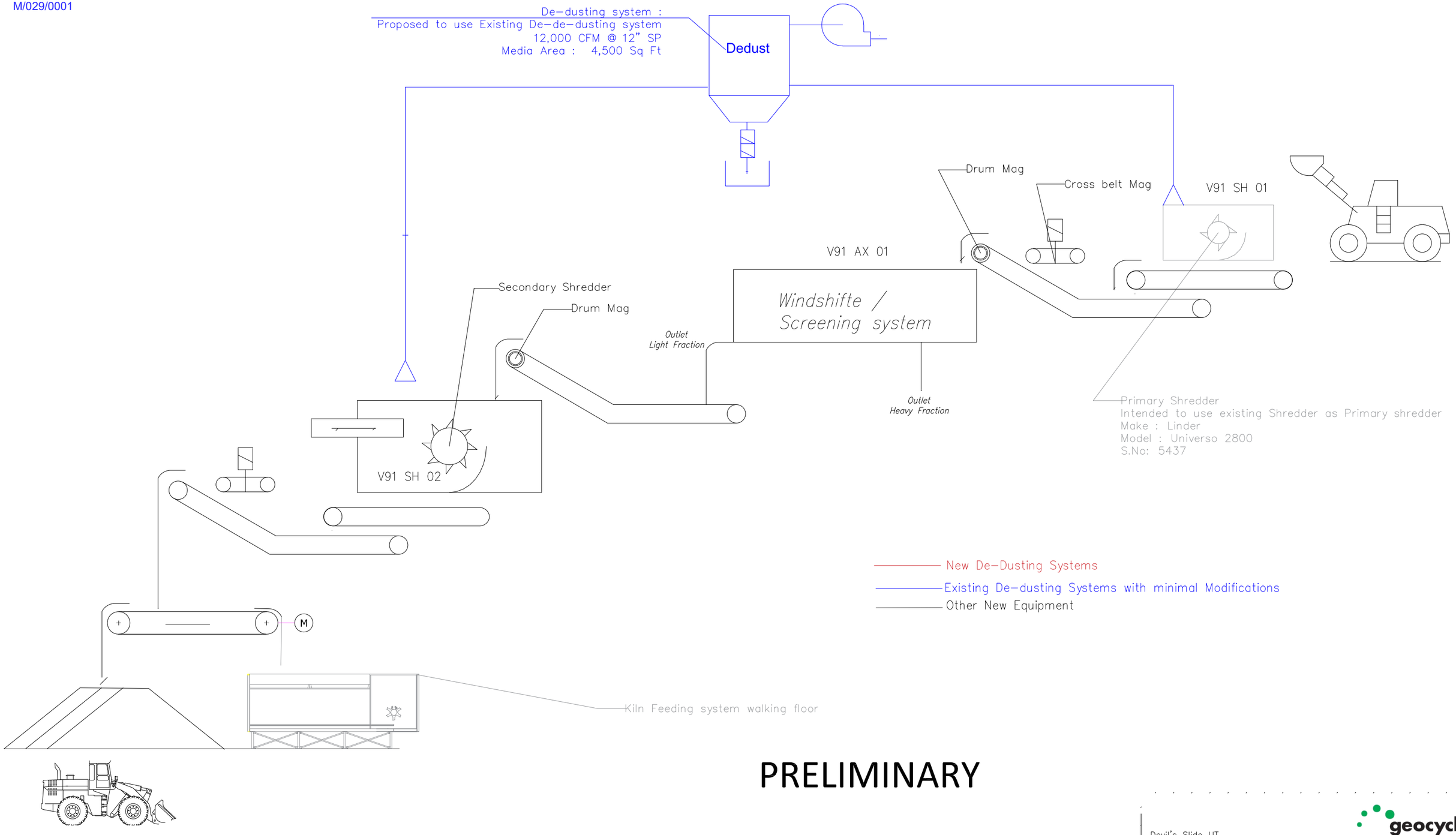

PRELIMINARY

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REV.	DATE:	DESCRIPTION:	REVISED BY:	CH'D.	REFERENCE
H	03/22/2024	Update to new Air conveyor concept			
A	07/18/2022	First issue for review	Raju		

Scale: NTS
Drawn: Raju
Date: 07 18 2022
Reviewed:
Date: – –

geocycle

Devil's Slide UT
AF Solids to Kiln Burner : Pre processing
Altranative Fuel : Solids : Pre processing
AF Solids to Kiln Burner: Pre processing
FLOWSHEET AF Solids to Kiln Burner : Pre processing

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NOTICE OF INTENT AIR PERMIT APPLICATION

Amrize Cement Inc. / Devil's Slide, UT

AMRIZE

To Modify Approval Order: DAQE-AN100070031-22

Prepared By:

TRINITY CONSULTANTS
4525 Wasatch Boulevard
Suite 150
Salt Lake City, Utah 84124
(801) 272-3000

July 2025

Trinity Consultants

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1. EXECUTIVE SUMMARY

Amrize Cement Inc. (Amrize), formerly known as Holcim (US) Inc., owns and operates the Devil's Slide portland cement manufacturing plant (Devil's Slide Plant) near Morgan City, Utah in Morgan County. Morgan County is designated as an attainment area for all criteria pollutants with respect to the National Ambient Air Quality Standards (NAAQS).[1] The site is a major source with respect to Prevention of Significant Deterioration (PSD) and Hazardous Air Pollutants (HAPs). Amrize is submitting this notice of intent (NOI) air permit application to the Utah Division of Air Quality (UDAQ) to modify the Devil's Slide Plant's current approval order (AO) DAQE-AN100070031-22.

The site is proposing to shift cement production from traditional ASTM Type I/II portland cement (higher clinker content cement) to blended cement products (blended cements) containing higher volumes of clinker substitutes such as limestone, pozzolans, etc. Switching to blended cement allows for increased clinker substitutes (e.g. lower clinker factor) in the formulation and results in a lower carbon intensive final product. In connection with this shift toward higher blending percentages, Amrize is proposing to install a fourth finish mill (Finish Mill 4) to accomplish the grinding and blending of limestone and pozzolan materials such as shale. No changes are proposed for the existing raw mill, finish mills, or kiln system. The total clinker production capacity of 930,000 tons of clinker will remain unchanged.

The Finish Mill 4 project will include the following components:

- Installation of one (1) vertical finish mill (Finish Mill 4) for grinding of clinker substitutes and clinker;
- Installation of one (1) 50 million British Thermal Units per hour (MMBtu/hr) hot air gas (HAG) generator;
- Installation of ancillary material handling and storage equipment controlled by baghouse dust collectors; and
- Increased paved road emissions from the delivery of the pozzolan materials.

Emissions from this project will consist of nitrogen oxides (NO_X), carbon monoxide (CO), particulate matter (PM) with an aerodynamic diameter of 10 and 2.5 microns or less (PM_{10} and $PM_{2.5}$, respectively), sulfur dioxide (SO_2), volatile organic compounds (VOCs), greenhouse gasses (GHGs) as carbon dioxide equivalent (CO_2e), and hazardous air pollutants (HAPs).

The Devil's Slide Plant is considered an existing major source under the PSD permitting program. The proposed increase in emissions for this project has been evaluated against significant emission rates (SERs) as described in Section 4 PSD Applicability Analysis and summarized in Appendix Table B-2. This project constitutes a minor modification at a major source.

This NOI air permit application has been developed pursuant to Utah Administrative Code (UAC) R307-401-5 and Utah's application guidance. It includes, but is not limited to:

- NOI Forms and Fees;
- Process Description;
- Potential Emission Calculations;
- Best Available Control Technology (BACT) Analysis;
- Applicable Requirements; and
- Emission Impact Analysis.

[1] EPA's Green Book, https://www3.epa.gov/airquality/greenbook/ancl.html, accessed in July 2025.

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2. GENERAL INFORMATION

The following section contains the information requested under the "Source Identification Information" section of UDAQ *Form 1 Notice of Intent (NOI) Application Checklist*.

2.1 Source Identification Summary

- Company Name: Amrize Cement Incorporated
- Site Address: 6055 East Croydon Road Morgan, UT 84050
- County: Morgan
- UTM Coordinates: 455,500 m Easting, 4,545,500 m Northing, UTM Zone 12
- Primary SIC Code: 3241 (Cement, Hydraulic)
- Area Designation: Attainment for all pollutants
- Source Size Determination: Major Source
- Current AO: DAQE-AN100070031-22

All correspondence regarding this submission should be addressed to:

Travis Reed
Senior Manager Environment and Land
715 Creek Wind Court
Duluth, GA 30097
travis.reed@amrize.com
(470) 617-8423

Clinton Badger
Area Manager, Environment and Public Affairs - Devil's Slide
6055 East Croyden Road
Morgan, Utah 84050
clinton.badger@amrize.com
385-243-8867

2.2 Area Designation

The Devil's Slide Plant is located at 6055 East Croydon Road, Morgan, UT, within Morgan County. Morgan County is designated an attainment area of the NAAQS for all criteria pollutants.

2.3 Source Size Determination

The proposed increase in emissions for this project has been evaluated against SERs as described in Section 4 of this report and summarized in Appendix Table B-2. This project constitutes a minor modification at a major source.

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2.4 Notice of Intent Forms

The following UDAQ forms have been included with the NOI Air Permit Application:

- Form 1 – Notice of Intent Application Checklist
- Form 2 – Source Identification Information
- Form 4 – Project Information
- Form 5 – Emissions Information Criteria/GHGs/HAPs
- Form 10 – Fabric Filter (Bag House)
- Form 19 – Fuel Burning Equipment (Boilers, Heater, Steam Generators)

2.5 Notice of Intent Fees

Amrize will use UDAQ's Payment Portal to prepay the following UDAQ NOI air permit application fees associated with this submittal:

- "Application Filing Fee" for the "New Minor NSR Source or Minor Modification at Minor or Major Source" category = $750
- "Application Review Fee" for the "New Minor NSR Source or Minor Modification at Minor or Major Source" category = $2,500
- Total UDAQ Fees = $3,250

Amrize understands that the total permit review fee is based on the total actual time spent by UDAQ staff processing this NOI air permit application. Upon issuance of the AO, if the total review time is more than 20 standard hours, UDAQ will invoice Amrize at $125 per hour for the additional time above 20 standard hours.

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3. DESCRIPTION OF PROJECT AND PROCESS

Amrize's Devil's Slide Plant produces cement by processing an intermediate product called clinker. Raw materials include but are not limited to limestone, sandstone, and iron ore which are mixed and ground in raw mills and then introduced to the rotating kiln. In the kiln, these raw materials are heated to increasingly high temperatures as they traverse the length of the kiln. The high temperatures create chemical reactions that transform the raw materials into an intermediate product known as clinker. The clinker exits the kiln and travels along grates in the clinker cooler until it is cool enough to move to storage or on for further processing. In the finish mills, the clinker is pulverized with the addition of additives (mainly gypsum) to create the final cement product. As part of this project, Amrize proposes to add a new vertical mill (Finish Mill 4) and associated equipment to grind additives (such as limestone and pozzolans) to produce a lower carbon cement product. A proposed HAG generator will maintain the desired grinding temperature for Finish Mill 4 during extreme cold weather conditions. After leaving the finish mills, the cement product is stored in enclosed cement silos before being shipped offsite by rail and/or pneumatic trucks. In addition to grinding the additives in Finish Mill 4, Amrize also proposes the flexibility to grind clinker in Finish Mill 4 in addition to the existing three roller mills. The proposed grinding throughput in Finish Mill 4 will be limited to a total of 495,000 tpy combined of all materials (i.e., clinker, pozzolans, and limestone). This project will not result in an increase in the overall production limits listed in Condition II.B.1.b of the existing AO, namely the 930,000 tons per year (tpy) of clinker limit.

This project will result in increased PM, PM_{10}, and $PM_{2.5}$ generation from the vertical mill and associated material handling operations and haul roads and combustion emissions (NO_X, PM_{10}, $PM_{2.5}$, CO, SO_2, VOCs, GHGs, and HAPs) from the HAG generator. The HAG generator will be equipped with a low-NO_X burner (LNB) to reduce NO_X emissions. Several baghouses will be utilized to control PM/PM_{10}/$PM_{2.5}$ emissions resulting from the material handling operations associated with the project. As part of this project, additional haul trucks delivering the pozzolans materials to the plant will increase PM/PM_{10}/$PM_{2.5}$ emissions.

Figure 3.1 below provides a high-level process flow diagram (PFD) of the Finish Mill 4 operations.

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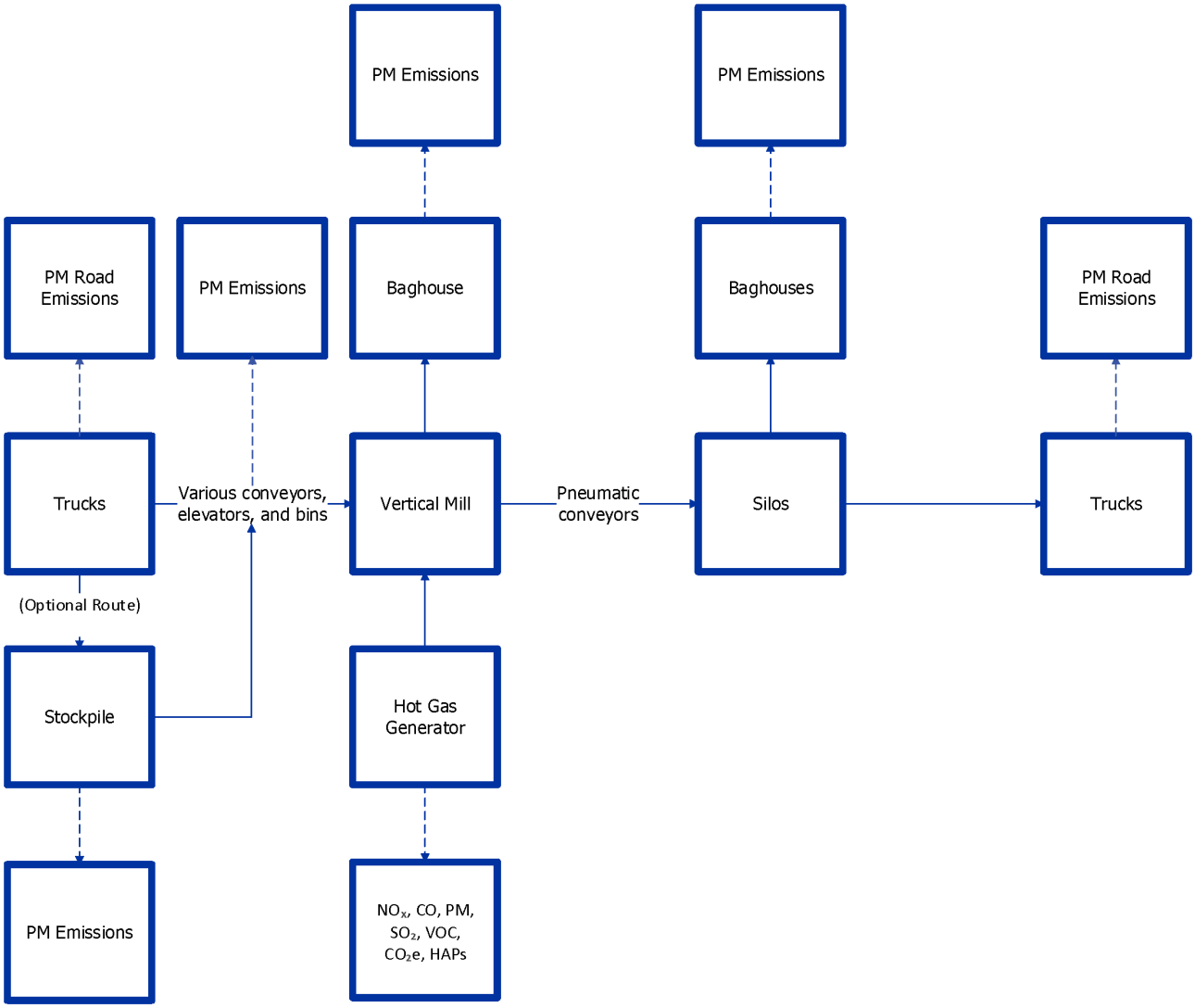
Figure 3-1. General Process Flow Diagram (see Appendix C for detailed PFDs)



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4. PSD APPLICABILITY ANALYSIS

The Devil's Slide Plant is considered an existing major source under PSD based on potential emissions of PM_{10}, $PM_{2.5}$, NO_X, CO, SO_2, and CO_2e. If a major source undergoes a physical or operational change, the facility must determine whether the project will be considered a major modification. Per 40 CFR 52.21(b)(2)(i), in order to be a major modification, the project must result in a significant emissions increase, and a significant net emissions increase. Per 40 CFR 52.21(b)(3), the net emissions increase applicability test includes evaluating the pollutant increases and decreases associated with the proposed project, as well as any projects occurring contemporaneously. If a significant emissions increase and a significant net emissions increase results from the analysis for a given pollutant, then PSD permitting is required for the given pollutant. The following approach is taken to determine the applicability of each pollutant for a PSD major modification.

For the purposes of this PSD applicability analysis, the Finish Mill 4 project and the GEOCYCLE project (UDAQ Project No. N100070032; Received March 17, 2025) are considered to be separate, non-aggregated projects and not substantially related. The GEOCYCLE project consists of the reconfiguration of the alternative fuel processing and feed system operations upstream of the kiln system while the Finish Mill 4 project involves changes to the finish mill operations downstream of the kiln system. This separation reflects the fundamentally distinct practical nature of the projects. Both projects have separate capital costs, affect different (and independent) components of Amrize's Devil's Slide operations as described above, are on separate timelines, and have individual permit applications. Thus, this PSD applicability analysis discusses only the Finish Mill 4 project.

4.1 Calculation Methodology

For all pollutants, the projected emissions increase is calculated as the difference between the projected actual emissions (PAE) after the proposed project and the actual emissions prior to the project (baseline actual emissions [BAE]).

4.1.1 Projected Actual Emissions

40 CFR 52.21(b)(41)(i) states:

> ***Projected actual emissions*** *means the maximum annual rate, in tons per year, at which an existing emissions unit is projected to emit a regulated NSR pollutant in any one of the 5 years (12-month period) following the date the unit resumes regular operation after the project, or in any one of the 10 years following that date, if the project involves increasing the emissions unit's design capacity or its potential to emit that regulated NSR pollutant and full utilization of the unit would result in a significant emissions increase or a significant net emissions increase at the major stationary source.*

Amrize estimates that their PAE will be equivalent to their post-project potential to emit (PTE) for existing affected sources. For new units, the emissions are based on the PTE.

4.1.2 Baseline Actual Emissions

40 CFR 52.21(b)(48)(ii) states:

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> *…baseline actual emissions means the average rate, in tons per year, at which the emissions unit actually emitted the pollutant during any consecutive 24-month period selected by the owner or operator within the 10-year period immediately preceding either the date the owner or operator begins actual construction of the project, or the date a complete permit application is received by the Administrator…*

Apart from existing cement silos, no other existing units are affected by the proposed modification. A list of existing cement silos sources downstream of the proposed Finish Mill 4 that are affected by the project with emissions of $PM_{10}/PM_{2.5}$ is provided below:

- 590-BF1 Cement Silo Elevator
- 590-BF2 Cement Silo Load
- 590-BF3 Bulk Cement Silo
- 590-BF4 Cement Silo Load
- 590-BF5 Cement Silo Load
- 593-BF1 GR III Silo Feed
- 593-BF2 GR III Fill Feed
- 593-BF3 GR III Silo Feed
- 626-BF1 GR III Load Out

Amrize selected 2022 and 2023 as baseline years for PM_{10} and $PM_{2.5}$ emissions. The PTE for existing cement silo sources is based on flow rate, outlet grain loading, and a maximum of 8,760 operating hours per year. To maintain consistency, actual emissions for 2022 and 2023 are calculated using the same flow-based parameters, incorporating each silo's specific flow rate, grain loading, and actual hours of operation.

As a result, the emissions values in this analysis differ from those reported in UDAQ's State and Local Emissions Inventory System (SLEIS), which are based on pound-per-ton emission factors and annual throughput. This approach aligns with the PTE methodology and supports a consistent basis for comparing emissions across years and sources. See Appendix Tables B-10, B-11, and B-12 for details.

4.1.3 Could Have Been Accommodated Emissions

In calculating project emissions increase, the United States Environmental Protection Agency (EPA) allows the exclusion of existing production or emissions rates that could have been accommodated during the baseline period. These "could have been accommodated" emissions are excluded based on 40 CFR 52.21(b)(41)(ii)(c) as follows:

> *Shall exclude, in calculating any increase in emissions that results from the particular project, that portion of the unit's emissions following the project that an existing unit could have accommodated during the consecutive 24-month period used to establish the baseline actual emissions under paragraph (b)(48) of this section and that are also unrelated to the particular project, including any increased utilization due to product demand growth;*

Although a demand growth exclusion is available to the Devil's Slide Plant for the exclusion of existing production and emissions rates that could have been accommodated during the baseline period, it has been elected not to use this exclusion at this time. Therefore, calculation of the could have been accommodated emissions have not been included in this application's applicability analysis.

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4.2 Project Emissions Calculations

The Finish Mill 4 project emissions are calculated for all criteria pollutants based on emission factors (EFs) and production volumes. See Section 5 of this report for details.

4.2.1 Associated Emissions Increase

As outlined in 40 CFR 52.21(a)(2), to determine if there is a potential increase in emissions from the proposed project, each increase of emissions from both existing and new sources shall be summed together and compared to the PSD permitting thresholds. The increase of emissions is the "positive" difference between the projected actual emissions and baseline actual emissions (projected minus baseline).

4.2.1.1 New Emissions Sources

New emission units are not subject to the actual-to-projected actual emissions calculation. For new emissions units, the baseline actual emissions shall equal zero (40 CFR 52.21(b)(48)(iii)) and their projected emissions are based on the new sources' PTE. The new equipment includes the following sources:

- Additional material handling operations and proposed Vertical Mill (Finish Mill 4)
- Hot air gas generator
- Haul Roads (pozzolan trucks)

Emissions from these sources include PM_{10} and $PM_{2.5}$ point and fugitive emissions and combustion emissions. See Section 5 of this report for details.

4.2.1.2 Existing Emissions Sources

For existing sources, the PAEs are the maximum annual rates in tons per year projected to occur during the next five to ten years if the existing sources' design capacities increase. Amrize has set the PAE equal to the PTE. A list of the affected emissions sources is provided in Section 4.1.2 above.

The project emission increase is the difference between the projected actual emissions and the baseline actual emissions. If the project increase is less than the SERs on a pollutant-by-pollutant basis, Amrize is not subject to PSD review for the given pollutant. Appendix Table B-2 summarizes the emission increase from the proposed new and modified sources.

If the emissions increase is greater than the SERs for a particular pollutant, Amrize may conduct a PSD review or continue through the steps to determine if it can "net" out of a PSD review. Amrize is below the SERs for all pollutants. As such, a netting analysis is not required, and this project constitutes a minor modification at a major source.

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5. EMISSIONS RELATED INFORMATION

This section details the methodology used to calculate the PTE and PAE of criteria pollutants and HAPs associated with the proposed project as regulated by UAC R307-401-5(2)(b). Amrize estimates that the PAE will be equivalent to their post project PTE. Detailed emission calculation tables are included in Appendix B.

5.1 Material Handling and Processing/Vertical Mill

The $PM_{10}/PM_{2.5}$ PTE associated with material handling and processing equipment (i.e., the movement of materials through the process using conveyors, elevators, and air slides) as well as the vertical mill are calculated using anticipated product throughputs and EFs from the EPA Compilation of Air Pollutant Emissions Factors from Stationary Sources (AP-42) 11.6-5 "Emissions Factors for Portland Cement Manufacturing" according to the equations below.

$$\text{PM}_{10}/\text{PM}_{2.5}\text{ Hourly Emissions }\left(\frac{\text{lb}}{\text{hr}}\right) = \text{Hourly Material Throughput (tph)} \times \text{EF}\left(\frac{\text{lb}}{\text{ton}}\right)$$

$$\text{PM}_{10}/\text{PM}_{2.5}\text{ Annual Emissions (tpy)} = \text{Annual Material Throughput (tpy)} \times \text{EF}\left(\frac{\text{lb}}{\text{ton}}\right) \times \left(\frac{1\text{ ton}}{2000\text{ lb}}\right)$$

Annual throughputs for each material type are distinguished from hourly throughputs in that they are determined by permitted throughput limits rather than by multiplying hourly rates by operational hours.

Material handling operations and the vertical mill are controlled by dust collectors, except for pozzolan processing prior to the Clinker Bin BI-303 (see PFDs in Appendix C) which is controlled by its inherent material moisture content. As such, controlled EFs from various AP-42 sections are used, as applicable. EFs for material handling and processing are obtained from AP-42 Section 11.19.2 Crushed Stone Processing and Pulverized Mineral Processing Table 11.19.2-2 and from AP-42 Section 11.6 Portland Cement Manufacturing Table 11.6-5 based on the size of the materials processed. EFs for silo loading are from AP-42 Section 11.12 Concrete Batching Table 11.12-2. Where EFs are not provided for PM_{10}, scaling factors from AP-42 Appendix B.2 Generalized Particle Size Distributions Page B.2-14 are applied. Where EFs are not provided for $PM_{2.5}$, scaling factors from AP-42 Appendix B.2 are applied.

5.2 Hot Air Gas Generator

The HAG generator is expected to emit NO_X, CO, PM, SO_2, VOCs, ammonia (NH_3), GHGs, and HAPs as byproducts of natural gas combustion.

The PAE and PTE for all pollutants, except GHGs, are calculated as a product of the HAG generator heat input capacity in MMBtu/hr, the natural gas higher heating value (HHV) in MMBtu per million standard cubic feet (MMscf), and the EF for each pollutant as shown in the equation below.

$$\begin{aligned}\text{Annual Emissions (tpy)} &= \text{Heat Input Capacity}\left(\frac{\text{MMBtu}}{\text{hr}}\right) \times \frac{1}{\text{NG HHV}\left(\frac{\text{MMBtu}}{\text{MMscf}}\right)} \times \text{EF}\left(\frac{\text{lb}}{\text{MMscf}}\right) \\ &\times \text{Annual Operating Hours}\left(\frac{\text{hr}}{\text{yr}}\right) \times \left(\frac{1\text{ ton}}{2000\text{ lb}}\right)\end{aligned}$$

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Criteria pollutant EFs are obtained from AP-42 Section 1.4 Natural Gas Combustion Tables 1.4-1 and 1.4-2. The ammonia EF is obtained from the EPA's Final Report on Ammonia Emission Factors, August 1994, Table 7-4. HAP EFs are obtained from AP-42 Table 1.4-3. The natural gas HHV is obtained from AP-42 Section 1.4. The calculations utilize an anticipated HAG generator annual operating time of 8,760 hours per year (hr/yr).

GHGs expected to be emitted from the HAG generator include CO_2, CH_4, and N_2O. CO_2e is calculated by weighting each of these pollutants according to their Global Warming Potential (GWP) as seen in the following equation:

$$\begin{aligned}&\text{CO}_2\text{e Annual Emissions (tpy)}\\&= \left(\left(\text{N}_2\text{O EF}\left(\frac{\text{lb}}{\text{MMBtu}}\right)\times \text{N}_2\text{O GWP}\right) + \left(\text{CO}_2\text{ EF}\left(\frac{\text{lb}}{\text{MMBtu}}\right)\times \text{CO}_2\text{ GWP}\right)\right.\\&\left. + \left(\text{CH}_4\text{ EF}\left(\frac{\text{lb}}{\text{MMBtu}}\right)\times \text{CH}_4\text{ GWP}\right)\right)\times \text{Input Heat Capcity}\left(\frac{\text{MMBtu}}{\text{hr}}\right)\\&\times \text{Annual Operating Hours}\left(\frac{\text{hr}}{\text{yr}}\right)\times\left(\frac{1\text{ ton}}{2000\text{ lb}}\right)\end{aligned}$$

EFs for CO_2, CH_4, and N_2O are obtained from 40 CFR Part 98, Subpart C, Table C-1, and Table C-2. The GWP for each GHG is obtained from 40 CFR Part 98, Subpart A, Table A-1.

5.3 Existing Cement Silo Equipment

The PAE and PTE for $PM_{10}/PM_{2.5}$ emissions associated with the cement silos are calculated using the outlet grain loading in grains per dry standard cubic foot per minute (gr/dscfm) and the flow rate for each of the baghouses that control the silos according to the equation below.

$$\begin{aligned}&\text{PM Annual Emissions (tpy)}\\&= \text{Flow Rate (dscfm)}\times \text{Outlet Grain Loading}\left(\frac{\text{gr}}{\text{dscf}}\right)\times\left(\frac{1\text{ lb}}{7000\text{ gr}}\right)\times\left(\frac{60\text{ minute}}{\text{hr}}\right)\\&\times\ \text{Annual Operating Hours}\left(\frac{\text{hr}}{\text{yr}}\right)\times\left(\frac{1\text{ ton}}{2000\text{ lb}}\right)\end{aligned}$$

5.4 Roads

The PAE and PTE for $PM_{10}/PM_{2.5}$ emissions associated with increased paved haul road truck traffic are calculated using haul truck weights, vehicle miles traveled (VMT), and EFs which are calculated according to UDAQ guidelines as shown in the equation below.[2]

$$\text{E}\left(\frac{\text{lb}}{\text{VMT}}\right) = \text{k}\left(\frac{\text{s}}{12}\right)^{\text{a}}\left(\frac{\text{W}}{3}\right)^{\text{b}}(1-\eta)$$

Where:

E = size specific EF (lb/VMT)
k, a, b = constants from AP-42 Table 13.2.2-2
s = surface material silt content (%), provided in the UDAQ guidelines

[2] Emission Factors for Paved and Unpaved Haul Roads, January 2015

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W = mean weight of all trucks (tons)
η = control efficiency

Control efficiencies are a product of the road surface material and which emission control measures are utilized; they are provided in the aforementioned guidance from UDAQ. The EF calculations utilize constants which are from AP-42 Section 13.2.2 Unpaved Roads Table 13.2.2-2.

The annual projected $PM_{10}/PM_{2.5}$ emissions are calculated using these EFs according to the equation below.

$$\text{PM Annual Emissions (tpy)} = \text{E}\left(\frac{\text{lb}}{\text{VMT}}\right) \times \text{VMT}\left(\frac{\text{miles}}{\text{yr}}\right) \times \left(\frac{1\text{ ton}}{2000\text{ lb}}\right)$$

5.5 Stockpiles

Pozzolan material would be stockpiled in the event that the material handling systems are down for maintenance or repair. The maximum pile area is multiplied by an EF, along with conversion factors, to determine the potential emissions associated with the stockpile. EFs are chosen based on what size the particle is ($PM_{2.5}$ or PM_{10}), and whether the stockpile is controlled or uncontrolled. All stockpiles will be controlled with water application. Uncontrolled EFs and control efficiencies for watering are obtained from AP-42 Fourth Edition Table 8.19.1-1 and AP-42 Appendix B.2 Table B.2-2.

$$\text{Annual Stockpile Emissions (tpy)} = \text{Max Pile Area (acre)} \times \text{EF}\left(\frac{\text{lb}}{\text{day} - \text{acre}}\right) \times \text{Conversion}\left(\frac{365\text{ day} \times 1\text{ ton}}{1\text{ year} \times 2{,}000\text{ lb}}\right)$$

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6. BEST AVAILABLE CONTROL TECHNOLOGY ANALYSIS

In the State of Utah, under UAC R307-401-5(2)(d), Notice of Intent, every facility, operation, or process that proposes any activity that would emit an air contaminant must consider BACT for the proposed activity. The BACT analysis below is performed pursuant to this rule. It only addresses units which will be modified, installed, or otherwise altered according to this NOI air permit application.

6.1 Particulate Emissions

The following equipment will produce PM_{10} and $PM_{2.5}$ emissions from the Finish Mill 4 project:

- Material transfer points;
- Vertical mill;
- Haul Roads; and
- Storage piles.

6.1.1 Material Handling & Vertical Mill

6.1.1.1 Material Handling & Vertical Mill Step 1 – Identify All Control Technologies

Control technologies identified for PM_{10} and $PM_{2.5}$ emissions from material handling operations and vertical mill are as follows, based on a February 24, 2025 review of relevant entries in the EPA's RACT/BACT/LAER Clearinghouse (RBLC), the Texas Commission on Environmental Quality (TCEQ) BACT Guidelines for Mechanical, Agricultural and Construction Sources, and the California Air Resources Board (CARB) BACT Guidelines Tool:

- Baghouse/Fabric Filter
- Cyclone
- Electrostatic Precipitator (ESP)
- Enclosures
- Management/Operation Practices
- Watering and Material Moisture Content
- Wet Scrubber

6.1.1.2 Material Handling & Vertical Mill Step 2 – Eliminate Technically Infeasible Options

Baghouse/Fabric Filter

Baghouses/fabric filters are used for medium and low gas-flow streams with high particulate concentrations. The typical baghouse/fabric filter has a control efficiency between 95% to 99.9%.[3] This is generally accomplished through the installation of ductwork, capture hoods, fans, motors, starters, stacks, and other stationary equipment. The use of baghouses/fabric filters is technically feasible.

Cyclone

A cyclone separator (cyclone) operates on the principle of centrifugal separation. The exhaust enters the inlet and spirals around towards the outlet; as the particles proceed through the cyclone, the heavier material hits the outside wall and drops out where it is collected and the cleaned gas escapes through an inner tube. Conventional cyclones can achieve 30 to 90% removal for PM_{10} and 0% to 40% removal for

[3] From EPA Air Pollution Control Technology Fact Sheet for baghouses, EPA-452/F-03-025.

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$PM_{2.5}$.[4] High efficiency cyclones are designed to achieve higher control of smaller particles than conventional cyclones. A high-efficiency cyclone is likely to achieve between 60% to 95% removal for PM_{10} and 20% to 70% removal for $PM_{2.5}$.[4] Like a baghouse, cyclone feasibility is based on routing emissions to a stationary control system via ductwork, capture hoods, fans, etc. The use of cyclones is technically feasible.

ESP

A dry ESP is a particle control device that uses electrical forces to move coarse particles at high concentrations out of a gas stream and onto collector plates, and then into a hopper. This removal efficiency is typically between 90-99.9%.[5] The use of a dry ESP is technically feasible.

Enclosures

Enclosures confine emissions to the enclosed area, prohibiting PM from reaching ambient air. Enclosures are typically able to achieve a control efficiency of 50-90% of fugitive emissions.[6] Enclosures are technically feasible.

Management/Operation Practices

Management practices will minimize $PM_{2.5}$ and PM_{10} emissions and will be implemented as part of this project. Best operating practices, such as regular inspection and maintenance, will be implemented as well.

Watering and Material Moisture Content

Watering and material moisture content can achieve a control efficiency of 40-90%.[7] Watering of and inherent moisture content are technically feasible.

Wet Scrubber

Wet scrubbers use sorbents, slurries, or liquid solvents to capture and remove PM from exhaust gases and can achieve 50-95% control of PM emissions.[8] This control technology is technically feasible.

6.1.1.3 Material Handling & Vertical Mill Step 3 – Rank Remaining Control Technologies by Control Effectiveness

Table 6-1. PM_{10} and $PM_{2.5}$ Control for Material Handling

Control Technologies	Rank	Percent Control
Baghouse/Fabric Filter	1	95-99.9%
ESP	2	90-99.9%
Wet Scrubber	3	50-95%
Enclosures	4	50-90%
Watering and Material Moisture Content	5	40-90%
Cyclone	6	20-95%
Best Management/Operational Practices	7	Variable

[4] From Air Pollution Control Technology Fact Sheet for cyclones, EPA-452/F-03-005
[5] EPA Air Pollution Control Technology Fact Sheets for Electrostatic Precipitators, EPA-452/F-03-027, EPA-452/F-03-028, EPA-452/F-03-029, and EPA-452/F-03-030.
[6] Texas Commission on Environmental Quality, Material Handling: Source Types, Controls, Emission Calculations for mechanical conveyance, p 10.
[7] AP-42 Appendix B.2 Generalized Particle Size Distributions Page B.2-21.
[8] EPA Air Pollution Control Technology Fact Sheet for Packed-Bed/Packed-Tower Wet Scrubber, EPA-452/F-03-015

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6.1.1.4 Material Handling & Vertical Mill Step 4 – Evaluate Most Effective Controls and Document Results

Material handling operations and the vertical mill are controlled by baghouse/dust collectors except for pozzolan processing prior to the Clinker Bin BI-303 (see PFDs in Appendix C) which is controlled by its inherent material moisture content. As baghouses constitute the highest available control technology, no economic, energy, or environmental impact evaluations are considered.

Emissions from the pozzolan material transfer drop points are calculated using the controlled EFs provided in AP-42 Section 11.19.2 Crushed Stone Processing and Pulverized Mineral Processing, Table 11.19.2-2. These EFs are applicable to materials with inherent moisture content within the range specified in Footnote b, which accurately reflects the characteristics of pozzolan. Since the emissions are already considered controlled under AP-42 methodology, the use of a baghouse would not alter the PTE of the pozzolan processes. As a result, implementing additional controls at these drop points is not economically feasible.

6.1.1.5 Material Handling & Vertical Mill Step 5 – Select BACT

Amrize proposes that BACT for $PM_{10}/PM_{2.5}$ emission from material handling and roller mill operations consists of the installation of baghouses and the inherent moisture content of pozzolan.

6.1.2 Storage Piles

Fugitive PM_{10} and $PM_{2.5}$ emissions are generated through wind disturbance on stockpiled pozzolan. Various operational practices can be considered for BACT. The most commonly practiced option is to spray water on all areas not covered with vegetation or synthetic material. This will be done through the use of a water truck.

Water application, best management practices, and maintaining established opacity limitations are considered BACT to control fugitive dust from the stockpile associated with this project.

6.1.3 Roads

Increased fugitive emissions of $PM_{10}/PM_{2.5}$ will result from increased vehicle traffic on paved roads associated with the Finish Mill 4 project.

6.1.3.1 Roads PM_{10} and $PM_{2.5}$ Step 1 – Identify All Control Technologies

Control technologies identified for PM_{10} and $PM_{2.5}$ emissions from roads are as follows, based on a January 28, 2025 review of relevant entries in the EPA's RBLC, a February 27, 2025 review of the TCEQ BACT Guidelines for Mechanical, Agricultural and Construction Sources, the CARB BACT Guidelines Tool, and the WRAP Fugitive Dust Handbook (2006):

- Street Sweeping
- Watering and Material Moisture Content

6.1.3.2 Roads PM_{10} and $PM_{2.5}$ Step 2 – Eliminate Technically Infeasible Options

Street Sweeping

Street sweeping is a method of $PM_{10}/PM_{2.5}$ control that utilizes a mobile street sweeping unit to remove loose material from paved road surfaces. This control technology is technically feasible on the paved haul

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road. The Devil's Slide Plant utilizes a vacuum sweeper on the paved haul road associated with the Finish Mill 4 project.

Watering and Material Moisture Content

Watering of haul roads reduces fugitive $PM_{10}/PM_{2.5}$ emissions by binding soil particles together, preventing them being picked up by wind or vehicles. Water is applied on a scheduled basis and supplemented as needed based on observation of dust conditions. Basic watering results in a dust control efficiency of up to 70%.[9] This control technology is considered technically feasible and will be used at the Devil's Slide Plant.

6.1.3.3 Roads PM_{10} and $PM_{2.5}$ Step 3 – Rank Remaining Control Technologies by Control Effectiveness

Table 6-2. Fugitive PM_{10} and $PM_{2.5}$ Control Technologies and Efficiencies for Roads.

Control Method	Control Efficiency (%)
Paved Road, Vacuum-Sweeping, and Watering	95%
Paved Road, Sweeping, and Watering	90%
Basic Watering	70%

6.1.3.4 Roads PM_{10} and $PM_{2.5}$ Step 4 – Evaluate Most Effective Controls and Document Results

For the paved haul road vacuum-sweeping and watering will be implemented to control fugitive dust emissions from truck traffic. As this is the highest available control technology, no economic, energy, or environmental impact evaluations are considered.

6.1.3.5 Roads PM_{10} and $PM_{2.5}$ Step 5 – Select BACT

BACT for the paved roads is considered to consist of paving, vacuum sweeping, and water application.

6.2 Combustion Sources (Hot Air Gas Generator)

6.2.1 Hot Air Gas Generator Step 1 – Identify All Control Technologies

Control technologies identified for the heater are as follows, based on a May 15, 2025, review of relevant entries in the EPA's RACT/BACT/LAER RBLC, the TCEQ BACT Guidelines for Mechanical, Agricultural and Construction Sources, and the CARB BACT Guidelines Tool:

- Good Combustion Practices
- Use of Natural Gas
- Flue Gas Recirculation (FGR)
- Ultra-Low NO_X Burner (ULNB)
- LNB

[9] UDAQ Guidelines: Emission Factors for Paved and Unpaved Haul Roads, January 2015

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6.2.2 Hot Air Gas Generator Step 2 – Eliminate Technically Infeasible Options

Good Combustion Practices

Good combustion practices include following manufacturer recommendations for operation and maintenance. Good combustion practices are technically feasible.

Use of Natural Gas

Natural gas is an inherently clean burning fuel that is considered BACT for PM and SO_2 emissions. This technology is technically feasible and is proposed for use.

LNB

NO_X formation during combustion is from three (3) major mechanisms: thermal NO_X, prompt NO_X, and fuel NO_X.[10] Thermal NO_X results from the thermal fixation of atmospheric nitrogen in the combustion air. Fuel NO_X is generated via the conversion of chemically bound nitrogen in the fuel. Prompt NO_X is generated from the reaction of nitrogen in the combustion air with hydrocarbon radicals that form from fuel early in the combustion process. Since natural gas is relatively free of fuel-bound nitrogen, the contribution of fuel NO_X emissions in natural-gas fired equipment is minimal. Prompt NO_X generation is usually negligible compared to thermal NO_X generation leaving thermal NO_X as the main source of NO_X emissions. Thermal NO_X formation is a function of residence time, oxygen level, nitrogen level, and flame temperature and can be minimized by controlling these elements in the design of the combustion equipment e.g. by utilizing burner designs which minimize NO_X formation. LNBs can reduce NO_X emissions by employing a variety of designs; staged combustion is the most common. The two most common types of staged combustion burners for this application are staged air burners and staged fuel burners. What constitutes an LNB can vary, but a threshold of 30 ppm NO_X is common. Amrize thus proposes that a HAG generator which utilizes a LNB and achieves 30 ppm of NO_X is considered BACT and is technically feasible.

FGR and ULNB

Ultra-low NO_X burners can achieve NO_X emission concentrations of 9 ppm or less. Ultra-Low NO_X burners use technology to reduce thermal and prompt NO_X formation by lowering the flame temperature and eliminating fuel-rich zones within the combustion flame. A lower flame temperature can be achieved by introducing cool air immediately upstream of the burner by using flue gas recirculation or overfired air injection. Fuel-rich zones are eliminated by rapidly mixing the gaseous fuel and air both prior and immediately following the burner. As the burner is a direct-fired unit and exposed to the material and turbulent air within the finish mill, the typical technologies to achieve ultra-low NO_X emissions rates are not technically feasible.

6.2.3 Hot Air Gas Generator Steps 3 – 5

All feasible control technologies are proposed for use; Steps 3 through 5 are thus combined. Amrize proposes to use LNB for NO_X emissions. For the remaining pollutants ($PM_{10}/PM_{2.5}$, CO, VOC, and SO_2), Amrize proposes good combustion practices and use of natural gas as BACT.

[10] EPA AP-42 Section 3.2.3.1 Natural Gas-fired Reciprocating Engines, Nitrogen Oxides

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7. EMISSIONS IMPACT ANALYSIS

7.1 Comparison to Modeling Thresholds

Appendix Table B-1 compares the total proposed emissions for each criteria pollutant to the applicable modeling thresholds contained in UAC R307-403-4 through 7, and UAC R307-410-4. As shown in Table B-1, the total emissions are not exceeded for any criteria pollutant. Additionally, the PTE of HAPs does not exceed emission threshold values (ETVs) established by UDAQ as seen in Table B-3.[11] As such, no air dispersion modeling was completed as part of this application.

7.2 Source Size Determination

As shown in Appendix Table B-2 and as described in Section 4 of this report, the proposed emissions increase at the Devil's Slide Plant are less than the SER thresholds. As such, the proposed project constitutes a minor modification at a major source.

[11] 2023 ACGIH Threshold Limit Values (TLVS), Toxic Screening Levels (TSLs) and Emission Threshold Values (ETVs)

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8. NONATTAINMENT/MAINTENANCE AREAS – OFFSETTING

Per UDAQ's Form 1 for NOI, UAC R307-403, R307-420, and R307-421, this section should include offset requirements for nonattainment and maintenance areas.

8.1 $PM_{2.5}$ Offsets

Per UAC R307-403, $PM_{2.5}$ offsets are applicable to new major sources or major modifications located within or impacting a $PM_{2.5}$ nonattainment area of the NAAQS. Amrize's Devil's Slide is not located in a $PM_{2.5}$ nonattainment area, nor does this project constitute a major modification, and it is therefore not subject to the $PM_{2.5}$ offset requirements.

8.2 PM_{10} Offsets

PM_{10} offset requirement applicability is described in UAC R307-421-2. PM_{10} offsets apply to new or modified sources of SO_2 or NO_X that are located in or impact Salt Lake County or Utah County. Amrize's Devil's Slide Plant is located in Morgan County and is therefore not subject to the PM_{10} offset requirements of UAC R307-421.

8.3 Ozone Offsets

Ozone offsets requirements recorded in UAC R307-420-3(2) are applicable to significant sources located within or impacting an ozone nonattainment area of the NAAQS. In summary, significant sources located in Davis County or Salt Lake County shall offset the proposed increase in VOCs or NO_X emissions before the Director may issue an AO to construct, modify, or relocate under UAC R307-401. As Amrize's Devil's Slide Plant is located in Morgan County, ozone offsets are not applicable.

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9. APPLICABLE REGULATIONS

The applicability of relevant state and federal air quality regulations, i.e., rules under the UAC Title R307 and 40 CFR Subchapter C, is summarized in this section.

9.1 State Regulations

Amrize has evaluated the applicability of each rule under the UAC Title R307. Rules that are generally applicable to Amrize's Devil's Slide Plant, but not directly associated with the proposed changes described in this NOI will not be discussed in this section. All applicable rules associated with this project will be discussed in the subsequent subsections.

Table 9-1. Evaluation of UDAQ Air Quality Rules

UAC	Regulation Name	Applicability	
		Yes	No
R307-101	General Requirements	X	
R307-102	[1] General Requirements: Broadly Applicable Requirements	X	
R307-103	[1] Administrative Procedures	X	
R307-104	Conflict of Interest		X
R307-105	General Requirements: Emergency controls		X
R307-107	General Requirements: Breakdowns	X	
R307-110	[1] General Requirements: State Implementation Plan	X	
R307-115	[1] General Conformity	X	
R307-120	General Requirements: Tax Exemption for Air Pollution Control Equipment		X
R307-122	General Requirements: Heavy Duty Vehicle Tax Credit		X
R307-123	General Requirements: Clean Fuels and Vehicle Technology Grant and Loan Program		X
R307-124	General Requirements: Conversion to Alternative Fuel Grant Program		X
R307-125	Clean Air Retrofit, Replacement, and Off-Road Technology Program		X
R307-130	General Penalty Policy	X	
R307-135	Enforcement Policy for Asbestos Hazard Emergency Response Act		X
R307-150	Emission Inventories	X	
R307-165	[1] Stack Testing		X
R307-170	Continuous Emission Monitoring Program		X

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UAC	Regulation Name	Applicability	
		Yes	No
R307-201	Emission Standards: General Emission Standards	X	
R307-202	Emission Standards: General Burning		X
R307-203	[1] Emission Standards: Sulfur Content of Fuels	X	
R307-204	Emission Standards: Smoke Management		X
R307-205	Emission Standards: Fugitive Emissions and Fugitive Dust	X	
R307-206	Emission Standards: Abrasive Blasting		X
R307-207	Residential Fireplaces and Solid Fuel Burning Devices		X
R307-208	Outdoor Wood Boilers		X
R307-210	Standards of Performance for New Stationary Sources	X	
R307-214	National Emission Standards for Hazardous Air Pollutants	X	
R307-220	Emission Standards: Plan for Designated Facilities		X
R307-221	Emission Standards: Emission Controls for Existing Municipal Solid Waste Landfills		X
R307-222	Emission Standards: Existing incinerator for Hospital, Medical, Infectious Waste		X
R307-223	Emission Standards: Existing Small Municipal Waste Combustion Units		X
R307-224	Mercury Emission Standards: Coal Fired Electric Generating Units		X
R307-230	NO_X Emission Limits for Natural Gas-Fired Water Heaters		X
R307-250	Western Backstop Sulfur Dioxide Trading Program		X
R307-301	Utah and Weber Counties: Oxygenated Gasoline Program as a Contingency Measure		X
R307-302	Solid Fuel Burning Devices		X
R307-303	Commercial Cooking		X
R307-304	Solvent Cleaning		X
R307-305	Nonattainment and Maintenance Areas for PM_{10}: Emission Standards		X
R307-306	PM_{10} Nonattainment and Maintenance Areas: Abrasive Blasting		X
R307-307	Road Salting and Sanding		X
R307-309	Nonattainment and Maintenance Areas for PM_{10} and $PM_{2.5}$: Fugitive Emissions and Fugitive Dust		X

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UAC	Regulation Name	Applicability	
		Yes	No
R307-310	Salt Lake County: Trading of Emission Budgets for Transportation Conformity		X
R307-311	Utah County: Trading of Emission Budgets for Transportation Conformity		X
R307-312	Aggregate Processing Operations for $PM_{2.5}$ Nonattainment Areas		X
R307-320	Ozone Maintenance Areas and Ogden City: Employer Based Trip Reduction		X
R307-325	Ozone Nonattainment and Maintenance Areas: General Requirements		X
R307-326	Ozone Nonattainment and Maintenance Areas: Control of Hydrocarbon Emissions in Petroleum Refineries		X
R307-327	Ozone Nonattainment and Maintenance Areas: Petroleum Liquid Storage		X
R307-328	Gasoline Transfer and Storage		X
R307-335	Degreasing		X
R307-341	Ozone Nonattainment and Maintenance Areas: Cutback Asphalt		X
R307-342	Adhesives and Sealants		X
R307-343	Wood Furniture Manufacturing Operations		X
R307-344	Paper, Film, and Foil Coatings		X
R307-345	Fabric and Vinyl Coatings		X
R307-346	Metal Furniture Surface Coatings		X
R307-347	Large Applicable Surface Coatings		X
R307-348	Magnet Wire Coatings		X
R307-349	Flat Wood Panel Coating		X
R307-350	Appliance Pilot Light		X
R307-351	Graphic Arts		X
R307-352	Metal Container, Closure, and Coil Coatings		X
R307-353	Plastic Parts Coatings		X
R307-354	Automotive Refinishing Coatings		X
R307-355	Aerospace Manufacture and Rework Facilities		X
R307-356	Appliance Pilot Light		X
R307-357	Consumer Products		X
R307-361	Architectural Coatings		X
R307-401	Permit: New and Modified Sources	X	

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UAC	Regulation Name	Applicability	
		Yes	No
R307-403	Permits: New and Modified Sources in Nonattainment and Maintenance Areas		X
R307-405	Permits: Major Sources in Attainment or Unclassified Areas (PSD)		X
R307-406	Visibility		X
R307-410	Permits: Emission Impact Analysis		X
R307-414	Permits: Fees for Approval Orders	X	
R307-415	Permits: Operating Permit Requirements	X	
R307-417	Permits: Acid Rain Sources		X
R307-420	Permits: Ozone Offset Requirements in Salt Lake County and Utah County		X
R307-421	Permits: PM_{10} Offset Requirements in Salt Lake County and Utah County		X
R307-424	Permits: Mercury Requirements for Electric Generating Units		X
R307-501 to 511	Oil and Gas Industry		X
R307-801	Utah Asbestos Rule		X
R307-840	Lead-Based Paint Program Purpose, Applicability, and Definitions		X
R307-841	Residential Property and Child-Occupied Facility Renovation		X
R307-842	Lead-Based Paint Activities		X

1. This subject rule is or could be applicable to Amrize's Devil's Slide Plant; however, this rule is not specific to this project and is therefore not discussed in this NOI air permit application.

9.1.1 UAC R307-101 General Requirements

Amrize will continue to adhere to the use of the general definitions outlined in UAC R307-101. All definitions, terms, abbreviations, and references in this application conform to those used in the UAC R307-101.

9.1.2 UAC R307-107 General Requirements: Breakdowns

Amrize will continue to report breakdowns at the Devil's Slide Plant within 24 hours via telephone, electronic mail, fax, or other similar method and provide detailed written description within 14 days of the onset of the incident to UDAQ. Breakdown reports will include all reporting details outlined in UAC R307-107-2, including, but not limited to, the cause and nature of the event, estimated quantity of emissions, and time of emissions.

9.1.3 UAC R307-130: General Penalty Policy

Amrize will continue to adhere to UAC R307-130 by paying/negotiating any applicable penalty fees in the event of any air pollution non-compliance.

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9.1.4 UAC R307-150 Emission Inventories

For every third year, Amrize will report its emissions inventory in accordance with UAC R307-150-6. The emissions inventory will include all criteria pollutants, including filterable and condensable PM, HAPs not exempted in R307-150-8 and chargeable pollutants in accordance with R307-150-6. Emission inventories will be submitted on or before April 15 of each year following the calendar year for which an inventory is required. Amrize will adhere to emission inventory record keeping requirements including maintaining a copy of the emission inventory submitted UDAQ and records indicating how the information submitted in the inventory was determined, including any calculations, data, measurements, and estimates used. The records under Section R307-150-4 (SO2) will be kept for ten years and other records will be kept for a period of at least five years from the due date of each inventory.

9.1.5 UAC R307-201 Emission Standards: General Emission Standards

Amrize will adhere to the visible emission opacity limits established in UAC R307-201-3 namely that visible emissions from installations except diesel engines shall be of a shade or density no darker than 20% opacity and emissions from diesel engines shall be of a shade or density no darker than 20% opacity. Opacity observations of emissions from stationary sources shall be conducted in accordance with EPA Method 9.

9.1.6 UAC R307-205 Emission Standards: Fugitive Emissions and Fugitive Dust

Amrize will ensure that fugitive emissions shall not exceed 20% opacity UAC R307-205-4. Amrize will control fugitive emissions from material storage, handling, and hauling operations per UAC R307-205-5. Such control may include the use of enclosures, covers, stabilization or other equivalent methods or techniques as approved by the director. Amrize will ensure that any fugitive dust deposited on a private or public paved road is cleaned promptly per and, if requested, Amrize will supply traffic count information as determined necessary to ascertain whether control techniques are adequate or additional controls are necessary per UAC R307-205-6. Mining operations are not proposed to be affected by this project so UAC R307-205-7-3, while broadly applicable, is not addressed here.

9.1.7 UAC R307-210 Standards of Performance for New Stationary Sources

UAC R307-210 incorporates the New Source Performance Standards (NSPS) codified at 40 CFR Part 60 by reference; NSPS are discussed in Section 9.2.

9.1.8 UAC R307-214 National Emission Standards for Hazardous Air Pollutants

UAC R307-214 incorporates the National Emission Standards for Hazardous Air Pollutants (NESHAP) codified at 40 CFR Part 61 and Part 63 by reference; NESHAP are discussed in Section 9.3.

9.1.9 UAC R307-401 Permit: New and Modified Permits

UAC R307-401-5 Permits: Permit New and Modified Sources – Notice of Intent

Per UAC R307-401-5, any person subject to UAC R307-401 shall submit a notice of intent to the director and receive an approval order precedent to the construction, modification, installation, establishment, or relocation of an air pollutant source. This application serves as Amrize's notice of intent and includes all the required information stipulated in UAC R307-401-5(2), including a description of the facility and process, air emission calculations, descriptions of air control apparatuses, and a BACT evaluation.

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UAC R307-401-8 Permits: Permit New and Modified Sources – Approval Order

Amrize acknowledges that, per UAC R307-401-8, the director will issue an approval order the following conditions have been met:

(a) The degree of pollution control for emissions, to include fugitive emissions and fugitive dust, is at least best available control technology. When determining best available control technology for a new or modified source in an ozone nonattainment or maintenance area that will emit volatile organic compounds or nitrogen oxides, best available control technology shall be at least as stringent as any Control Technique Guidance document that has been published by EPA that applies to the source.

(b) The proposed installation will meet the applicable requirements of:
- (i) Rule R307-403, Permits: New and Modified Sources in Nonattainment Areas and Maintenance Areas;
- (ii) Rule R307-405, Permits: Major Sources in Attainment or Unclassified Areas (PSD);
- (iii) Rule R307-406, Visibility;
- (iv) Rule R307-410, Permits: Emissions Impact Analysis;
- (v) Rule R307-420, Permits: Ozone Offset Requirements in Davis and Salt Lake Counties;
- (vi) Rule R307-210, Standards of Performance for New Stationary Sources;
- (vii) National Primary and Secondary Ambient Air Quality Standards;
- (viii) Rule R307-214, National Emission Standards for Hazardous Air Pollutants;
- (ix) Rule R307-110, General Requirements: State Implementation Plan; and
- (x) any other requirements of Title R307.

Amrize acknowledges that if the director determines that a proposed stationary source, modification or relocation does not meet the conditions established UAC R307-401-8(1) the director will not issue an approval order and that receipt of an approval order does not relieve any owner or operator of the responsibility to comply with the requirements of Title R307 or the State Implementation Plan.

9.1.10 UAC R307-405 Permits: Major Sources in Attainment or Unclassified Areas (PSD)

As shown in Appendix Table B-2 and as described in Section 4 of this report, the proposed emissions increase at the Devil's Slide Plant are less than the SER thresholds. As such, the proposed project constitutes a minor modification at a major source and UAC R307-405 is not applicable.

9.1.11 UAC R307-410 Permits: Emission Impact Analysis

UAC R307-410 requires that Amrize evaluate the emissions impact that the Finish Mill 4 project may have on the air quality specifically in relation to the attainment status of the NAAQS and the impact of HAPs. In accordance with this rule, the necessity of an emission impact analysis has been evaluated; refer to Section 7 of this application for this analysis.

9.1.12 UAC R307-414 Permits: Fees for Approval Orders

Fees associated with the submission of this NOI air permit application are addressed in Section 2.5 of this submittal.

9.1.13 UAC R307-415 Permits: Operating Permit Requirements

The Devil's Slide Plant complies with the definitions, terms, abbreviations, and references used in the UAC R307-101, R307-415, and 40 CFR, unless otherwise noted in the Devil's Slide Plant Title V Operating Permit.

Amrize will update their Title V permit to reflect the changes proposed in this NOI within the required timeframe.

9.2 Federal Regulations – New Source Performance Standards

NSPS, federal regulations found in Title 40 of the CFR (40 CFR) Part 60 require new, modified, or reconstructed sources to control emissions to the level achievable by the best demonstrated technology as specified in the applicable provisions. Any source subject to an NSPS is also subject to the general provisions of NSPS Subpart A, except as specified by rule.

9.2.1 NSPS Subpart A

All affected sources subject to source-specific NSPS are subject to the general provisions of NSPS Subpart A unless specifically excluded by the source-specific NSPS.

NSPS Subpart A requires the following of facilities subject to a source specific NSPS:

- Initial construction/reconstruction notification;
- Initial startup notification;
- Performance tests;
- Performance test date initial notification;
- General monitoring requirements;
- General recordkeeping requirements; and
- Semiannual monitoring system and/or excess emission reports.

9.2.2 NSPS Subpart F

40 CFR Part 60 Subpart F (NSPS Subpart F), Standards of Performance for Portland Cement Plants, provides standards of performance for affected facilities including:

- Kilns;
- Clinker coolers;
- Raw mill systems;
- Finish mill systems;
- Raw mill dryers;
- Raw material storage;
- Clinker storage;
- Finished product storage;
- Conveyor transfer points; and
- Bagging and bulk loading and unloading systems.

The proposed raw material storage, Finish Mill 4, and associated conveyor transfer points will be subject to NSPS Subpart F. Amrize has assessed whether NSPS Subpart F will be triggered for the existing finished product storage and bagging and bulk loading and unloading systems.

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Table 9-2. Existing Sources

Unit	EU Description	Point	Baghouse ID	Source Description
17379	Cement Silo Elevator	16776	590-BF1	Cement Silo Elevator
1343	Cement Silo Load	108	590-BF5	Cement Silo Load
1340	Bulk Cement Silo	105	590-BF3	Bulk Cement Silo
1343	Cement Silo Load	108	590-BF2	Cement Silo Load
1343	Cement Silo Load	108	590-BF4	Cement Silo Load
172683	GR III Silo Feed	20655	593-BF1	GR III Silo Feed
172681	GR III Fill Feed	20654	593-BF2	GR III Fill Feed
172683	GR III Silo Feed	20655	593-BF3	GR III Silo Feed
172680	GR III Load Out	20652	626-BF1	GR III Load Out

Based on Amrize's assessment, the production of low carbon cement does not meet the definition of a modification per 40 CFR §60.2, Definitions:

> *Modification means any physical change in, or change in the method of operation of, an existing facility which increases the amount of any air pollutant (to which a standard applies) emitted into the atmosphere by that facility or which results in the emission of any air pollutant (to which a standard applies) into the atmosphere not previously emitted.*

While the proposed project represents a change in the method of operation of the existing facilities, the change will not result in an increase in short-term actual emissions (as per 40 CFR §60.14(b)) of any air pollutant (to which a standard applies) emitted into the atmosphere by any potentially-affected facility and will not result in the emission of any air pollutant (to which a standard applies) into the atmosphere not previously emitted. As such, the equipment does not trigger applicability of NSPS Subpart F.

Amrize will adhere to the emission standards, emission test methods, and recordkeeping and reporting requirements outlined in NSPS Subpart F.

9.2.3 NSPS Subpart OOO

40 CFR Part 60 Subpart OOO (NSPS Subpart OOO), Standards of Performance for Nonmetallic Mineral Processing Plants, provides standards of performance for affected facilities located at fixed or portable nonmetallic mineral processing plants that are constructed, modified, or reconstructed after August 31, 1983. Equipment located at the Devil's Slide Plant meets the definition of a nonmetallic mineral processing plant per 40 CFR 60.671 "Nonmetallic mineral processing plant". With this project Amrize is proposing to introduce limestone and pozzolan materials into a new finish mill system to produce low carbon cement. Limestone meets the definition of "nonmetallic mineral". The affected equipment includes bucket elevators, belt conveyors, and raw material storage bins. Per U.S. EPA's Applicability Determination Index [ADI] Control Number 9600050, the nonmetallic mineral processing plant ends after the secondary crusher conveyor and the raw mill system [NSPS Subpart F] begins with the raw material storage facility. The first conveyor transfer point subject to Subpart F is the transfer point associated with the conveyor transferring material from the raw material storage to the grinding operations.[12] As discussed above, Finish Mill 4 and

[12] U.S. Environmental Protection Agency Applicability Determination Index, Control Number: 9600050, Portland Cement Plants-Subparts F, OOO, *Applicability of NSPS Subparts F and OOO at Portland Cement Plants*, dated June 12, 1995.

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affected equipment after the raw material storage bins is subject to NSPS Subpart F. Existing equipment not affected by this project is not addressed in this application.

Amrize will adhere to the emission standards, emission test methods, and recordkeeping and reporting requirements outlined in NSPS Subpart OOO. Key requirements are discussed below.

Per 40 CFR 60.672(a), as an affected facility, the Devil's Slide Plant must meet the particulate matter emission limits and compliance requirements in Table 2 and/or Table 3 of the standard within 60 days after achieving maximum production rate but no later than 180 days after initial startup. These limits are presented in Table 9-3 of this application. Monitoring/equipment inspections and maintenance must be conducted in accordance with 40 CFR 60.674(c) and (d) for baghouses. Finally, testing, recordkeeping, and reporting must be met in accordance with 40 CFR 60.675 and 60.676. Amrize will demonstrate compliance with the requirements upon completion of construction of the affected facilities.

Table 9-3. NSPS Subpart OOO Emissions Limits

	Requirement	Limit	Regulatory Citation
I.	**Stack Emission Limits**	Not applicable (except for individual enclosed storage bins) 7 percent for dry control devices on individual enclosed storage bins.[1]	Table 2 to Subpart OOO of Part 60, Title 40
II.	**Additional Fugitive Emission Limits**	Opacity must be less than 7 percent for bucket elevators, transfer points on belt conveyors, storage bins, or from any other affected facility.	Table 3 to Subpart OOO of Part 60, Title 40

1. Per 60.672(f), any baghouse that controls emissions from only an individual, enclosed storage bin is exempt from the applicable stack PM concentration limit (and associated performance testing) in Table 2 of this subpart but must meet the applicable stack opacity limit and compliance requirements in Table 2 of this subpart. This exemption from the stack PM concentration limit does not apply for multiple storage bins with combined stack emissions.

9.3 Federal Regulations – National Emission Standards for Hazardous Air Pollutants

The NESHAP federal regulations found in 40 CFR Part 63 are emission standards for HAPs. NESHAP are applicable to both major sources of HAPs (facilities that exceed the major source thresholds of 10 tpy of a single HAP and 25 tpy of any combination of HAPs from stationary sources) as well as non-major sources (termed "area sources"). NESHAP applies to sources in specifically regulated industrial source classifications (Clean Air Act Section 112(d)) or on a case-by-case basis (Clean Air Act Section 112(g)) for facilities not regulated as a specific industrial source type. NESHAP requires new, modified, or reconstructed sources to control emissions to the level achievable by the best demonstrated technology as specified in the applicable provisions.

9.3.1 NESHAP Part 63 Subpart A

40 CFR Part 63 Subpart A (NESHAP Subpart A), General Provisions, contains national emissions standards for HAPs defined in Section 112(b) of the Clean Air Act. All affected sources, which are subject to another NESHAP are subject to the general provisions of NESHAP Subpart A, unless specifically excluded by the source specific NEHSAP. Subpart A requires initial notification, performance testing, recordkeeping, and monitoring, provides reference methods, and mandates general control device requirements for all other subparts. The following sections detailing each subpart requirements also include requirements that are referenced to Subpart A.

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9.3.2 NESHAP Part 63 Subpart LLL

40 CFR Part 63, Subpart LLL – National Emission Standards for Hazardous Air Pollutants from the Portland Cement Manufacturing Industry establishes process/source specific emission limits for PM, VOC (expressed as total hydrocarbon, i.e., THC), mercury (Hg), dioxins/furans (D/F), and visible emissions. In addition to limiting HAP emissions such as Hg and D/F, Subpart LLL also limits emissions of other solid and gaseous HAP compounds by limiting PM and THC emissions because portions of such emissions are EPA-listed HAPs. Subpart LLL requires compliance with applicable emissions limits on and after the initial startup of cement production. To further reduce emissions, Subpart LLL also establishes operational requirements for the use of cement kiln dust (CKD), fly ash, fuel and control equipment. Subpart LLL also specifies process/source specific emissions testing, monitoring, recordkeeping, reporting, and compliance demonstration requirements. The compliance requirements for the site are detailed in the TV Permit. Amrize will continue to comply with the requirements of Subpart LLL to demonstrate compliance. The existing finish mills and Finish Mill 4 will be subject to a 10% opacity standard. This project does not result in an applicability change with Subpart LLL other than adding Finish Mill 4 to recordkeeping, reporting, monitoring and testing related plans at the site.

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APPENDIX A. FORMS

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Form 1
Notice of Intent (NOI) Application Checklist

Date July 2025

Company Amrize (US) Inc.

Utah Division of Air Quality
New Source Review Section

Source Identification Information [R307-401-5]

1.	Company name, mailing address, physical address and telephone number	☑	
2.	Company contact (Name, mailing address, and telephone number)	☑	
3.	Name and contact of person submitting NOI application (if different than 2)	☑	
4.	Source Universal Transverse Mercator (UTM) coordinates	☑	
5.	Source Standard Industrial Classification (SIC) code	☑	
6.	Area designation (attainment, maintenance, or nonattainment)	☑	
7.	Federal/State requirement applicability (NAAQS, NSPS, MACT, SIP, etc.)	☑	
8.	Source size determination (Major, Minor, PSD)	☑	
9.	Current Approval Order(s) and/or Title V Permit numbers	☑	

NOI Application Information: [R307-401]

1.	Detailed description of the project and source process	☑	
2.	Discussion of fuels, raw materials, and products consumed/produced	☑	
3.	Description of equipment used in the process and operating schedule	☑	
4.	Description of changes to the process, production rates, etc.	☑	
5.	Site plan of source with building dimensions, stack parameters, etc.	☑	
6.	Best Available Control Technology (BACT) Analysis [R307-401-8]		
	A. BACT analysis for all new and modified equipment	☑	
7.	Emissions Related Information: [R307-401-2(b)]		
	A. Emission calculations for each new/modified unit and site-wide (Include PM_{10}, $PM_{2.5}$, NO_x, SO_2, CO, VOCs, HAPs, and GHGs)	☑	
	B. References/assumptions, SDS, for each calculation and pollutant	☑	
	C. All speciated HAP emissions (list in lbs/hr)	☑	
8.	Emissions Impact Analysis – Approved Modeling Protocol [R307-410]		
	A. Composition and physical characteristics of effluent (emission rates, temperature, volume, pollutant types and concentrations)	☑	
9.	Nonattainment/Maintenance Areas – Major NSR/Minor (offsetting only) [R307-403]		
	A. NAAQS demonstration, Lowest Achievable Emission Rate, Offset requirements	☐	N/A ■
	B. Alternative site analysis, Major source ownership compliance certification	☐	N/A ■
10.	Major Sources in Attainment or Unclassified Areas (PSD) [R307-405, R307-406]		
	A. Air quality analysis (air model, met data, background data, source impact analysis)	☐	N/A ■
	B. Visibility impact analysis, Class I area impact	☐	N/A ■
11.	Signature on Application	☑	

Note: The Division of Air Quality will not accept documents containing confidential information or data. Documents containing confidential information will be returned to the Source submitting the application.

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Form 2
Company Information/Notice of Intent (NOI)

Date July 2025

Utah Division of Air Quality
New Source Review Section

Application for: ☐ **Initial Approval Order** ☑ **Approval Order Modification**

General Owner and Source Information

1. Company name and mailing address:
Amrize Cement Inc.
6055 E. Croydon Rd
Morgan, UT 84050
Phone No.: (801) 829-6821
Fax No.: ( )

2. Company** contact for environmental matters:
Travis Reed
Phone no.: (470) 617-8423
Email: Travis.Reed@amrize.com
*** Company contact only; consultant or independent contractor contact information can be provided in a cover letter*

3. Source name and physical address (if different from above):
Phone no.: ( )
Fax no.: ( )

4. Source Property Universal Transverse Mercator coordinates (UTM), including System and Datum:
UTM: 12
X: 455,500 m Easting
Y: 4,545,500 m Northing

5. The Source is located in: Morgan County

6. Standard Industrial Classification Code (SIC)
3241

7. If request for modification, AO# to be modified: DAQE # AN1100070031-22 DATED: 03 / 10 / 22

8. Brief (50 words or less) description of process.
Portland cement production.

Electronic NOI

9. A complete and accurate electronic NOI submitted to DAQ Permitting Mangers Jon Black (*jlblack@utah.gov*) or Alan Humpherys (ahumpherys@utah.gov) can expedite review process. Please mark application type.

Hard Copy Submittal ☐ Electronic Copy Submittal ☑ Both ☐

Authorization/Signature

I hereby certify that the information and data submitted in and with this application is completely true, accurate and complete, based on reasonable inquiry made by me and to the best of my knowledge and belief.

Signature: Title: Plant Manager

Javier Sosa Ortiz
Name (Type or print)

Telephone Number:
(801) 829-2181
Email:
Javier.Sosa@amrize.com

Date: 07/14/25

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Form 4
Project Information
Utah Division of Air Quality
New Source Review Section

Company Amrize (US) Inc.
Site Devil's Slide

Process Data - For Modification/Amendment ONLY

1. Permit Number DAQE-AN100070031-22

If submitting a new permit, then use Form 3

Requested Changes

2. Name of process to be modified/added:
Finish Mill 4

End product of this process:
cement

3. Permit Change Type:

	New	Increase*
Equipment	☑	☐
Process	☐	☐

Condition Change II.A
Other
Other
Other

4. Does new emission unit affect existing permitted process limits?
Yes ☐ No ☑

5. Condition(s) Changing:
II.A

6. Description of Permit/Process Change**

Amrize is proposing to install a fourth finish mill (Mill 4) to accommodate the longer grinding times to produce blended cement products. No changes are proposed for the existing finish mills. The clinker production capacity will remain unchanged.

7. New or modified materials and quantities used in process. **

Material	Quantity Annually
See NOI	

8. New or modified process emitting units **

Emitting Unit(s)	Capacity(s)	Manufacture Date(s)
See NOI		

**If the permit being modified does not include CO_2e or $PM_{2.5}$, the emissions need to be calculated and submitted to DAQ, which may result in an emissions increase and a public comment period.*
***If additional space is required, please generate a document to accommodate and attach to form.*

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Form 5
Emissions Information
Criteria/GHGs/ HAP's
Utah Division of Air Quality
New Source Review Section

Company Amrize (US) Inc.

Site Devil's Slide

Potential to Emit* Criteria Pollutants & GHGs			
Criteria Pollutants	**Permitted Emissions (tons/yr)**	**Emissions Increases (tons/yr)**	**Proposed Emissions (tons/yr)**
PM_{10} Total			
PM_{10} Fugitive			
$PM_{2.5}$			
NO_x			
SO_2			
CO			
VOC			
VOC Fugitive			
NH_3			
Greenhouse Gases	**CO_2e**	**CO_2e**	**CO_2e**
CO_2			
CH_4			
N_2O			
HFCs			
PFCs			
SF_6			
Total CO2e			

See Appendix B

See Appendix B

Potential to emit to include pollution control equipment as defined by R307-401-2.

Hazardous Air Pollutants** (**Defined in Section 112(b) of the Clean Air Act)				
Hazardous Air Pollutant* **	**Permitted Emissions (tons/yr)**	**Emission Increase (tons/yr)**	**Proposed Emission (tons/yr)**	**Emission Increase (lbs/hr)**
Total HAP				

See Appendix B

*** Use additional sheets for pollutants if needed*

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Utah Division of Air Quality
New Source Review Section

Form 10
Fabric Filters (Baghouses)

Company Amrize (US) Inc.
Site/Source Devil's Slide
Date July 2025

Baghouse Description

1. Briefly describe the process controlled by this baghouse:

See list (next page)

Gas Stream Characteristics

2. Flow Rate (acfm): See list (next page)		3. Water Vapor Content of Effluent Stream (lb. water/lb. dry air)	4. Particulate Loading (grain/scf)	
Design Max	Average Expected		Inlet	Outlet
5. Pressure Drop (inches H_2O) High _____ Low _____		6. Gas Stream Temperature (°F):	7. Fan Requirements (hp) (ft^3/min)	

Equipment Information and Filter Characteristics

8. Manufacturer and Model Number:

9. Bag Material:	10. Bag Diameter (in.)	11. Bag Length (ft.)	12. Number of Bags:	13. Stack Height
☐ Nomex nylon ☐ Polyester ☐ Acrylics ☐ Fiber glass ☐ Cotton ☐ Teflon ☐ _____	14. Filtering Efficiency Rating: _____%	15. Air to Cloth Ratio: _____: 1	16. Hours of Operation: Max Per day _____ Max Per year _____	_____ feet Stack Inside Diameter _____ inches 17. Cleaning Mechanism: ☐ Reverse Air ☐ Shaker ☐ Pulse Jet ☐ Other: _____

Emissions Calculations (PTE)

18. Calculated emissions for this device

PM_{10} _____ Lbs/hr _____ Tons/yr $PM_{2.5}$ _____ Lbs/hr _____ Tons/yr
NO_x _____ Lbs/hr _____ Tons/yr SO_x _____ Lbs/hr _____ Tons/yr
CO _____ Lbs/hr _____ Tons/yr VOC _____ Lbs/hr _____ Tons/yr
HAPs _____ Lbs/hr (speciate) _____ Tons/yr (speciate)

See Appendix B

Submit calculations as an appendix.

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Due to the quantity of baghouses being added or modified by this permit application, the content of Form 10 is presented here in a condensed form

Baghouse ID	Process Controlled by BH	Flow Rate (acfm)	Status
DC-101	Expanded shale unloading	3,600	New
DC-102	Expanded shale transport	2,945	New
DC-201	Limestone handling	3,500	New
DC-202	Limestone/shale handling	2,945	New
DC-301	Expanded shale feed silo bin vent	8,834	New
DC-302	Limestone & shale silo withdrawal	3600	New
DC-303	Limestone feed silo bin vent	8,834	New
DC-401	Mill reject bin feed/mill feed belt dust collector	6,095	New
DC-402	Mill reject bucket elevator dust collector	6,095	New
DC-403	Mill recirculation system venting	3,500	New
DC-501	VRM process filter	82,898	New
DC-601	Mill product conveying dust collector	1,400	New
DC-601A	Product transport bucket elevator venting	1,400	New
DC-602	Expanded shale product silo bin vent	2,500	New
DC-603	Limestone product silo bin vent	2,500	New
DC-701	Limestone dosing hopper to existing silos	2,500	New
DC-702	Limestone dosing hopper to existing silos	2,500	New
DC-703	Expanded shale dosing hopper to existing silos	2,500	New
DC-704	Expanded shale dosing hopper to existing silos	2,500	New
FR-701	Dosing system filter receiver to existing silos	8,000	Modified
FR-702	Dosing system filter receiver to existing silos	8,000	Modified
590-BF1	Cement Silo Elevator	6,000	Modified
590-BF2	Cement Silo Load	2,400	Modified
590-BF3	Bulk Cement Silo	4,600	Modified
590-BF4	Cement Silo Load	2,400	Modified
590-BF5	Cement Silo Load	2,400	Modified
593-BF1	GR III Silo Feed	9,706	Modified
593-BF2	GR III Fill Feed	9,706	Modified
593-BF3	GR III Silo Feed	9,706	Modified
626-BF1	GR III Load Out	4,600	Modified

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New Source Review Section

Company Amrize (US) Inc.
Site/Source Devil's Slide
Date July 2025

Form 19
Natural Gas Boilers and Liquid Heaters

Boiler Information

1. Boiler Manufacturer: _____

2. Model Number: _____ 3. Serial Number: _____

4. Boiler Rating: _____50_____(10^6 Btu per Hour)

5. Operating Schedule: _____24_____ hours per day ____7_____ days per week ___52_____ weeks per year

6. Use: ☐ steam: psig _____ ☐ hot water ☐ other hot liquid: hot air gas

7. Fuels:
   - ☒ Natural Gas ☐ LPG ☐ Butane ☐ Methanol
   - ☐ Process Gas - H_2S content in process gas _____ grain/100cu.ft.
   - ☐ Fuel Oil - specify grade: _____ ☐ Other, specify: _____
   - Sulfur content _____ % by weight Days per year during which unit is oil fired: _____

   Backup Fuel: ☐ Diesel ☐ Natural Gas ☐ LPG ☐ Butane ☐ Methanol ☐ Other _____

8. Is unit used to incinerate waste gas liquid stream? ☐ yes ☒ no
   (Submit drawing of method of waste stream introduction to burners)

Gas Burner Information

9. Gas Burner Manufacturer: _____

10. No. of Burners: _____ 11. Minimum rating per burner: _____ cu. ft/hr

12. Average Load: _____% 13. Maximum rating per burner: _____ cu. ft/hr

14. Performance Guarantee (ppm dry corrected to 3% Oxygen):
    NO_x: _____ CO: _____ Hydrocarbons: _____

15. Gas burner mode of control: ☐ Manual ☐ Automatic on-off ☐ Automatic hi-low ☐ Automatic full modulation

Oil Burner Information

16. Oil burner manufacturer:

17. Model: _____ number of burners: _____ Size number: _____

18. Minimum rating per burner: _____ gal/hr 19. Maximum rating per burner: _____ gal/hr

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Form 11 - Natural Gas Boiler and Liquid Heater (Continued)

Modifications for Emissions Reduction

20. Type of modification: ☑ Low NO_X Burner ☐ Flue Gas Recirculation (FGR)
☐ Oxygen Trim ☐ Other (specify) _____

For Low-NO_X Burners

21. Burner Type: ☐ Staged air ☐ Staged fuel ☐ Internal flue gas recirculation
☐ Ceramic ☐ Other (specify): _____

22. Manufacturer and Model Number: _____

23. Rating: _____ 10^6 BTU/HR

24. Combustion air blower horsepower: _____

For Flue Gas Recirculation (FGR)

25. Type: ☐ Induced ☐ Forced Recirculation fan horsepower: _____

26. FGR capacity at full load: _____ scfm _____%FGR

27. FGR gas temperature or load at which FGR commences: _____ ^{O}F _____% load

28. Where is recirculation flue gas reintroduced? _____

For Oxygen Trim Systems

29. Manufacturer and Model Number: _____

30. Recorder: ☐ yes ☐ no Describe: _____

Stack or Vent Data

31. Inside stack diameter or dimensions _____
Stack height above the ground _____
Stack height above the building _____

32. Gas exit temperature: _____ ^{O}F

33. Stack serves: ☐ this equipment only, ☐ other equipment (submit type and rating of all other equipment exhausted through this stack or vent)

34. Stack flow rate: _____ acfm Vertically restricted? ☐ Yes ☐ No

Emissions Calculations (PTE)

35. Calculated emissions for this device

PM_{10} _____Lbs/hr_____ Tons/yr
$PM_{2.5}$ _____Lbs/hr_____ Tons/yr
NO_x _____Lbs/hr _____Tons/yr
SO_x _____Lbs/hr_____ Tons/yr
CO _____Lbs/hr _____Tons/yr
VOC _____Lbs/hr _____Tons/yr
CO_2 _____ Tons/yr
CH_4 _____Tons/yr
N_2O _____Tons/yr
HAPs_____ Lbs/hr (speciate)_____Tons/yr (speciate)

See Appendix B

Submit calculations as an appendix. If other pollutants are emitted, include the emissions in the appendix.

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APPENDIX B. EMISSION CALCULATIONS

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Table B-1. Amrize Future Potential to Emit

Emissions	Potential Annual Emissions Estimate (tpy)							
	NO_X	CO	PM_{10}	$PM_{2.5}$	VOC	SO_2	CO_2e	Total HAPs
Material Handling and Mill	0.00	0.00	10.09	6.84	0.00	0.00	0.00	0.00
Existing Cement Silos (Change in PTE)[1]	0.00	0.00	0.41	0.07	0.00	0.00	0.00	0.00
Hot Air Gas Generator	10.74	18.04	1.63	1.63	1.18	0.13	25,644	0.40
Roads	0.00	0.00	0.12	0.01	0.00	0.00	0.00	0.00
Stockpile	0.00	0.00	0.11	0.07	0.00	0.00	0.00	0.00
Currently Permitted PTE[2]	1,825	1,820	221.00	50.00	151.00	457.00	-	79.36
Proposed PTE	**1,836**	**1,838**	**233.37**	**58.62**	**152.18**	**457.13**	**25,644**	**79.76**
Major Source Thresholds[3]	100	100	100	100	100	100	100,000	10/25
Threshold Exceeded?	*Yes*	*Yes*	*Yes*	*No*	*Yes*	*Yes*	*Yes*	*Yes*
Modeling Limits[4]	40	100	15	--	--	40	--	See HAPs Summary
Threshold Exceeded?	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*

1. The Mill 4 project will not directly result in an increase in cement silo emissions but a change in PTE is presented here to reflect a revision of the flow rate of baghouse 626-BF1 which controls one of the silos:

	PM_{10}	$PM_{2.5}$
PTE for corrected flow rate (tpy):	1.22	0.22
Currently permitted PTE (tpy):	0.81	0.14
Proposed change in PTE (tpy):	0.41	0.07

2. AO DAQE-AN100070031-22

3. Criteria pollutant major source thresholds defined by 40 CFR 51.165(a)(1)(iv)(A) and 40 CFR 52.21(b)(1)(i)(b).

4. Modeling limit is stated in UDAQ Emissions Impact Assessment Guidelines under Table 1: Total Controlled Emission Rates for New Sources or Emissions Increase.

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Table B-2. Amrize Mill 4 PSD Applicability Summary

Emissions	Emissions Increase Summary (tpy)							
	NO_X	CO	PM_{10}	$PM_{2.5}$	VOC	SO_2	CO_2e	Total HAPs
Material Handling and Mill	0.00	0.00	10.09	6.84	0.00	0.00	0.00	0.00
Cement Silos - Net Increase	0.00	0.00	2.71	0.48	0.00	0.00	0.00	0.00
Hot Air Gas Generator	10.74	18.04	1.63	1.63	1.18	0.13	25,644	0.40
Roads	0.00	0.00	0.12	0.01	0.00	0.00	0.00	0.00
Stockpile	0.00	0.00	0.11	0.07	0.00	0.00	0.00	0.00
Total	**10.74**	**18.04**	**14.67**	**9.03**	**1.18**	**0.13**	**25,644**	**0.40**
Comparison to Significant Emission Rates								
Significant Emission Rates[1]	40	100	15	10	40	40	75,000	--
Threshold Exceeded?	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*

1. Criteria pollutant significant emission rates defined by 40 CFR 52.21(b)(23)(i).

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Table B-3. Amrize HAP PTE

Pollutant	HAG Generator PTE		ETV [1]	Modeling Required?
	lb/hr	tpy	lb/hr	
Benzene	1.03E-04	4.51E-04	0.32	No
Formaldehyde	3.68E-03	0.02	0.06	No
Naphthalene	2.99E-05	1.31E-04	14.10	No
Toluene	1.67E-04	7.30E-04	14.92	No
Acenaphthene	8.82E-08	3.86E-07	-	-
Acenaphthylene	8.82E-08	3.86E-07	-	-
Anthracene	1.18E-07	5.15E-07	-	-
Benz(a)anthracene	8.82E-08	3.86E-07	-	-
Benzo(g,h,i)perylene	5.88E-08	2.58E-07	-	-
Chrysene	8.82E-08	3.86E-07	-	-
Dibenzo(a,h) anthracene	5.88E-08	2.58E-07	-	-
Fluoranthene	1.47E-07	6.44E-07	-	-
Fluorene	1.37E-07	6.01E-07	-	-
Phenanthrene	8.33E-07	3.65E-06	-	-
Pyrene	2.45E-07	1.07E-06	-	-
2-Methylnaphthalene	1.18E-06	5.15E-06	-	-
3-Methylcholanthrene	8.82E-08	3.86E-07	-	-
7,12-Dimethylbenz(a)anthracene	7.84E-07	3.44E-06	-	-
Benzo(a)pyrene	5.88E-08	2.58E-07	-	-
Benzo(b)fluoranthene	8.82E-08	3.86E-07	-	-
Dichlorobenzene	5.88E-05	2.58E-04	16.17	No
Hexane	0.09	0.39	47.41	No
Indeno(1,2,3-cd)pyrene	8.82E-08	3.86E-07	-	-
Total HAPs	0.09	0.40	-	-

1. ETV conservatively assumes a vertically unrestricted release < 50 m from the property boundary

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Table B-4. Hot Air Gas (HAG) Generator

Parameter	Value	Unit
HAG Input Heat Capacity[1]	32.000	MMBtu/hr
Number of Units[1]	1	
Total Input Heat Capacity	50	MMBtu/hr
Total Run Time	8,760	hr/yr
Natural Gas Higher Heating Value (HHV)[2]	1,020	MMBtu/MMscf
Total Potential Natural Gas Usage	429.41	MMscf/yr

1. Per manufacturer spec sheet

2. Per AP-42 Chapter 1, Section 1.4 Natural Gas Combustion

Table B-5. Emission Factors

Pollutant	Emission Factor	Units	Reference
NO_x	50.00	lb/MMscf	1
CO	84.00	lb/MMscf	1
PM	7.60	lb/MMscf	1
PM_{10}	7.60	lb/MMscf	1
$PM_{2.5}$	7.60	lb/MMscf	1
SO_2	0.60	lb/MMscf	1
VOC	5.50	lb/MMscf	1
NH_3	3.20	lb/MMscf	2
CO_2	116.98	lb/MMBtu	3
CH_4	2.20E-03	lb/MMBtu	3
N_2O	2.20E-04	lb/MMBtu	3
CO_2e	117.10	lb/MMBtu	3

1. Natural Gas Emission Factor from AP-42 Section 1.4

2. EPA's Final Report on Ammonia Emission Factors, August 1994, Table 7-4

3. GHG emission factors from Tables C-1 and C-2, 40 CFR 98, Subpart C. CO_2e is the sum of GHG constituents multiplied by their respective global warming potential (i.e. 1 for CO_2, 28 for CH_4, and 265 for N_2O), per Table A-1, 40 CFR 98, Subpart A.

Table B-6. HAG Generator Criteria Pollutant PTE

Pollutant	Natural Gas Emissions	
	Hourly	Annually
	(lb/hr)	(tpy)
NO_x	2.45	10.74
CO	4.12	18.04
PM	0.37	1.63
PM_{10}	0.37	1.63
$PM_{2.5}$	0.37	1.63
SO_2	2.94E-02	0.13
VOC	0.27	1.18
NH_3	0.16	0.69
CO_2e	5,855	25,644

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Table B-7. Miscellaneous HAP Emission Factors

Pollutant	Natural Gas[1]	
	Value	Unit
Benzene	2.10E-03	lb/MMscf
Formaldehyde	7.50E-02	lb/MMscf
Naphthalene	6.10E-04	lb/MMscf
Toluene	3.40E-03	lb/MMscf
Acenaphthene	1.80E-06	lb/MMscf
Acenaphthylene	1.80E-06	lb/MMscf
Anthracene	2.40E-06	lb/MMscf
Benz(a)anthracene	1.80E-06	lb/MMscf
Benzo(g,h,i)perylene	1.20E-06	lb/MMscf
Chrysene	1.80E-06	lb/MMscf
Dibenzo(a,h) anthracene	1.20E-06	lb/MMscf
Fluoranthene	3.00E-06	lb/MMscf
Fluorene	2.80E-06	lb/MMscf
Phenanthrene	1.70E-05	lb/MMscf
Pyrene	5.00E-06	lb/MMscf
2-Methylnaphthalene	2.40E-05	lb/MMscf
3-Methylcholanthrene	1.80E-06	lb/MMscf
7,12-Dimethylbenz(a)anthracene	1.60E-05	lb/MMscf
Benzo(a)pyrene	1.20E-06	lb/MMscf
Benzo(b)fluoranthene	1.80E-06	lb/MMscf
Dichlorobenzene	1.20E-03	lb/MMscf
Hexane	1.8	lb/MMscf
Indeno(1,2,3-cd)pyrene	1.80E-06	lb/MMscf

1. Emission factors from AP-42 Section 1.4 Table 1.4-3 for natural gas combustion

Table B-8. Hag Generator HAP PTE

Pollutant	Natural Gas Emissions	
	Hourly	Annually
	(lb/hr)	(tpy)
Benzene	1.03E-04	4.51E-04
Formaldehyde	3.68E-03	1.61E-02
Naphthalene	2.99E-05	1.31E-04
Toluene	1.67E-04	7.30E-04
Acenaphthene	8.82E-08	3.86E-07
Acenaphthylene	8.82E-08	3.86E-07
Anthracene	1.18E-07	5.15E-07
Benz(a)anthracene	8.82E-08	3.86E-07
Benzo(g,h,i)perylene	5.88E-08	2.58E-07
Chrysene	8.82E-08	3.86E-07
Dibenzo(a,h) anthracene	5.88E-08	2.58E-07
Fluoranthene	1.47E-07	6.44E-07
Fluorene	1.37E-07	6.01E-07
Phenanthrene	8.33E-07	3.65E-06
Pyrene	2.45E-07	1.07E-06
2-Methylnaphthalene	1.18E-06	5.15E-06
3-Methylcholanthrene	8.82E-08	3.86E-07
7,12-Dimethylbenz(a)anthracene	7.84E-07	3.44E-06
Benzo(a)pyrene	5.88E-08	2.58E-07
Benzo(b)fluoranthene	8.82E-08	3.86E-07
Dichlorobenzene	5.88E-05	2.58E-04
Hexane	8.82E-02	3.86E-01
Indeno(1,2,3-cd)pyrene	8.82E-08	3.86E-07
Total HAPS	**0.09**	**0.40**

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Table B-9. Material Handling and Vertical Mill Emissions

EPN	Description	Flow Diagram	Equipment Status	Control	Hourly Throughput (tph)	Annual Throughput (tpy)	PM EF (lbs/ton)	PM_{10} EF (lbs/ton)	$PM_{2.5}$ EF (lbs/ton)	PM (lb/hr)	PM_{10}[1] (lb/hr)	$PM_{2.5}$[1] (lb/hr)	PM (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	EF Reference
EP1	Drop: Truck to Hopper	Flow 1	New	Moisture Content	400	180,000	0.003	1.10E-03	1.10E-03	1.200	0.440	0.440	0.270	0.099	0.099	AP-42 Table 11.19.2-2 (08/04) Conveyor Transfer Point. Assume PM10=PM2.5
EP2	Drop: Conveyor to conveyor	Flow 1	New	Moisture Content	400	180,000	0.003	1.10E-03	1.10E-03	1.200	0.440	0.440	0.270	0.099	0.099	AP-42 Table 11.19.2-2 (08/04) Conveyor Transfer Point. Assume PM10=PM2.5
EP3	Drop: Conveyor to Elevator	Flow 1/Flow 3	New	Moisture Content	400	180,000	0.003	1.10E-03	1.10E-03	1.200	0.440	0.440	0.270	0.099	0.099	AP-42 Table 11.19.2-2 (08/04) Conveyor Transfer Point. Assume PM10=PM2.5
DC-201	Drop: Conveyor to Conveyor	Flow 2	New	Dust Collector	1000	115,000	0.003	1.10E-03	1.10E-03	3.000	1.100	1.100	0.173	0.063	0.063	AP-42 Table 11.19.2-2 (08/04) Conveyor Transfer Point. Assume PM10=PM2.5
DC-201	Drop: Conveyor to Elevator	Flow 2/Flow 3	New	Dust Collector	1000	315,000	0.003	1.10E-03	1.10E-03	3.000	1.100	1.100	0.473	0.173	0.173	AP-42 Table 11.19.2-2 (08/04) Conveyor Transfer Point. Assume PM10=PM2.5
DC-202	Drop: Elevator to Conveyor	Flow 3	New	Dust Collector	300	495,000	0.003	1.10E-03	1.10E-03	0.900	0.330	0.330	0.743	0.272	0.272	AP-42 Table 11.19.2-2 (08/04) Conveyor Transfer Point. Assume PM10=PM2.5
DC-301	Drop: Conveyor to Bins	Flow 3	New	Dust Collector	300	495,000	0.003	1.10E-03	1.10E-03	0.900	0.330	0.330	0.743	0.272	0.272	AP-42 Table 11.19.2-2 (08/04) Conveyor Transfer Point. Assume PM10=PM2.5
DA-302	Drop: Bin to Conveyor	Flow 3	New	Dust Collector	65	180,000	9.40E-03	7.99E-03	2.82E-03	0.611	0.519	0.183	0.846	0.719	0.254	AP-42 Table 11.6-5 (2/25) Finish grinding mill weigh hopper with fabric filter; PM10 = 85% PM; PM2.5 = 30% PM
DA-302	Drop: Bin to Conveyor	Flow 3	New	Dust Collector	65	115,000	9.40E-03	7.99E-03	2.82E-03	0.611	0.519	0.183	0.541	0.459	0.162	AP-42 Table 11.6-5 (2/25) Finish grinding mill weigh hopper with fabric filter; PM10 = 85% PM; PM2.5 = 30% PM
DA-302	Drop: Bin 303 to Conveyor 301	Flow 3	New	Dust Collector	100	200,000	9.40E-03	7.99E-03	2.82E-03	0.940	0.799	0.282	0.940	0.799	0.282	AP-42 Table 11.6-5 (2/25) Finish grinding mill weigh hopper with fabric filter; PM10 = 85% PM; PM2.5 = 30% PM
DC-401	Drop: Elevator to Conveyor	Flow 4	New	Dust Collector	100	570,000	2.90E-05	2.47E-05	8.70E-06	0.003	0.002	0.001	0.008	0.007	2.48E-03	AP-42 Table 11.6-5 (2/25) Limestone Transfer with fabric filter; PM10 = 85% PM; PM2.5 = 30% PM
DC-401	Drop: Conveyor to Reject Bin	Flow 4	New	Dust Collector	5	15,000	2.90E-05	2.47E-05	8.70E-06	1.45E-04	1.23E-04	4.35E-05	2.18E-04	1.85E-04	6.53E-05	AP-42 Table 11.6-5 (2/25) Limestone Transfer with fabric filter; PM10 = 85% PM; PM2.5 = 30% PM
DC-402	Drop: Conveyor to Elevator	Flow 3/Flow 4	New	Dust Collector	100	495,000	2.40E-03	2.04E-03	7.20E-04	0.240	0.204	0.072	0.594	0.505	0.178	AP-42 Table 11.6-5 (2/25) Finish grinding mill feed belt with fabric filter; PM10 = 85% PM; PM2.5 = 30% PM
DC-402	Drop: Reject Bin to Conveyor	Flow 4	New	Dust Collector	5	15,000	2.90E-05	2.47E-05	8.70E-06	1.45E-04	1.23E-04	4.35E-05	2.18E-04	1.85E-04	6.53E-05	AP-42 Table 11.6-5 (2/25) Limestone Transfer with fabric filter; PM10 = 85% PM; PM2.5 = 30% PM
DC-402	Drop: Conveyor to Reject Container	Flow 4	New	Dust Collector	5	15,000	2.90E-05	2.47E-05	8.70E-06	1.45E-04	1.23E-04	4.35E-05	2.18E-04	1.85E-04	6.53E-05	AP-42 Table 11.6-5 (2/25) Limestone Transfer with fabric filter; PM10 = 85% PM; PM2.5 = 30% PM
DC-402	Drop: Conveyor to Conveyor	Flow 4	New	Dust Collector	5	15,000	2.90E-05	2.47E-05	8.70E-06	1.45E-04	1.23E-04	4.35E-05	2.18E-04	1.85E-04	6.53E-05	AP-42 Table 11.6-5 (2/25) Limestone Transfer with fabric filter; PM10 = 85% PM; PM2.5 = 30% PM
DC-402	Drop: Conveyor to Elevator	Flow 4	New	Dust Collector	5	15,000	2.90E-05	2.47E-05	8.70E-06	1.45E-04	1.23E-04	4.35E-05	2.18E-04	1.85E-04	6.53E-05	AP-42 Table 11.6-5 (2/25) Limestone Transfer with fabric filter; PM10 = 85% PM; PM2.5 = 30% PM
DC-402	Drop: Conveyor to Elevator	Flow 4	New	Dust Collector	25	60,000	2.90E-05	2.47E-05	8.70E-06	7.25E-04	6.16E-04	2.18E-04	8.70E-04	7.40E-04	2.61E-04	AP-42 Table 11.6-5 (2/25) Limestone Transfer with fabric filter; PM10 = 85% PM; PM2.5 = 30% PM
DC-403	Drop: Conveyor to Conveyor	Flow 4	New	Dust Collector	25	60,000	2.90E-05	2.47E-05	8.70E-06	7.25E-04	6.16E-04	2.18E-04	8.70E-04	7.40E-04	2.61E-04	AP-42 Table 11.6-5 (2/25) Limestone Transfer with fabric filter; PM10 = 85% PM; PM2.5 = 30% PM
DC-403	Drop: Roller Mill to Conveyor (recirc)	Flow 4/Flow 5	New	Dust Collector	25	60,000	2.90E-05	2.47E-05	8.70E-06	7.25E-04	6.16E-04	2.18E-04	8.70E-04	7.40E-04	2.61E-04	AP-42 Table 11.6-5 (2/25) Limestone Transfer with fabric filter; PM10 = 85% PM; PM2.5 = 30% PM
Stack501	Finish Mill Grinding w/ Seperator (Vertical Roller Mill)	Flow 5	New	Baghouse	125	620,000	0.028	0.0154	0.0126	3.500	1.925	1.575	8.680	4.774	3.906	AP-42 Table 11.6-5 (2/25) Finish grinding mill air separator with fabric filter; Based on existing finish mill particle sizes
DC-601	Drop: Air Slide Drops	Flow 6	New	Dust Collector	100	495,000	2.90E-05	2.47E-05	8.70E-06	0.003	0.002	8.70E-04	0.007	0.006	2.15E-03	AP-42 Table 11.6-5 (2/25) Limestone Transfer with fabric filter; PM10 = 85% PM; PM2.5 = 30% PM
DA-602	Drop: Airslide to Silo	Flow 7	New	Dust Collector	65	180,000	2.90E-05	2.47E-05	8.70E-06	0.002	0.002	5.66E-04	0.003	0.002	7.83E-04	AP-42 Table 11.6-5 (2/25) Limestone Transfer with fabric filter; PM10 = 85% PM; PM2.5 = 30% PM
DA-603	Drop: Airslide to Silo	Flow 7	New	Dust Collector	65	115,000	2.90E-05	2.47E-05	8.70E-06	0.002	0.002	5.66E-04	0.002	0.001	5.00E-04	AP-42 Table 11.6-5 (2/25) Limestone Transfer with fabric filter; PM10 = 85% PM; PM2.5 = 30% PM
DA-701	Drop: Silo to Hopper	Flow 7	New	Dust Collector	32.5	90,000	9.40E-03	7.99E-03	2.82E-03	0.306	0.260	0.092	0.423	0.360	0.127	AP-42 Table 11.6-5 (2/25) Finish grinding mill weigh hopper with fabric filter; PM10 = 85% PM; PM2.5 = 30% PM
DA-702	Drop: Silo to Hopper	Flow 7	New	Dust Collector	32.5	90,000	9.40E-03	7.99E-03	2.82E-03	0.306	0.260	0.092	0.423	0.360	0.127	AP-42 Table 11.6-5 (2/25) Finish grinding mill weigh hopper with fabric filter; PM10 = 85% PM; PM2.5 = 30% PM
DA-703	Drop: Silo to Hopper	Flow 7	New	Dust Collector	32.5	57,500	9.40E-03	7.99E-03	2.82E-03	0.306	0.260	0.092	0.270	0.230	0.081	AP-42 Table 11.6-5 (2/25) Finish grinding mill weigh hopper with fabric filter; PM10 = 85% PM; PM2.5 = 30% PM
DA-704	Drop: Silo to Hopper	Flow 7	New	Dust Collector	32.5	57,500	9.40E-03	7.99E-03	2.82E-03	0.306	0.260	0.092	0.270	0.230	0.081	AP-42 Table 11.6-5 (2/25) Finish grinding mill weigh hopper with fabric filter; PM10 = 85% PM; PM2.5 = 30% PM
FR-701	Drop: Hopper to Elevator	Flow 7	New	Dust Collector	65	347,500	9.90E-04	3.40E-04	3.40E-04	0.064	0.022	0.022	0.172	0.059	0.059	AP-42 Table 11.12-2 Controlled Cement unloaded to elevated storage silo (pneumatic). Assume PM10=PM2.5
FR-702	Drop: Hopper to Elevator	Flow 7	New	Dust Collector	65	347,500	9.90E-04	3.40E-04	3.40E-04	0.064	0.022	0.022	0.172	0.059	0.059	AP-42 Table 11.12-2 Controlled Cement unloaded to elevated storage silo (pneumatic). Assume PM10=PM2.5
BI-802	Drop: Silo to Conveyor	Flow 8	New	Dust Collector	100	200,000	3.00E-03	1.10E-03	1.10E-03	0.300	0.110	0.110	0.300	0.110	0.110	AP-42 Table 11.19.2-2 (08/04) Conveyor Transfer Point. Assume PM10=PM2.5
BC-841	Drop: Conveyor to Conveyor	Flow 8	New	Dust Collector	100	200,000	3.00E-03	1.10E-03	1.10E-03	0.300	0.110	0.110	0.300	0.110	0.110	AP-42 Table 11.19.2-2 (08/04) Conveyor Transfer Point. Assume PM10=PM2.5
BC-842	Drop: Conveyor to Conveyor	Flow 8	New	Dust Collector	100	200,000	3.00E-03	1.10E-03	1.10E-03	0.300	0.110	0.110	0.300	0.110	0.110	AP-42 Table 11.19.2-2 (08/04) Conveyor Transfer Point. Assume PM10=PM2.5
BC-843	Drop: Conveyor to Conveyor	Flow 8/Flow 2	New	Dust Collector	100	200,000	3.00E-03	1.10E-03	1.10E-03	0.300	0.110	0.110	0.300	0.110	0.110	AP-42 Table 11.19.2-2 (08/04) Conveyor Transfer Point. Assume PM10=PM2.5
										19.87	**9.68**	**7.33**	**17.49**	**10.09**	**6.84**	

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Table B-10. Silos Potential to Emit

Baghouse ID	Emission Unit Description	Flow Rate (dscfm)	Operating Hours (hr/yr)	PM Emissions (tpy)	PM_{10} Emissions (tpy)	$PM_{2.5}$ Emissions (tpy)
590-BF1	Cement Silo Elevator	4,256	8,760	1.60	1.36	0.24
590-BF2	Cement Silo Load	1,855	8,760	0.70	0.59	0.10
590-BF3	Bulk Cement Silo	3,318	8,760	1.25	1.06	0.19
590-BF4	Cement Silo Load	1,855	8,760	0.70	0.59	0.10
590-BF5	Cement Silo Load	1,855	8,760	0.70	0.59	0.10
593-BF1	GR III Silo Feed	6,423	8,760	2.41	2.05	0.36
593-BF2	GR III Fill Feed	6,423	8,760	2.41	2.05	0.36
593-BF3	GR III Silo Feed	6,423	8,760	2.41	2.05	0.36
626-BF1	GR III Load Out	3,824	8,760	1.44	1.22	0.22
			Total	**13.60**	**11.56**	**2.04**

1. PM_{10} particle size distribution per AP-42 Appendix B.2:

PM_{10}: 85%

$PM_{2.5}$ particle size distribution per "Baghouse PSD" tab:

$PM_{2.5}$: 15%

Table B-11. Silos Actual Emissions

Baghouse ID	Emission Unit Description	Flow Rate (dscfm)	Operating Hours (hr/yr)		PM_{10} Emissions (tpy)		$PM_{2.5}$ Emissions (tpy)		Average (tpy)	
			2022	2023	2022	2023	2022	2023	PM_{10}	$PM_{2.5}$
590-BF1	Cement Silo Elevator	4,256	8,026	6,784	1.24	1.05	0.22	0.19	1.15	0.20
590-BF2	Cement Silo Load	1,855	3,607	3,632	0.24	0.25	0.04	0.04	0.24	0.04
590-BF3	Bulk Cement Silo	3,318	8,400	7,854	1.02	0.95	0.18	0.17	0.98	0.17
590-BF4	Cement Silo Load	1,855	4,004	3,754	0.27	0.25	0.05	0.04	0.26	0.05
590-BF5	Cement Silo Load	1,855	3,760	3,608	0.25	0.24	0.04	0.04	0.25	0.04
593-BF1	GR III Silo Feed	6,423	8,251	7,688	1.93	1.80	0.34	0.32	1.86	0.33
593-BF2	GR III Fill Feed	6,423	8,251	7,688	1.93	1.80	0.34	0.32	1.86	0.33
593-BF3	GR III Silo Feed	6,423	8,251	7,668	1.93	1.79	0.34	0.32	1.86	0.33
626-BF1	GR III Load Out	2,531	3,955	4,100	0.36	0.38	0.06	0.07	0.37	0.07
				Total	**9.18**	**8.51**	**1.62**	**1.50**	**8.85**	**1.56**

Table B-12. Silos Net Emissions Increase

Baghouse ID	Emission Unit Description	PTE (tpy)		Baseline Actuals (tpy)		Net Emissions Increase (tpy)	
		PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
590-BF1	Cement Silo Elevator	1.36	0.24	1.15	0.20	0.21	0.04
590-BF2	Cement Silo Load	0.59	0.10	0.24	0.04	0.35	0.06
590-BF3	Bulk Cement Silo	1.06	0.19	0.98	0.17	0.08	0.01
590-BF4	Cement Silo Load	0.59	0.10	0.26	0.05	0.33	0.06
590-BF5	Cement Silo Load	0.59	0.10	0.25	0.04	0.34	0.06
593-BF1	GR III Silo Feed	2.05	0.36	1.86	0.33	0.18	0.03
593-BF2	GR III Fill Feed	2.05	0.36	1.86	0.33	0.18	0.03
593-BF3	GR III Silo Feed	2.05	0.36	1.86	0.33	0.19	0.03
626-BF1	GR III Load Out	1.22	0.22	0.37	0.07	0.85	0.15
	Total	**11.56**	**2.04**	**8.85**	**1.56**	**2.71**	**0.48**

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Table B-13. Roads Emissions - Emission Factors

Road Surface	Controls [1]	Control Efficiency (%) [1]	Vehicle Emission Factors [2]	
			PM_{10}	$PM_{2.5}$
Paved or Unpaved	None	0%	1.85	0.19
Unpaved	Watering	75%	0.46	0.05
Unpaved	Chemical Suppressant and Watering	85%	0.28	0.03
Paved	Paved Road Surface with Vacuum Sweeping and Watering	95%	0.09	9.27E-03

1. Emission controls and control efficiency for vehicular traffic on paved and unpaved roads per UDAQ guidelines: Emission Factors for Paved and Unpaved Haul Roads, January 2015.

2. Emission factors calculated per UDAQ guidelines: Emission Factors for Paved and Unpaved Haul Roads, January 2015, in conjunction with U.S. EPA AP-42 Section 13.2.2 Unpaved Roads.

using: $E = k(s/12)^a(W/3)^b(1-\eta)$

where: E = Size-specific emission factor (lb/VMT)

k, a, b = Constants

	PM	PM_{10}	$PM_{2.5}$
k =	4.9	1.5	0.15
a =	0.7	0.9	0.9
b =	0.45	0.45	0.45

s = surface material silt content (%)

s =	4.8	Per UDAQ guidance given in Emission Factors for Paved and Unpaved Haul Roads, January 2015.
W =	30.000	Mean weight of all vehicles (tons), per UDAQ guidance given in Emission Factors for Paved and Unpaved Haul Roads, January 2015.
η =	Control Efficiency	

Table B-14. Roads Emissions - Traveling Parameters (Supporting Operations)

Vehicle Type	Road Source	Max Hourly Product Throughput	Annual Product Throughput	Mean Vehicle Weighs (tons)[1]		Vehicle Haul Capacity	Maximum Hauls per Hour	Hauls per Year	Total Travel Distance per Haul (miles/haul)	Total Vehicle Miles Traveled			
				Empty	Loaded					Hourly (VMT/hr)	Annual (VMT/yr)	Average Vehicle Weight (tons)	
		(tph)	(tpy)	(ton)	(tpy)	(ton/haul)			Paved	Paved	Paved	Weighted Percentage	30.0000
Truck	Trucks to Hopper	400	180,000	10	50	40	10.00	4,500	0.58	5.75	2,588	100%	30.0000

1. Paved haul route distance one-way (mi): 0.29

Table B-15. Roads Emissions - PTE

Vehicle Type	Road Source	Control	Controlled Emissions					
			Hourly PTE Emissions (lb/hr)[1]		Daily PTE Emissions (lb/day)		Annual PTE Emissions (tpy)	
			PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
Truck	Paved	Paved Road Surface with Vacuum Sweeping and Watering	0.53	0.05	12.79	1.28	0.12	0.01
Total			**0.53**	**0.05**	**12.79**	**1.28**	**0.12**	**0.01**

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Table B-16. Pozzolan Stockpile Inputs

Category	Value	Unit
Stockpile Area	0.33	acre
Operational Time	365	days per year
Operational Time	24	hours per day

Tale B-17. Stockpile Emission Factors

Source	Uncontrolled Active Emission Factor (lb/day/acre)		Controlled Active Emission Factor (lb/day/acre) [3]	
	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
Stockpiles[1, 2]	6.3	1.85	1.89	1.11

1. PM_{10} emission factors for stockpiles obtained from AP-42, Fourth Edition, Section 8.19.1 (Sand and Gravel Processing), Table 8.19.1-1, per UDAQ guidance.

2. Per UDAQ storage pile calculation workbook citation of AP-42 Appendix B-2 Page B.2-13:

PM_{10} content:	0.51
$PM_{2.5}$ content:	0.15

3. Control Efficiency - Water Application

PM_{10} Control Efficiency	70%	per WRAP Fugitive Dust Handbook, 2006, "Fugitive Dust Control Measures Applicable for the WRAP Region."
$PM_{2.5}$ Control Efficiency	40%	per AP-42 Appendix B-2 page B.2-21

Table B-18. Stockpile PTE

Location	Source	Maximum Area (Acres)	Control	Hourly PTE (lb/hr)		Daily PTE (lb/day)		Annual PTE (tpy)	
				PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
Pozzolan Stockpile	Stockpiles	0.33	Water	0.03	0.02	0.62	0.37	0.11	0.07

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APPENDIX C. PROCESS FLOW DIAGRAMS

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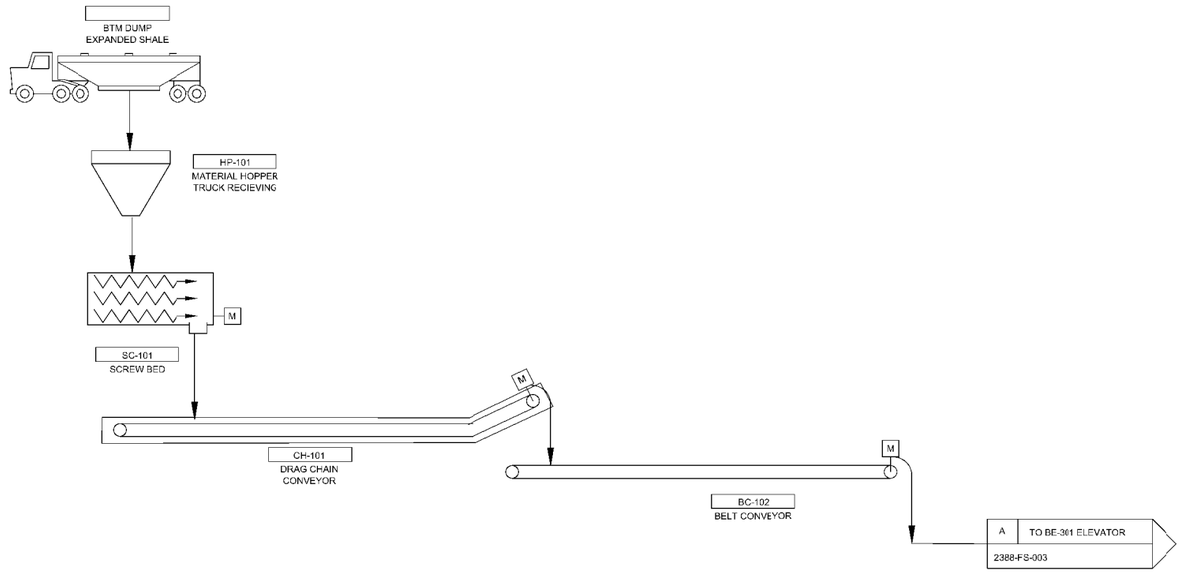

MATERIAL CHARACTERISTICS				
	LIMESTONE	GYPSUM	CLINKER	EXPANDED SHALE
BULK DENSITY CONVEYING	75 lbs/ft3	75 lbs/ft3	85 lbs/ft3	45 lbs/ft3
BULK DENSITY STORAGE	94 lbs/ft3	94 lbs/ft3	94 lbs/ft3	55 lbs/ft3
BULK DENSITY STRUCTURAL	110 lbs/ft3	110 lbs/ft3	112 lbs/ft3	80 lbs/ft3
TEMP	105 °F	105 °F	250 °F	AMBIENT
MOISTURE CONTENT	2-6%	3%	0.2%	1%
PARTICLE SIZE	3" MINUS	4" MINUS	3" MINUS	1/2" MINUS
ANGLE OF REPOSE	38°	40°	34°	34°

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- A — PNEUMATIC OPERATOR
- E — E.ECTRIC OPERATOR
- F — HYDRAULIC OPERATOR
- G — GRAVITY OPERATOR
- H — MANUAL OPERATOR
- M — E.ECTRIC MOTOR
- VS — VARIABLE SPEED

LINE STYLES	LINE DEFINITIONS
AIR	COMPRESSED AIR
	EXISTING EQUIP. & FLOW
	FUTURE EQUIP. & FLOW
	DUST CO..LECTION
GAS	GAS
	NEW EQUIPMENT
	NEW FLOW
W	WATER

REV	DATE	REVISION DESCRIPTION	BY	CHK	APP
B	07/07/23	ISSUED FOR REVIEW	NGR	TED	TH
A	05/22/23	ISSUED FOR REVIEW	JKL	TED	TH

HOLCIM
6055 Corycon Rd.
Morgan, UT 84050

DESIGNED:	TED	DATE: 05/15/23
DRAWN:	JKL	DATE: 05/15/23
CHECKED:	TED	DATE: 05/15/23
SMACC APPR:	TH	DATE: -

Industrial Ally
Full Service Engineering and Design
1422 Elbridge Payne Rd. Suite 120
Chesterfield, MO 63017
INDUSTRIAL ALLY PROJECT NUMBER: 2388

FINISH MILL 7
TRUCK UNLOADING
FLOW DIAGRAM

IA DRAWING NUMBER
2388-FS-001

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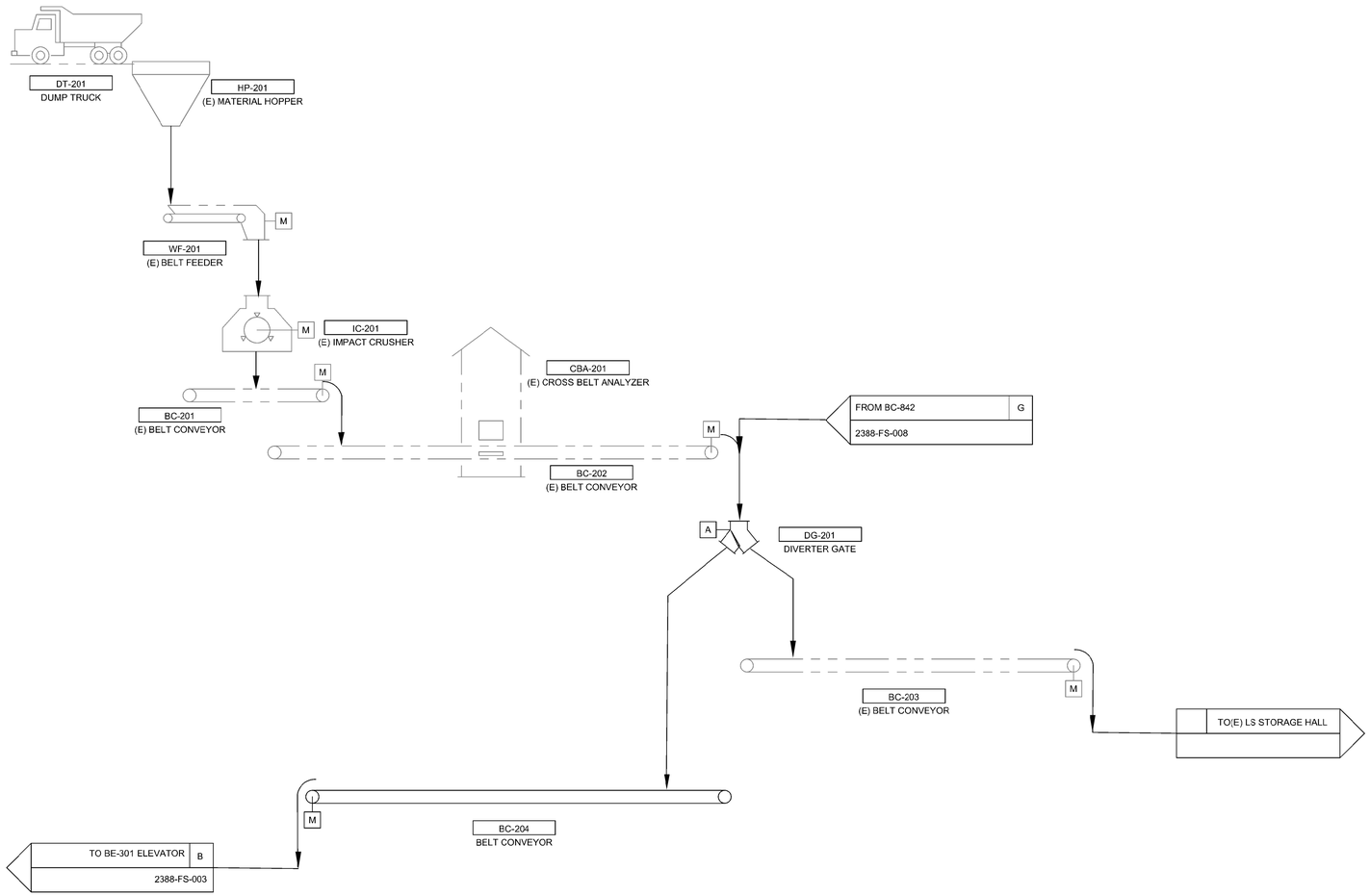

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- G — GRAVITY OPERATOR
- H — MANUAL OPERATOR
- M — ELECTRIC MOTOR
- VS — VARIABLE SPEED

LINE STYLES	LINE DEFINITIONS
AIR	COMPRESSED AIR
	EXISTING EQUIP. & FLOW
	FUTURE EQUIP. & FLOW
	DUST COLLECTION
GAS	GAS
	NEW EQUIPMENT
	NEW FLOW
W	WATER

REV	DATE	REVISION DESCRIPTION	BY	CHK	APP
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A	05/22/23	ISSUED FOR REVIEW	JKL	TED	TH

HOLCIM
6055 Croydon Rd.
Morgan, UT 84050

DESIGNED:	TED	DATE: 05/15/23
DRAWN:	JKL	DATE: 05/15/23
CHECKED:	TED	DATE: 05/15/23
SMACC APPR:	TH	DATE: -

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Full Service Engineering and Design
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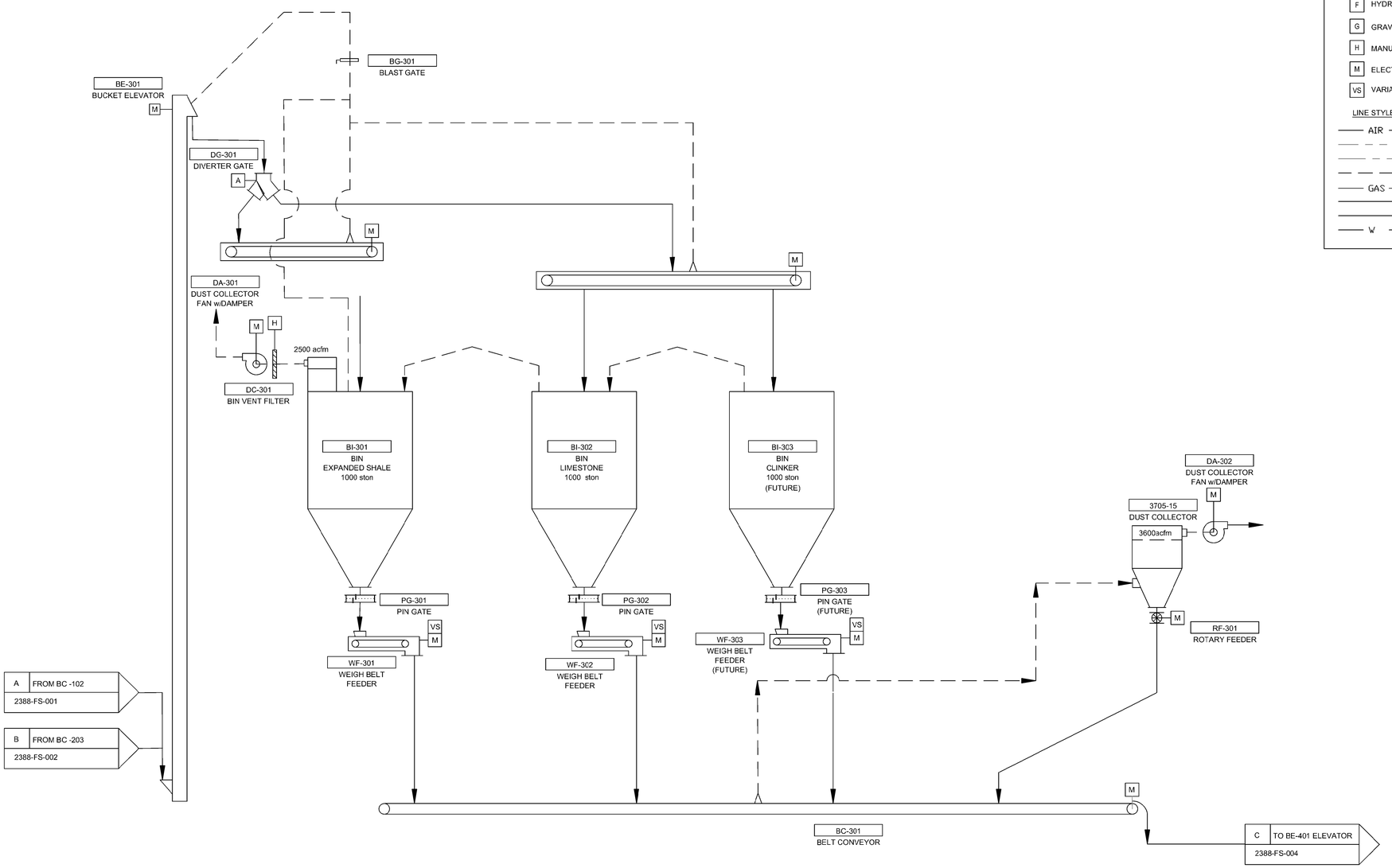

LEGEND

XXX-XXXX
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- F — HYDRAULIC OPERATOR
- G — GRAVITY OPERATOR
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- M — ELECTRIC MOTOR
- VS — VARIABLE SPEED

LINE STYLES	LINE DEFINITIONS
AIR	COMPRESSED AIR
	EXISTING EQUIP. & FLOW
	FUTURE EQUIP. & FLOW
	DUST COLLECTION
GAS	GAS
	NEW EQUIPMENT
	NEW FLOW
W	WATER

REV	DATE	REVISION DESCRIPTION	BY	CHK	APP
B	07/07/23	ISSUED FOR REVIEW	NGR	TED	TH
A	05/22/23	ISSUED FOR REVIEW	JKL	TED	TH

HOLCIM
6055 Croydon Rd.
Morgan, UT 84050

DESIGNED:	TED	DATE: 05/15/23
DRAWN:	JKL	DATE: 05/15/23
CHECKED:	TED	DATE: 05/15/23
SMACC APPR:	TH	DATE: -

Industrial Ally
Full Service Engineering and Design
1422 Elbridge Payne Rd. Suite 120
Chesterfield, MO 63017
INDUSTRIAL ALLY PROJECT NUMBER: 2388

FINISH MILL 7
MILL FEED BINS
FLOW DIAGRAM

PRELIMINARY
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REV. B

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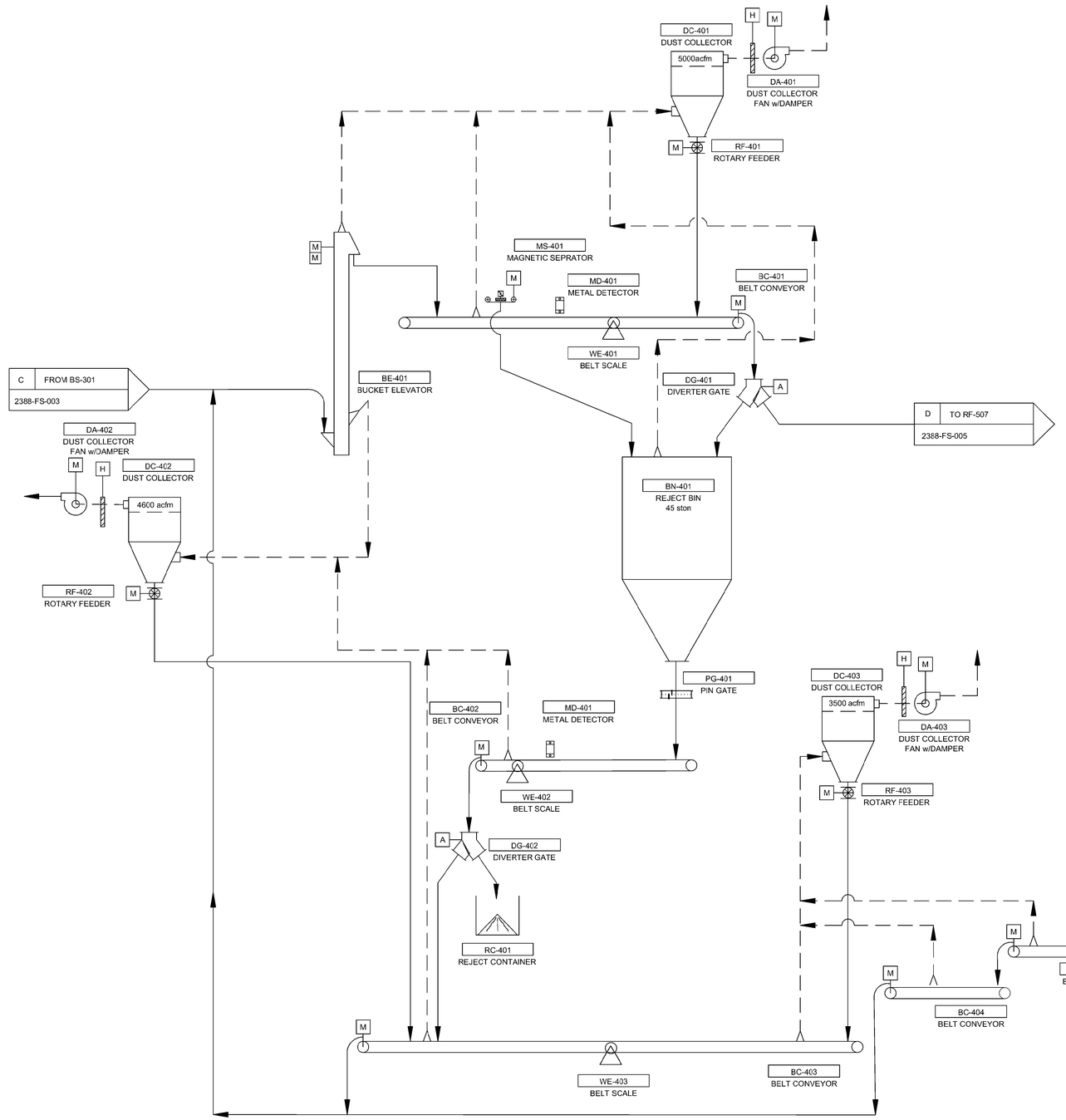

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AIR	COMPRESSED AIR
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	DUST COLLECTION
GAS	GAS
	NEW EQUIPMENT
	NEW FLOW
W	WATER

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HOLCIM
6055 Croydon Rd.
Morgan, UT 84050

DESIGNED: TED — DATE: 05/15/23
DRAWN: JKL — DATE: 05/15/23
CHECKED: TED — DATE: 05/15/23
SMACC APPR: TH — DATE: -

Industrial Ally
Full Service Engineering and Design
1422 Elbridge Payne Rd. Suite 120
Chesterfield, MO 63017
INDUSTRIAL ALLY PROJECT NUMBER: 2388

FINISH MILL 7
MILL FEED TOWER
FLOW DIAGRAM

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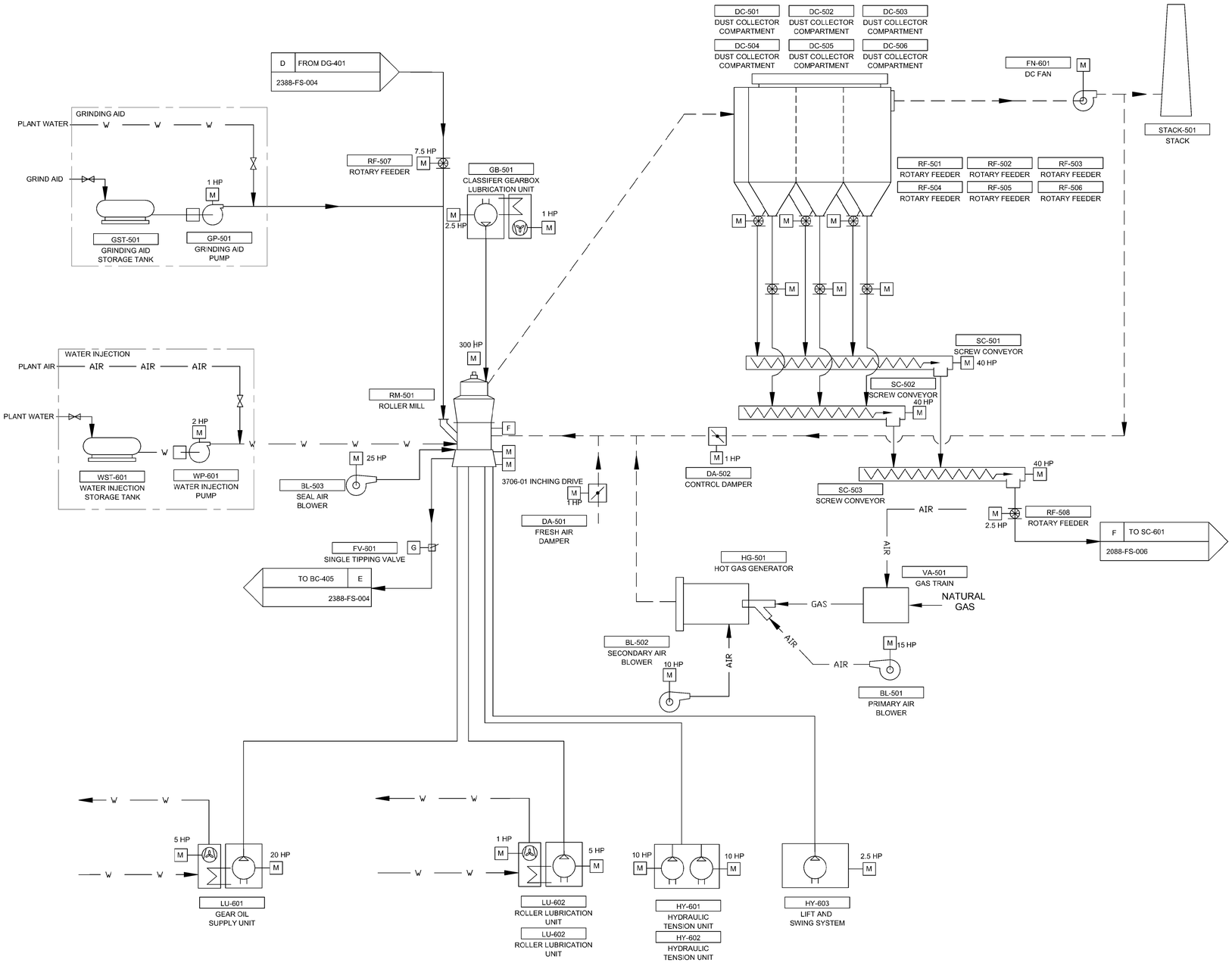

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VS	VARIABLE SPEED

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	DUST COLLECTION
GAS	GAS
	NEW EQUIPMENT
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HOLCIM
6055 Croydon Rd.
Morgan, UT 84050

DESIGNED:	TED	DATE: 05/18/23
DRAWN:	JKL	DATE: 05/18/23
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SMACC APPR:	TH	DATE: -

Industrial Ally
Full Service Engineering and Design
1422 Elbridge Payne Rd. Suite 120
Chesterfield, MO 63017
INDUSTRIAL ALLY PROJECT NUMBER: 2388

FINISH MILL 7
VERTICAL ROLLER MILL
FLOW DIAGRAM

IA DRAWING NUMBER
2388-FS-005

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LINE STYLES	LINE DEFINITIONS
AIR	COMPRESSED AIR
	EXISTING EQUIP. & FLOW
	FUTURE EQUIP. & FLOW
	DUST COLLECTION
GAS	GAS
	NEW EQUIPMENT
	NEW FLOW
W	WATER

F — FROM RF-508 / FS-005

DC-601
DUST COLLECTOR
1400 acfm

DA-601
DUST COLLECTOR FAN w/DAMPER

EP-304	
STACK HT	10 ft
DESIGN FLOW	1400 acfm
TEMP	150 (°F)

RF-601
ROTARY FEEDER

SC-601
SCREW CONVEYOR

FV-601
CONTROL VALVE
(FUTURE)

COOLING WATER SUPPLY

CC-601
CEMENT COOLER
(FUTURE)

DG-601
DIVERTER GATE
(FUTURE)

COOLING WATER RETURN

WP-601
WATER SUMP PUMP
(FUTURE)

RP-601
RETURN WATER PUMP
(FUTURE)

SA-601
SAMPLER
(FUTURE)

OPTION 1

AS-601
AIRSLIDE

AS-602
AIRSLIDE

BB-115
DISTRIBUTION BOX

AS-603
AIRSLIDE
G-601
PNEUMATIC SHUTOFF GATE

AS-604
AIRSLIDE
G-602
PNEUMATIC SHUTOFF GATE

3HP

H — TO BI-702 / 2388-FS-007

BE-601
BUCKET ELEVATOR
(BLOCK W/ PARAMETERS)

7.5HP

FA-601
FAN-AIR SLIDES

G — TO BI-701 / 2388-FS-007

OPTION 2

HP-601
PUMP HOPPER

SP-601
SCREW PUMP

10" Ø PNEUMATIC CONVEYING LINE

DG-601
PNEUMATIC DIVERTER GATE

H — TO BI-702 / 2388-FS-007

G — TO BI-701 / 2388-FS-007

PLANT AIR — AIR — AIR

TC-601
PNEUMATIC TRANSPORT COMPRESSOR

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HOLCIM
6055 Croydon Rd.
Morgan, UT 84050

DESIGNED:	TED	DATE: 05/15/23
DRAWN:	JKL	DATE: 05/15/23
CHECKED:	TED	DATE: 05/15/23
SMACC APPR:	TH	DATE: -

Industrial Ally
Full Service Engineering and Design
1422 Elbridge Payne Rd. Suite 120
Chesterfield, MO 63017
INDUSTRIAL ALLY PROJECT NUMBER: 2388

FINISH MILL 7
FM7 BAGHOUSE DISCHARGE
FLOW DIAGRAM

IA DRAWING NUMBER
2388-FS-006

DWG. SCALE: As indicated
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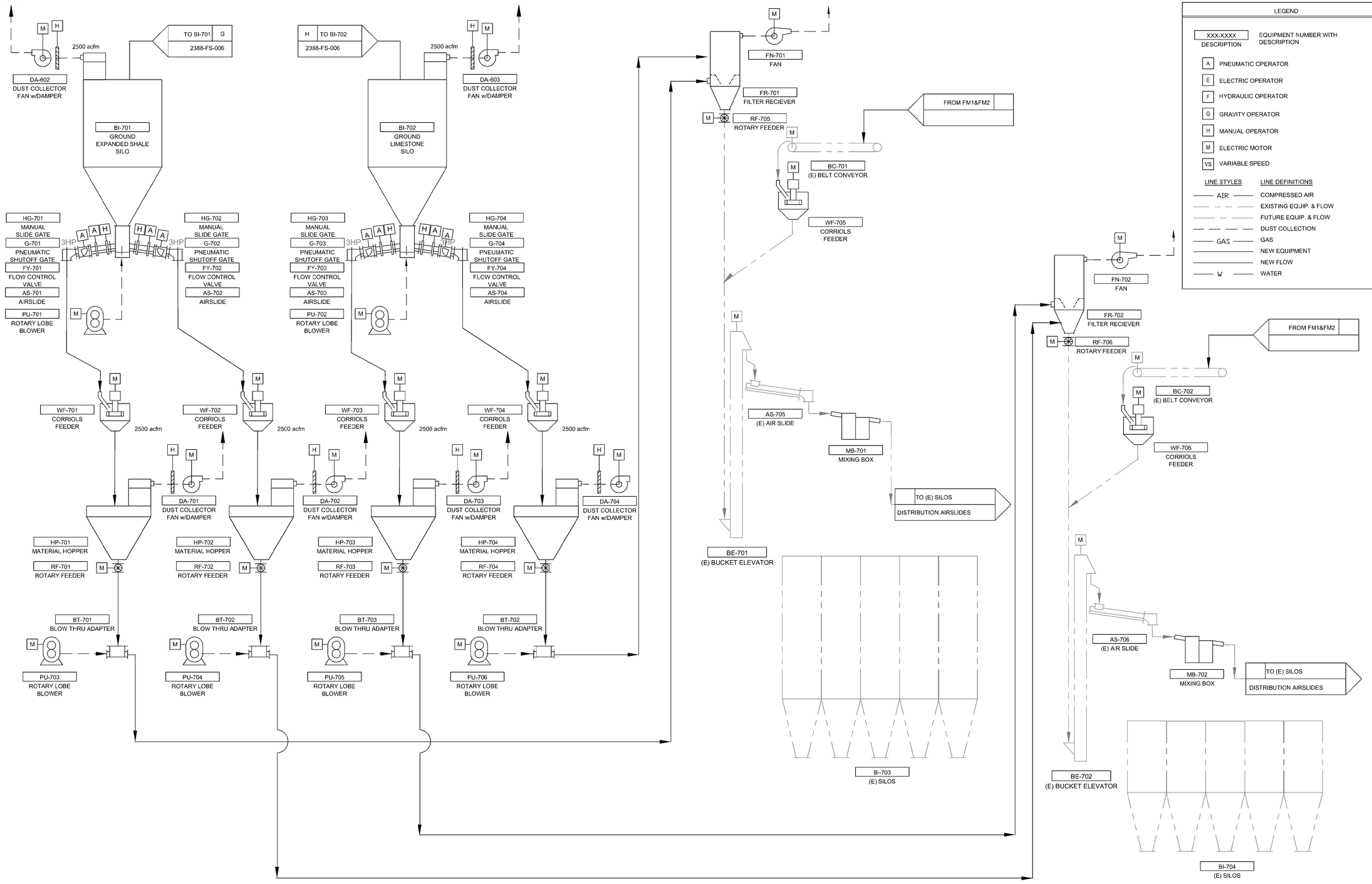

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M	ELECTRIC MOTOR
VS	VARIABLE SPEED

LINE STYLES	LINE DEFINITIONS
AIR	COMPRESSED AIR
	EXISTING EQUIP. & FLOW
	FUTURE EQUIP. & FLOW
	DUST COLLECTION
GAS	GAS
	NEW EQUIPMENT
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Industrial Ally
Full Service Engineering and Design
1422 Elbridge Payne Rd. Suite 120
Chesterfield, MO 63017
INDUSTRIAL ALLY PROJECT NUMBER: 2388

FINISH MILL 7
CEMENT STORAGE
FLOW DIAGRAM

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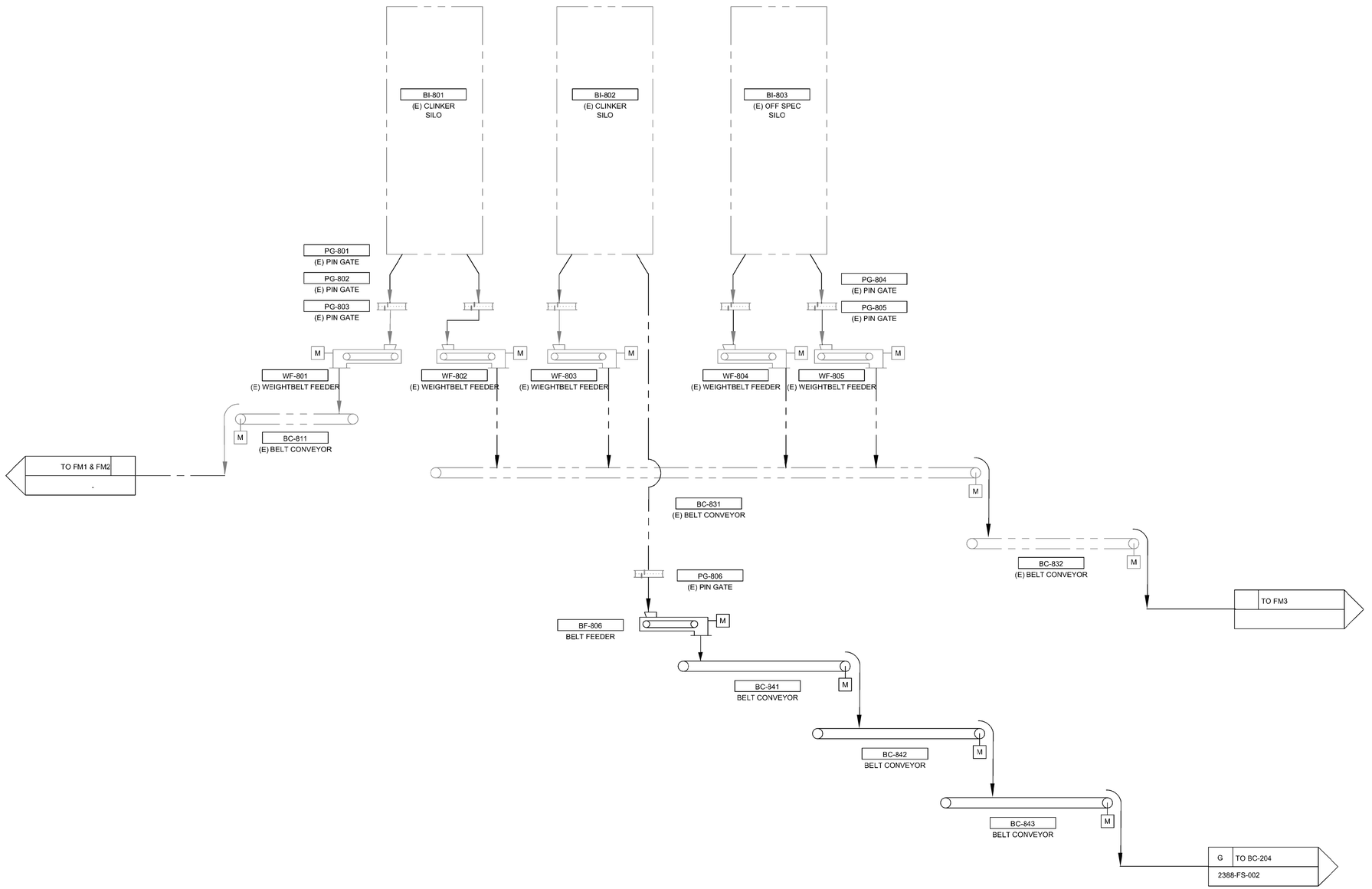

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VS	VARIABLE SPEED

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	FUTURE EQUIP. & FLOW
	DUST COLLECTION
GAS	GAS
	NEW EQUIPMENT
	NEW FLOW
W	WATER

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INDUSTRIAL ALLY PROJECT NUMBER: 2388

FINISH MILL 7
CLINKER SILO
FLOW DIAGRAM

IA DRAWING NUMBER
2388-FS-008

DWG. SCALE:	REV.
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Material Analysis Report

Material: Cement Kiln Dust

Test Period: 01-Dec-2019 to 31-Dec-2019

Date Issued: 06-Jan-2020

Standard Test Results

General Information

Supplier:	Holcim (US) Inc. d/b/a LafargeHolcim US	Source Location:	Devils Slide Plant
Address:	8700 West Bryn Mawr Ave Chicago, IL 60631		6055 E. Croydon Road Devil's Slide, UT 84050
Contact:		Contact:	Doug Wilde / (801) 829-6821

The following is based on average test data during the test period. The data is typical of product shipped from this source; individual shipments may vary.

Chemical			Physical		
Item	**Limit [1]**	**Result**	**Item**	**Limit [1]**	**Result**
SiO_2 (%)	-	17.4			
Al_2O_3 (%)	-	3.7			
Fe_2O_3 (%)	-	3.0			
CaO (%)	-	54.3			
MgO (%)	-	2.6			
SO_3 (%)	-	7.0			
K_2O (%)	-	3.7			
Na_2O (%)	-	0.6			
TiO_2 (%)	-	0.18			
P_2O_5 (%)	-	0.06			
SrO (%)	-	-			
Mn_2O_3 (%)	-	0.05			
Cl (%)	-	2.75			
F (%)	-	-			
Loss on Ignition (%)	-	-			
Freelime (%)	-	-			

Chemical			Physical		
Item	**Limit [1]**	**Result**	**Item**	**Limit [1]**	**Result**

Notes (*1-9)

1 - Tested using methods as per ASTM D5050 "Standard Guide for Commercial Use of Lime Kiln Dusts and Porland Cement Kiln Dusts". There are no specification limits that exist for CKD.

2 - By providing this information, LafargeHolcim is not making and specifically disclaims any warranties or representations of any kind or character, express or implied, including any implied Warranty of Merchantability and any implied Warranty of Fitness for a particular purpose.

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Version: 180412

Doug Wilde,
Quality Manager

REMEDIAL SITE ASSESSMENT DECISION – EPA Region 08

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Site Name: IDEAL BASIC IND/CEMENT DIV
Alias(es): DEVILS SLIDE

City: CROYDON **County or Parish:** MORGAN **State:** UT
Refer to Report Dated: 01/30/2018 **EPA ID:** UTD089320121
Report Developed By: STATE **State ID:**
Report Type: Expanded Site Inspection #001 **Decision Date:** 01/30/2018

☑ **1. Further Remedial Site Assessment Under CERCLA (Superfund) is not required because:**
NFRAP-Site does not qualify for the NPL based on existing information

☐ **2. Further Assessment Needed Under CERCLA.**

☐ **3. Remedial study/cleanup needed.**

Decision/Rationale:

The site is located at 6055 East Croydon Road in Croydon, Utah. There is a cement plant (formerly Ideal Basic Cement Company) currently operating on site. Elevated levels of heavy metals including lead, arsenic, copper, selenium and zinc have been found in process waste (cement-kiln dust) and chromium IV in buried refractory bricks.

In 2015, the Utah Department of Environmental Quality (UDEQ) conducted sampling near the cement plant to evaluate the potential for off-site migration of contaminants. Results from this sampling are documented in the 2017 Ideal Basic Industries – Cement Division Expanded Site Inspection report. The results indicate the presence of heavy metals (primarily arsenic, selenium, copper and zinc) in soil, surface water and drinking water wells above naturally occurring background levels. There are no surface water intakes used for drinking water and the concentrations detected in off-site wells and soil samples are relatively low and below acceptable health-based benchmarks.

Based on the review of the 2017 report, the U.S. Environmental Protection Agency concurs with State of Utah's recommendation of No Further Remedial Action Planned (NFRAP).

The U.S. Environmental Protection Agency (EPA) has determined that no further remedial action by the Federal Superfund program is warranted at the referenced site, at this time. The basis for the no further remedial action planned (NFRAP) determination is provided above. A NFRAP designation means that no additional remedial steps under the Federal Superfund program will be taken at the site unless new information warranting further Superfund consideration or conditions not previously known to EPA regarding the site are disclosed.In accordance with EPA's decision regarding the tracking of NFRAP sites, the referenced site may be removed from EPA's Active site inventory and placed in a separate Archive site inventory as an historical record if no further Superfund interest is warranted.Archived sites may be returned to the Active site inventory if new information necessitating further Superfund consideration is discovered.

Site Decision Made By: Ryan Dunham

Signature: _____ **Decision Date:** 01/30/2018

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

FEBRUARY 22, 1995

The Honorable Daniel P. Moynihan
United States Senate
Washington, D.C. 20510

Dear Senator Moynihan:

Thank you for your letter of December 16, 1994 regarding your constituent Michael Clarke's concerns about the Environmental Protection Agency's (EPA's) Final Regulatory Determination on cement kiln dust (CKD).

CKD is one of six "special wastes" also known as "Bevill wastes" that were temporarily exempt from hazardous waste regulation under the Resource Conservation and Recovery Act (RCRA), until information could be gathered and assessed, and the most appropriate regulatory approach could be determined. In 1993, EPA issued a detailed and comprehensive study of CKD in a Report to Congress that explored a broad spectrum of issues related to the adverse effects on human health and the environment from the disposal of CKD. Following extensive evaluation and public comment, on January 31, 1995, EPA concluded that additional control of CKD is warranted in order to protect human health and to prevent environmental damage associated with current disposal practices for this waste.

EPA will take a common sense approach in imposing such controls by developing tailored regulations in conjunction with existing authorities. In order to avoid duplication among regulatory programs, EPA will use, as appropriate, its various authorities under the Clean Air Act and RCRA to address contaminant releases from CKD into air and ground water respectively. EPA believes that existing regulations under the Clean Water Act already provide adequate control over contaminant releases from CKD to surface water. EPA's decision affects all CKD, regardless of the type(s) of fuel burned in the cement manufacturing process.

The CKD regulatory program will be risk-based, flexible, and tailored to site-specific conditions. In order to avoid over-regulation, it will provide minimally burdensome environmental protection at a reasonable cost. In developing the program, EPA will work with all interested parties, including states and industry.

Until the tailored regulations are published by EPA, CKD will retain the Bevill exemption, and the status of CKD under RCRA Subtitle C will remain unchanged. The current RCRA rules for waste derived residuals require that cement facilities burning hazardous waste in

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their kilns test their CKD prior to disposal (see 40 CFR 266.112). CKD that is affected by combustion of hazardous waste must be managed according to the appropriate RCRA regulations.

We have enclosed an Environmental Fact Sheet that contains additional details of the future CKD regulatory program. Should you have any further questions, please call Robert Hall, Acting Chief of the Special Wastes Branch at (703) 308-8432.

Sincerely yours,

Michael Shapiro, Director
Office of Solid Waste

Enclosure

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M/029/0001

Appendix E

Storm Water and Spill Prevention Plans (SWPPP and SPCC)

Trinity Consultants, Inc. (2022 & 2025)

Five Star Engineers LLC
220 N 900 E
Hyde Park, Utah 84318
Tel: 435-881-5339
Issahamud@5starengineers.com

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Holcim	Originating Department: Devil's Slide Plant Environmental Office	Classification: Document	E	Q	H&S
			Y	N	Y
Date Issued: 16 July 2004; Updated – 5 September 2006	Control Number: DS.03.010	Revision Number: 19 July 2007	HAC Number: N/A		
Prepared By: Kevin L. Ovard Title: Environmental Manager	Approved By: Keith Krugh Title: Plant Manager	Page 1 of 18			
Distribution:	Environmental Department Files (For regulatory compliance.) Portal (For informational purposes.)				
Subject:	Holcim (US) Inc. – Devil's Slide Storm Water Pollution Prevention Plan (SWPPP)				

Holcim (US) Inc. – Devil's Slide Plant

Storm Water Pollution Prevention Plan (SWPPP)

SWPPP Plan
Holcim (US) Inc. – Devil's Slide Plant
Morgan, Utah

19 July 2007

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FIGURE 1: FACILITY PLOT PLAN

Appendix

APPENDIX A: Completed Quarterly Monitoring Forms (SWDMR – Form)
APPENDIX B: DEVIL'S SLIDE SPILL RESPONSE PLAN

Related Documents

DS.03.009~~6~~B Plant SPCC and SWP3 Monthly Inspection Form
DS.03.009C Quarry SPCC and SWP3 Monthly Inspection Form

Related documents are not included in this SWPPP. The related documents are available from the Environmental Manager.

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1. INTRODUCTION

On behalf of Holcim (US) Inc., Environmental Resources Management (ERM) has prepared this Storm Water Pollution Prevention Plan (SWPPP) for the Devil's Slide Plant (Plant). The Plant is located at:

Holcim (US) Inc. – Devil's Slide Plant
6055 East Croydon Road
Morgan, Utah 84050
(801) 829-6821

The Plant manufactures cement from raw materials which are mined at the adjacent quarry to the northwest and are shipped to the Plant. Plant operations include: mining raw materials in the quarry area northwest of the Plant; shipping other raw materials and additives to the Plant; and processing these raw materials into clinker and cement. Descriptions for the raw materials are detailed in this SWPPP. The facility produces approximately 800,000 short tons of clinker and 900,000 tons of cement annually. The cement is transported off site via railcars and trucks. Based on these operations, the Plant is classified as a cement manufacturing facility and operates under the Standard Industrial Classification (SIC) code 3241. Holcim submitted a Notice of Intent (NOI) to the Utah Division of Water Quality in order to discharge storm water from the Plant under the Permit (NOI, 9 March 2004). This SWPPP was prepared in general accordance with the *Utah Pollutant Discharge Elimination System (UPDES) Mulit-Sector General Permit for Storm Water Discharges Associated with Industrial Activity (Permit UTR000000), GROUP 3, Sector E. Glass, Clay, Cement, Concrete, and Gypsum Product Manufacturing Facilities* (Utah Division of Water Quality, effective January 12, 2006) (herein referenced as "Permit").

Mr. Christopher D. Brown, P.E., with ERM performed a site visit of the Plant on 5 June 2007. Mr. Kevin Ovard, Environmental Manager with Holcim (US) Inc. accompanied Mr. Brown during the site visit and identified the materials used in the cement manufacturing process, as well as the overall surface drainage layout for the plant. The information detailed in this SWPPP is based on the 5 June 2007 site visit.

The SWPPP is organized into the following Sections:

1. INTRODUCTION
2. CERTIFICATION
3. POLLUTION PREVENTION TEAM
4. PLANT DRAINAGE AND INVENTORY OF POTENTIAL POLLUTANT SOURCES
5. MEASURE AND CONTROLS
6. MONITORING – REPORTING AND COMPLIANCE EVALUATION

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2. CERTIFICATION

2.1 Management Approval and Certification Statement

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Name: Keith Krugh
Title: Plant Manager

Signature: _____

Date: _____

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3. POLLUTION PREVENTION TEAM

Members of the pollution team with their responsibilities and contact information are presented below.

Kevin Ovard, Environmental Manager: Manages the implementation of best management practices (BMPs), SWPPP updates, inspections, and SWPPP communication to Pollution Prevention Team Members. Responsible for overall training of Plant personnel as related to handling materials which may come into contact with stormwater. Responsible for retaining SWPPP records generated by the implementation of this SWPPP.
Office: 801.829.2122
Cell: 801.710.8685
Home: 801.829.6545

Mr. Keith Krugh, Plant Manager: Overall responsibility for SWPPP development and implementability, report submittal, and signatory requirement.
Office: 801.829.2181
Cell: 719.431.2120
Home: 435.615.6996

Ernie Durant, Safety Coordinator: Oversees plant safety issues. Responsible for implementation of BMPs, maintenance of equipment and spill controls, and communication of necessary changes to the plan.
Office: 801.829.2113
Cell: 801.710.5003
Home: 801.829.3513

Lance Stephens, Production Manager
Responsible for updating any process or material requirement changes affecting this plan.

Doug Wilde, Quality Control Manager
Responsible for identifying chemicals or materials affecting this plan and communicating the storage requirements.

Kenneth Stephens, Maintenance Manager
Responsible for implementation of best management practices (BMPs), maintenance of equipment and spill controls, and communication of necessary changes to the plan.

Ken George, Quarry Supervisor
Responsible for maintenance of quarry garage and mobile equipment BMPs, spill controls, and communication of changes as necessary.

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4. PLANT DRAINAGE AND INVENTORY OF POTENTIAL POLLUTANT SOURCES

4.1 Plant Drainage

The layout and main components of the Plant are identified in Figure 1. The main components of the Plant include: rock crusher, conveyor belts, pre-blending hall, raw mill, blending silo, coal silo and mill, cement kiln dust silos, cement kiln, cement silos, waste derived fuel storage bins, and administrative building with parking lot. The construction of these Plant components (except for the parking lot) utilize buildings, permanent structures, and enclosures to prevent direct contact of precipitation with materials used at the Plant. The area encompassed by the Plant is approximately 50 acres, located on the north side of Highway 156. The nearest waterway is Lost Creek which is located just south of Highway 156. Lost Creek flows in a western direction and drains into the Weber River approximately one mile to the west of the Plant. Immediately northwest of the Plant is the quarry which produces raw materials (e.g., limestone) for the Plant. The quarry is higher in elevation than the adjacent Plant area. The rock quarry operates under Permit Number ACT/029/001 issued by the Utah Division of Oil, Gas, and Mines.

The ground surface at the Plant consists of a combination of concrete, gravel, soil, and vegetative surfaces. The ground surface at the Plant is generally flat with overall site drainage flowing towards one of three on-site detention basins via overland flow. Figure 1 identifies the locations of the three detention basins. Surface drainage from the south face of the rock quarry also flows towards the on-site detention basins. Stormwater runoff at the Plant follows one of the following four routes, as identified in Figure 1:

1. Stormwater remains on site and percolates into the ground and/or evaporates.
2. Surface flow enters Detention Basin No. 1. If the capacity of Detention Basin No. 1 is exceeded, overflow drainage enters Detention Basin No. 2 via underground pipe. If the capacity of Detention Basin No. 1 is not reached in a storm event, any water which discharges into the basin will percolate into the ground and/or evaporate. Holcim reports that Detention Basin No. 1 is designed to retain surface water produced by a 10-year, 24 hour storm event.
3. Surface flow (and overflow from Detention Basin No. 1) enters Detention Basin No. 2. If the capacity of Detention Basin No. 2 is exceeded, overflow drainage leaves Detention Basin No. 2 and discharges into Lost Creek via an underground pipe at Outfall No. 1. As with Detention Basin No. 1, if the capacity of Detention Basin No. 2 is not reached, any water in the basin will percolate into the ground and/or evaporate. Holcim reports that Detention Basin No. 2 is designed to retain surface water produced by a 10-year, 24 hour storm event.
4. Surface flow enters Detention Basin No. 3. If the capacity of Detention Basin No. 3 is exceeded, overflow drainage leaves Detention Basin No. 3 and enters a below grade french drain located on the west side of the Plant. If the capacity of Detention Basin No. 3 is not reached, any water in the basin will percolate into the ground and/or evaporate. Based on the June 5, 2007 site visit by ERM, Detention Basin No. 3 appears to be approximately the same size as Detention Basins 1 and 2.

Holcim personnel reported to ERM that discharge from Detection Basin No. 1 and No. 2 into Lost Creek has not been observed since preparation of the SWPPP dated 9 March 2004. Since stormwater discharge from Detention Basin Nos. 1 and 2 into Lost Creek via Outfall No. 1 has not been observed, Holcim does not have historical stormwater discharge data for Outfall No. 1.

4.2 Inventory of Potential Pollutant Sources

The materials and processes at the Plant create a potential pollutant source which may enter storm water runoff. ERM reviewed an inventory of the materials located at the Plant with Holcim. The inventory of

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materials which may serve as a potential pollutant sources are summarized in Table 4.2.1. For each material presented in Table 4.2.1, a figure reference number is provided which identifies the location of the material at the Plant in Figure 1. Table 4.2.1 also presents detailed information regarding each material (e.g., potential contaminants of concern; potential exposure concerns; and control and prevention measures).

Table 4.2.1: List of Materials Storage

Figure 1 Reference Number	Material	Potential Contaminants of Concern	Potential Exposure Concern	Control and Prevention Measures
AA-1	Gasoline	Petroleum products	Release during fueling; tank rupture.	SPCC Plan Measures in place. These include secondary containment and sorbent materials to contain spills/releases.
BB-1, BB-2, BB-3	Lubricant Oils	Petroleum products	Drum spillage.	SPCC Plan Measures in place. These include secondary containment and sorbent materials to contain spills/releases.
CC-1, CC-2	Diesel	Petroleum Products	Release during fueling; tank rupture.	SPCC Plan Measures in place. These include secondary containment and sorbent materials to contain spills/releases.
DD-1, DD-2, DD-3	Portland Cement	Suspended solids, high pH.	Release during movement along conveyor belts, dust during transfer into trucks/railcars and silos.	Finish Portland cement is stored in silos. Low potential for contact with stormwater.
EE-1, EE-2	Chlorine	Chlorine (gas and aqueous), low pH if aqueous.	Rupture of tanks/vessels, contact with stormwater.	Chlorine is stored in tanks and vessels, minimal potential for exposure to stormwater.
FF-1, FF-2	Ammonium Nitrate	Ammonia and nitrate. High pH.	Exposure to stormevent.	Ammonium Nitrate is stored in weather proof containers.
GG-1, GG-2, GG-3	Limestone	Suspended solids, high pH	Migration of fine-grained materials during storm events	Raw materials visually inspected by quarry personnel. Raw materials stored in area that limits drainage. Raw materials also stored in weather proof preblending hall. Stormwater runoff is collected in detention basins designed for a 10-year, 24-hr storm event.
HH-1, HH-2	Gypsum	Suspended solids, high pH.	Dust from processing.	Gypsum placed in weather proof enclosure.
II-1	Cement kiln dust (CKD)	Suspended solids, high pH.	Dust from loading trucks from chutes.	Clinker is stored in silos where potential exposure to stormwater minimal.

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Figure 1 Reference Number	Material	Potential Contaminants of Concern	Potential Exposure Concern	Control and Prevention Measures
JJ-1, JJ-2, JJ-3, JJ-4	Waste derived fuel	Suspended solids, free floating debris.	Contact with stormwater.	Waste derived fuels are stored in weather proof bins and loading docks. Any waste derived fuels stored outside are minimal duration. Practice good housekeeping.
KK-1, KK-2, KK-3	Coal	Suspended solids, high pH	Migration of fine-grained materials during storm events	Coal unloaded to a hopper and silo. If coal is stockpiled outside the covered hopper/silo, the storage time period is kept minimal. Stormwater runoff is collected in detention basins designed for a 10-year, 24-hr storm event.
LL-1, LL-2, LL-3	Iron oxide/Iron Slag	Iron, suspended solids.	Potential for contact with stormwater.	Iron oxide/iron slag is stored outside for a minimal amount of time. Good house keeping practices in area. Raw materials also stored in weather proof preblending hall. Stormwater runoff is collected in detention basins designed for a 10-year, 24-hr storm event.
MM-1, MM-2, MM-3	Clay	Suspended solids, high pH	Migration of fine-grained materials during storm events	Raw materials visually inspected by quarry personnel. Raw materials stored in area that limits drainage. Raw materials also stored in weather proof preblending hall. Stormwater runoff is collected in detention basins designed for a 10-year, 24-hr storm event.
NN-1	Calcium chloride	High pH.	Spillage during filling tank, or rupture of tank.	Stored in tank.
OO-1, OO-2, OO-3	Fly ash	Suspended solids, high pH.	Dust from loading/loading trucks.	Fly ash is stored in silos. Good house keeping practices. Minimal potential contact with stormwater.
PP-1, PP-2	Finish additive	Suspended solids.	Potential contact with stormwater.	Finish additives are stored in weather proof containers where potential exposure to stormwater is minimal.
QQ-1	Carbon dioxide	Gaseous carbon dioxide.	Rupture of tank.	Carbon dioxide is stored in tank.
RR-1	Magnesium Chloride	Liquid magnesium chloride.	Spillage during filling tank, or rupture of tank.	Stored in tank.
TT-1, TT-2	Diatomaceous Earth (DE)	Suspended solids.	Fine-grain material in stormwater.	Pile north of mill building is a short term storage. Good housekeeping in area. Potential for stormwater from DE pile at the east end of the quarry to reach stormwater drainage is minimal. Stormwater runoff is collected in detention basins designed for a 10-year, 24-hr storm event.

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Figure 1 Reference Number	Material	Potential Contaminants of Concern	Potential Exposure Concern	Control and Prevention Measures
UU-1	Bottom ash	Suspended solids, high pH.	Material potentially in contact with stormwater.	Bottom ash is stored outside for a minimal amount of time. Good house keeping practices in area. Stormwater runoff is collected in detention basins designed for a 10-year, 24-hr storm event.
VV-1	Clinker	Suspended solids, high pH.	Fine-grained material potentially in contact with storm water	Clinker is stored in silos where potential exposure to stormwater is minimal.
WW-1	Grinding Aid	Ethylene glycol and amine acetates	Rupture of containers/tanks and contact with stormwater.	Material stored in containers/tanks. Goodhouse keeping practices.
Miscellaneous electrical transformers. Transformers are not identified on the Map. Refer to SPCC plan for transformer locations.	Miscellaneous electrical transformers	Oil.	Rupture of transformer and release of oil.	SPCC Plan Measures in place. These include secondary containment and sorbent materials to contain spills/releases.

5. MEASURES AND CONTROLS

The types of materials present at the Plant with their respective potential contaminant of concern, potential exposure concern, and control and prevention measures are detailed in Section 4. Given the types of materials and drainage at the Plant, Section 5 presents the measures and controls the Plant utilizes to ensure that exposure of materials to stormwater runoff is minimized.

5.1 Employee Training

The Plant has established a Pollution Prevention Team as outlined in Section 3. The Environmental Manager is responsible for training Plant personnel who directly utilize materials which may come in contact with stormwater. Training addresses topics such as spill response, good housekeeping practices, and proper materials management. Training will occur once per calendar year and at new employee training orientation. Records of training topics and employees who attend the training will be maintained by the Human Resources Department.

5.2 Spill Prevention and Response Procedures

The Plant has a Spill Prevention Control and Countermeasure (SPCC) Plan for petroleum based materials that are used and stored at the site, as required under the 40 Code of Federal Regulations (CFR) 112. The SPCC Plan is maintained and implemented by the Environmental Manager. The SPCC Plan provides the controls that are implemented to minimize the potential for spill or release of a petroleum product, as well as corrective actions that would be taken in the event of a spill or release at

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the Plant. In the event of a spill of the materials identified in Table 4.2.1, the Pollution Prevention Team identified in Section 3 is responsible for responding and ensuring that the spill is adequately contained and managed. The procedures presented in the Plant's SPCC Plan provides guidance to respond, control, and manage a spill or release of a material identified in Table 4.2.1. Appendix B of this SWPPP plan provides a Spill Response Plan for the Plant.

5.3 Sediment and Erosion Control

There are no areas at the Plant which requires special consideration for erosion control. Grassy areas and paved surfaces at the Plant minimize the potential for erosion. The rock quarry to the northwest operates under Permit Number ACT/029/001issued by the Utah Division of Oil, Gas, and Mines. Operation of the rock quarry requires maintenance of haul roads and quarry operations such that erosion and generation of sedimentation is minimized. The rock quarry utilizes rock lined drain/swale areas to handle erosion and sedimentation at the quarry. The Environmental Manager and Quarry Manager operate the quarry such that these stormwater runoff BMPs are in place at the rock quarry. Minimization of erosion and sedimentation from the quarry is important since the north face of the quarry is immediately adjacent to the Plant and some surface drainage enters the Plant area from the north face of the quarry.

5.4 Inspections and Preventative Maintenance

The Plant operates 24-hours, 365 days a year. Each manager of the Plant is responsible for having appropriately trained personnel inspect Plant operations to ensure that Plant efficiency is maintained. On-going inspections are routine, and any deficiencies are reported to managers. The managers and maintenance supervisors are responsible for repairing Plant components which handle materials, identified in Table 4.2.1 such that exposure to stormwater runoff is minimized. The routine inspections also lead to preventative maintenance of Plant components, which minimizes the risk for exposure of materials to precipitation and stormwater.

Inspections at the Plant are subdivided into three categories: Ongoing; Monthly Site Inspections; and Comprehensive Annual Site Compliance Evaluation. Requirements for each of these three inspection categories are outlined below.

Ongoing Inspections - All areas of the Plant are routinely inspected by operating personnel during their normal shift duties and irregularities (including potential exposure of materials to stormwater runoff) are reported at the Daily Weekly Operating Report (DWOR) meetings which are performed on weekday mornings. Managers represented in the DWOR meetings delegate to area supervisors to repair or fortified any identified deficient areas/components.

Quarterly Site Inspections - The Environmental Manager verifies that an inspection of the material areas detailed in Table 4.2.1 is conducted. The inspection is conducted at a minimum of once per quarter (3-month period). The inspection is performed by area department managers and supervisors as generated by the Plant's SAP PM system. This inspection is performed in parallel with the inspection performed under the SPCC plan. Deficient items observed during the inspection are recorded on the following forms: the Plant SPCC and SWP3 Monthly Inspection Form (DS.03.009B); and the Quarry SPCC and SWP3 Monthly Inspection Form (DS.03.009C). Any identified deficient items are repaired and recorded by the Environmental Manager.

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Comprehensive Annual Site Compliance Evaluations – The Environmental Manager is responsible for performing a site compliance evaluation. Additional details regarding these evaluation are outlined in Section 6.2.

5.5 Management of Runoff

The overall construction, layout, and operation of the Plant and the management systems in place (i.e., SPCC Plan and SWPPP) at the Plant work together such that stormwater runoff is adequately managed. A main component for adequately managing runoff is attributed to the following four items:

1. Implementation of the SPCC Plan and SWPPP.
2. Placement and storage of certain materials in appropriate weather proof containers/structures. Other materials may not be stored in weather proof containers/structures; however, these materials are stockpiled and managed with good house keeping practices to minimize significant runoff.
3. The capacity of the detention basins appear to serve the Plant adequately. The Plant relies on the capacity of the detention basins to serve as the protection of stormwater runoff into Lost Creek. Therefore, the Plant management ensure that the maintenance and operation of the detention basins are included in the routine operational procedures of the Plant such that proper management of stormwater runoff/discharge is maintained.
4. The certification by the plant manager of this SWPPP identifies a commitment to operate the Plant in a manner which is consistent with current and acceptable stormwater control practices.

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6. MONITORING, REPORTING AND COMPLIANCE EVALUATION

The SWPPP is implemented in a manner which ensures and accounts for management of stormwater runoff and discharge such that the requirements of the Permit are satisfied. In addition to the Measures and Controls detailed in Section 5, monitoring, reporting, and compliance evaluation tasks are performed in conjunction with this SWPPP as described within this section. This generates necessary documentation to verify compliance with the Permit.

6.1 Non-Storm Water Discharge - Certification

A "Non-Storm Water Discharge" is defined as a discharge of a liquid from the Plant into a water of the State of Utah which is not associated with stormwater runoff. The Plant does not operate such that a Non-Storm Water Discharge occurs nor does the Plant management intend on operating such that Non-Storm Water Discharges occurs.

If Non-Storm Water Discharge is later determined as an option for Plant operation, Holcim would be required to follow the requirements detailed in paragraph 3.a.(7) (titled "Non-Storm Water Discharges") of Appendix E of the Permit. These requirements would include submittal of detailed information describing define the source, results of any tests/evaluation, and point of discharge in writing and as a certification to the *Executive Secretary* of the Utah Division of Water Quality in accordance with paragraph 3.a(3)(g)(iii) of Appendix E of the Permit.

6.2 Comprehensive Site Compliance Evaluation

Once a year, the Environmental Manager is responsible for directing a site compliance evaluation. The site compliance evaluation is performed for the areas at the Plant which contribute to stormwater discharges. The site compliance evaluation will be performed by qualified personnel and provide the following three items:

1. Evaluation of the areas which contribute to stormwater discharges associated with Plant operations (includes the areas identified in Table 4.2.1 of this SWPPP). These areas will be visually inspected. The inspections need to evaluate the control/measures in place which reduce pollutant loadings and determine whether they are adequate and properly implemented and maintained, and if additional control measures are needed. As the management of stormwater at the Plant is dependent on the three detention basins, the visual inspection shall verify that inlets, outlets, and overflow structures of the detention basins are clear of debris and operational. The operational status of Outfall No. 1 into Lost Creek will be verified during this inspection.

2. Based on the inspection and evaluation performed in item 1, if inadequacies are identified in Plant operations as related to pollution prevention in stormwater discharge, the measure and controls section of this SWPPP (Section 5) shall be modified within 2 weeks, and physical implementation of any changes to the plan shall be executed in a timely manner, but in no case more than 12 weeks after the site inspection/evaluation.

3. Utilizing the information obtained in items 1 and 2, a written report shall be prepared which summarizes the inspection and evaluation as well as any adjustments to measure and controls. The written report shall include the scope of the inspection, changes to measure and controls, name(s) and qualifications of personnel making the inspections, the date(s) of the inspection, and major observations relating to the implementation of the SWPPP. Where a report does not identify any incidents of noncompliance, the report shall contain a certification that the Plant is in compliance with the SWPPP and the Permit. The certification

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shall be made by the same management signatory requirements detailed in Section 2.1 of this SWPPP and retained for 3 years. If the report identifies non-compliance and can not be certified, Holcim will provide a written report to the *Executive Secretary* of the Utah Division of Water Quality and detail the non-compliance item; how the non-compliance item will be fixed; and a schedule to fix the non-compliance item. The address for the Utah Division of Water Quality is:

Executive Secretary
Division of Water Quality
PO Box 144870
Salt Lake City, Utah 84114-4870

6.3 Monitoring and Reporting Requirements

Under the Permit the Plant is subject to quarterly monitoring and reporting; and annual compliance monitoring and reporting. Appendix E of the Permit provides the requirements for monitoring at a cement manufacturing facility.

The basis for quarterly and annual compliance monitoring, as set forth in Appendix E, is summarized below:

- Specifically, Paragraph 4.1 of Appendix E indicates that any discharge from a manufacture of cement shall not exceed a maximum concentration for any time of 50 milligrams per liter (mg/L) Total Suspended Solids (TSS) nor the 6.5 to 9.0 range for pH. The same paragraph continues to state: "Any untreated overflow from facilities designed, constructed and operated to treat the volume of material storage pile runoff that is associated with a 10-year, 24-hour rainfall event shall not be subject to the TSS or pH limitations." Holcim has reported that the design of the three detention basins are based on a 10-year, 24-hour rainfall event; therefore, stormwater discharges from the Plant at Devil's Slide are not subject to TSS or pH limitations of the Permit.

- Paragraph 5 of Appendix E provides numeric effluent limitations (Tables E-1 and E-2) for Clay Product Manufactures and Concrete and Gypsum Product Manufactures. Since the Devil's Slide Plant is a cement manufacturing facility, the numeric effluent limitations prescribed by Tables E-1 and E-2 are not applicable to the Plant.

- Although specific numeric effluent limitations (TSS, pH, and other constituents) are not necessary, the Permit does require quarterly monitoring/reporting and annual monitoring/reporting (compliance). The quarterly and annual monitoring/reporting requirements are presented in subsections 6.3.1 and 6.3.2 respectively.

Quarterly monitoring and reporting and annual compliance monitoring for the Holcim Plant are described in the following sections (Section 6.3.1 and 6.3.2).

6.3.1 Quarterly Monitoring and Reporting

Paragraph 5.3 (titled "Quarterly Visual Examination of Storm Water Quality") of Appendix E of the Permit outlines the quarterly monitoring/reporting requirements of the Plant. The Plant is required to perform a visual examination of stormwater quality on a quarterly basis. The Plant shall perform and document the quarterly visual examination of a stormwater discharge from Outfall No. 1 at least once in each of the following three month periods per year: January through March; April through June; July through

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September; and October through December. The quarterly visual examination of stormwater discharge from Outfall No. 1 shall meet the following requirements:

1. The examination shall be made during daylight hours unless there is insufficient rainfall or snow melt to produce a runoff event.
2. Examination shall be made of grab samples collected within the first 30-minutes (or soon thereafter as practical, but not to exceed 1 hour) of when the runoff or snowmelt begins discharging.
3. The examination shall document observations of color, odor, clarity, floating solids, settled solids, suspended solids, foam, oil sheen, and other obvious indicators of stormwater pollution. No analytical tests are required to be performed on the samples.
4. All samples shall be collected from the discharge resulting from a storm event that is greater than 0.1 inches in magnitude and that occurs at least 72 hours from the previously measurable (greater than 0.1 inch rainfall) storm event.
5. When practical, the same sampler shall perform the visual examination of discharges.
6. When a visual examination cannot be performed in a quarterly period as a result of adverse climatic conditions, the discharger must document the reason for not performing the visual examination and retain this documentation onsite with the records of the visual examinations. Adverse weather conditions that may prohibit sample collection (creates a dangerous condition for the sampler) include: local flooding, high winds, hurricane, tornadoes, and electrical storms) or otherwise make the collection of a sample impracticable (drought, extended frozen condition).
7. For each quarterly visual examination event, defined by steps 1 through 6 above, a visual examination report will be prepared and include the following: examination date and time, examination personnel, the nature of the discharge (rain or snow melt), visual quality of the stormwater discharge (including observations of color, odor, clarity, floating solids, settled solids, suspended solids, foam, oil sheen, and other indicators of stormwater pollution), and probable sources of any stormwater contamination. The Stormwater Discharge Monitoring report form (SWDMR-form) which is provided in the Permit will be used to document the necessary items for the quarterly visual monitoring. Each quarterly visual examination report will be retained with the SWPPP records by the Environmental Manager. Submittal of the visual examination report to the Utah Division of Water Quality is not required.

The quarterly monitoring reports (SWDMR-form) will be retained in Appendix A of this SWPPP.

6.3.2 Annual Monitoring (Compliance) and Reporting

Paragraph 5.4 (titled "Compliance Monitoring") of Appendix E of the Permit sets forth that the runoff must be monitored at least annually for TSS and pH for cement manufacturing facilities and submittal of an annual compliance monitoring report to the Utah Division of Water Quality is necessary. However, annual compliance monitoring as well as submittal of an Annual Monitoring (Compliance) report to the Utah Division of Water Quality for pH and TSS is not required for the Devil's Slide Plant for the following reasons:

- Paragraph 4.1 of Appendix E states: "Any untreated overflow from facilities designed, constructed and operated to treat the volume of material storage pile runoff that is associated with a 10-year, 24-hour rainfall event shall not be subject to the TSS or pH limitations." Detention Basins No. 1 and 2 are designed for a 10-year, 24-hour rainfall event.

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- Detention Basin No. 3 is connected to an on-site, below ground french drain system and does not discharge stormwater from the site.
- No other stormwater discharges from the site have been identified.

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Figure 1: Facility Plot Plan

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Appendix A: Completed Quarterly Monitoring Report Forms (SWDMR-Form)

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Appendix B: Devil's Slide Spill Response Plan

This Spill Response Plan provides procedures if a spill or release of liquid and/or dry materials occurs at the Plant.

1. The person(s) on site at the time of the spill will begin countermeasure actions and commit the company's resources as necessary to mitigate and clean up the spill.

2. The source of the spill will be identified and the flow of material stopped if this action poses no danger to personnel. If a drum or container is leaking, the drum will be righted and container contents will be transferred to another drum. If a transfer hose or pipeline is ruptured or becomes disconnected the pumps will be turned off and the valves will be closed.

3. Absorbent material or pads will be applied to the spill or the spill will be surrounded by absorbent material or absorbent socks / booms or material from our rock storage piles. Shovels, brooms or such equipment as necessary will be used to collect any spent absorbent. The spent absorbent material, pads and or socks will be placed into a drum designed for this use. Any free oil will be placed in a separate drum or container.

4. Subsequent to the facilities personnel actions to stop the source of the spill and prevent or minimize the impact of the spilled material on the environment, proper notifications, as necessary, will be given to the appropriate agencies listed in Section IV of the SPCC Plan.

5. Once the spill has been controlled and materials collected and secured the person responsible for implementing the plan will inspect the area for cleanliness and will undertake decontamination of spill or personal protective equipment, if necessary. This person will also be responsible for subsequently managing and disposing of the collected material in accordance with applicable federal and state environmental regulations.

6. Spill cleanup equipment is located in the following areas: Quarry Drum Oil storage area, Mill Drum Oil storage area, Storeroom Drum Oil storage area, and absorbent material are located near all small drum storage areas. Clean soil from the quarry area may be mobilized with on-site equipment and used as additional sorbent material

7. The following is a list of the spill equipment on site:
   a. Spill response equipment capable of containing a spill of at least 42 gallons. This equipment includes absorbent spill pads, socks, or booms.

   b. An adequate number of gloves, boots and personal protective equipment.

   c. First aid kits are located in various areas in the quarry and mill and other plant locations.

   d. Eye wash stations are located near the major storage areas of the facility.

   e. Fire fighting equipment is located in various locations in the facility

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Holcim	**Originating Department:** Devil's Slide Plant Environmental Office	**Classification:** Document	**E**	**Q**	**H&S**
			Y	**N**	**Y**
Date Issued: July 9, 2004 (Original Version)	**Control Number:** DS.03.009	**Revision Number:** July 9, 2007	**HAC Number:** N/A		
Prepared By: Kevin L. Ovard **Title:** Environmental Manager	**Approved By:** Keith Krugh **Title:** Plant Manager	**Page** 1 of 31			
Distribution:	**Environmental Department Files (For regulatory compliance.)** **Portal (For informational purposes.)**				
Subject:	**Holcim (US) Inc. – Devil's Slide Spill Prevention Control and Countermeasure Plan (SPCC Plan)**				

Holcim (US) Inc. – Devil's Slide Plant

Spill Prevention Control and Countermeasure Plan (SPCC)

SPCC Plan
Holcim (US) Inc. – Devil's Slide Plant
Morgan, Utah

9 July 2007

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Related Documents

DS.03.009B Plant SPCC and SWP3 Monthly Inspection Form
DS.03.009C Quarry SPCC and SWP3 Monthly Inspection Form
DS.03.001 Used Oil Management
DS.03.002 Drum Management

(Related documents listed here have been reviewed by the plant manager and by the certifying Professional Engineer. These related documents are not included with this SPCC Plan; however, are retained in the Devil's Slide Environmental Manager's Office)

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1. CERTIFICATION

1.1 Facility

Holcim (US) Inc. – Devil's Slide Plant
6055 East Croydon Road
Morgan, Utah 84050
(801) 829-6821

1.2 Management Approval

This SPCC Plan will be implemented as described herein.

Name: Keith Krugh
Title: Plant Manager

Signature: _____

Date: _____

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1.3 PE Certification

As a Professional Engineer (PE) in the State of Utah, I attest, by means of this certification:

- That I am familiar with the requirements of 40 CFR 112;
- That I or my agent has visited and examined the facility;
- That this SPCC Plan has been prepared in accordance with good engineering practice, including consideration of industry standards, and in accordance with 40 CFR 112;
- That procedures for required inspections and testing have been established; and
- That this SPCC Plan is adequate for the facility.

This certification shall in no way relieve the owner or operator of his duty to prepare and fully implement this SPCC Plan in accordance with the requirements of 40 CFR Part 112.

SEAL:

Certification: C. D. Brown Date: 7/9/2007

Christopher D. Brown, P.E.

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1.4 Certification of the Applicability of the Substantial Harm Criteria Checklist

FACILITY NAME: Holcim (US) Inc. – Devil's Slide Plant
FACILITY ADDRESS: 6055 East Croydon Road, Morgan, Utah 84050

1) Does the facility transfer oil over water to or from vessels and does the facility have a total oil storage capacity greater than or equal to 42,000 gallons? Yes ☐ No ☒

2) Does the facility have a total oil storage capacity greater than or equal to 1 million gallons and does the facility lack secondary containment that is sufficiently large to contain the capacity of the largest aboveground oil storage tank plus sufficient freeboard to allow for precipitation within any aboveground oil storage tank area? Yes ☐ No ☒

3) Does the facility have a total oil storage capacity greater than or equal to 1 million gallons and is the facility located at a distance (as calculated using the formula in Attachment C-III, Appendix C, 40 CFR 112 or a comparable formula) such that a discharge from the facility could cause injury to fish and wildlife and sensitive environments? [For further description of fish and wildlife and sensitive environments, see Appendices I, II, and III to DOC/NOAA's "Guidance for Facility and Vessel Response Environments" (Section 10, Appendix E, 40 CFR 112 for availability) and the applicable Area Contingency Plan.] Yes ☐ No ☒

4) Does the facility have a total oil storage capacity greater than or equal to 1 million gallons and is the facility located at a distance (as calculated using the appropriate formula in Attachment C-III, 40 CFR 112 or a comparable formula) such that a discharge from the facility would shut down a public drinking water intake? Yes ☐ No ☒

5) Does the facility have a total oil storage capacity greater than or equal to 1 million gallons and has the facility experienced a reportable oil spill in an amount greater than or equal to 10,000 gallons within the last 5 years? Yes ☐ No ☒

I certify that under penalty of law that I have personally examined and am familiar with the information submitted in this document, and that based on my inquiry of those individuals responsible for obtaining this information, I believe that the submitted information is true, accurate, and complete.

Name: Keith Krugh
Title: Plant Manager

Signature: _____

Date: _____

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2. INTRODUCTION

This Spill Prevention Control and Countermeasure (SPCC) Plan has been prepared for the Holcim (US) Inc. – Devils Slide Plant by Environmental Resources Management (ERM) in accordance with Title 40, Code of Federal Regulations Part 112 (40 CFR 112) Oil Pollution Prevention. Due to the facility's location, the discharge of oil into navigable water is highly unlikely. The information detailed in this SPCC Plan is based on ERM's site visit performed on June 5, 2007 and other information provided by Mr. Kevin Ovard with Holcim (US) Inc. Environmental Manager. The organization of this SPCC Plan is such that each section is followed by the corresponding section (s), subsection (s), and paragraph(s) of 40 CFR 112.

If changes are made to this SPCC Plan, the changes shall be performed in accordance with Section 6.

3. GENERAL APPLICABLITY – 40 CFR 112.1

The purpose of the SPCC Plan is to establish procedures, methods, equipment, and other measures to prevent the discharge of oil to navigable waters. While the SPCC Plan is intended to identify and take preventative measures of foreseeable potential releases of oil to navigable water, not every potential situation can be foreseen.

Holcim (US) Inc. – Devil's Slide Plant (Holcim) is subject to the SPCC regulations because the aggregate above ground storage capacity contained in storage containers is greater than 1,320 gallons.

4. REQUIREMENT TO PREPARE AND IMPLEMENT AN SPCC PLAN - 40 CFR 112.3

As the site was in operation before August 16, 2002, Holcim is required to maintain/update the SPCC Plan by July 1, 2009 to meet the requirements of 40 CFR 112. This document is an update of the July 9, 2004 SPCC Plan and has been modified to meet this requirement.

5. AMENDMENT OF SPCC PLAN BY REGIONAL ADMINISTRATOR - 40 CFR 112.4

5.1 Requirements of Section - 112.4 (a)

The owner or operator must submit facility information to the EPA Regional Administrator within 60 days whenever any discharge of 1,000 gallons of oil to navigable waters or within 60 days of two discharges of 42 gallons of oil to navigable waters occurs. The facility information must be submitted with a written description of the spill, the maximum storage capacity of the facility, the normal daily throughput, corrective action taken, an adequate description of the facility including maps and flow diagrams, cause of the discharge, and plans for preventing recurrence. Other necessary information may be submitted to the EPA as requested by the EPA. The EPA Regional Administrator may then require SPCC Plan amendments.

5.2 Facility Information – 112.4 (a)(1-3)

Facility Name: Holcim (US) Inc. – Devil's Slide Plant

Facility Address: 6055 East Croydon Road
Morgan, Utah 84050

Phone Number: 801.829.6821

Fax Number: 801.829.2180

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Plant personnel are made aware of this SPCC Plan and are accountable for oil spill prevention, emergency procedures, reporting, record-keeping, and employee training.

For question regarding this SPCC plan please contact the Environmental Manager or the Plant Manager.

Environmental Manager: Kevin L. Ovard
Office Phone Number: 801.829.2122
Cell Phone Number: 801.710.8685

Plant Manager: Keith Krugh
Office Phone Number: 801.829.2181
Cell Phone Number: 719.431.2120

5.3 Oil Storage Capacity and Normal Throughput – 112.4 (a)(4)

Facility oil storage, including above ground storage tanks (ASTs) and other containers, and associated secondary containment systems are summarized in Table 5.3-1. The facility oil storage locations are identified in the facility plot plan in Appendix 1.

Holcim (US) Inc. reported to ERM that no underground storage tanks (USTs) are present at the Devil's Slide Plant. If underground storage tanks (USTs) were present at the facility, Utah Department of Environmental (UDEQ) UST requirements would apply.

Table 5.3-1: Holcim (US) Inc. – Devil's Slide Tanks and Oil Storage

Map Reference Number	Location/Description of Area	Tank Type	Tank Volume (gallon)	Tank Contents	Content Use	Tank Construction Material	Leak Detection	Secondary Containment
1	Quarry Fuel Tank Area	AST	10,000 gallons	Diesel	Quarry Mobile Equipment	Steel	Observation	Concrete secondary containment (31' x 21' x 4') with 15,338 gallon capacity.
1	Quarry Fuel Tank Area	AST	10,000 gallons	Diesel	Quarry Mobile Equipment	Steel	Observation	Concrete secondary containment (31' x 21' x 4') with 15,338 gallon capacity.
2	Fuel station west of finish mill	AST	2,500 gallons	Gasoline	Plant trucks and equipment	Steel	Observation	Concrete secondary containment (18' x 9' x 45") with 4,500 gallon capacity.
2	Fuel station west of finish mill	AST	300 gallons	Diesel	Plant trucks and equipment	Steel	Observation	Concrete secondary containment (18' x 9' x 45") with 4,500 gallon capacity.
3	Oil Storehouse	drums (30 - 55 gallon)	50 drums;250 gallons	Oil	Plant equipment lubrication	Steel	Observation	No Secondary Containment but located in building
3	Oil Storehouse	cans (5-gallons)	15 cans; 75 gallons	Kerosene, gasoline, and oil	Misc. small equipment	Metal	Observation	No Secondary Containment but located in building

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Map Reference Number	Location/Description of Area	Tank Type	Tank Volume (gallon)	Tank Contents	Content Use	Tank Construction Material	Leak Detection	Secondary Containment
3	Oil Storehouse	cans (1-gallon)	20 cans; 20 gallons	paint	Misc. plant use	Metal	Observation	No Secondary Containment but located in building
3	Oil Storehouse - outside, north side	portable tank	340 gallons	used oil	Equipment maintenance collection - recycle offisite	Metal	Observation	Dirt berm containment with metal entrance/exit ramp/threshold.
3	Oil Storehouse - outside, north side	portable tank	340 gallons	used oil	Equipment maintenance collection - recycle offisite	Metal	Observation	Dirt berm containment with metal entrance/exit ramp/threshold.
3	Oil Storehouse - outside, north side	portable tank	700 gallons	used oil	Equipment maintenance collection - recycle offisite	Metal	Observation	Dirt berm containment with metal entrance/exit ramp/threshold.
3	Oil Storehouse - outside, north side	drums (55-gallons)	6 - 10 drums (550 gallons)	used grease	Used kiln gear lubricant. Recycle offsite.	Metal	Observation	Dirt berm containment with metal entrance/exit ramp/threshold.
4	Quarry Garage	drums (55-gallon)	15 drums; 1,400 gallons	transmission, oil, kerosene, antifreeze, envirosolvent	Quarry Equipment Maintenance	Metal	Observation	No Secondary Containment but located in building
4	Quarry Garage	units (298-gallons)	3 units, 894 gallons	oil	Quarry Equipment Maintenance	Metal	Observation	No Secondary Containment but located in building
4	Quarry Garage	units (126-gallons)	1 unit, 126 gallons	oil	Quarry Equipment Maintenance	Metal	Observation	No Secondary Containment but located in building
4	Quarry Garage	cans (5-gallons)	5 cans; 15 gallons	kerosene	Quarry Equipment Maintenance	Metal	Observation	No Secondary Containment but located in building
4	Quarry Garage	buckets (5-gallons)	3 buckets; 15 gallons	brake cleaner	Quarry Equipment Maintenance	Metal	Observation	No Secondary Containment but located in building
5	Oil room - 1st Pier, north side	drums (55-gallons)	5 drums; 75 gallons	oil	Plant Equipment Use	Metal	Observation	No Secondary Containment but located in building
5	Oil room - 1st Pier, north side	containers (70-gallons)	8 containers; 560 gallons	oil	Plant Equipment Use	Metal	Observation	No Secondary Containment but located in building
15	Machine Shop	drums (55-gallons)	5 drum; 275 gallons	oil	Plant Equipment Use	Metal	Observation	No Secondary Containment but located in building
15	Machine Shop	drums (55-gallons)	2 drum; 110-gallons	kerosene	Plant Equipment Use	Metal	Observation	No Secondary Containment but located in building
15	Machine Shop	drums (55-gallons)	1 drum; 55-gallons	enviro solvent	Plant Equipment Use	Metal	Observation	No Secondary Containment but located in building
15	Machine Shop	cans (1-gallon)	20 can; 20-gallon	paints	Plant Equipment Use	Metal	Observation	No Secondary Containment but located in building

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Map Reference Number	Location/Description of Area	Tank Type	Tank Volume (gallon)	Tank Contents	Content Use	Tank Construction Material	Leak Detection	Secondary Containment
7	Packhouse - compressor room in basement	drums (55-gallons)	4 drums; 220 gallons	oil	Compressor and plant equipment maintenance	Metal	Observation	contained in basement
9	Generator on north side of office	built within generator	22 gallons	diesel	Emergency power	Metal	Observation	Built in secondary containment
9	Generator on north side of office	placed within generator	< 1 gallon	sulfuric acid battery	Emergency power	Plastic caste	Observation	Built in secondary containment
10	Electrical substation west of Finish Mill	transformer	2,500 gallons	non-PCB oil	transformer oil	metal	Observation	Secondary containment with concrete/soil berm.
10	Electrical substation west of Finish Mill	transformer	1,603 gallons	non-PCB oil	transformer oil	metal	Observation	Secondary containment with concrete/soil berm
10	Electrical substation west of Finish Mill	reactors	3 reactors; 750 gallons	non-PCB oil	transformer oil	metal	Observation	Secondary containment with concrete/soil berm
10	Electrical substation west of Finish Mill	capacitor	18 capacitor; 18 gallons	non-PCB oil	oil	metal	Observation	Secondary containment with concrete/soil berm
11	Main Substation - east of baghouse	transformer	2,850 gallons	non-PCB oil	transformer oil	metal	Observation	Surface rock localized spill containment
11	Main Substation - east of baghouse	LTC tank	150 gallons	non-PCB oil	transformer oil	metal	Observation	Surface rock localized spill containment
11	Main Substation - east of baghouse	capacitor	24; 24 gallons	non-PCB oil	oil	metal	Observation	Surface rock localized spill containment
12	Main Substation - east of baghouse	transformer	253 gallons	non-PCB oil	transformer oil	metal	Observation	rock pit with sump secondary containment
12	Main Substation - east of baghouse	transformer	370 gallons	non-PCB oil	transformer oil	metal	Observation	rock pit with sump secondary containment
12	Main Substation - east of baghouse	transformer	350 gallons	non-PCB oil	transformer oil	metal	Observation	rock pit with sump secondary containment
13	Transformer Station - Preheater Tower, south side	transformer	225 gallons	non-PCB oil	transformer oil	metal	Observation	rock pit with sump secondary containment
13	Transformer Station - Preheater Tower, south side	transformer	350 gallons	non-PCB oil	transformer oil	metal	Observation	rock pit with sump secondary containment
14	Cooler substation transformer	transformer	510 gallons	non-PCB oil	transformer oil	metal	Observation	Secondary containment present
6	Mobile tanks at Quarry	mobile tank	2,500 gallons	diesel	Quarry equipment fuel and maintenance	metal	Observation	No secondary containment
6	Mobile tanks at Quarry	mobile tank	800 gallons	diesel	Quarry equipment fuel and maintenance	metal	Observation	No secondary containment
6	Mobile tanks at Quarry	mobile tank	125 gallons	diesel	Quarry equipment fuel and maintenance	metal	Observation	No secondary containment
6	Mobile tanks at Quarry	mobile tank	80 gallons	diesel	Quarry equipment fuel and maintenance	metal	Observation	No secondary containment

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Map Reference Number	Location/Description of Area	Tank Type	Tank Volume (gallon)	Tank Contents	Content Use	Tank Construction Material	Leak Detection	Secondary Containment
6	Mobile tanks at Quarry	mobile tank	2,500 gallons	diesel	Quarry equipment fuel and maintenance	metal	Observation	No secondary containment
6	Mobile tanks at Quarry	mobile tank	800 gallons	diesel	Quarry equipment fuel and maintenance	metal	Observation	No secondary containment
6	Mobile tanks at Quarry	mobile tank	125 gallons	diesel	Quarry equipment fuel and maintenance	metal	Observation	No secondary containment
6	Mobile tanks at Quarry	mobile tank	80 gallons	diesel	Quarry equipment fuel and maintenance	metal	Observation	No secondary containment
6	Mobile tanks at Quarry	mobile tank	120 gallons	new oil	Quarry equipment fuel and maintenance	metal	Observation	No secondary containment
6	Mobile tanks at Quarry	mobile tank	120 gallons	new oil	Quarry equipment fuel and maintenance	metal	Observation	No secondary containment
6	Mobile tanks at Quarry	mobile tank	240 gallons	new oil	Quarry equipment fuel and maintenance	metal	Observation	No secondary containment
6	Mobile tanks at Quarry	mobile tank	1,000 gallons	used oil	Quarry equipment fuel and maintenance	metal	Observation	No secondary containment
6	Mobile tanks at Quarry	mobile tank	89 gallons	used oil	Quarry equipment fuel and maintenance	metal	Observation	No secondary containment
16	Cooler Hydraulic Unit - 2nd Pier	plant tank	140 gallons	oil	Hydraulic use	metal	Observation	Built in secondary containment
17	Plant Auxiliary Generator- first pier lower level, east	built within generator	300 gallons	diesel	Backup power	Steel	Observation	Built in secondary containment, in building
18	Kiln grease receptacles at 1st Pier, east side	drums (55-gallon)	2 drums; 110 gallons	grease	Used kiln gear lubricant. Recycle offsite.	Metal	Observation	Metal drum within a plastic overpack container.
19	Raw Mill Hydraulic Unit	built within unit	370 gallons	oil	Hydraulic pump reservoir	metal	Observation	Built in secondary containment, with sump collection.
20	Raw Mill Hydraulic Pumps - 2nd Level	built within unit	66 gallons	oil	Hydraulic pump reservoir	metal	Observation	Built in secondary containment, with sump collection
20	Raw Mill Hydraulic Pumps - 2nd Level	built within unit	46 gallons	oil	Hydraulic pump reservoir	metal	Observation	Built in secondary containment, with sump collection
21	Coal Mill Hydraulic Unit	built within unit	50 gallons	oil	Hydraulic pump reservoir	metal	Observation	No secondary containment
22	1st Pier - 2nd level storeroom, east side	drums (30-gallons)	30 drums; 900 gallons	grease	lubrication	metal	Observation	Contained by walls and 1" threshold at doors.

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Map Reference Number	Location/Description of Area	Tank Type	Tank Volume (gallon)	Tank Contents	Content Use	Tank Construction Material	Leak Detection	Secondary Containment
22	1st Pier - 2nd level storeroom, east side	drums (30-gallons)	30 drums; 900 gallons	grease	lubrication	metal	Observation	Contained by walls and 1" threshold at doors.
23	Finish Mill #3 Electrical Room	drums (30-gallons)	4 drums; 120 gallons	grease	lubrication	metal	Observation	Contained by walls and door.
28	Finish Mill #3 Slide Shoe	steel box	180 gallons	oil	gear lubrication	metal	Observation	Contained within building
28	Finish Mill #3 Symetro	steel box	25 gallons	oil	gear lubrication	metal	observation	Contained within building
25	Finish Mill #3 Outside	transformer	476 gallons	non-PCB oil	transformer oil	metal	Observation	Secondary containment
25	Finish Mill #3 Outside	transformer	337 gallons	non-PCB oil	transformer oil	metal	Observation	Secondary containment
26	Group III Silo	transformer	337 gallons	non-PCB oil	transformer oil	metal	Observation	Secondary containment
27	Finish Mill #1 Slide Shoe	steel box	575 gallons	oil	gear lubrication	metal	Observation	Contained within building
27	Finish Mill #1 Symetro	steel box	450 gallons	oil	gear lubrication	metal	observation	Contained within building
28	Finish Mill #2 Slide Shoe	steel box	575 gallons	oil	gear lubrication	metal	Observation	Contained within building
28	Finish Mill #2 Symetro	steel box	450 gallons	oil	gear lubrication	metal	observation	Contained within building

The cumulative storage volume of oil/oil products summarized in Table 5.3-1 is approximately 48,500 gallons contained within above ground storage tanks and other containers. Normal throughput rates of oil or petroleum oil products are approximated Table 5.3-2. Estimated throughput is based on delivery frequencies and average delivery quantities obtained from purchasing records.

Table 5.3-2: Estimated Throughput

Material	Tank Loading/Unloading Frequency	Average Load (Gallons)	Gallons Per Year
Diesel Fuel	1 time per week	7,500	310,000
Gasoline Fuel	1 time per quarter	2,500	5,000
Lube Oil	1 time per week	50	2,500
Used Oil	4 times per year	850	2,500

5.4 Corrective Action and Countermeasures – 112.4 (a)(5 & 7)

In the event of an applicable spill, documentation shall be provided regarding corrective actions and countermeasures that were taken. Devil's Slide will keep a log of reported spills, the cause of the spills and the corrective actions taken, as applicable. Holcim reports that no spill has occurred at the Facility. If a spill occurs at the Facility and it is reportable to the EPA, the spill will be documented in Table 5.3-3.

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Table 5.3-3: Spill History Log

Spill Date	Location	Material	Volume (Gallons)	Method of Containment	Reported to EPA	Action(s) Performed

5.5 Facility Description – 112.4 (a)(6)

The Devil's Slide cement production facility covers approximately 45 acres. The primary activities conducted at the facility are cement production from raw materials and bulk cement storage. The facility SIC code is 3241.

Holcim operates the Devil's Slide plant 24 hours per day and 365 days per year, with periods of routine maintenance. Raw materials, such as limestone, shale, and sandstone, are mined on site at the adjacent Quarry, which operates under Permit ACT\029\001 from the Utah Division of Oil, Gas and Mining. Other raw materials, such as iron are purchased from outside vendors and delivered to the site. Raw materials are crushed, screened, and stored on-site. Raw material transfer is provided by Holcim's heavy equipment. Fuel, coal, lube oils, and alternative fuels such as tires and diapers are also purchased from vendors and used to operate the facility. The layout of the facility is presented in the facility plot plan in Appendix 1. On an annual basis, this facility produces approximately 850,000 tons of Portland Cement. The Portland Cement product is shipped to off-site customers via railcars and/or trucks.

6. AMENDMENT OF SPCC PLAN BY OWNERS OR OPERATORS - 40 CFR 112.5

The SPCC Plan will be amended whenever a change in facility design, construction, operation or maintenance materially increases the potential for discharge of oil to navigable waters. Such technical amendments shall be incorporated as soon as possible, but not later than six months after such change occurs. Technical amendments must be certified by a P.E. in accordance with 40 CFR 112.3, except as specified in 40 CFR 112.6.

A complete review and evaluation of the SPCC plan must be conducted every five years. Devil's Slide will keep a log of plan review and plan amendment activities. Documentation shall include a summary of sections reviewed and/or amended, review date and the signature of the reviewer on a statement as to whether or not the SPCC Plan will be amended. Section 10 provides the SPCC Review and Amendment Log Form. When this SPCC Plan is amended based on the requirements detailed in this Section (Section 6), the Review and Amendment Log Form in Section 10 will be updated.

Administrative changes (e.g., revised names and telephone numbers, etc.) can be noted directly on this SPCC Plan. Administrative changes do not require re-certification by a P.E.

7. GENERAL REQUIREMENTS FOR SPCC PLAN - 40 CFR 112.7

7.1 Facility Conformance – 112.7(a)

The facility is in conformance with the general SPCC requirements.

7.2 Physical Layout of Facility – 112.7 (a)(3)

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The physical layout of the facility, including the location and contents of bulk oil storage containers, is included in the Facility Plot Plan in Appendix 1.

7.3 Oil Type in Each Container and Storage Capacity – 112.7 (a)(3)(i)

Table 5.3-1 summarizes storage container contents and capacity and cross referenced on the Facility Plot Plan included in Appendix 1.

7.4 Facility Discharge Prevention Measures – 112.7 (a)(3)(ii)

Facility discharge prevention measures include on-site transfers of oils through dedicated piping; attendances by personnel during load/unloading operations; and transfer of oils is overseen by truck drivers and operators.

7.5 Facility Discharge or Drainage Controls – 112.7 (a)(3)(iii)

If drainage from secondary containment areas is necessary, fluids will be pumped and disposed of properly.

7.6 Countermeasures for Discharge Discovery and Response – 112.7 (a)(3)(iv)

Spill kits and absorbent pads/materials are staged throughout the facility at the following areas as referenced (Figure Reference Number) on the Facility Plot Plan in Appendix 1:

- Oil Store House – Figure Reference Number 3
- Oil Room – Figure Reference Number 5
- Quarry Store House – Figure Reference Number 4
- Plant Auxiliary Generator – Figure Reference Number 17

In addition to these locations where spill kits and pads/materials are stored, the quarry has a surplus of clean soil which can be easily moved by on-site equipment to areas where a spill may occur and serve as a sorbent material.

These locations and associated countermeasure materials were chosen based on locations and volumes of materials with potential for spilling. Person(s) who discover a spill will utilize these spill kits to prevent a discharge of oil from spreading. Appendix 2 includes the Devil's Slide Spill Response Plan. Methods of contact will be followed as detailed in Section 7.8.

7.7 Methods of Disposal – 112.7 (a)(3)(v)

Oil clean-up materials, granular sorbent materials and pads will be disposed of properly. Potential disposal options include the following.

- TW Company, 505 North Main, North Salt Lake City, Utah 84504.
  - Mark Crane
  - 801-829-3123, home
  - 801-829-3545, office
  - 605.270.2984, cell

- Lincoln Environmental Services.
  - 1-800-257-5370

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7.8 Contact List – 112.7 (a)(3)(vi)

Telephone numbers and call out sequence for use in the event of a spill are summarized below.

First Alternative:	Mill Coordinator	
	Primary Office:	801.829.2130
	Secondary Office:	801.829.6821
Second Alternative:	Kevin L. Ovard, Environmental Manager	
	Office:	801.829.2122
	Cell:	801.710.8685
	Home:	801.829.6545
Third Alternative:	Ernie Durrant	
	Office:	801.829.2113
	Cell:	801.710.5003
	Home:	801.829.3513
Fourth Alternative:	Keith Krugh, Plant Manager	
	Office:	801.829.2181
	Cell:	719.431.2120
	Home:	435.615.6996

As necessary, outside entities will be notified of spills. Relevant agencies and phone numbers are summarized below. Notifications will follow Holcim's incident notification procedures.

National Response Center	800.424.8802
Utah Department of Environmental Quality Division of Environmental Response and Remediation	801.536.4100 Business Hours 801.536.4123 After Hours
Utah Department of Environmental Quality Division of Water Quality	801.538.6146
US EPA Region VIII	303.312.6312
Morgan County Fire Department	911
Morgan County Sheriff Department	911
Morgan County Ambulance Service	911
Morgan County Fire Department, non-emergency	801.845.4049
Morgan County Sheriff Dispatch, non-emergency	801.829.0590
Ambulance Business Calls, non-emergency	801.845.4048

The caller should provide the following information:

- Address and phone number of the facility: Holcim (US) Inc. – Devil's Slide Plant
6055 East Croydon Road
Morgan, Utah 84050
Phone: 801. 829.6821
- Date and time of discharge;
- Type of material discharged;

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- Estimate of total quantity discharged;
- Source and location of the discharge;
- Description of affected media;
- Cause of the discharge;
- Damages or injuries caused by the discharge and potential hazards caused by the discharge;
- Actions being used to stop, remove and mitigate the effects of the discharge;
- Whether an evacuation may be needed;
- The names of individuals or organizations who have also been contacted; and
- The name of the person making the report/call.

7.9 Potential for Equipment Failure – 112.7 (b)

The Devil's Slide Facility has indicated that no historic reportable spills of oil have occurred. Based on the facility experience, the potential for a release of oil is low. In the unlikely event of a release of oil, impact would vary depending on the spill location, spill duration, spill volume, spill flow rate, spill flow direction and response time. Tanks and containers are constructed with secondary containment; located in a building; and/or placed in locations of the facility where the ground surface is level such that if an oil release were to occur, it would remain relatively centralized and allow for containment and cleanup.

Potential for catastrophic failure of a storage tank is minimal. A more likely oil release scenario would be related to transfer operations. Operations that may present a risk of releasing oil include tank overfill, tank truck loading and unloading, service equipment fluid changing and spill or puncture of a container. Releases during transfer operations are typically minor because of early discovery by the individual performing the transfer and secondary containment measures in place.

The Holcim facility is predominantly level and spills would not necessarily flow in a consistent direction. The direction of a spill would be governed by localized drainage paths. In general, due to the relatively small volumes of oil present in tanks and other containers, coupled with the localized flat drainage paths, potential spills would most likely remain centralized around the tank or container location.

Facility drainage is designed to prohibit spilled materials from leaving the site. The Facility surface drainage (stormwater) is designed such that all stormwater runoff collects in Detention Basin Nos. 1 and 2 (located on the east side of the Facility) and Detention Basin No. 3 (located on the west side of the Facility). Holcim reports that the detention basins are designed for a 10-year, 24 hour storm event. If the capacity of Detention Basin Nos. 1 and 2 is exceeded, the discharge would enter Lost Creek. If the capacity of Detention Basin No. 3 is exceeded, the discharge would enter a below grade french drain located on the west side of the Facility. The detention basins and their features are identified in the facility plot plan in Appendix 1. In the unlikely event that a spill was to escape the general area, all liquids would be contained on the facility by pooling immediately around the release location (due to the flat surface conditions observed at the facility) or contained within the three detention basins. The volume of any spill would not exceed the capacities of the detention basins, thus preventing any spill from leaving the facility. Potential leak or spill scenarios are listed in Table 7.9-1.

Table 7.9-1: Potential Spill Scenarios

Figure Reference Number	Location/Description of Area	Tank Type	Tank Volume (gallon)	Tank Contents	Failure Type	Total Potential Spill Volume (gallons)	Potential Spill Rate (gal/hr)	Flow Direction	Secondary Containment Measures
1	Quarry Fuel Tank Area	AST	10,000 gallons	Diesel	Rupture, Leakage, Hose Failure, Overfill	10,000	10,000	Within concrete secondary containment.	Concrete secondary containment.

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Map Reference Number	Location/Description of Area	Tank Type	Tank Volume (gallon)	Tank Contents	Failure Type	Total Potential Spill Volume (gallons)	Potential Spill Rate (gal/hr)	Flow Direction	Secondary Containment Measures
1	Quarry Fuel Tank Area	AST	10,000 gallons	Diesel	Rupture, Leakage, Hose Failure, Overfill	10,000	10,000	Within concrete secondary containment.	Concrete secondary containment.
2	Fuel station west of finish mill	AST	2,500 gallons	Gasoline	Rupture, Leakage, Hose Failure, Overfill	2,500	2,500	Within concrete secondary containment.	Concrete secondary containment.
2	Fuel station west of finish mill	AST	300 gallons	Diesel	Rupture, Leakage, Hose Failure, Overfill	300	300	Within concrete secondary containment.	Concrete secondary containment.
3	Oil Storehouse	drums (30 - 55 gallon)	50 drums;250 gallons	Oil	Rupture, Leakage	55 to 250	55 to 250	Remain within oil storehouse.	Spill kits, absorbent pads/materials available at the facility.
3	Oil Storehouse	cans (5-gallons)	15 cans; 75 gallons	Kerosene gasoline, and oil	Rupture, Leakage	5 to 75	5 to 75	Remain within oil storehouse.	Spill kits, absorbent pads/materials available at the facility.
3	Oil Storehouse	cans (1-gallon)	20 cans; 20 gallons	paint	Rupture, Leakage	1 to 20	1 to 20	Remain within oil storehouse.	Spill kits, absorbent pads/materials available at the facility.
3	Oil Storehouse - outside, north side	portable tank	340 gallons	used oil	Rupture, Leakage	340	340	Remain within dirt bermed area with metal ramp threshold.	Secondary containment with dirt berm and metal ramp threshold.
3	Oil Storehouse - outside, north side	portable tank	340 gallons	used oil	Rupture, Leakage	340	340	Remain within dirt bermed area with metal ramp threshold.	Secondary containment with dirt berm and metal ramp threshold.
3	Oil Storehouse - outside, north side	portable tank	700 gallons	used oil	Rupture, Leakage	700	700	Remain within dirt bermed area with metal ramp threshold.	Secondary containment with dirt berm and metal ramp threshold.
3	Oil Storehouse - outside, north side	drums (55-gallons)	6 - 10 drums (550 gallons)	used grease	Rupture, Leakage	55 to 550	55 to 550	Remain within dirt bermed area with metal ramp threshold.	Secondary containment with dirt berm and metal ramp threshold.
4	Quarry Garage	drums (55-gallon)	15 drums; 1,400 gallons	transmission, oil, kerosene, antifreeze envirosol vent	Rupture, Leakage	55 to 1,400	55 to 1,400	Remain within Quarry Garage and drain towards the entrance/exit on the north.	Spill kits, absorbent pads/materials available at the facility.
4	Quarry Garage	units (298-gallons)	3 units, 894 gallons	oil	Rupture, Leakage	298 to 894	298 to 894	Remain within Quarry Garage and drain towards the entrance/exit on the north.	Spill kits, absorbent pads/materials available at the facility.
4	Quarry Garage	units (126-gallons)	1 unit, 126 gallons	oil	Rupture, Leakage	126	126	Remain within Quarry Garage and drain towards the entrance/exit on the north.	Spill kits, absorbent pads/materials available at the facility.
4	Quarry Garage	cans (5-gallons)	5 cans; 25 gallons	kerosene	Rupture, Leakage	5 to 25	5 to 25	Remain within Quarry Garage and drain towards the entrance/exit on the north.	Spill kits, absorbent pads/materials available at the facility.

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Map Reference Number	Location/Description of Area	Tank Type	Tank Volume (gallon)	Tank Contents	Failure Type	Total Potential Spill Volume (gallons)	Potential Spill Rate (gal/hr)	Flow Direction	Secondary Containment Measures
4	Quarry Garage	buckets (5-gallons)	3 buckets; 15 gallons	brake cleaner	Rupture, Leakage	5 to 15	5 to 15	Remain within Quarry Garage and drain towards the entrance/exit on the north.	Spill kits, absorbent pads/materials available at the facility.
5	Oil room - 1st Pier, north side	drums (55-gallons)	5 drums; 275 gallons	oil	Rupture, Leakage	55 to 275	55 to 275	Remain in building and immediate flat area.	Spill kits, absorbent pads/materials available at the facility.
5	Oil room - 1st Pier, north side	containers (70-gallons)	8 containers; 560 gallons	oil	Rupture, Leakage	70 to 560	70 to 560	Remain in building and immediate flat area.	Spill kits, absorbent pads/materials available at the facility.
15	Machine Shop	drums (55-gallons)	5 drum; 275 gallons	oil	Rupture, Leakage	55 to 275	55 to 275	Remain in the machine shop and immediate flat area.	Spill kits, absorbent pads/materials available at the facility.
15	Machine Shop	drums (55-gallons)	2 drum; 110-gallons	kerosene	Rupture, Leakage	55 to 110	55 to 110	Remain in the machine shop and immediate flat area.	Spill kits, absorbent pads/materials available at the facility.
15	Machine Shop	drums (55-gallons)	1 drum; 55-gallons	enviro solvent	Rupture, Leakage	55	55	Remain in the machine shop and immediate flat area.	Spill kits, absorbent pads/materials available at the facility.
15	Machine Shop	cans (1-gallon)	20 can; 20-gallon	paints	Rupture, Leakage	1 to 20	1 to 20	Remain in the machine shop and immediate flat area.	Spill kits, absorbent pads/materials available at the facility.
7	Packhouse - compressor room in basement	drums (55-gallons)	4 drums; 220 gallons	oil	Rupture, Leakage	55 to 220	55 to 220	Remain in the basement of the Packhouse.	Spill kits, absorbent pads/materials available at the facility.
9	Generator on north side of office	built within generator	22 gallons	diesel	Rupture, Leakage, Hose Failure, Overfill	22	22	Built in secondary containment. If secondary containment ruptures, flow will remain in the immediate area.	Built in secondary containment. Spill kits, absorbent pads/materials available at the facility.
9	Generator on north side of office	placed within generator	< 1 gallon	sulfuric acid battery	Rupture, Leakage	1	1	Remain in the immediate area.	Spill kits, absorbent pads/materials available at the facility.
10	Electrical substation west of Finish Mill	transformer	2,500 gallons	non-PCB oil	Rupture, Leakage	2,500	2,500	Remain in the secondary containment curb/dirt berm.	Partial secondary containment. Spill kits, absorbent pads/materials available at the facility.
10	Electrical substation west of Finish Mill	transformer	1,603 gallons	non-PCB oil	Rupture, Leakage	1,603	1,603	Remain in the secondary containment curb/dirt berm.	Partial secondary containment. Spill kits, absorbent pads/materials available at the facility.

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10	Electrical substation west of Finish Mill	reactors	3 reactors; 750 gallons	non-PCB oil	Rupture, Leakage	750	750	Remain in the secondary containment curb/dirt berm.	Partial secondary containment. Spill kits, absorbent pads/materials available
10	Electrical substation west of Finish Mill	capacitor	18 capacitor; 18 gallons	non-PCB oil	Rupture, Leakage	18	18	Remain in the secondary containment curb/dirt berm.	Partial secondary containment. Spill kits, absorbent pads/materials available at the facility.
11	Main Substation - east of baghouse	transformer	2,850 gallons	non-PCB oil	Rupture, Leakage	2,850	2,850	Remain localized in the immediate flat area.	Spill kits, absorbent pads/materials available at the facility.
11	Main Substation - east of baghouse	LTC tank	150 gallons	non-PCB oil	Rupture, Leakage	150	150	Remain localized in the immediate flat area.	Spill kits, absorbent pads/materials available at the facility.
11	Main Substation - east of baghouse	capacitor	24; 24 gallons	non-PCB oil	Rupture, Leakage	24	24	Remain localized in the immediate flat area.	Spill kits, absorbent pads/materials available at the facility.
12	Main Substation - east of baghouse	transformer	253 gallons	non-PCB oil	Rupture, Leakage	253	253	Remain within rockpit area and immediate flat area.	Rockpit with sump. Spill kits, absorbent pads/materials available at the facility.
12	Main Substation - east of baghouse	transformer	370 gallons	non-PCB oil	Rupture, Leakage	370	370	Remain within rockpit area and immediate flat area.	Rockpit with sump. Spill kits, absorbent pads/materials available at the facility.
12	Main Substation - east of baghouse	transformer	350 gallons	non-PCB oil	Rupture, Leakage	350	350	Remain within rockpit area and immediate flat area.	Rockpit with sump. Spill kits, absorbent pads/materials available at the facility.
13	Transformer Station - Preheater Tower, south side	transformer	225 gallons	non-PCB oil	Rupture, Leakage	225	225	Remain within rockpit area and immediate flat area.	Rockpit with sump. Spill kits, absorbent pads/materials available at the facility.
13	Transformer Station - Preheater Tower, south side	transformer	350 gallons	non-PCB oil	Rupture, Leakage	350	350	Remain within rockpit area and immediate flat area.	Rockpit with sump. Spill kits, absorbent pads/materials available at the facility.
14	Cooler substation transformer	transformer	510 gallons	non-PCB oil	Rupture, Leakage	510	510	Remain within grated secondary containment area.	Secondary Containment.
6	Mobile tanks at Quarry	mobile tank	2,500 gallons	diesel	Rupture, Leakage, Hose Failure, Overfill, Transfer Errors	2,500	2,500	Facility surface is flat. Any release will remain within the immediate flat area.	Spill kits, absorbent pads/materials available at the facility.

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Map Reference Number	Location/Description of Area	Tank Type	Tank Volume (gallon)	Tank Contents	Failure Type	Total Potential Spill Volume (gallons)	Potential Spill Rate (gal/hr)	Flow Direction	Secondary Containment Measures
6	Mobile tanks at Quarry	mobile tank	800 gallons	diesel	Rupture, Leakage, Hose Failure, Overfill, Transfer Errors	800	800	Facility surface is flat. Any release will remain within the immediate flat area.	Spill kits, absorbent pads/materials available at the facility.
6	Mobile tanks at Quarry	mobile tank	125 gallons	diesel	Rupture, Leakage, Hose Failure, Overfill, Transfer Errors	125	125	Facility surface is flat. Any release will remain within the immediate flat area.	Spill kits, absorbent pads/materials available at the facility.
6	Mobile tanks at Quarry	mobile tank	250 gallons	diesel	Rupture, Leakage, Hose Failure, Overfill, Transfer Errors	250	250	Facility surface is flat. Any release will remain within the immediate flat area.	Spill kits, absorbent pads/materials available at the facility.
6	Mobile tanks at Quarry	mobile tank	80 gallons	diesel	Rupture, Leakage, Hose Failure, Overfill, Transfer Errors	80	80	Facility surface is flat. Any release will remain within the immediate flat area.	Spill kits, absorbent pads/materials available at the facility.
6	Mobile tanks at Quarry	mobile tank	2,500 gallons	diesel	Rupture, Leakage, Hose Failure, Overfill, Transfer Errors	2,500	2,500	Facility surface is flat. Any release will remain within the immediate flat area.	Spill kits, absorbent pads/materials available at the facility.
6	Mobile tanks at Quarry	mobile tank	125 gallons	diesel	Rupture, Leakage, Hose Failure, Overfill, Transfer Errors	125	125	Facility surface is flat. Any release will remain within the immediate flat area.	Spill kits, absorbent pads/materials available at the facility.
6	Mobile tanks at Quarry	mobile tank	80 gallons	diesel	Rupture, Leakage, Hose Failure, Overfill, Transfer Errors	80	80	Facility surface is flat. Any release will remain within the immediate flat area.	Spill kits, absorbent pads/materials available at the facility.
6	Mobile tanks at Quarry	mobile tank	120 gallons	new oil	Rupture, Leakage, Hose Failure, Overfill, Transfer Errors	120	120	Facility surface is flat. Any release will remain within the immediate flat area.	Spill kits, absorbent pads/materials available at the facility.
6	Mobile tanks at Quarry	mobile tank	120 gallons	new oil	Rupture, Leakage, Hose Failure, Overfill, Transfer Errors	120	120	Facility surface is flat. Any release will remain within the immediate flat area.	Spill kits, absorbent pads/materials available at the facility
6	Mobile tanks at Quarry	mobile tank	240 gallons	new oil	Rupture, Leakage, Hose Failure, Overfill, Transfer Errors	240	240	Facility surface is flat. Any release will remain within the immediate flat area.	Spill kits, absorbent pads/materials available at the facility.
6	Mobile tanks at Quarry	mobile tank	1,000 gallons	new oil	Rupture, Leakage, Hose Failure, Overfill, Transfer Errors	1,000	1,000	Facility surface is flat. Any release will remain within the immediate flat area.	Spill kits, absorbent pads/materials available at the facility.
6	Mobile tanks at Quarry	mobile tank	89 gallons	used oil	Rupture, Leakage, Hose Failure, Overfill, Transfer Errors	89	89	Facility surface is flat. Any release will remain within the immediate flat area.	Spill kits, absorbent pads/materials available at the facility.
16	Cooler Hydraulic Unit - 2nd Pier	plant tank	140 gallons	oil	Rupture, Leakage	140	140	Built in secondary containment. Immediate area is flat, and flow will remain in central area.	Built in secondary containment, spill kits, absorbent pads/materials available at the facility.

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Map Reference Number	Location/Description of Area	Tank Type	Tank Volume (gallon)	Tank Contents	Failure Type	Total Potential Spill Volume (gallons)	Potential Spill Rate (gal/hr)	Flow Direction	Secondary Containment Measures
17	Plant Auxiliary Generator- first pier lower level, east	built within generator	300 gallons	diesel	Rupture, Leakage, Hose Failure, Overfill, Transfer Errors	300	300	Built in secondary containment, and flow will remain within building.	Built in secondary containment, within building, and spill kits, absorbent pads/materials available at the facility.
18	Kiln grease receptacles at 1st Pier, east side	drums (55-gallon)	2 drums; 110 gallons	grease	Rupture, Leakage	55 to 110	55 to 110	Flow will remain within dirt berm area.	Bermed area and spill kits, absorbent pads/materials available at the facility.
19	Raw Mill Hydraulic Unit	built within unit	370 gallons	oil	Rupture, Leakage, Overfill, Transfer Errors	370	370	Flow will remain within secondary containment, and flow into a sump area within the building.	Built in secondary containment; sump area; and spill kits, absorbent pads/materials available at the facility.
20	Raw Mill Hydraulic Pumps - 2nd Level	built within unit	66 gallons	oil	Rupture, Leakage, Overfill, Transfer Errors	66	66	Flow will remain within secondary containment, and flow into a sump area within the building.	Built in secondary containment; sump area; and spill kits, absorbent pads/materials available at the facility.
20	Raw Mill Hydraulic Pumps - 2nd Level	built within unit	46 gallons	oil	Rupture, Leakage, Overfill, Transfer Errors	46	46	Flow will remain within secondary containment, and flow into a sump area within the building.	Built in secondary containment; sump area; and spill kits, absorbent pads/materials available at the facility.
21	Coal Mill Hydraulic Unit	built within unit	50 gallons	oil	Rupture, Leakage, Overfill, Transfer Errors	50	50	Flow will remain in the immediate flat area.	Spill kits, absorbent pads/materials available at the facility.
22	1st Pier - 2nd level storeroom, east side	drums (30-gallons)	30 drums; 900 gallons	grease	Rupture, Leakage, Overfill, Transfer Errors	30 to 900	30 to 900	Flow will remain within room and threshold at door.	Containment by room; and spill kits, absorbent pads/materials available at the facility.
23	Finish Mill #3 Electrical Room	drums (30-gallons)	20 drums; 150 gallons	grease	Rupture, Leakage, Overfill, Transfer Errors	30 to 900	30 to 900	Flow will remain within room and threshold at door.	Containment by room; and spill kits, absorbent pads/materials available at the facility.
28	Finish Mill #3 Slide Shoe	steel box	180 gallons	oil	Rupture, Leakage, Overfill, Transfer Errors	180	180	Flow will remain within building.	Containment in building; and spill kits, absorbent pads/materials available at the facility.

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Map Reference Number	Location/Description of Area	Tank Type	Tank Volume (gallon)	Tank Contents	Failure Type	Total Potential Spill Volume (gallons)	Potential Spill Rate (gal/hr)	Flow Direction	Secondary Containment Measures
28	Finish Mill #3 Symetro	steel box	25 gallons	oil	Rupture, Leakage, Overfill, Transfer Errors	25	25	Flow will remain within building.	Containment in building; and spill kits, absorbent pads/materials available at the facility.
25	Finish Mill #3 Outside	transformer	476 gallons	non-PCB oil	Rupture, Leakage	476	476	Flow will remain within rock/sump containment.	Containment and spill kits, absorbent pads/materials available at the facility.
26	Group III Silo	transformer	337 gallons	non-PCB oil		337	337	Flow will remain within rock/sump containment.	Containment and spill kits, absorbent pads/materials available at the facility.
27	Finish Mill #1 Slide Shoe	steel box	575 gallons	oil	Rupture, Leakage, Overfill, Transfer Errors	575	575	Flow will remain within building and immediate flat area.	Contained within building and use of spill kits, absorbent pads/materials available at the facility.
27	Finish Mill #1 Symetro	steel box	450 gallons	oil	Rupture, Leakage, Overfill, Transfer Errors	450	450	Flow will remain within building and immediate flat area.	Contained within building and use of spill kits, absorbent pads/materials available at the facility.
28	Finish Mill #2 Slide Shoe	steel box	575 gallons	oil	Rupture, Leakage, Overfill, Transfer Errors	575	575	Flow will remain within building and immediate flat area.	Contained within building and use of spill kits, absorbent pads/materials available at the facility.
28	Finish Mill #2 Symetro	steel box	450 gallons	oil	Rupture, Leakage, Overfill, Transfer Errors	540	540	Flow will remain within building and immediate flat area.	Contained within building and use of spill kits, absorbent pads/materials available at the facility.

7.10 Containment Structures for Onshore Facilities - 112.7 (c)(1)

The facility uses several different types of preventative systems to contain oil and prevent discharged oil from reaching navigable waters. Table 7.9-1 presents specific information on the storage tanks including capacity, contents, and method of secondary containment.

7.11 Dikes and Berms - 112.7 (c)(1)(i)

Reference to Tables 5.3.1 and 7.9.1 identifies that certain tanks and containers utilize soil berms and door-threshold lips (located at entrance/exits of buildings) as containment structures.

7.12 Curbing - 112.7 (c)(1)(ii)

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Reference to Tables 5.3.1 and 7.9.1 identifies that certain tanks and containers utilize concrete curbing as containment structures.

7.13 Drainage Systems - 112.7 (c)(1)(iii)

The facility does not employ drainage systems as "front line" containment structures. However, as a final safe guard, facility-wide drainage is designed for on-site containment if a structure failure would necessitate it.

7.14 Weirs, Booms or Other Barriers - 112.7 (c)(1)(iv)

Absorbent material such as clean soil from the quarry is available for use as a barrier/sorbent material if a spill/release were to occur during loading and unloading operations of the fuel tanks, used oil tank, and lube oil tanks. Equipment is available at the facility to move clean soil to spill locations, if necessary.

7.15 Spill Diversion and Retention Ponds - 112.7 (c)(1)(v)&(vi)

The facility drains towards detention basins if all other containment procedures fail. The detention basins are designed to prohibit material from leaving the site.

7.16 Sorbent Materials - 112.7 (c)(1)(vii)

Generally, permanent secondary containment structures provide more than adequate spill containment for tanks and drums. Generally sorbent materials are used for cleanup of minor spills and leaks that may occur during loading and unloading operations.

Placement of the amount of and types of sorbent materials was determined based on risk level posed by various tanks. The main sorbent storage areas are: the oil storage house, the store room, and under the number one pier. Additionally, smaller quantities of sorbent materials are kept at various locations throughout the plant.

7.17 Containment Structures for Offshore Facilities - 112.7 (c)(2)

No offshore facilities are associated with the Devil's Slide Plant.

7.18 Impractical Secondary Containment and Diversionary Structures - 112.7 (d)

Secondary containment or diversionary structures are provided as required in 40 CFR 112.7(c) regarding secondary containment for equipment and 40 CFR 112.7 (h)(1) regarding secondary containment for tank truck load/unload areas. Because that secondary containment is provided, the requirements of 40 CFR 112.7(d) do not apply.

7.19 Inspections, Tests, and Records - 112.7 (e)

Visual inspections of tanks and dispensing pumps are conducted quarterly as triggered by the computerized maintenance schedule program (i.e., SAP). Inventory records are maintained. Records are required to be developed and retained on site for three years. SPCC records are kept in the Environmental Managers Office. Records are kept on SPCC forms DS.03.009B (Plant SPCC and SWP3 Monthly Inspection Form) and DS.03.009C (Quarry SPCC and SWP3 Monthly Inspection Form).

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7.20 Personnel Training - 112.7 (f)(1)

Spill prevention and response training is provided to Holcim personnel with oil handling responsibilities. The training program is designed to minimize the potential for oil spills by instructing personnel in proper operation and maintenance of equipment to prevent discharge of oil. Personnel are trained to understand the importance of and their role in meeting Holcim's commitment to compliance with environmental and pollution control laws. Critical personnel for SPCC training include the Plant Manager, the Production Manager, the Maintenance Manager, the Maintenance Planner, both Maintenance Supervisors, and Mechanical Maintenance personnel, and Shift Maintenance personnel.

7.21 Responsible Person - 112.7 (f)(2)

The Environmental Manager is responsible for coordinating spill prevention programs and activities and for communicating SPCC procedures to the appropriate supervisors at the facility. Supervisors are responsible for communicating SPCC procedures to their appropriate personnel.

7.22 Spill Prevention Briefings - 112.7 (f)(3)

Spill prevention briefings are conducted periodically, at a minimum of once per year, to assure adequate understanding of the SPCC Plan by oil handling personnel. Those briefings are intended to highlight and describe known spill events or failures, malfunctioning components, and recently developed precautionary measures.

Devil's Slide will keep a log of those meetings, including topics reviewed and attendance of the briefings. From DS.05.005 (Training Sign In Form) will be used to record that information. These forms will be maintained at the facility for a minimum of three years.

7.23 Security Requirements - Fences - 112.7 (g)(1)

A perimeter fence secures most of the Devil's Slide facility boundary. To the north, northwest, and northeast of the facility, steep terrain provides a natural barrier to the facility. The site is protected by the perimeter fence and the presence of employees throughout the site. The facility is operated 24-hours per day and personnel are on-site to observe and prevent any unauthorized entry.

7.24 Valve Locks - 112.7 (g)(2)

There are no drain valves that would permit direct outward flow of the contents of any tank.

7.25 Starter Control Locks - 112.7 (g)(3)

Electrical pumps are used for fuel transfers at the facility. The facility is attended 24-hours per day, 7 days a week; however, in the unlikely event that no personnel are at the facility, the electrical power to the pumps will be shut down or a key lock will be in place.

7.26 Loading/Unloading Connections - 112.7 (g)(4)

The loading/unloading connections of all oil transfer piping are securely capped when not in service or in standby service for an extended period of time. All loading/unloading connections are located on the top of the tanks so fluid contents must be pumped to be removed.

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7.27 Facility Lighting - 112.7 (g)(5)

Since the Facility operates 24-hours a day, lights are located throughout the property to aid in operations. Facility lighting is sufficient for the discovery of spills occurring during the hours of darkness or prevention of spills occurring through acts of vandalism.

7.28 Facility Tank Truck Loading/Unloading - 40 CFR 112.7 (h)

The driver of the tank truck is responsible for safety and spill prevention during tank truck loading/unloading at the facility. Holcim personnel monitor tank inventory based upon usage experience and order quantities accordingly. Order quantities are less than the available capacity in the tank. Upon completion of the transfer the truck driver must verify proper disconnect and inspect the vehicle to ensure drains, valves, and hose connections are closed and not leaking.

7.29 Spill Containment System - 112.7 (h)(1)

In the event that secondary containment procedures fail, the spill would flow toward and into the detention basins. Spill kits and sorbent materials are located throughout the facility. The quarry/facility has a surplus of clean soil which can be moved with on-site equipment to contain a spill/release. If a spill/release could not be contained by secondary containments, sorbent materials, and/or clean soil, the facility also has the detention basins which serve as the final method to contain a spill/release.

7.30 Warning Devices - 112.7 (h)(2)

Warning signs will be posted in loading/unloading areas to remind the driver to

- Use wheel chocks,
- Completely disconnect transfer lines before departure, and
- Examine all vehicle tank drain and hose connection outlets for leakage prior to departure.
- Truck drivers/operators are present during oil transfer operations.

7.31 Drain Examination - 112.7 (h)(3)

Prior to tank truck departure, drivers must closely examine all tank drain and hose connection outlets for leakage, and if necessary, tighten, adjust, or replace drain and hose connection outlets to prevent liquid leakage during transit.

7.32 Brittle Fracture Failure - 112.7 (i)

There are no known field-constructed aboveground containers to which SPCC rules are applicable at this facility so this section is not applicable (The water tank is a field-constructed aboveground container, but does not contain SPCC-regulated materials).

7.33 Conformance with Applicable Requirements - 112.7 (j)

Holcim will continue to comply with applicable requirements of the SPCC Rules.

8. SPCC REQUIREMENTS FOR ONSHORE FACILITIES- 40 CFR 112.8

As an onshore facility, Holcim must meet the general requirements listed under 40 CFR 112.7 presented above and the specific discharge prevention and containment procedures listed under 40 CFR 112.8.

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8.1 Facility Drainage from Diked Storage Areas - 112.8 (b)(1)

Refer to Section 7.11.

8.2 Flapper-Type Drain Valves - 112.8 (b)(2)

This facility does not use flapper-type drain valves.

8.3 Drainage from Undiked Areas - 112.8 (b)(3)

This section requires drainage from undiked areas with a potential for a discharge to flow to detention basins, ponds, lagoons, or catch basins. The terrain at the facility is specifically contoured to ensure that if, in the unlikely event that a spill was not contained by secondary containment measures, the material would flow into the detention basins (refer to Section 7.9).

8.4 Drainage Diversion System - 112.8 (b)(4)

This section requires, for facilities that do not meet 40 CFR 112.8 (b)(3) above, a drainage diversion system on all drainage ditches in the facility. The diversion system would be designed to retain oil in the facility. The Devil's Slide facility utilizes detention basins and surface drainage at the facility as an adequate means and methods from preventing a discharge of oil from the facility. The facility is not required to install a drainage diversion system.

8.5 Drainage System Design - 112.8 (b)(5)

Drainage systems have been designed to prevent a discharge in the event of equipment failure or human error at the facility. Holcim reports that all surface drainage enters the detention basins designed for a 10-year, 24-hour storm event and that the surface water runoff which enter the detention basins infiltrates into the ground and/or evaporates. Except when the capacity of the retention basis is exceeded by a 10-year storm, 24-hour event, discharge does not leave the facility.

8.6 Materials of Construction and Compatibility - 112.8 (c)(1)

Storage tank construction and materials are compatible with the pressure and temperature conditions and the material stored. Storage tanks operate at ambient pressure and temperature. Tank information is provided in Table 5.3-1.

8.7 Secondary Containment - 112.8 (c)(2)

As indicated in Table 5.3.1 storage tanks and other containers at the facility either have adequate secondary containment and/or on-site detention basins to prevent any potential off-site movement of oil.

8.8 Underground and Partially Buried Storage Tanks - 112.8 (c)(5 & 6)

Holcim reports that underground storage tanks are not present at the facility.

8.9 Inspections and Integrity Testing of Aboveground Tanks - 112.8 (c)(6)

Operating personnel visually inspect tanks on a quarterly basis for signs of deterioration or leaks that may lead to a spill and for accumulation of oil inside the secondary containment. Tank inspections include

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testing of tank level monitors (as applicable) and inspecting secondary containment to detect accumulation of product inside the secondary containment or any decrease in secondary containment capacity due to rain, snow, or ice buildup.

Visual inspections of tanks and dispensing pumps are conducted quarterly as triggered by the computerized maintenance schedule program (i.e., SAP). Inventory records are maintained. Records are kept on forms DS.03.009B (Plant SPCC and SWP3 Monthly Inspection Forms) and DS.03.009C (Quarry SPCC and SWP3 Monthly Inspection Forms). Records of inspections will be maintained at the facility for a minimum of three years.

8.10 Internal Heating Coils - 112.8 (c)(7)

Internal heating coils are not utilized at the facility.

8.11 Fail Safe Engineering - 112.8 (c)(8)

Oil and fuel tanks are directly filled by a supply vehicle parked in close proximity. Sight gauges are provided for some of the tanks/containers to aid direct fill-level information to the operator during transfers.

8.12 Effluent Treatment Facilities - 112.8 (c)(9)

Secondary containment areas and oil related work areas are not connected to sanitary or storm sewers. Process wastewater effluent is not discharged from the facility.

8.13 Corrective Action for Visible Oil Leaks - 112.8 (c)(10)

Visible oil leaks from tanks and ancillary facilities are reported and corrected as soon as practicable after they are detected.

8.14 Mobile or Portable Oil Storage Tanks - 112.8 (c)(11)

Table 5.3.1 identifies several mobile tanks associated with the quarry activities. The tanks contain gasoline, diesel, lube oils, and waste oils. The mobile tanks are moved throughout the quarry and facility to service equipment. Proper use includes making sure that servicing of equipment is performed in flat areas such that if a release were to occur, it could be readily contained.

8.15 Facility Transfer Operations - 112.8 (d)

Facility transfer operations occur using dedicated pumps and hoses for fuel transfers. Lube oils are loaded with dedicated pumps and hoses and are gravity drained.

8.16 Buried Piping Installations - 112.8 (d)(1)

Buried piping is not known to be associated with any of the tanks and other containers at the facility.

8.17 Idle Pipelines - 112.8 (d)(2)

There is no known idle piping at the facility. If an oil pipe is removed from service for an extended time it is either completely removed or, if left in place, the ends are capped and labeled.

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8.18 Pipe Supports - 112.8 (d)(3)

Holicim reports that all oil pipe support racks at this facility are properly designed.

8.19 Piping Inspections - 112.8 (d)(4)

Holcim employees conduct periodic inspections of above ground valves, piping and appurtenances to assess their general condition. Periodic inspections conducted by Holcim employees are recorded on forms DS.03.009B (Plant SPCC and SWP3 Monthly Inspection Form) and DS.03.009C (Quarry SPCC and SWP3 Monthly Inspection Form). Records of inspections will be maintained at the facility for a minimum of three years.

8.20 Vehicular Traffic - 112.8 (d)(5)

Storage tanks and other containers are located out of traffic areas related to railcars, trucks and personnel vehicles. There is no known piping in vehicle traffic areas.

9. ADDITIONAL SPCC REQUIREMENTS - 40 CFR 112.9 – 40CFR 112.15

Due to the nature of plant operations, requirements of 40 CFR 112.9 through 112.15 do not apply.

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10. DOCUMENT REVISIONS

Revision Number	Date	Major Edits
0	July 9, 2004	An SPCC Plan was originally prepared for the Devil's Slide facility, and dated July 9, 2004.
1	July 9, 2007	The SPCC Plan was updated and certified by a registered professional engineer.

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Appendix 1: Facility Plot Plans

See attached 11x17 Appendix 1 Facility Plot Plan with Oil Storage Locations

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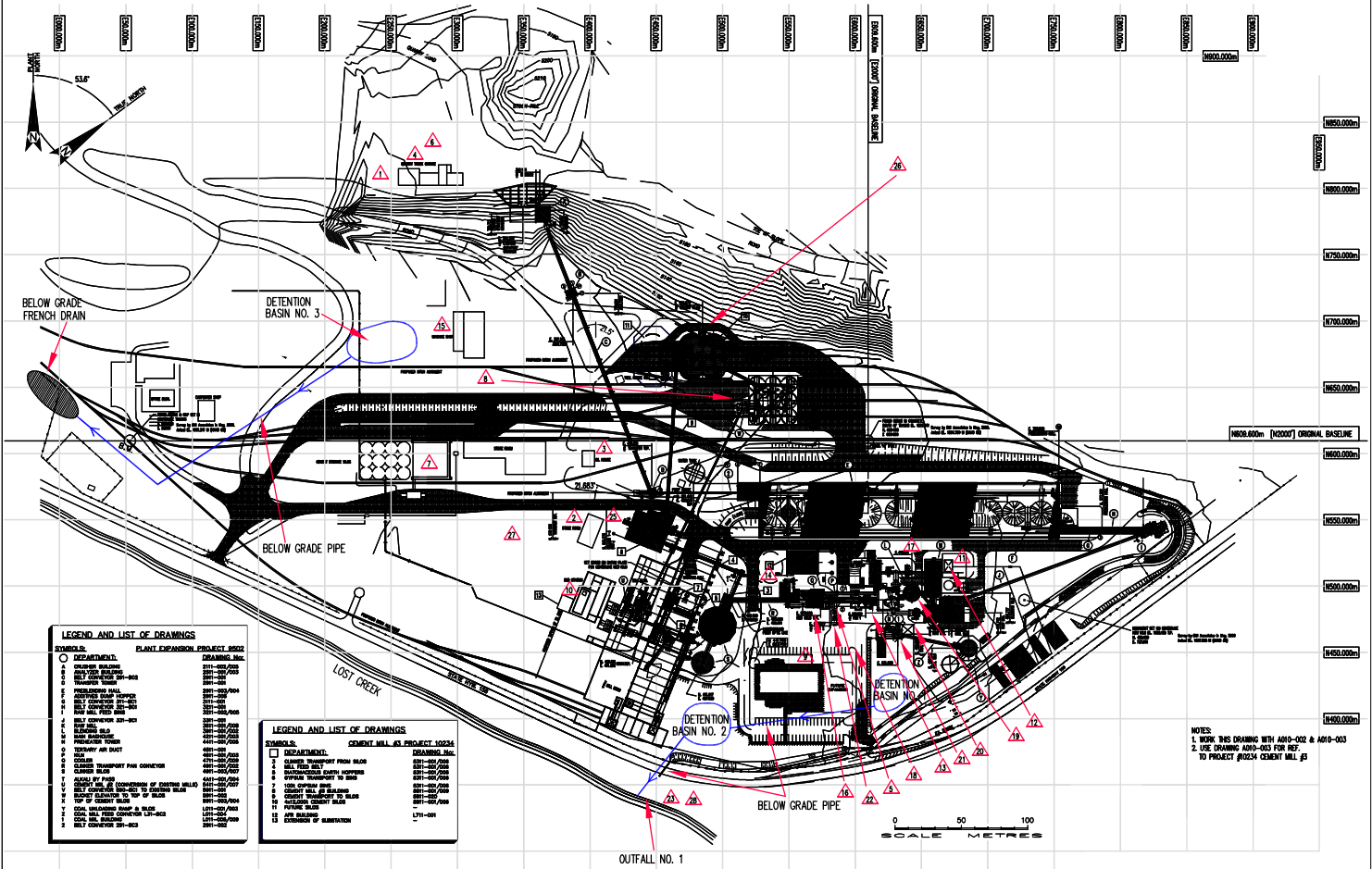

LEGEND AND LIST OF DRAWINGS

SYMBOLS: PLANT EXPANSION PROJECT 9502

	DEPARTMENT:	DRAWING No.
A	CRUSHER BUILDING	2311-002/003
B	ANALYZER BUILDING	2311-002/003
C	BELT CONVEYOR 301-BC3	2311-002
D	TRANSFER TOWER	2311-002/004
E	PROPORTIONING SILO	2311-002/004
F	ADDITIVES SURGE HOPPER	2311-002
G	BELT CONVEYOR 321-BC1	2311-002
H	BELT CONVEYOR 321-BC2	2311-002
I	RAW MILL FEED BINS	2311-002/005
J	BELT CONVEYOR 331-BC1	2311-002
K	RAW MILL	2311-002/006
L	BLENDING SILO	2311-002/006
M	MAIN BAGHOUSE	2311-002/005
N	PREHEATER TOWER	2311-002/007
O	TERTIARY AIR DUCT	2311-002
P	KILN	2311-002
Q	CLINKER	2311-002/005
R	CLINKER TRANSPORT PAN CONVEYOR	2311-002/005
S	CLINKER SILOS	2311-002/007
T	ALKALI BY PASS	2311-002/004
U	CEMENT MILL #2 (CONVERSION OF EXISTING MILL#2)	2311-002/007
V	BELT CONVEYOR 3301-BC1 TO EXISTING SILOS	2311-002
W	BUCKET ELEVATOR 10 TOP OF SILOS	2311-002
X	TOP OF CEMENT SILOS	2311-002/004
Y	COAL UNLOADING RAMP & SILOS	L211-002/003
Z	COAL MILL FEED CONVEYOR L31-BC2	L211-002/004
1	COAL MILL BUILDING	L211-002/009
2	BELT CONVEYOR 291-BC3	2311-002

LEGEND AND LIST OF DRAWINGS

SYMBOLS: CEMENT MILL #3 PROJECT 10234

	DEPARTMENT:	DRAWING No.
3	CLINKER TRANSPORT FROM SILOS	2311-002/005
4	CLINKER SILOS	2311-002/005
5	SHACKLEFORD EARTH HOPPERS	2311-002/005
6	GYPSUM TRANSPORT TO SILOS	2311-002/005
7	GYPSUM SHED	2311-002/005
8	CEMENT MILL #3 BUILDING	2311-002/005
9	CEMENT TRANSPORT TO SILOS	2311-002
10	4x12,000t CEMENT SILOS	2311-002/006
11	FUTURE SILOS	-
12	APR BUILDING	L211-001
13	EXPANSION OF SUBSTATION	-

NOTES:
1. WORK THIS DRAWING WITH A010-002 & A010-003
2. USE DRAWING A010-003 FOR REF. TO PROJECT #10234 CEMENT MILL #3

NOTE 1: FACILITY PLOT PLAN, BASE MAP PROVIDED BY HOLCIM ON 6/5/2007.

NOTE 2: DETENTION BASIN 1 AND DETENTION BASIN 2 REPORTED BY HOLCIM ENVIRONMENTAL MANAGER ARE DESIGNED FOR A 10-YEAR, 24-HOUR STORM EVENT WITH OVERFLOW PIPED FOR DISCHARGE INTO LOST CREEK, OUTFALL NO. 1.

NOTE 3: DETENTION BASIN 3 REPORTED BY HOLCIM ENVIRONMENTAL MANAGER IS DESIGNED FOR A 10-YEAR, 24-HOUR STORM EVENT WITH OVERFLOW PIPED FOR DISCHARGE INTO A BELOW GRADE FRENCH DRAIN.

NOTE 4: OIL STORAGE LOCATIONS OBSERVED DURING 6/5/07 SITE VISIT.

NOTE 5: OIL QUANTITIES ARE BASED ON INFORMATION PROVIDED BY HOLCIM DEVIL'S SLIDE ENVIRONMENTAL MANAGER.

NOTE 6: OIL STORAGE LOCATIONS ARE APPROXIMATE AND QUANTITIES CHANGE WITH FACILITY OPERATIONS.

NOTE 7: OVERALL SITE DRAINAGE IS GENERAL FLAT WITH FINAL DRAINAGE WHICH ENTERS DETENTION BASINS 1, 2, AND 3.

F:\RM106\H\Holcim-Devils Slide Plant\0067447\CAD\FIG1 FACILITY PLOT PLAN.dwg

LEGEND

Figure Reference Number	Location/Description of Area	Tank Type	Tank Volume (gallon)	Tank Contents	Secondary Containment
1	Quarry Fuel Tank Area	AST	10,000 gallons	Diesel	Concrete secondary containment (31' x 21' x 4')
1	Quarry Fuel Tank Area	AST	10,000 gallons	Diesel	Concrete secondary containment (31' x 21' x 4')
2	Fuel station west of finish mill	AST	2,500 gallons	Gasoline	Concrete secondary containment (19' x 9' x 40')
2	Fuel station west of finish mill	AST	900 gallons	Diesel	Concrete secondary containment (19' x 9' x 40')
3	Oil Storehouse	drums (30 - 55 gallons)	90 drums (250 gallons)	Oil	No Secondary Containment but located in building
3	Oil Storehouse	cans (5-gallons)	15 cans (75 gallons)	Kerosene, gasoline, and oil	No Secondary Containment but located in building
3	Oil Storehouse	cans (1-gallon)	20 cans (20 gallons)	paint	No Secondary Containment but located in building
3	Oil Storehouse - outside, north side	portable tank	340 gallons	used oil	Dirt berm containment with metal entrance/exit ramp/thresholds.
3	Oil Storehouse - outside, north side	portable tank	340 gallons	used oil	Dirt berm containment with metal entrance/exit ramp/thresholds.
3	Oil Storehouse - outside, north side	portable tank	700 gallons	used oil	Dirt berm containment with metal entrance/exit ramp/thresholds.
3	Oil Storehouse - outside, north side	drums (55-gallons)	6 - 10 drums (550 gallons)	used grease	Dirt berm containment with metal entrance/exit ramp/thresholds.
4	Quarry Garage	drums (55-gallon)	15 drums (1,400 gallons)	transmission, oil, kerosen, antifreeze, enviroclean	No Secondary Containment but located in building
4	Quarry Garage	units (295-gallons)	3 units (894 gallons)	oil	No Secondary Containment but located in building
4	Quarry Garage	units (125-gallons)	1 unit (125 gallons)	oil	No Secondary Containment but located in building
4	Quarry Garage	cans (5-gallons)	3 cans (15 gallons)	kerosene	No Secondary Containment but located in building
4	Quarry Garage	buckets (5-gallon)	3 buckets(25 gallons	brake cleaner	No Secondary Containment but located in building
5	Oil room - 1st Pier, north side	drums (55-gallons)	5 drums (275 gallons)	oil	No Secondary Containment but located in building
5	Oil room - 1st Pier, north side	containers (55-gallons)	9 containers (660 gallons)	oil	No Secondary Containment but located in building
15	Machine Shop	drums (55-gallons)	5 drum (275 gallons)	oil	No Secondary Containment but located in building
15	Machine Shop	drums (55-gallons)	2 drum (110-gallons)	kerosene	No Secondary Containment but located in building
15	Machine Shop	drums (55-gallons)	1 drum (55-gallons)	enviro solvent	No Secondary Containment but located in building
15	Machine Shop	cans (1-gallon)	20 can (20-gallon)	paints	No Secondary Containment but located in building
7	Packhouse - compressor room in basement	drums (55-gallons)	4 drums (220 gallons)	oil	contained in basement
9	Generator on north side of office	built within generator	22 gallons	diesel	Built in secondary containment
9	Generator on north side of office	above within generator	< 1 gallon	sulfuric acid battery	Built in secondary containment
10	Electrical substation west of Finish Mill	transformer	2,500 gallons	non-PCB oil	Secondary containment with concrete/soil berm
10	Electrical substation west of Finish Mill	transformer	1,603 gallons	non-PCB oil	Secondary containment with concrete/soil berm
10	Electrical substation west of Finish Mill	reactors	3 reactors (750 gallons)	non-PCB oil	Secondary containment with concrete/soil berm
10	Electrical substation west of Finish Mill	capacitor	18 capacitor (18 gallons)	non-PCB oil	Secondary containment with concrete/soil berm
11	Main Substation - east of baghouse	transformer	2,850 gallons	non-PCB oil	Surface rock bioaliving cell containment
11	Main Substation - east of baghouse	LTC tank	199 gallons	non-PCB oil	Surface rock bioaliving cell containment
11	Main Substation - east of baghouse	capacitor	24/24 gallons	non-PCB oil	Surface rock bioaliving cell containment
12	Main Substation - east of baghouse	transformer	253 gallons	non-PCB oil	rock oil with sump secondary containment
12	Main Substation - east of baghouse	transformer	370 gallons	non-PCB oil	rock oil with sump secondary containment
12	Main Substation - east of baghouse	transformer	350 gallons	non-PCB oil	rock oil with sump secondary containment
13	Transformer Station - Preheater Tower, south side	transformer	225 gallons	non-PCB oil	rock oil with sump secondary containment
13	Transformer Station - Preheater Tower, south side	transformer	350 gallons	non-PCB oil	rock oil with sump secondary containment
14	Cooler substation transformer	transformer	310 gallons	non-PCB oil	Secondary containment present
6	Mobile tanks at Quarry	mobile tank	2,500 gallons	diesel	No secondary containment
6	Mobile tanks at Quarry	mobile tank	800 gallons	diesel	No secondary containment
6	Mobile tanks at Quarry	mobile tank	125 gallons	diesel	No secondary containment
6	Mobile tanks at Quarry	mobile tank	90 gallons	diesel	No secondary containment
6	Mobile tanks at Quarry	mobile tank	2,500 gallons	diesel	No secondary containment
6	Mobile tanks at Quarry	mobile tank	125 gallons	diesel	No secondary containment
6	Mobile tanks at Quarry	mobile tank	90 gallons	diesel	No secondary containment
6	Mobile tanks at Quarry	mobile tank	120 gallons	new oil	No secondary containment
6	Mobile tanks at Quarry	mobile tank	120 gallons	new oil	No secondary containment
6	Mobile tanks at Quarry	mobile tank	240 gallons	new oil	No secondary containment
6	Mobile tanks at Quarry	mobile tank	1,000 gallons	used oil	No secondary containment
6	Mobile tanks at Quarry	mobile tank	89 gallons	used oil	No secondary containment
16	Cooler Hydraulic Unit - 2nd Pier	plant tank	140 gallons	oil	Built in secondary containment
17	Plant Auxiliary Generator- first pier lower level, east	built within generator	300 gallons	diesel	Built in secondary containment, in building
18	Kiln grease receiver/silo at 1st Pier, east side	drums (55-gallon)	2 drums (110 gallons)	grease	Wood drum with a plastic overpack container.
19	Raw Mill Hydraulic Unit	built within unit	370 gallons	oil	Built in secondary containment, within hole
20	Raw Mill Hydraulic Pumps - 2nd Level	built within unit	66 gallons	oil	Built in secondary containment, within hole
20	Raw Mill Hydraulic Pumps - 2nd Level	built within unit	46 gallons	oil	Built in secondary containment, within hole
21	Coal Mill Hydraulic Unit	built within unit	90 gallons	oil	No secondary containment
22	1st Pier - 2nd level storeroom,	drums (30-gallons)	30 drums (900 gallons)	grease	Contained by walls and 1" threshold at doors.
23	Finish Mill #2 Electrical Room	drums (30-gallons)	20 drums (150 gallons)	grease	Contained by walls and door.
28	Finish Mill #3 Slide Shoe	steel box	180 gallons	oil	Contained within building
28	Finish Mill #3 Symetro	steel box	25 gallons	oil	Contained within building
25	Finish Mill #3 Outside	transformer	476 gallons	non-PCB oil	Secondary containment
25	Finish Mill #3 Outside	transformer	337 gallons	non-PCB oil	Secondary containment
26	Group III Silo	transformer	337 gallons	non-PCB oil	Secondary containment
27	Finish Mill #1 Slide Shoe	steel box	575 gallons	oil	Contained within building
27	Finish Mill #1 Symetro	steel box	450 gallons	oil	Contained within building
28	Finish Mill #2 Slide Shoe	steel box	575 gallons	oil	Contained within building
28	Finish Mill #2 Symetro	steel box	450 gallons	oil	Contained within building

1 OIL STORAGE LOCATION

REVISION	DESCRIPTION	DATE

N W E S

Environmental Resources Management
6455 S. Yosemite St.
Suite 900
Greenwood Village, Colorado 80111-4954
ERM (303) 741-8850

HOLCIM DEVILS SLIDE PLANT
MORGAN, UTAH

APPENDIX 1
FACILITY PLOT PLAN WITH OIL STORAGE LOCATIONS

DESIGNED	CB
DRAWN	MJ
CHECKED	
DATE	Jul 05, 2007
TIME	1:55 pm

FIGURE

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December 10, 2008
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Appendix 2: Devil's Slide Response Plan

SPILL RESPONSE PLAN

1. The person(s) on site at the time of the spill will begin countermeasure actions and commit the company's resources as necessary to mitigate and clean up the spill.

2. The source of the spill will be identified and the flow of material stopped if this action poses no danger to personnel. If a drum or container is leaking, the drum will be righted and container contents will be transferred to another drum. If a transfer hose or pipeline is ruptured or becomes disconnected the pumps will be turned off and the valves will be closed.

3. Absorbent material or pads will be applied to the spill or the spill will be surrounded by absorbent material or absorbent socks / booms or material from our rock storage piles. Shovels, brooms or such equipment as necessary will be used to collect any spent absorbent. The spent absorbent material, pads and or socks will be placed into a drum designed for this use. Any free oil will be placed in a separate drum or container.

4. Subsequent to the facilities personnel actions to stop the source of the spill and prevent or minimize the impact of the spilled material on the environment, proper notifications, as necessary, will be given to the appropriate agencies listed in Section IV.

5. Once the spill has been controlled and materials collected and secured the person responsible for implementing the plan will inspect the area for cleanliness and will undertake decontamination of spill or personal protective equipment, if necessary. This person will also be responsible for subsequently managing and disposing of the collected material in accordance with applicable federal and state environmental regulations.

6. For any spill greater than the reportable quantity (see Section 5.1 and 7.8) or 42 gallons, whichever is less, this plan shall be implemented and proper records of action shall be kept on-site per this SPCC Plan.

7. Spill cleanup equipment is located in the following areas: Quarry Drum Oil storage area, Mill Drum Oil storage area, Storeroom Drum Oil storage area, and absorbent material are located near all small drum storage areas. Clean soil from the quarry area may be mobilized with on-site equipment and used as additional sorbent material

8. The following is a list of the spill equipment on site:
   a. Spill response equipment capable of containing a spill of at least 42 gallons. This equipment includes absorbent spill pads, socks, or booms.

   b. An adequate number of gloves, boots and personal protective equipment.

   c. First aid kits are located in various areas in the quarry and mill and other plant locations.

   d. Eye wash stations are located near the major storage areas of the facility.

   e. Fire fighting equipment is located in various locations in the facility

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Appendix F

Vegetation and Soil Baseline Assessment
WP Natural Resource Consulting LLC (2005)

Five Star Engineers LLC
220 N 900 E
Hyde Park, Utah 84318
Tel: 435-881-5339
Issahamud@5starengineers.com

STATE OF UTAH. DEPARTMENT OF NATURAL RE .CES. DIVISION OF OIL. GAS AND MINING
355 WEST NORTH TEMPLE. 3 TRIAD CENTER. SUITE 350. SALT LAKE CITY. UTAH 84180-1203. TELEPHONE: (801) 538-5340

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MINERAL EXPLORATION DRILL HOLE PERMANENT ABANDONMENT FINAL REPORT FORM MR-9

PURSUANT TO THE TERMS OF RULE M-3(5) OF THE MINED LAND RECLAMATION ACT. ALL INFORMATION PROVIDED IN THIS REPORT SHALL BE PROTECTED AS CONFIDENTIAL INFORMATION BY THE DIVISION. THIS REPORT MUST BE FILED WITH THE DIVISION. AT LEAST ANNUALLY FOR EACH EXPLORATION PROJECT.

PROJECT NAME: Ideal Basic Industries, Devil's Slide

COUNTY: Morgan

DOGM EXPLORATION FILE # EXP/ /

DRILL HOLE ID NUMBER	LOCATION TOWNSHIP & RANGE	SEC.	1/4 SEC.	DRILLING MEDIUM*	HOLE DEPTH	METHOD OF PLUGGING*	DATE DRILLED	DATE RESEEDED
1	T4N,R4E	19	NE	N/A	280 Feet	1	1953	
1A	T4N,R4E	19	SE		1000 Feet	1	1953	
2	T4N,R4E	19	NE		296	1	1953	
3	T4N,R4E	19	SE		196	1	1953	
104	T4N,R4E	19	NE		595	1	May 15, 1969	
L-5	T4N,R4E	19	NE		120	1	Oct 4, 1978	
L-6	T4N,R4E	19	NE		20	1	Oct 4, 1978	
L-6A	T4N,R4E	19	NE		200	1	Oct 5, 1978	
L-7	T4N,R4E	19	NE		100	1	Oct 5, 1978	

*SEE LAST PAGE FOR GENERAL PLUGGING MEDIUM TYPES AND PLUGGING PROCEDURES.

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APPENDIX B

RECLAMATION COST ESTIMATE

	Operation	Amount	Rate	Cost
	A. CLEANUP			
1.	Removal of structures and equipment	Lot		$ 2,000
2.	Removal of trash and debris	Lot		500
3.	Leveling of ancillary facilities, pads, and access roads	51 hrs Dozer	140	7,140
	B. RE-GRADING AND RE-CONTOURING			
1.	Earthwork including haulage & grading of spoils, waste & overburden	129 hrs Dozer	140	18,060
2.	Re-contouring of highwalls and excavations	-		
3.	Spreading of soil or surficial materials	Incl. in B.1.		
	C. STABILIZATION			
1.	Soil Preparation, scarifications, fertilizations, etc.	Incl. in C.2.		
2.	Seeding and planting	78.7 Ac.	600	47,220
3.	Construction of terraces, waterbars, etc.	Lot		11,850
	D. LABOR			
1.	Supervision	120 hrs	30	3,600
2.	Labor exclusive of dozer time	80 hrs	20	1,600
	E. SAFETY			
1.	Erection of fences, portal coverings, etc.	-		
2.	Removal or neutralization of explosive or hazardous mat'ls.	-		
	F. MONITORING			
1.	Continuing or periodic monitoring, sampling, and testing deemed necessary	5 trips	200	1,000
	G. OTHER			
	TOTAL			$92,970

A Holdenbank Group Company

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RECLAMATION COST ESTIMATE CALCULATIONS

A.1. Powderhouse and Garage

(15 X 15 X 8)/27 + (25 X 33 X 12)/27 = 433 cu. yd.

433 cu. yd. X $4.60/cu. yd. = $1,992

A.2. Trash and Debris

100 cu. yd. X $4.85/cu. yd. = $485

A.3. Road Leveling

6.5 miles X 5,280 ft./mi. X 20 ft. X 1 ft./27 = 25,422 cu yd

25,422 cu. yd./494 cu. yd./hr = 51 hrs

B.1.&3. Grading Strip Areas

78.7 acres X 43,560 sq. ft./acre X 0.5 ft./27 = 63,485 cu yd

63,485 cu. yd./494 cu. yd./hr = 128.5 hours

C.1.&2. Preparation, Seeding, and Planting

$600/acre quote by Green Valley Reclamation

C.3. Channels (See Appendix D)

Earthwork 1,154 cu. yd. X $1.50/cu. yd. = $1,730

Rock (Filter & Rip Rap) 920 ton X $11/ton = $10,120

Total Earthwork and Rock = $11,850

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IDEAL

CATERPILLER D9L DOZER
OPERATING COST ESTIMATE

Fuel	17.0 gal./hr. @ $1.00/gal.		
Cost/Hr.			$17.00
Lube, Oil, Filters			$0.54
Undercarriage			
Basic Factor		$12.50	
Impact	0.2		
Abrasiveness	0.1		
"Z"	0.2		
Total	0.5		
Cost/Hr.			$6.25
Repair reserve			
Basic Factor		$10.00	
Extended Life Multiplier	1.10		
Cost/Hr.			$11.00
Special Wear Items			$2.50
Operator Wage			$18.00
Total Operator Cost/Hr.			$55.29
Owning Cost/Hr.			$41.00
Total O & O Cost/Hr.			$96.29
Contractor OH&P @ 45%			$43.33
Total Cost/Hr.			$139.62

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CATERPILLER D9L DOZER PRODUCTION

Production - 250'	690 cu. yd./hr.
Correction Factors	
Operator - Avg.	0.750
50 Min./Hr.	0.830
Favorable Grade	1.150
Total Correction Factor	0.716
CORRECTED PRODUCTION	494.040 cu yd/hr

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APPENDIX C

KILN DUST ANALYSIS

Sample #	86-276	86-277	86-278	87-18
Date of Sample	05/01/86	05/06/86	05/12/86	01/17-18/87
Cement Type	V	II	I	I
% SiO2	15.79	15.49	15.43	16.67
% Al2O3	3.71	3.65	3.53	3.70
% Fe2O3	2.61	2.08	2.08	1.33
% CaO	47.65	45.84	45.59	46.37
% MgO	2.09	2.12	2.09	2.40
% SO3 (Total)	3.06	4.38	3.80	3.75
% Na2O	0.48	0.61	0.58	1.06
% K2O	3.23	4.68	4.24	4.46
% Loss	20.40	20.39	21.76	19.92
% TiO2	0.17	0.19	0.14	0.17
% ZnO	0.04	0.09	0.08	0.03
% Mn2O3	0.04	0.03	0.03	0.03
% SrO	0.03	0.04	0.04	0.03
% P2O5	0.11	0.11	0.11	0.12
Total	99.59	99.70	99.49	100.04
% Free Lime	6.95	5.81	6.04	6.92
% Na2O *	0.28	0.43	0.37	0.58
% K2O *	2.40	3.70	3.27	3.26
% SO3 *	1.55	2.73	3.02	2.31
% Na2O Equivalent *	1.86	2.87	2.52	2.73

EP Toxicity Procedure (ppm)

		EPA Maximum Concentration				
As	ppm	5.0	0.002	0.001	0.002	<0.001
Ba	ppm	100.0	0.930	0.750	1.060	1.070
Cd	ppm	1.0	0.050	0.050	0.050	0.050
Cr	ppm	5.0	0.320	0.210	0.230	0.280
Pb	ppm	5.0	0.790	0.720	0.660	0.700
Hg	ppm	0.2	0.006	0.004	0.008	0.004
Se	ppm	1.0	0.002	0.001	0.001	0.001
Ag	ppm	5.0	0.090	0.090	0.080	0.080

* Note: Water Soluble Extract

March 11, 1987
IBI Production and Quality Services

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APPENDIX D

WATER RIGHTS

WUCNO: 35-8288 APPLICATION/CLAIM NO.: CERT. NO.: RUN DATE: 07/17/86 Page 1

OWNERSHIP**********

NAME: Union Portland Cement Company INTEREST: 100
ADDRESS:
CITY: STATE: UT ZIP CODE:

LAND OWNED BY APPLICANT? Yes

DATES, ETC.**********

Filing: 00/00/0000 Priority: 00/00/1883 Advertise Paper: Date: 00/00/0000 Protested? Approval: 00/00/0000
Proof Due: 00/00/0000 Ext Filed: 00/00/0000 Elec/Proof: Filed: 00/00/0000 Cert. or WUC Issued: 00/00/0000
Rej, Etc.: 00/00/0000

PD Book No. Status/Type of Right: DEC Source of Info: Map: Date Verified: 00/00/0000 Initials:
PD REMARKS REFERENCE -- Name: Interest: Flow: Type of Right: Priority: Source:

LOCATION OF WATER RIGHT**********

FLOW: 0.38 cfs SOURCE: Spring and Lost Creek
TRIBUTARY 1: Weber River TRIBUTARY 2:
COUNTY: Weber COMMON DESCRIPTION: DRAINAGE AREA: Weber River

POINTS OF DIVERSION -- SURFACE:
(1) N 1450 ft. W 1050 ft. from SE corner, Section 19, T 4N, R 4E, SLBM
Diverting Works: Pipeline Source: Lost Creek
(2) N 1800 ft. W 1200 ft. from SE corner, Section 19, T 4N, R 4E, SLBM
Diverting Works: Pipeline Source: Spring and Lost Creek

USES OF WATER RIGHT**********

CLAIMS USED FOR PURPOSE DESCRIBED: 286, 288
Referenced To: Claims Groups: Type of Reference -- Claims: Purpose: Remarks:

###IRRIGATION

	---NORTH EAST QUARTER---				*---NORTH WEST QUARTER---*				*---SOUTH WEST QUARTER---*				*---SOUTH EAST QUARTER---*				Section
Tot Irr. Acrg.: 10.00*	NE	NW	SW	SE *	NE	NW	SW	SE *	NE	NW	SW	SE *	NE	NW	SW	SE *	Totals
or a Total of .00 acres.				Sole Supply:				acres	Diversion Limit:								PERIOD OF USE: 03/01 TO 11/01

Point of diversion is in Secs. 19 & 20 T4N, R4E,SLB&M. Used to irrigate land inDevils Slide. Used for Irr. Dom.Stk. Used to irrigate 10 acs. of lawn.

###STOCKWATERING: 6 Equivalent Livestock Units Diversion Limit: PERIOD OF USE: 01/01 TO 12/31

###DOMESTIC: 400 Persons Diversion Limit: PERIOD OF USE: 01/01 TO 12/31

OTHER COMMENTS**********

Weber River Decree No.288
Not for official Use
Proposed Determination No. 340.5a Pg. 119

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APPENDIX E

DRAINAGE CALCULATIONS

STORM RUNOFF:

Quarry Hollow

	Sq. In.	Sq. In.	Acres	CN	AcxCN
HeG	1.74	278,400	6	80	480
KrG	8.44	1,350,400	31	80	2,480
LHG	20.94	3,350,400	77	80	6,160
StG	54.47	8,715,200	200	70	14,000
Rock	12.81	2,049,600	47	30	1,410
Total	98.40	15,744,000	361	68 *	24,530

Boneyard

HeG	9.60	1,536,000	35	80	2,800
StG	10.97	1,755,200	40	70	2,800
KrG	16.08	2,572,800	59	80	4,720
Refuse	3.59	574,400	13	97	1,261
Rock	27.17	4,347,200	100	30	3,000
Total	67.41	10,785,600	247	59 *	14,581

*Weighted CN

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CATCH BASINS:

Basin #	Depth	Width	Length	Volume Ft 3 X 1,000	Ac. Ft.
Quarry Hollow					
1	5	30	200	30.0	0.69
Bone Yard					
2	3	50	50	7.5	0.17
3	5	100	150	75.0	1.72
4	15	20	50	15.0	0.34
5	20	120	120	24.0	0.55
6	35	350	270	450.0	10.33
7	10	70	110	12.8	0.29
Total				584.3	13.40

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PEAK FLOW:

Assumptions

1. Precipitation 6 hour storm duration

10 year = 1.4"
50 year = 2.0"
100 year = 2.2" From Miller, et. al.

2. Type B Storm Distribution

	Hydraulic Length*	Elevation Change	Time of Concentration**
Quarry Hollow	1.924 miles	1,350 ft.	0.344
Boneyard	1.242 miles	790 ft.	0.255

Discharge***	Q 10 yr. 6 hour	Q 50 yr. 6 hour	Q 100 yr. 6 hour
Quarry Hollow	6.5 cfs	23.0 cfs	35.9 cfs
Bone Yard	<1.0 cfs	5.9 cfs	8.4 cfs

* From Attachment #5
** Kirpitch-s formula
*** SCS CN Methodology as in NEH4

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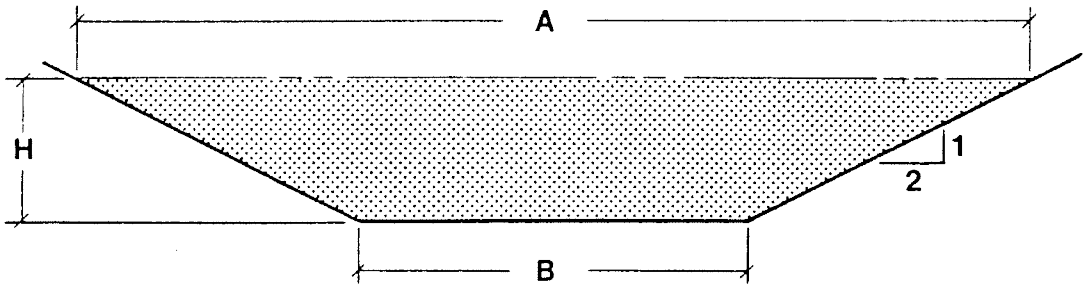
CHANNEL DESIGN:

Assumptions

1. Channel to have trapezoidal cross section with 2:1 side slopes.
2. Slope * S = 80/1,000 Quarry Hollow
   S = 110/400 Bone Yard
3. Roughness Coefficient ** N = 0.04

Quarry Hollow

B	H	A	Area	Wetted Perim.	R**	V**	Q
4'	8"	6.66'	3.56 Sq. Ft.	6.96'	.51	6.74 fps	24 cfs



V = 6.74 fps D50 = 7" Rip Rap plus 8" Filter Blanket

Quarry Hollow Length = 80/Sin Tan -1 0.08 = 1,003 feet

Bone Yard Length = 110/Sin Tan -1 0.275 = 415 feet

Use same design for both watersheds: Total Length = 1,418 feet.

Earthwork: 28/12(57+169)/2/12/27 X 1,418 = 1,154 cu. yd.

Rock: 7 X 20/12/27 X 1,418 = 613 cu. yd. ~920 ton

* From Attachment 1
** Mannings Equation

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Morgan

APPENDIX G
PRECIPITATION DATA FOR MORGAN
UTAH STATE CLIMATOLOGIST

Monthly Precipitation

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1981	.57	.66	2.44	.72	3.36	.77	.20	.11	1.04	3.47	.92	3.04	
1982	2.14	1.19	3.48	2.32	1.00	.55	2.14	.30	7.13	1.34	1.80	1.24	
1983	1.18	2.75	3.04	0.13	2.64	1.56	.75	2.12	1.05	2.25	3.71	5.76	
1984	.37	1.01	.97	2.01	2.40	3.06	1.76	1.44	3.01	3.12	3.03	1.29	
1985	.32	.92	1.99	.58	2.95	.74	.30	t	2.08	1.81	4.33	.98	
1986	1.66	6.88	2.04	4.50									

Greatest 24 hr. Precip. and Date

	Amt	Date	Amt	Date	Amt	Date	Amt	Date	Amt	Date	Amt	Date	Amt	Date	Amt	Date	Amt	Date	Amt	Date	Amt	Date
1981	.24	30	.26	26	.48	30	.23	19	.79	21	.41	3	.08	24+	.04	21+	.55	5	.90	16	.26	25	.64	30
1982	.40	1	.33	23	.33	4	1.02	12	.55	19	.28	7	.81	28	.10	27	1.61	10	.30	5	.85	19	.31	23
1983	.51	28	.87	8	.44	14	.76	25	.82	11	.76	1	1.36	9	.47	19	.82	27	.47	10	.65	13	1.25	7
1984	.10	26+	.52	16	.25	14	.46	9	.80	31	.96	5	.97	25	.87	16	1.32	6	.92	17	1.14	8	.28	19+
1985	.18	8	.25	20	.73	12	.38	22	1.07	10	.50	25	.13	30	.00	31	.58	12	1.02	7	.75	12	.34	3
1986	.52	6	1.87	17	.66	8	1.04	2																

RECORD OF RIVER AND CLIMATOLOGICAL OBSERVATIONS

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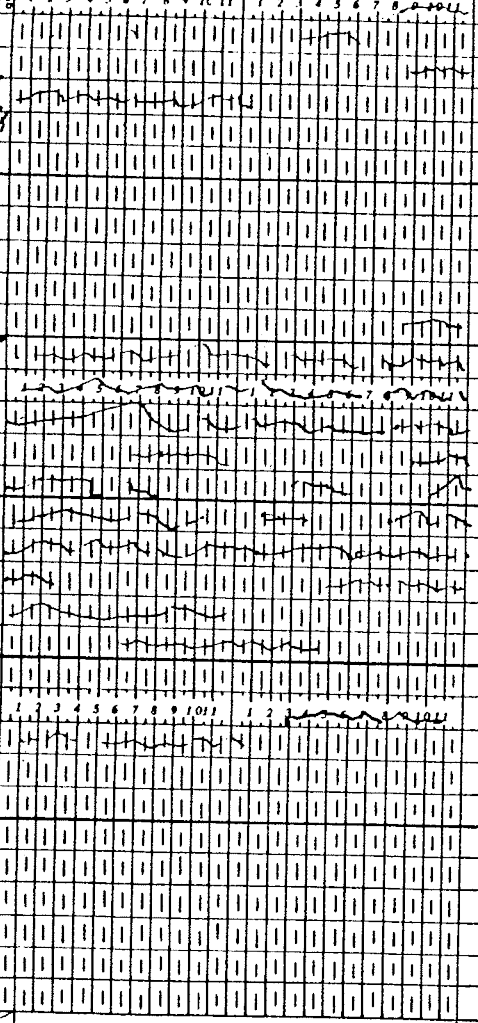
TIME (local) OF OBS: 4PM | TION RIVER | TEMP. 6PM: Morgan | PRECIPITATION 6PM | STANDARD TIME IN USE

TYPE OF RIVER GAGE | ELEVATION OF RIVER GAGE ZERO Ft. | FLOOD STAGE Ft. | NORMAL POOL STAGE Ft.

DATE	TEMPERATURE F. 24 HRS. ENDING AT OBSERVATION MAX.	MIN.	AT OBSN.	PRECIPITATION 24-HR AMOUNTS Rain, melted snow, etc. (inches and hundredths)	Snow, ice pellets, hail (inches and tenths)	At Ob. Snow, ice pellets, hail, ice on ground (inches)
1	39	25	36	.09		
2	45	26	39	T		
3	49	34	37	.47	8"	6"
4	42	32	32	T	T	5"
5	36	9	29			
6	35	17	25			
7	36	7	24			
8	38	12	26			
9	29	-6	24			
10	38	2	33			
11	34	19	29	.11	2"	4"
12	30	3	31	.06	1	4
13	42	20	40	1.49	3	4
14	45	29	41	.03	T	3
15	50	29	49	.23		1
16	48	34	42	.33		1
17	56	35	42	1.82		0
18	55	42	52	.21		0
19	54	33	45	.76		
20	47	33	35	.43	1"	1"
21	43	25	28	.06	2"	0
22	47	32	40	.09		0
23	50	36	45	.29		0
24	65	31	34			
25	65	29	58			
26	69	32	57			
27	63	30	59			
28	62	38	58			
29						
30						
31						
SUM				6.88	17"	
				Greatest		

Draw a straight line (——) through hours precipitation was observed, and a waved line (~~~) through hours precipitation probably occurred unobserved.

A.M. NOON P.M.



WEATHER (Calendar Day) — Mark 'X' for all types occurring each day.

DATE	Fog	Ice Pellets	Glaze	Thunder	Hail	Damaging Winds	Time of observation if different from above
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							
31							
SUM	Fog	Ice Pel.	Glaze	Thund.	Hail	Dam. Winds	

RIVER STAGE

DATE	CONDITION	GAGE READING AT ___ A.M.	TENDENCY
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			

REMARKS (Special observations, etc.)

Rain
Rain
Snow
"

Snow
"
" Rain
" Rain
Rain
Rain
Rain
Rain
Rain
Rain Snow
Snow
Rain
Rain

CONDITION OF RIVER AT GAGE

A. Obstructed by rough ice.
B. Frozen, but open at gage.
C. Upper surface of smooth ice.
D. Ice gorge above gage.
E. Ice gorge below gage.
F. Shore ice.
G. Floating ice.
H. Pool stage.

CHECK BAR (For wire-weight) NORMAL CK. BAR

READING	DATE

OBSERVER: Robert D Brinkley

SUPERVISING OFFICE

STATION INDEX NO.: 42 [illegible]

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TYPE OF RIVER GAGE | ELEVATION OF RIVER GAGE ZERO Ft. 6PM | 6PM | FLOOD STAGE Ft. | NORMAL POOL STAGE Ft.

RECORD OF RIVER AND CLIMATOLOGICAL OBSERVATIONS

TEMPERATURE F.			PRECIPITATION					WEATHER (Calendar Day)								RIVER STAGE			
24 HRS. ENDING AT OBSERVATION			24-HR AMOUNTS		At Ob.	Draw a straight line (——) through hours precipitation was observed, and a waved line (~~~) through hours precipitation probably occurred unobserved.		Mark 'X' for all types occurring each day.							Time of observation if different from above	CONDITION	GAGE READING AT ___A.M.	TENDENCY	REMARKS (Special observations, etc.,)
MAX.	MIN.	AT OBSN.	Rain, melted snow, etc. (ins. and hundredths)	Snow, ice pellets, hail (ins. and tenths)	Snow, ice pellets, hail on ground (ins.)	A.M.	NOON P.M.	Fog	Ice Pellets	Glaze	Thunder	Hail	Damaging Winds						
91	45	85																	
92	47	87																	
92	50	86																	
96	50	88																	
92	50	87																	
93	48	86																	
92	50	88	T																
88	56	83	.16																Rain Rain
91	49	84																	
92	52	86																	
90	45	88																	
89	45	86	.04																Rain
86	47	80																	
85	41	81																	
87	39	82																	
94	40	88																	
95	49	89																	
96	45	87																	
92	58	88																	
90	58	90	.13																
91	55	75	2.30																Rain 1' 11
81	54	77	.04																
87	52	79	.01																
81	53	77																	
86	50	85																	
95	52	84																	
96	50	87																	
89	54	79	.01																
83	53	78																	Rain
85	52	81	.05																
86	53	86																	Rain
		SUM	2.64																
		Greatest																	

CHECK BAR (For wire-weight) NORMAL CK. BAR

READING	DATE

Fog	Ice Pel.	Glaze	Thund.	Hail	Dam. Winds	SUM

OBSERVER Robert Bradley

SUPERVISING OFFICE

STATION INDEX NO. 0

TION OF RIVER AT GAGE

structed by rough ice.
en, but open at gage.
per surface of smooth ice.
gorge above gage.
E. Ice gorge below gage.
F. Shore ice.
G. Floating ice.
H. Pool stage.

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UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

P.O. Box 840 , Morgan , Utah 84050 April 23, 1986

Gordon Stephens, Quarry Supervisor
Ideal Basic Industries, Cement Division
Devils Slide Plant
Auxiliary Route No.3
Morgan , Utah , 84050

Dear Mr. Stephens:

Attached is the original and two copies of the report you requested on the cement plant property at Devils Slide. I talked to James Leatherwood, soil scientist, and Lynn Kunzler, biologist, with the Utah State Department of Natural Resources as to the material needed in the report. They indicated the material should include a plant life survey, recommendations for test plot seed mixes, and a soil sample analysis with fertilizer recommendations. This report should cover these subjects.

I apologize for taking so long to get this material to you. If there is any additional information we can supply let us know.

Sincerely,

Wendell Petterson

Wendell Petterson

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IDEAL BASIC INDUSTRIES, CEMENT DIVISION - DEVILS SLIDE

This report consists of a plant life inventory, a potential plant life community, test plot plant varieties, and fertilizer recommendations for rehabilitation of disturbed areas. There are four soils associated with the area being studied. These soils are delineated on the attached soils map as LHG, Lithic Haploxerolls 40-80% slopes, KrG, Kilfoil Rock Outcrops 40-60% slopes, StG, St. Marys-Hoskins cobbly loam 30-50% slopes, and HeG Henefer loam, 40-60% slopes. Mining operations had been or were being carried out on a portion of the site at the time the soil survey field work was done. These areas were mapped as quarries. It is evident that the quarried portion was either KrG, Kilfoil Rock Outcrop 40-60% slope, or LHG , Lithic Haploxerolls, prior to the beginning of the quarry operations.

Each of the soils shown on the attached Soil Survey Map #46 is also a designated "Range Site". These range sites are range-land ecosystems and are determined by a number of factors including climate, soils, and topography. One range site may include several different soil mapping units. The three range sites described in this report cover the study area for the Ideal Basic Cement Plant at Devils Slide, Morgan County, Utah.

Soils and their assigned "Range Sites" are as follows:

Soil Symbol	Soil Name	Range Site
LHG	Lithic Haploxerolls- Rock Outcrop complex 40-80% slopes	Mountain Shallow Loam UT38
KrG	Kilfoil-Rock outcrop complex 40-60% slopes	Mountain Gravelly Loam UT32
StG	St.Marys-Hoskins cobbly Loam, 30-50% slopes	Mountain Gravelly Loam UT32
HeG	Henefer Loam,40-60% slopes	Mountain Loam UT35

Range Site Description - Mountain Shallow Loam UT38

The climate of this site is cool and quite humid with cold snowy winters and warm dry summers. The average annual precipitation is about 20 inches. Distribution of the precipitation is about 55 to 60% during the plant dormant period (October to March). This is the most dependable supply of moisture for plant growth. Lower precipitation and high evapotranspiration rates during July, August, and September causes slowing down in growth of all plant species and dormancy in most grasses and forbs.

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Plants begin to grow from April to May. The grasses have a dormancy period from July 15 to August 15, but grasses may green up again in September when fall rains occur. Shrub species grow until frost though at a reduced rate during the summer months. Optimum growth period is during June. Frost-free period varies from 70 to 130 days.

The dominant native vegetation aspect of this site is that of shrubs. The composition by annual air dry weight is approximately 50% grasses, 5% forbs, and 45% shrubs.

Plant species not a part of the climax community that are most likely to invade the site if plant cover deteriorates through overgrazing or mechanical disturbance are: cheatgrass, annual forbs, houndstongue, knotweed, mulesear dock, mullein, mustard, musk thistle, big sagebrush , and yellowbrush.

Field evaluation of the range plant community for this range site, using SCS Utah-2 procedures, determined this area to be in "Good" condition. This procedure uses percent of climax vegetation present, current erosion, and stand for the site to determine the condition rating. Based on clippings of 61 plots in this range site in good condition, annual yields of air dry vegetation from 600 to 1400 pounds per acre are produced. The variation depends largely on variable climatic factors.

Dominant plants for this range site are:

Common Name	Percent Composition
Bluebunch Wheatgrass	25%
Antelope Bitterbrush	15%
Muttongrass	10%
Basin Wildrye	5%
Nevada Bluegrass	5%
Big Sagebrush	5%

On-site evaluations noted that on both the Mountain Shallow Loam and Mountain Gravelly Loam range sites areas which had been disturbed were initially invaded by plants of sunflower, Musk thistle, Russian thistle, Ground cloud, and Rubber rabbitbrush.

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Range Site Description - Mountain Gravelly Loam UT32

The climate of this site is cool and quite humid with cold snowy winters and warm dry summers. The average annual precipitation varies from 16 to 22 inches with an average of around 19. Distribution is 55 to 60% during the plant dormant period (October to March) This is the most dependable for plant growth. Lower precipitation and high evapo-transpiration rates during July, August and September causes slowing down in growth of all plant species and dormancy in most of the grasses and forbs.

Plants begin to grow from April 15 to May 1. The grasses have a dormancy period from July 15 to August 15, but grasses may green up again in September when fall rains occur. Shrub species grow until frost though at a reduced rate during summer months. Optimum growth period is during June. Frost free period varies from 80 to 130 days.

The vegetation of this site is a browse aspect and consists of about 25% shrubs, 60% grasses, and 15% forbs. No tree species are present but Gambel oak and curlleaf mountainmahogany become tall shrubs on this site.

Plant species not a part of the climax community that are most likely to invade the site if plant cover deteriotates through overgrazing or mechanical [redacted] disturbance are cheatgrass, annual forbs, houndstounge, flannel mullein, rubber rabbitbrush, and snakeweed.

Field evaluation of the range plant community for this range site determined this area to be in "Good" condition. Based on actual clippings in this range site in "Good" condition, annual yields of air dry vegetation from 500 to 1700 pounds per acre,with an average of 1325 pounds , are produced.

Dominant plants for this range site are:

Common Name	Percent Composition
Bluebunch Wheatgrass	30%
Birchleaf mountainmahogany	15%
Nevada Bluegrass	12%
Muttongrass	10%
Longtongue muttongrass	5%

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Range Site Description - Mountain Loam (Oak) UT35

This site occurs on gentle to steep mountain slopes and ridges with slopes mostly 30-50%. Exposures are predominantly north and east. The climate is cool and quite humid with cold snowy winters and warm dry summers. Average precipitation is about 19 inches with 55 to 60% falling during the plant dormant period (October to March). This is the most dependable supply for plant growth. Lower precipitation and high evapotranspiration rates during July , August and September causes slowing down in growth of all plant species and dormancy in most of the grasses and forbs.

Plants begin to grow from April 15 to May 1. The grasses have a dormancy period from July 15 to August 15, but grasses may green up again in September when fall rains occur. Shrub species grow until frost though at a reduced rate during the summer months. Optimum growth period is during June. Frost free period varies from 70 to 130 days.

The dominant aspect of the plant community is shrubs with Gambel oak being the primary species. The composition is approximately 25% grasses, 10% forbs, and 65% shrubs by annual air dry weight.

Plant species not a part of the climax plant community that are most likely to invade if plant cover deteriorates are:cheatgrass, annual forbs, dandelion, houndstongue, Utah juniper, rubber rabbitbrush, and snakeweed.

Field evaluation of the range plant community for this range site determined this area to be in "Good" condition. Average annual production of air dry vegetation of this range site in "Good" condition is about 1650 pounds per year but may vary from 1,000 to 3,000 pounds per acre because of climatic variables.

Dominant plants for this range site are:

Common Name	Percent Composition
Gamble oak	25%
Bluebunch Wheatgrass	10%
Bearded Wheatgrass	6%
Bigtooth Maple	5%
Mountain Snowberry	5%
Serviceberry	5%
Utah Snowberry	5%

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Seeding Recommendations for Revegetation

The dominant grass species for all three range sites is Bluebunch Wheatgrass. Other native species of grasses include Muttongrass, Nevada Bluegrass, Bearded Wheatgrass, and Basin Wildrye. Major forb species consist of Arrowleaf Balsamroot, Aster, Daisy, and Goldenrod. The dominant shrub species are Antelope Bitterbrush, Birchleaf Mountainmahogany, Mountain Snowberry, Gambel Oak, Serviceberry, and Bog Sagebrush.

Additional species of introduced grasses and forbs are also adapted to these sites and could be used in a revegetation program. These species would include Paiute Orchardgrass, Crested Wheatgrass(Hycrest),Tall Wheatgrass, Small Burnet, Lewis Blue-flax, and Sweetclover.

Adapted Species for Trial Seeding Plots

Species	Seeds per/lb.	Seeding Rate
1. Whitmar Bluebunch Wheatgrass	117,000	Drilled-8# p/a Broadcast- 12# p/a
2. Basin Wildrye	130,000	Drilled-4# p/a Broadcast-6# p/a
3. Tall Wheatgrass	79,000	Drilled - 8# p/a Broadcast- 12# p/a
4. Hycrest-Crested Wheatgrass	175,000	Drilled - 7# p/a Broadcast-10# p/a
5. Pauite Orchardgrass	654,000	Drilled-3# p/a Broadcast - 5#p/a
6.Small Burnet	55,000	Drilled-2# p/a Broadcast-3# p/a
7. Lewis Flax	293,000	Drilled - 1# p/a Broadcast- 1# p/a
8. Sweetclover(yellow)	260,000	Drilled-2# p/a Broadcast-3#p/a
9. Antelope Bitterbrush	15,000	1-2Lbs p/a covered with 1/4" soil -Fall
10.Mountain Snowberry	76,000	Propogate in nursery for field planting
11. Birchleaf Mountainmahogany	59,000	1-2lbs p/a covered with 1/4" soil-Fall

Drilled seedings on the flatter slopes and hydro-seeding on steeper embankments is preferred. If broadcast method is used the seed will need to be covered with some type of mechanical operation.

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Fertilizer Recommendations

Five test plots were sampled and analyzed for phosphorus and potassium content, salinity, and pH. Nitrogen fertilizer recommendations are generally based on crop and fertilizer history of prior years. A valid test for nitrogen content requires special sampling procedures which in this case we do not feel are justified. An application of 20-40 pounds of available nitrogen per acre for all sample areas will assist in establishing new seedings. Potassium content of all five samples appears to be adequate. Phosphorus content in all samples are below recommended levels. The table below indicates fertilizer levels and recommended application rates.

Plot No.	N-Nppm	P-ppm	K-ppm	pH
1.				
Present	-	2.6	122	8.0
Recommend	20-40 lbs.p/a	45lbs.p/a	Adequate	-
2.				
Present	-	7.8	over 400	8.5*
Recommend	20-40 lbs.p/a	25lbs.p/a	Adequate	-
3.				
Present	-	1.8	116	8.2
Recommend	20-40 lbs.p/a	45 lbs.p/a	Adequate	-
4.				
Present	-	5.0	131	8.1
Recommend	20-40 lbs.p/a	40 lbs.p/a	Adequate	-
5.				
Present	-	1.4	132	8.2
Recommend	20-40 lbs.p/a	45 lbs.p/a	Adequate	-

* At this sample salinity level this pH value indicates a probable sodium problem.

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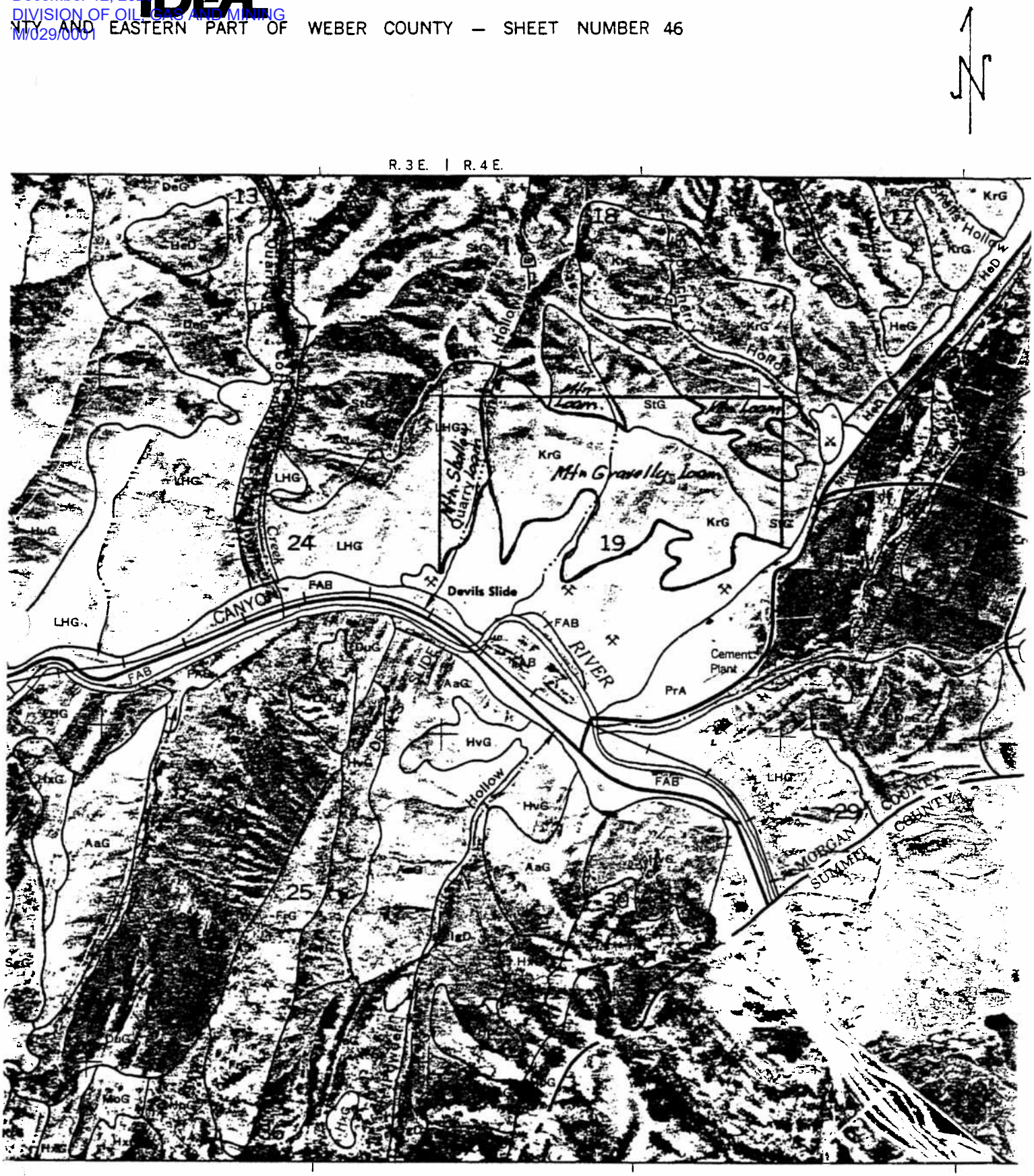
NITY AND EASTERN PART OF WEBER COUNTY — SHEET NUMBER 46



1 2 Miles

5000 10000 Feet

Scale 1:24000

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APPENDIX I

Test Plot #2 Data Sheet

Planting Date:	October 31, 1986
Planting Method:	Hydroseeded
Number of Acres:	1
Planted by:	Green Valley Reclamation
Seed Provided by:	NPI (Small Burnet and Paiute Orch. by SCS)

Seed Mix:

Variety	Pounds PLS
Whitmar Beardless Bunch Wheatgrass	18.74
Tall Wheatgrass	13.33
Nordan Crested Wheatgrass	10.20
Magnar Basin Wildrye	6.52
Paiute Orchard Grass	6.46
Yellow Blossom Sweetclover	3.19
Birchleaf Mt. Mahogany (hand planted)	1.50
Bitterbrush (hand planted)	1.50
Small Burnet	4.00

Additives:

Type	Pounds
Fertilizer:	
IFA 0-44-0	50
IFA 34-0-0	50
Tacifier:	
AZ-Tac	40
Mulch:	
Weyerhauser Silva Fiber	1500

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ITTE[illegible]E/AD[illegible]S (In[illegible] ADDENDUM

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)

DISCHARGE MONITORING REPORT (DMR)

Form Approved
OMB No. 2060-0015

NAME Ideal Basic Industries, Inc.
ADDRESS Auxiliary Route #3
Morgan, Utah 84050

FACILITY Devils Slide
LOCATION

(2-16) PERMIT NUMBER: Utah-0000159
(17-19) DISCHARGE NUMBER: 002

MONITORING PERIOD

	YEAR	MO	DAY		YEAR	MO	DAY
FROM	86 (18-21)	10 (22-23)	01 (24-25)	TO	86 (26-27)	12 (28-29)	31 (30-31)

NOTE: Read instructions before completing this form.

PARAMETER (32-37)		(3 Card Only) QUANTITY OR LOADING (46-53) AVERAGE	(54-61) MAXIMUM	UNITS	(4 Card Only) QUALITY OR CONCENTRATION (38-45) MINIMUM	(46-53) AVERAGE	(54-61) MAXIMUM	UNITS	NO. EX (62-63)	FREQUENCY OF ANALYSIS (64-68)	SAMPLE TYPE (69-70)
Total Flow	SAMPLE MEASUREMENT	.299		MGD						1/90	Inst.
	PERMIT REQUIREMENT		.300								
Total S. S.	SAMPLE MEASUREMENT				1	1	3	mg/L		1/30	Grab
	PERMIT REQUIREMENT					25					
p H	SAMPLE MEASUREMENT				6.7	6.8	7.0	Units		1/90	Grab
	PERMIT REQUIREMENT				6.5		9.0				
Oil and Grease	SAMPLE MEASUREMENT				0	0	0	mg/L		1/30	Grab
	PERMIT REQUIREMENT						10				
Temp	SAMPLE MEASUREMENT				-	15	-	C.		1/90	Grab
	PERMIT REQUIREMENT						21				
Total Res $C/_2$	SAMPLE MEASUREMENT				0	0	0	mg/L		1/90	Grab
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER

L. G. Giles, Plant Manager
TYPED OR PRINTED

I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN; AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION, I BELIEVE THE SUBMITTED INFORMATION IS TRUE, ACCURATE AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT. SEE 18 U.S.C. § 1001 AND 33 U.S.C. § 1319. *(Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between 6 months and 5 years.)*

SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

TELEPHONE: AREA CODE 801, NUMBER 829-6021

DATE: YEAR 87, MO 01, DAY 07

COMMENT AND EXPLANATION OF ANY VIOLATIONS *(Reference all attachments here)*

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M/029/0001

2. Cooperative Agreements/Memoranda of Understanding:

The Division of Oil, Gas and Mining (Division) will cooperate with other state agencies, local governmental bodies, agencies of the federal government, and private interests in the furtherance of the purposes of the Utah Mined Land Reclamation Act. The Division is authorized to enter into cooperative agreements and develop memoranda of understanding with agencies in furtherance of the purposes of the Act. The objective is to minimize the need for operators to undertake duplicative, overlapping, excessive, or conflicting procedures.

3. Operator Responsibilities, Compliance with other Local, State and Federal Laws:

The approval or acceptance of a complete notice of intention shall not relieve an operator from his responsibility to comply with the applicable statutes, rules, regulations, and ordinances of all local, state and federal agencies with jurisdiction over any aspect of the operator's mining operations, including, but not limited to: Utah State Division of Water Rights, the Utah Department of Business Regulation, the Utah State Industrial Commission, the Utah Department of Environmental Quality, the Utah Division of State History, the Division of Forestry, Fire and State Lands, The School and Institutional Trust Lands Administration, the Utah Division of Wildlife Resources, the U. S. Fish and Wildlife Service, the United States Bureau of Land Management, the United States Forest Service, the United States Environmental Protection Agency, and local county or municipal governments.

4. Division Guidelines, Operator Assistance in Application Preparation:

Each operator who conducts mining operations on any lands within the state of Utah is responsible for compliance with the following rules. The Division shall provide guidelines to aid the operator in complying with the rules.

R647-1-103. General Rules.

The following are general rules for statewide application.

R647-1-104. Violations and Enforcement.

If after notice and hearing, the Board finds that a violation of the Act, these rules, a notice of intention, or a Board or Division order has occurred, the Board may take any enforcement action authorized by law including requiring: compliance, abatement, mitigation, cessation of operations, a civil suit, forfeiture of surety, reclamation, or any other lawful action.

R647-1-105. Forms.

The attached forms are intended for the convenience of the operator and the Division, and may be changed from time to time. The forms are not part of these rules and use of a particular form, though encouraged, is not required, as long as all of the necessary information is provided in a reasonable manner.

R647-1-106. Definitions.

"Act" means the Utah Mined Land Reclamation Act, enacted in 1975, as amended. (Section 40-8-1, et seq., UCA).

"Adjudicative proceeding" means an agency action or proceeding that determines the legal rights, duties, privileges, immunities, or other legal interests of one or more identifiable persons, including all agency actions to grant, deny, revoke, suspend, modify, annul, withdraw, or amend an authority,

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Reclamation Plan for Overburden Dump rea

Devil's Slide Plant – Morgan, Utah

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State of Utah, Department of Natural Resources
Division of Oil, Gas and Mining
1594 West North Temple, Suite 1210
Box 145801
Salt Lake City, Utah 84114-5801

Attention: Doug Jensen

RE: Reclamation Plan for Overburden Dump Area
Notice of Intention to Revise Mining Operations
Devil's Slide Plant – Morgan, Utah

Gentlemen:

Holcim (U.S. Inc.) proposes to amend Operating Permit ACT/029/001 to construct additional overburden dump areas at the Devil's Slide Plant Quarry, the Cottonwood Canyon Dump and The Quarry Hollow Dump. This document has formatted to follow the outline of Form MR-REV – Notice of Intention to Revise Mining Operations, as required by the State of Utah, Department of Natural Resources, Division of Oil, Gas and Mining (DOGM). Form MR-REV is submitted for the proposed Overburden Dump and incorporates by reference the existing reclamation plan ACT/029/001 submitted on May 8, 1987 by Ideal Cement – Devil's Slide Cement Plant. The following paragraphs outline this draft reclamation plan.

The Overburden Dump Application to Revise Large Mining Operations/Permit is submitted as a separate, stand-alone document/permit.

I. GENERAL INFORMATION (Rule R647-4-104)

1.	Name of Operator/Applicant	Holcim (U.S. Inc.) – Devil's Slide Plant
2.	Name of Company/Corporation	Holcim (U.S. Inc.) P.O. Box 122 Dundee, Michigan 48131 (313) 529-2411
3.	Address of Plant	Holcim (U.S. Inc.) –Devil's Slide Plant 6055 E. Croydon Road Morgan, Utah 84050
4.	Phone:	(801) 829-6821
5.	Name of Mine/Project:	Devil's Slide Quarry Overburden Dump Area
6.	Previously Assigned File Number:	ACT/029/001

7. Location of Proposed Activities: The proposed Overburden Dump area is north of existing mine operations.

COUNTY: Morgan

TOWNSHIP: T. 4 N. **RANGE:** R. 3 E.
SECTION(S) NE ¼ and SE ¼ of SE ¼, Section 13 (Identify to ¼, ¼ section)

And

TOWNSHIP: T. 4 N. **RANGE:** R. 4 E.
SECTION(S): NW ¼ and SW ¼, Section 18 (Identify to ¼, ¼ section)

8. Ownership of Land Surface:

Private (Fee)	Owners Name(s): (Private)	M.R. Wilde & Sons, L.L.C. 2200 North 7000 East Croydon, Utah 84018

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9. Ownership of Minerals:

Private (Fee)	Owners Name(s): (Private)	U.P. Resources-Minerals P.O. Box 7, MS 2905 Fort Worth, Texas 76101-0007 NE ¼ & SE ¼ of SE ¼, Section 13, T. 4N, R.4E.

II. MAPS, DRAWINGS and PHOTOGRAPHS (Rule R647-4-105)

Appropriate maps, drawings, plates, etc. should be provided that are pertinent to the revision, or amendment of mining operations. Please provide a revised map outlining the previously approved and the new proposed disturbed area boundaries. These materials should be prepared according to the requirements of Rule R647-4-105. List map numbers or appendices used for this section:

See tables and maps at the end of this document for appropriate maps, drawings, figures, etc.

III. Operation Plan (Rule R647-4-106)

Provide a narrative description, referencing any appropriate attached maps or drawings, of the pertinent details of the proposed change(s) in the operation plan. Specific details, which are different from those described in the original approved NOI, should be included. Identify additional proposed surface disturbance. Include the total number of acres to be affected by the revision or amendment. All appropriate information requirements as outlined under Rule R647-4-106 must be addressed in the application.

1. **Type of mineral(s) to be mined:**

The proposed Overburden Dumps will be used for permanent disposal of overburden material removed from above the economic limestone and sandstone beds. The overburden material does not have any mineral value. Minerals to be mined are described in the ACT/029/001 – Reclamation Plan, submitted on May 8, 1987 by Ideal Cement/Holnam Devils Slide Plant (Appendix C – Limestone & Sandstone).

2. **Type of operations to be conducted, including the mining/processing methods to be used on-site, and the identification of any deleterious or acid forming materials present or to be left on the site as a result of mining or mineral processing.**

Mining operations to be conducted at the proposed Overburden Dump sites includes placement of overburden materials generated from stripping operations in the quarry. Operations will include spreading and contouring slopes as the overburden dump is built.

A slope stability analysis was conducted for the proposed Overburden Dump. For this analysis, Holcim reviewed three possible "re-contoured" slope gradients under high and low groundwater conditions. The three slope gradients examined include a 2:1, 2.5:1 and 3:1 Horizontal to Vertical (H:V) slopes. The slope stability evaluation examines the slopes under the static loading conditions using a "grid & radius" failure search program, which defines a rotational slump failure. Soil strength information (internal friction angle, cohesion and unit density) has not been developed for this site through drilling and material testing. Subsequently Holcim is using historical data from material testing of the limestone at the Devil's Slide quarry in addition to published literature regarding soil and rock strength based on similar soil types. Published references have been submitted for review in subsequent paragraphs under this question. In the following, Holcim's approach to calculating the slope stability analysis is presented.

The slope stability analyses were performed on profiles A-A', and B-B' (see Map DCC-1702 – Holnam Cross Sections of the Overburden Dump, Scale under the figures section. Profile A-A' is located down the center of Quarry Hollow, which includes some of the deepest portions of overburden dump. The second profile, B=B' is located through the steepest portion of the Overburden Dump that extends to the west into Cottonwood Canyon. Both profiles encompass the total length and depth of the proposed overburden dump. The Overburden Dump slope stability analysis was completed by utilizing the SLOPE/W Version 3 (1995) computer program GEO-SLOPE© International Ltd., Calgary, Alberta, Canada, to compute factors of safety against failure. The factor of safety is the ratio of the forces resisting the slope movement to the forces, which cause the slope to fail. The resisting forces are determined by the shear strength of the overburden dump soils to resist failure along a specific surface. The forces which tend to cause failure include, but are not limited to: (a) the angle of the slope; (b) the location of existing roads and drainage ditches in relation to the slope; (c) pore pressure or water table acting on the failure plane; and (d) the characteristics of the soil placed in the overburden dump. A factor of safety of 1.0 implies that the slope is marginally stable for cross-section profiles, overburden soil material strengths, groundwater, and slope gradient conditions. Surface water was not evident during the calendar year 2000 field investigation, except in a shallow depression used for watering cattle.

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Parameter Selection

A description of the criteria used in the GEO-SLOPE© program to evaluate the factors of safety for slope stability failure on Profiles A-A' and B-B' of the Overburden Dump is as follows:

Slope Geometry: The stability analysis incorporated three different slope profile gradients. The slope profile gradients examined by the GEO-SLOPE© program are 2:1, 2.5:1 and 3:1 (H:V). Both profiles (A-A' and B-B') were modeled with the three slope gradients. Geometrically, both profiles encompass the deepest and steepest portions of the proposed Overburden Dump, respectively.

Groundwater: Depth to groundwater has not been determined for this site. However, in an alpine environment, groundwater is expected to be high in the late winter/early spring and low to non-existent in the summer and fall. It is anticipated that groundwater will follow the natural flow lines of the Quarry Hollow and Cottonwood Canyon topography. Groundwater is expected to be absent at higher elevations (unless perched), and flow toward the naturally occurring drainage channels at lower elevations. For this stability modeling effort, Holcim assumed both a high groundwater table and a very low groundwater table. Two high groundwater table scenarios are possible in the proposed Overburden Dump. The first scenario represents a perched aquifer from stratification of fine to coarse sediments in the Overburden Dump. The second scenario represents a free draining Overburden Dump that has high saturation (and retention(from snow melt or heavy rainfall. For this environment, a low groundwater table will probably exist. Hydrologically, the low groundwater table was incorporated above and along the bedrock/colluvial soil contact.

Soil strength Properties: Three soil types were modeled in this analysis. The soil types included an overburden soil, colluvial clay and limestone/siltstone bedrock. The Overburden Dump and the colluvial soil strength parameters are based on published information of similar soils and from historical date from mining operations at Devil's Slide. Colluvial soil strength values are based on textbook parameters as determined by Harding ESE using the Unified Soil Classification System. The bedrock strength value is estimated from a mining industry reference (Hoek and Bray, 1994), the soil parameters are as follows:

- Overburden Dump soil matrix: Low plastic clay, silts mixed with limestone and sandstone gravel and cobble sized debris, cohesion 50.0 psf, internal friction angle 35.0 degrees, moist unit weight 110.0 pcf. In our model, the depth of the overburden soils is based on the cross section profiles in Map DCC-1702.

- Colluvial soils: Clay, silts and gravel's, cohesion 600.0 psf, internal friction angle 26.0 degrees, moist unit weight 100.0 pcf, saturated unit weight 116.0 pcf. In our model, the thickness of the colluvial soil has been estimated. For our purposes, colluvial soil(s) have been modeled thicker than what may be expected in the field. A thicker colluvial soil will have a lower factor of safety, as the rotation slump will extend into this soil horizon.

- Bedrock: Limestone with some siltstone layering: Bedrock is below the colluvial soils, cohesion 20,000.0 psf, internal friction angle 35.0 degrees, moist unit weight 130.0 pcf. For our purpose bedrock is modeled relatively deep within the profiles. Typically landslides do not occur in bedrock, thus to truly represent the overburden dump soil's landslide possibility, bedrock exposure was minimized.

The GEO-SLOPE© computer program uses the ordinary, Janbu, Bishop, and Spencer method of slices to determine failure. It compares the forces resisting slope failure to the forces, which cause slope failure along a specified failure surface. The analysis utilizes a limit equilibrium procedure to calculate the factor of safety against failure. The input information for the analyses includes, but is not limited to, slope geometry, groundwater conditions, and soil strength loading conditions. A complete set of graphical computer files have been attached to this permit letter under Appendix A. The GEO-SLOPE© graphical computer files are submitted as palrs. The first file shows the location of the potential rotational failure and the corresponding lowest factor of safety for this potential rotational failure plane. The second file shows the grid and radius search pattern, utilized to find the lowest factor of safety for that particular model/analysis.

Slope Stability Results

The results of the Overburden Dump slope stability analyses are outlined in the following table:

Table One: Factors of Safety for Overburden Dump

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Profile	Slope Gradient H:V	Perched Groundwater Table	No Groundwater Table
A-A'	2:1	1.41	2.04
	2.5:1	1.42	2.08
	3:1	1.42	2.13
B-B'	2:1	1.39	1.96
	2.5:1	1.4	1.98
	3:1	1.99	1.99

From this stability analysis some evident patterns have been determined. The first pattern is that the factors of safety are lower in the models having a high groundwater table, alternatively the factors of safety are higher when the groundwater is low. The lower factors of safety in the high groundwater model can be expected, as the groundwater provides the necessary lubrication for a landslide to occur. The second pattern is that the factors of safety increase as the slope gradient gets flatter from the 2:1 (H:V) to the 3:1 (H:V) slope. A less obvious pattern in the graphical files indicates that, although a grid and radius failure search pattern was used for the entire slope, landslides tend to occur in the bottom third of the slopes. This can be expected as groundwater will flow to the toe and the weight of the higher elevation soils will push down on the lower soil layers to create a possible landslide toe failure.

General Observations: The proposed Overburden Dump slopes will have a sufficient factor of safety at a 2:1 Horizontal to Vertical slope (factor of safety falls within the range specified by the DOGM), a 2.5:1 or 3:1 is more practical from a construction and reclamation purpose and will be used. All outside slopes of the Overburden Dump will be graded and contoured so as to minimize soil erosion and enhance log-term plant growth reclamation. A more comprehensive discussion on contouring, surface roughness and slope breaks is discussed in question R647-4-109.4 Impact Assessment.

There will be no deleterious or acid forming materials present or left on the site as a result of overburden dumping.

3. **Estimated acreage's proposed to be disturbed and/or reclaimed annually or sequentially.**

Holcim has a detailed map of the Overburden Dump area. The surety calculation will include 184.5 acres as proposed for the Overburden Dumps.

The revegetation calculation is submitted as Appendix A. Assumptions used for determining the surety calculations are as follows:

1. Details such as vegetation species were obtained from DOGM. No fertilizer mixture or application rate was provided by the agency; thus no fertilizer costs have been included in the cost estimate. Assumptions used to complete the cost estimate included the use of a rangeland drill to plant the seed mixture. Holcim has committed to completing vegetation and soil surveys for the proposed Overburden Dump in the summer following approval of this permit application. The seeding requirements (as outlined in the surety calculation table section) and fertilizer application rate could change as a result of these surveys.
2. The method used for seeding Test Plot #2 was hydroseeding. (While this is appropriate for small test areas, it may be more cost effective to use standard agricultural equipment to seed a much larger area with longer slopes.
3. The disturbance/reclamation acreage figure of 184.5 acres was obtained from Holcim's plan map of the Devil's Slide area. It reflects the area labeled "Limit of Proposed Dump Overburden." This area includes ancillary roads, haul road, topsoil piles, and increased disturbance footprint due to reclamation activities.

4. **A description of the nature of the materials to be mined or processed including waste/overburden materials and the estimated annual tonnage's of ore and waste materials to be mined.**

The materials to be mined for economic production are Limestone and Sandstone. Material, which will be processed as a result of this amendment, is composed of inert overburden waste. Soils in the proposed overburden Dump area consist of mountain loams, well drained with a pH of 8.0 to 8.5. Estimated annual tonnage of waste materials is calculated in table 2.

Volume and tonnage estimate of available space for the Overburden Dumps: Cottonwood Canyon Side is 199,799,943 Cubic feet or 7,399,997 Cubic Yards. With a conversion factor of 126 lbs/ft^3 the

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Profile	Slope Gradient H:V	Perched Groundwater Table	No Groundwater Table
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approximate tonnage is 12,587,397 tons. Quarry Hollow is 175,169,399 Cubic feet or 6,487,755 Cubic Yards. Using a conversion factor of 126 lbs/ft^3 gives approximate tonnage of 11,035,672 tons. The two dumps added together provide sufficient capacity for 23,623,069 tons.

5. **A description of existing soil types, including the location and extent of topsoil or suitable plant growth material. If no suitable soil material exists, an explanation of the conditions shall be given.**

A soil survey of the proposed overburden dump will be completed in the summer following approval of this permit revision. The soil survey will describe the volume of material to be salvaged, the location and size of all soil material stockpiles, how the soil material will be protected so that it is available for reclamation and how soil material will be redeposited for reclamation (including depth of replacement). After an on-site visit by DOGM, it was agreed upon that until said survey was completed, Holcim will remove 12 inches of topsoil material and stockpile it to be available for reclamation. Following DOGM recommendations, the first phase of the Overburden Dump will be stripped of topsoil and the topsoil will be moved to stockpile near the last phase of the Overburden Dump which will allow for concurrent reclamation as the Quarry Hollow Dump is filled up. Quarry Hollow will be stripped and reclaimed in four phases moving from north to south down the canyon. Holnam will also submit a soil-stripping map indicating what sections of land will be stripped for the overburden dump, and in what sequence. Supplementary language describing the soil stripping will accompany the new map. The soil survey will be submitted as an addendum to the overburden dump permit.

6. **A description of the plan for protecting and redepositing existing soils.**

The soil survey under question 106.5 will include the location(s) of the topsoil pile(s) and methods for protecting against erosion.

7. **A description of existing vegetative communities and cover levels, sufficient to establish revegetation success standards in accordance with Rule R647-4-111.**

A vegetation survey will be conducted in the spring/summer following the approval of the permit revision. The vegetation survey will be conducted for the proposed overburden dump area. The vegetation survey will provide a baseline inventory, including the percentage of canopy cover. The vegetation survey will be submitted as an addendum to the Overburden Dump permit. In the interim, Holcim would like to start stripping and placement of overburden soils prior to the start of the vegetation survey. The vegetation survey will provide an estimate of vegetation type and amount in areas that have been stripped and prepared for deposit of overburden soils.

8. **Depth to groundwater, extent of overburden material and geologic setting.**

There are no known aquifers in the quarry area and groundwater has not been encountered in any exploratory drill holes. The current quarry area (mining operations) is down gradient from the proposed location of the Overburden Dumps. Groundwater seepage into the quarry from the existing Overburden Dumps has not occurred.

A response to the question "Extent of overburden material" is not required for the Overburden Dumps area, as this are will not be stripped for mining purposes.

Geologic setting of this area is discussed in the original reclamation plan (Section I, B. Geology and in Attachment 2, Geology Map #MF-290).

9. **Proposed location and size of ore and waste stockpiles, tailings facilities and water storage treatment ponds.**

The proposed location and size of the proposed Overburden Dumps and ancillary features can be found on tab 3, Map 3 of this reclamation plan.

IV. OPERATING PRACTICES (Rule R647-4-107).

What downstream controls will exist in Quarry Hollow or Cottonwood Hollow to prevent the downstream migration of sediments during construction?

1. **Drainages to minimize damage.**

Under the first part of this question plans and designs for the drainage channels for runoff in response to snow melt and severe thunder storms for Quarry Hollow and Cottonwood Canyon have been addressed under R647-4-111 – Reclamation Practices Question 111.2 – Reclamation of natural channels. Supporting text maps, and tables have been attached to this document. Downstream

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controls to minimize the migration of sediments during construction will be controlled through the field implementation of various Best Management Practices (BMP's). There are various published and non-published BMP's for controlling runoff and migration of sediment. Some appropriate BMP's that could be utilized the Overburden Dump are submitted under Appendix B of this Letter. The various methods of BMP's in Appendix B include runoff interception, water resource protection, gravel filter berms, straw bale barriers, dugout ditch basins, sediment control fences and vegetative buffer strips. Holcim reserves the right to use any or all of these BMP methods to control runoff and to implement downstream control measures that will limit the migration of sediments during construction and the operation life of the Overburden Dump. In previous published Holnam documents, we have used the following BMP's for control. The quarry strip material in the Bone Yard and Quarry Hollow is placed on the natural angle of repose (approximately 35 degrees). This has proven to be sufficient to prevent any washing due to the amount of rock and the wide gradation range providing a very stable slope. Additional stabilization is not required prior to reclamation due to the integrity of existing slopes and no evidence of washing or erosion. The catch basins and emergency dams as discussed in Section III.B. (1984 Reclamation plan) are a major part of sediment control. The road berms, as required by MSHA safety regulations, also direct minimal road runoff to a catch basin. Representatives of DOGM have visited the quarry and given recommendations on additions and improvements to the berm system. These suggestions are being implemented. The existing roads have no culverts, cross-drains or ditches. Runoff quantities have never occurred to cause any drainage problems. The roads are all built to MSHA regulations and well maintained by quarry operations.

2. **Erosion Control & Sediment Control.**

Site facilities map will provide locations of current sediment and erosion control structures and are appropriately scaled to the surface facilities map for this permit letter. Actual erosion control features (BMP's) for the Overburden Dump will be placed in accordance to field conditions (i.e. field fitted based on need). Erosion control structures for the Overburden Dump will be temporary in nature and will evolve as the dump evolves. Typical BMP's will be consistent to those presented in Appendix B.

3. **Suitable Soils Removed & Stored.**

The overburden dump will be staged such that reclamation may be able to be initiated in stages. Holcim reserves the right to submit a permit letter addendum for staging the reclamation on the Overburden Dump after certain initial portions have been completed/constructed.

V. IMPACT ASSESSMENT (Rule R647-4-109)

Please provide information as required under Rule R647-4-109 regarding projected potential surface and/or subsurface impacts which may be associated with the proposed change(s) in mining operations.

1. **Projected impacts to surface and groundwater systems.**

No springs have been identified or mapped in Quarry Hollow or on the upper slope of Cottonwood Canyon; therefore no impact to springs is anticipated (USGS, .5 Minute Devils Slide, Utah, Photo revised 1991).

In the spring/early summer an ephemeral stream flows down the center of Quarry Hollow. A livestock reservoir has been excavated in the headwaters of Quarry Hollow (see Pictures 3 and 4 of Tab 4) to impound this surface water. The surface water is used to provide water for livestock in this section of land. Construction of the Overburden Dumps is anticipated to have minimal impact on the Quarry Hollow ephemeral stream. During construction, the ephemeral stream in Quarry Hollow will be impounded in the existing reservoir for livestock watering and dust abatement during initial overburden dumping operations. At completion of construction of the Overburden Dumps, the surface of the Overburden Dumps will be regraded to reestablish a natural drainage way to prevent surface water retention and direct surface water off of the reclaimed dump surface.

There are no ephemeral streams in the upper slope of Cottonwood Canyon; therefore, no impacts are anticipated.

There are no projected impacts to the groundwater system in Quarry Hollow or the headwaters of Cottonwood Canyon (Section III (8) – Operation Plan (Rule R647-4-106).

Erosion control measures currently utilized at the Devil's slide mine site will be constructed on the proposed Overburden Dump (see Section 107.1 as to various methods of BMP's). These erosion control measures have successfully minimized erosion from a recent 100-year storm cycle.

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The most significant consideration in analyzing the quarry drainage is that no significant runoff has ever occurred during the life of the mine. For example, on February 17, 1986 there was 1.82 inches of rainfall. The storm lasted for several days, and in addition to the rainfall, the entire snowpack in the quarry area melted during this storm and added to the runoff. Morgan County received $400,000 in damage to public facilities due to flooding and was declared a State and National Disaster area. The ten-year storm of 1.4 inches and the theoretical runoff for the two drainages in the quarry area is given in the "Drainage Calculation". This amount of runoff did not occur at any time during or after the storm. The Bone Yard drainage had standing water (< 1 inch) on the loading floors and flat areas during the worst of the storm. The emergency dike (catch basin #6) contained less than .02 acre-feet of water (approximately 400 sq. ft. of surface area). There was no significant flow and the standing water on the flat areas was absorb3d in a very short time after the rain ceased.

The Quarry Hollow drainage also showed a very high percolation rate. Above the quarry operation there occurred a small channel flow that came into the "french drain". After that point no surface flow occurred and it was evident that the flow was underground in the "french drain". At the bottom of Quarry Hollow on the haul road and the sandstone loading floor there was standing water (< 1 inch) during the worst of the storm. It was possible at this time that some of the flow entering the "french drain" was surfacing next to the haul road. This was very slight, if at all, and difficult to determine amounts due to the standing water on the road. The theoretical flow as calculated did not occur and as stated, no flow occurred in Quarry Hollow in the Quarry area.

On August 20,1986 there was another heavy storm that confirmed the results of the February storm. A total of 2.2 inches of rain fell and the runoff conditions were nearly identical to the earlier storm with the exception that no water surfaced at the bottom of the Quarry Hollow "french drain" and no water was retained by the emergency dike in the Bone Yard drainage. This could be due to the different soil condition that during the February storm when most of the ground was frozen. (1987 Reclamation Plan).

Published and unpublished standards for slope/surface roughness erosion control have been reviewed. A detailed drawing with supporting text for slope roughing of the Overburden Slopes has been provided (Appendix B). Overall stability of the Overburden Dump is discussed in Section 106.2, Slopes breaks and erosional stability addressed in Appendix A of this document.

2. **Potential impacts to state and federal threatened and endangered species or their critical habitats.**

No threatened or endangered species have been noted in the area of the projected Devil's Slide Overburden Dumps (Lynn Kunzler, DOGM). The Weber River and Lost Creek drainages have been identified as winter range for Bald Eagles, but the area proposed for the Overburden Dumps is located outside the range of both of these waterways (Mr. Rory Reynolds, Division of Wildlife Resources (DWR)). No other listed plant or wildlife species have been noted in the proposed amendment area.

3. **Projected impacts of the mining operation on existing soil resources.**

Development of the proposed Overburden Dumps is not projected to have an impact on existing soil resources.

4. **Projected impacts of mining operations on slope stability, erosion control, air quality, and public health and safety.**

Projected impacts of Overburden dumps mining operations will not decrease slope stability in Quarry Hollow as the final Overburden Dumps will be placed in a matter that supports and fills existing slopes. Regrading of the completed Overburden Dumps will be consistent with the approved reclamation Plan (Section II) which states: "Quarry strip material in Bone Yard and Quarry Hollow is placed on the natural angle of repose (approximately 35 degrees). This has proven to be sufficient to prevent any washing due to the amount of rock and the wide gradation range providing a very stable slope." Slope stability of the Overburden Dump soils in the upper slope of Cottonwood Canyon should be similar in nature as Quarry Hollow.

Erosion control will be completed as approved in the original reclamation plan (Section II, D. Erosion Control).

Dust suppression to maintain air quality in the vicinity of the proposed Overburden Dumps will be completed as required for normal mining operations in accordance with MSHA safety regulations. Dust control will utilize water for suppression.

Vehicle access into the Overburden Dumps will be limited to haul roads through either the mine or across private property to provide public safety. As required by MSHA safety regulations, warning

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signs will be posted at all vehicle entrances and at regular intervals along the perimeter of the disturbance area.

5. **Actions which are proposed to mitigate any of the above referenced impacts.**

Holcim (U.S. Inc.) proposes to shape, contour and revegetate proposed overburden dump slopes at the completion of mining. Reclamation of the proposed dump slopes will return the area to a beneficial use.

VI. RECLAMATION PLAN (Rule R647-4-110)

Describe how you intend to stabilize the disturbed areas upon cessation of operations. This includes backfilling excavations, grading, sloping or contouring, permanent stabilization of slopes or roads, permanent closure of roads, removal of structures and improvements, etc. Provide cross-section of the proposed final contour of the land after reclamation.

1. **A statement of the current land use and the proposed post-mining land use for the disturbed area.**

Current land use of the proposed Overburden Dumps includes livestock grazing in the summer and providing winter range for mule deer. Post mining land use for the disturbed area will consist of grazing livestock in the summer and a winter range for mule deer. Cross sections of reclaimed Overburden Dump slopes are provided in Map 3.

2. **A description of the manner and the extent to which roads, highwalls, slopes, impoundment's, drainages, pits and ponds, piles, shafts and adits, drill holes, and similar structures will be reclaimed.**

Reclamation will be performed in accordance with the approved reclamation plan (Section IV, A. Earthwork and B. Vegetation). All areas (roads, and pads) associated with the proposed Overburden Dumps will be regraded to prevent any surface water retention.

Proposed changes to the revegetation seeding and amendment rates will be submitted in a letter addendum for the Overburden Dump revision after the Vegetation Survey. Changes to the revegetation seed mix and fertilizer application rate will be a function of the vegetation and soil surveys proposed for completion in the summer following the approval of this reclamation plan revision.

3. **A detailed description of any surface facilities to be left as part of the post mining land use, including but not limited to buildings, utilities, roads, pads, ponds, pits and surface equipment.**

Surface facilities to be left at the Overburden Dumps after reclamation will include minor access roads for the private landowner. A surface water retention pond for livestock watering may also be left at the direction of the private landowner.

4. **A description of the treatment, location and disposition of any deleterious or acid-forming materials generated and left on-site, including a map showing the location of such materials upon the completion of reclamation.**

Deleterious or acid-forming materials will not be deposited in the Overburden Dumps.

5. **A planting program as best calculated to revegetate the disturbed area.**

5.11. **Plans shall include, at a minimum, grading and/or stabilization procedures, topsoil replacement, seed bed preparation, seed mixture(s) and rate(s), and timing of seeding (fall seeding is preferred timing).**

Reclamation will be performed in accordance with the approved reclamation plan (Section IV, A. Earthwork and B. Revegetation).

5.12 **Where there is no original protective cover, an alternative practical procedure must be proposed to minimize or control erosion or siltation.**

Reclamation will be performed in accordance with the approved reclamation plan (Section IV, A. Earthwork and B. Revegetation).

VII. RECLAMATION PRACTICES (Rule 647-4-111)

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1. **Public safety & welfare – Posting warning signs.**

Posting of warning signs for purposes of public safety and welfare will be completed by Holcim. Signs will be placed in accordance to MSHA standards.

2. **Reclamation of natural channels.**

Currently French drains are being utilized for routing water on the mine site. Holcim will provide appropriate examples, pictures or figures and support text for this question using current mine practices as referenced. The size and expected runoff from the watershed will be calculated and any channels will be sized as needed to control erosion.

Hydrology Response:

A drainage area delineation of the Holcim dump expansion at the Devil's Slide quarry in Utah was conducted using a USGS quadrangle map. Two small drainage basins were identified that affect the proposed dump expansion (Drainage Area Map R647-4-111.2a under Appendix C). Existing plans call for a sloped fill area at the northeastern perimeter of the dump expansion that will create a desilting basin. As a result, and because of the different cover and slopes between the non-disturbed upper drainage area and the dump, the eastern drainage area was split into two sub-drainages for design purposes. They are DA-1N (northern section with native slopes and vegetation) and DA-1S (mine dump expansion).

Surface drainage is well developed in much of the area. Following are the series type and a brief hydrologic description of the soils identified on the mine property:

- St. Marys (gravelly loam) – Well drained and with medium to rapid runoff and moderate to moderately rapid permeability.
- Hoskin (cobbly loam) – Well drained or somewhat excessive drained with medium to rapid runoff and moderate to moderately rapid permeability.
- Henefer (silt loam) – Well drained with medium to slow runoff and slow permeability.
- Kilfoil (loam) – Well drained with medium runoff and moderate permeability above the bedrock.

Average annual precipitation for the area is 24 to 28 inches per year (NCRS Utah Annual Precipitation, 1961 0 1990). Design storm rainfall intensities were taken from Utah Isopluvial (hyetograph) maps, NOAA Atlas 2, Volume VI (Appendix C). Runoff was calculated sing SCS Type II method. Hydrologic soil cover classes (National Engineering handbook, Handbook for Environmental Engineering and NRCS maps) were used to determine curve numbers, and these were assigned to each of the drainage areas. Peak flow, runoff depths and volumes were calculated for four 24-hour storm events (2, 10, 50 and 100year). This information is presented in the Dump Expansion Hydraulic Summary table.

Ditches and Desilting Basins (Ditches and Basins Map R647-4-111.2b in Appendix C)

Drainage Area 1: Runoff from drainage area DA-1N (north) will report to an upper desilting basin at a sloped fill area being constructed at the northeastern perimeter of the dump expansion. This basin will be sized to contain runoff from the 10-year event. From this point, an overflow ditch will be sized to contain runoff from the 10-year event. From this point, an overflow ditch will be constructed and maintained on the eastern edge of drainage area DA-1S (south) to transport the combined flows of the two drainage areas. The ditch is divided into two segments for design purposes (see Ditches and Basins Map):

- Ditch Segment 1: "V" notch or equivalent 2 feet deep with 3:1 side-slopes. Armor with 4 inch (median diameter) riprap a minimum of 1 foot deep (below flow line) to reduce velocity and limit scour.
- Ditch Segment 2: "V" notch or equivalent 1.0 feet deep with 3:1 side-slopes. Armor with 40 inch (median diameter) riprap a minimum of six feet deep (below flow line) to reduce velocity and limit scour. See Design Summary and Pipe option section.

Construction of a lower basin at the southern (down-gradient) end of the dump expansion will desilt the dump runoff and overflow from the upper basin.

Drainage area 2: This drainage area consists almost entirely of dump expansion. Assuming the expansion will be level across the top with a uniform sloped face, no ditches will be necessary to prevent erosion; however, the entire topsoil area will be cross-ripped (perpendicular to the slope) and seeded. A temporary desilting basin will be constructed and maintained at the bottom of the west slope until vegetation is established. An optional swale or swales may be constructed between the toe of the dump and the west-desilting basin to direct flow in a northerly direction. This will reduce velocities and serve as a pre-desilting basin should runoff cut a path through the cross-ripped area. The swale will also serve as a rolling rock barrier at the toe of the western dump.

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Channels and desilting basins have been designed to contain and transport runoff for a 10-year storm event. Desilting basins will be monitored on a regular basis to check for breaches or sediment deposits. Removal of deposits and repairs will be made as necessary. Design dimensions are included with the attached tables.

3. **Erosion and Sediment control**

Please see response to Section 107.2 and Appendix B

4. **Dams & Impoundments left self-draining and stable. (111.9)**

The surface owner (M.R. Wilde and Sons L.L.C.) can see no positive effect in leaving the basins intact after the dump is complete. Part of the reclamation will involve breaching the basins, returning the slopes to conditions prior to construction of the basins and re-seeding the area with approved seed mixture.

5. **Topsoil redistribution (111.12)**

Topsoil replacement depths will reflect the results of the soil survey to be conducted in the summer following the approval of the reclamation plan revision. Volume calculations of the soil to be salvaged will be submitted with the soil survey.

VIII. VARIANCE (Rule R647-7-112).

Please identify any requests for variance from the requirements of rules R647-4-107, -108, or –111. A narrative justification must also be included for each variance request. A discussion of any alternate methods or other mitigating measures should be included, if applicable.

1. Holcim originally requested a variance which exempts the operator from including rock outcrops in the reclamation plan. Since there are no rock outcrops in either Quarry Hollow or Cottonwood Canyon, there is no need for this request for variance in this plan revision.

2. Holcim reserves the right to request other variances at the point when the soil and vegetation surveys are completed.

IX. SURETY (Rule 647-4-113).

Indicate whether the proposed activities will change the amount of work required to reclaim the mine site. If significant changes will result, then an itemized reclamation cost estimate should be provided (and attached) with direct reference to the specifics of the proposed change(s). This information will be used to assist the Division in determining any reclamation surety adjustments required for the operation.

1. Holcim has calculated the acreage to be reclaimed is 184.5 acres.

2. Holcim has obtained a contractor's bid for grading and topsoil placement on the Overburden Dump slopes (last item in the Tables section). The volume of soil available for reclamation as well as the revegetation seed mixture and fertilizer application rate may be amended following completion of the soil and vegetation surveys in the summer following approval of this reclamation permit revision. Revision of the contractor's bid estimate as well as the revegetation cost estimate may be necessary as a result of these tasks. If so, this information will be submitted as part of the amendment to the Overburden Dump Permit.

TABLES:

Question 106.3 – Estimated acreage disturbed, reclaimed, annually Reclamation costs
Question 111.2 – Dump Expansion Hydraulic Analysis (111.2)
Question 111.2 – Dump Expansion Dutch and Riprap Sizing (111.2)
Flare Construction Stripping Bid

Appendices:

A: Stability Analysis Computer Output files for the GEO-SLOPE© Software
B: Best Management Practice for Erosion and Sediment Control

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C: Hydrology/Hydraulic Support Documentation, Question 111.2
Map R-647-4-111.2a – Drainage Areas
Map R-647-4-111.2b – Drainage Ditches and Desilting Basins, Devil's Slide Mine Soil Series Descriptions
Isopluvial Maps, NOAA Atlas 2, Volume VI
D: Overburden Dump Pictures

Figures:

Map DCC-1597 – USGS – Topography Devil's Slide Plant & Quarry Area, Graphical Scale
Map DCC-1597 – Holnam Topography Devil's Slide Plant & Quarry Area, Scale 1" = 400'
Map dcc-1338-97 – Holnam Plan View of the Overburden Dump, Scale 1" = 200'
Map DCC-1702 – Holnam Cross Sections of the Overburden Dump, Scale 1" = 200'

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106.3 Estimated acreage disturbed, reclaimed, annually

Reclamation Costs*
Devil's Slide Dump Expansion
*Costs developed per data from Test Plot #2

Seed Variety	Seed Costs Pounds PLS/Ac	Cost/ Pound	Cost/ Acre
Whitmar Beardless Wheatgrass not available - substitute Goldar Wheatgrass	18.74	$9.00	$168.66
Tall Wheatgrass	13.33	$1.50	$20.00
Nordan Chrested Wheatgrass	10.2	$3.00	$30.60
Magnar Basin Wildrye	6.52	$18.00	$117.36
Paiute Orchard Grass	6.46	$1.50	$9.69
Yellow Blossom Sweetclover	3.19	$55.00	$175.45
Birchleaf Mountain Mahogany (broadcast)	1.5	$49.00	$73.50
Bitterbrush (broadcast)	1.5	$22.00	$33.00
Small Burnet	4	$2.00	$8.00
Seed Cost per Acre Subtotal			$636.26

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Fertilizer
and Hydroseeding

Fertilizer	Pounds/ Acre	Cost/ Pound	Cost/ Acre
IFA 0-44-0 (difficult availability) Substitute 11-52-0 or equivalent	50	$8.03	$401.50
IFA 34-0-0	50	$7.22	$361.00
Fertilizer Subtotal			$762.50
Tackifier and Mulch			
Tackifier	40	$1.00	$40.00
Mulch Weyerhause SilvaFiber no longer available - substitute EcoFiber or equivalent	1500	$0.16	$240.00
Fertilizer, Tackifier and Mulch Subtotal			$1,042.50

Hydroseeder Equipment Cost	Hours	Cost/ Hours	
Hydroseeder 1100 gal. Capacity - 2 man crew	8	$110.00	$880.00
Mobe and Demobe			$200.00
Hydroseeder Subtotal			$1,080.00

Disturbance Area Totals
Based on Limit of Proposed Overburden Dump
Plan and Profile - Devil's Slide Plant

	Cost/Ac.	Number of Acres	Total per Unit
Seed Costs	$636.26	222.4	$141,504.22
Fertilizer, Tackifier, and Mulch	$1,042.50	222.4	$231,852.00
Hydroseeder			$1,080.00
Total			$374,436.22

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Recommended Revegetation Species List
for

Holnam, Inc.
Devil's Slide Plant
M/029/001

Common Name	Species Name	*Rate lbs/ac (PLS)
Tall wheatgrass	*Agropyron elongatum*	1.0
Bluebunch wheatgrass	*Agropyron spicatum*	2.0
'Piute' orchard grass	*Dactylis glomerata 'piute'*	0.5
'Magnar' Basin Wildrye	*Elymus cinereus 'magnar'*	2.0
'Ephraim' Crested wheatgrass	*Agropyron cristatum 'ephraim'*	0.5
Ladac Alfalfa	*Medicago sativa*	0.5
Yellow sweetclover	*Melilotus officinalis*	0.5
Palmer penstemon	*Penstemon palmerii*	0.5
Small burnet	*Sanguisorba minor*	1.5
Mountain big sagebrush	*Artemisia tridentata vaseyana*	0.1
Rubber Rabbitbrush	*Chrysothamnus nauseosus*	0.25
Forage kochia	*Kochia prostrata*	0.5
Bitterbrush	*Purshia tridentata*	1.0
	Total	10.85 lbs/ac

*This the recommended broadcast seeding rate.

Prepared by DOGM 1/22/01

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Flare Construction inc.

Post Office Box 134 • Coalville, Utah 84017 • Telephone (801) 336 2888

Monday, July 30, 2001

Estimate Only*

To: Ken George, Holnam
From: Chad Simister, Flare Construction, Inc.
Date: Monday, July 30, 2001
RE: Estimate for striping of Quarry Hollow and Cottonwood.
For bonding purposes. Mobilizaiton and Demobilization 4 times.

Item	Description	Meas.	Qty	Total Cost
1.	**Strip Quarry Hollow Area** Strip the site down 10" and stockpile material.	CY	104,765	$424,525.00
2.	**Strip Cottonwood Hollow Area** Strip the site down 10" and stockpile material.	CY	65,000	$273,000.00
3.	**Build Access Roads for Construction**	LS	1	$74,340.00
4.	**Reclaim Quarry Hollow Area** Spread 10" of material over stockpile material.	CY	104,765	$255,053.00
5.	**Reclaim Cottonwood Hollow Area** Spread 10" of material over stockpile material.	CY	65,000	$185,360.00

Conditions & Exclusions:

1. Estimate based on drawings and quantities from Holnam.
2. Estimate based on 4 mobilizations.
3. Estimate does not include seeding.

Respectfully,

Chad Simister
Estimator

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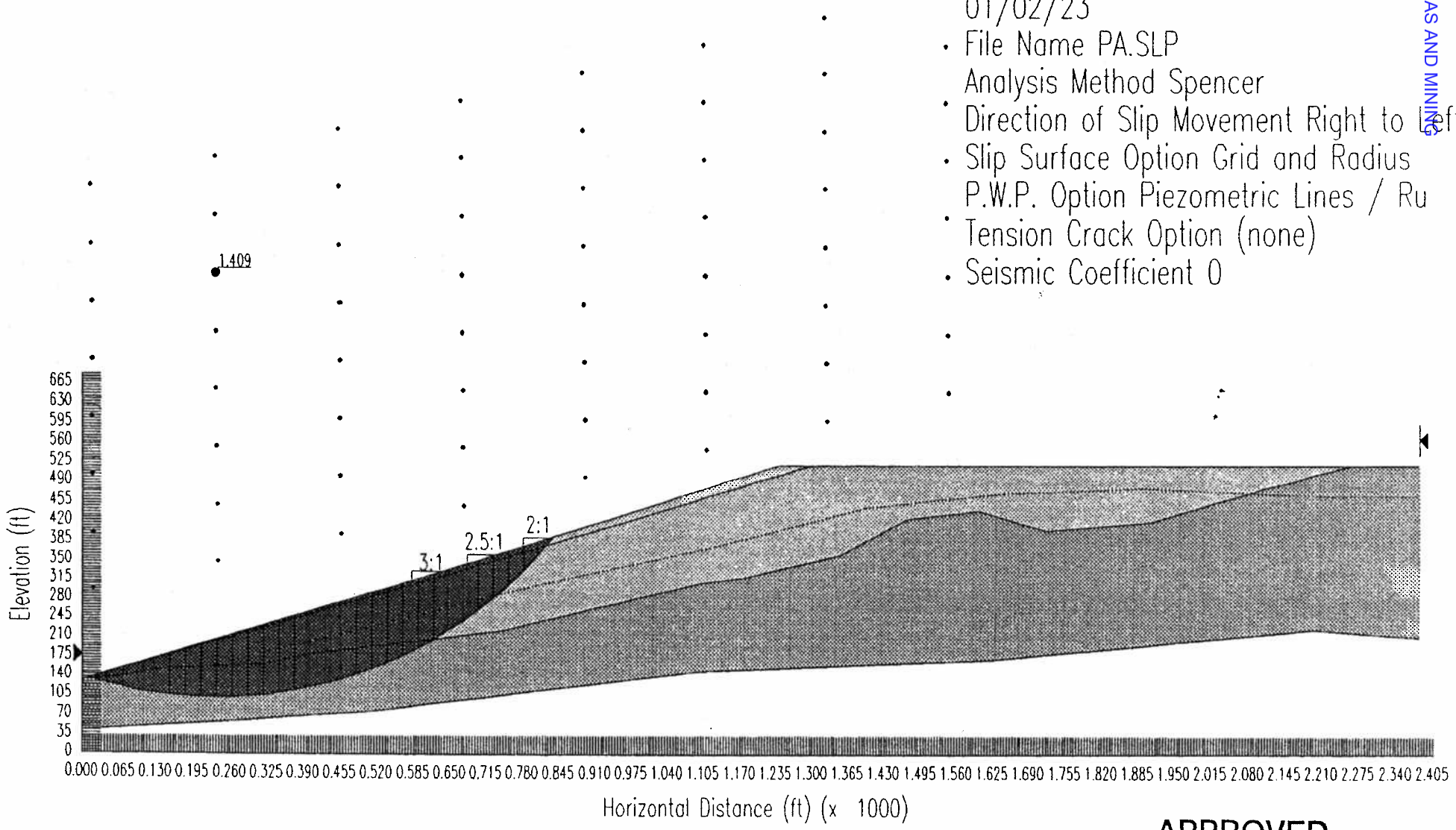
Devils Slide Plant
Overburden Dump Profile A
01/02/23
File Name PA.SLP
Analysis Method Spencer
Direction of Slip Movement Right to Left
Slip Surface Option Grid and Radius
P.W.P. Option Piezometric Lines / Ru
Tension Crack Option (none)
Seismic Coefficient 0



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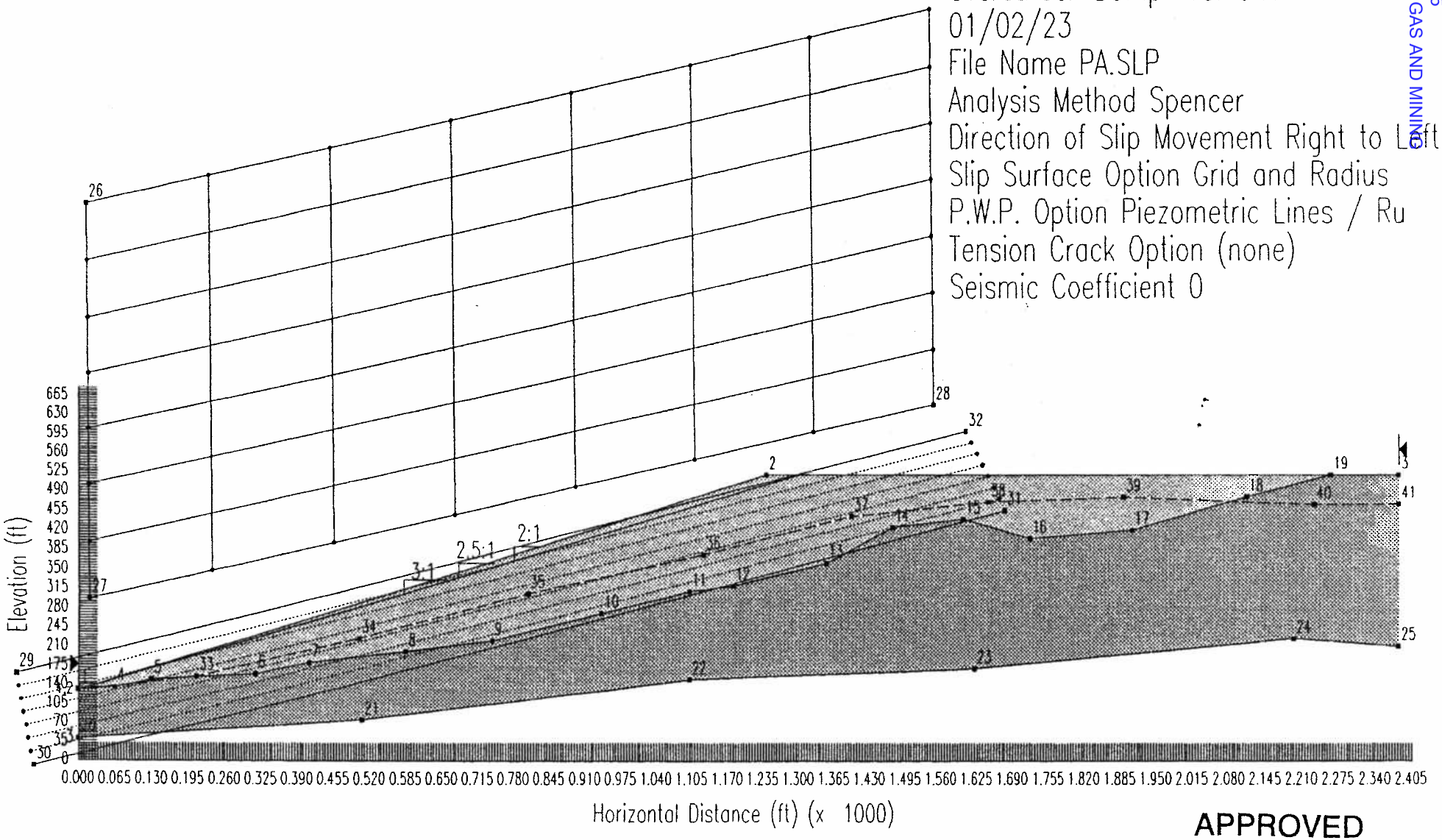
Seismic Coefficient 0



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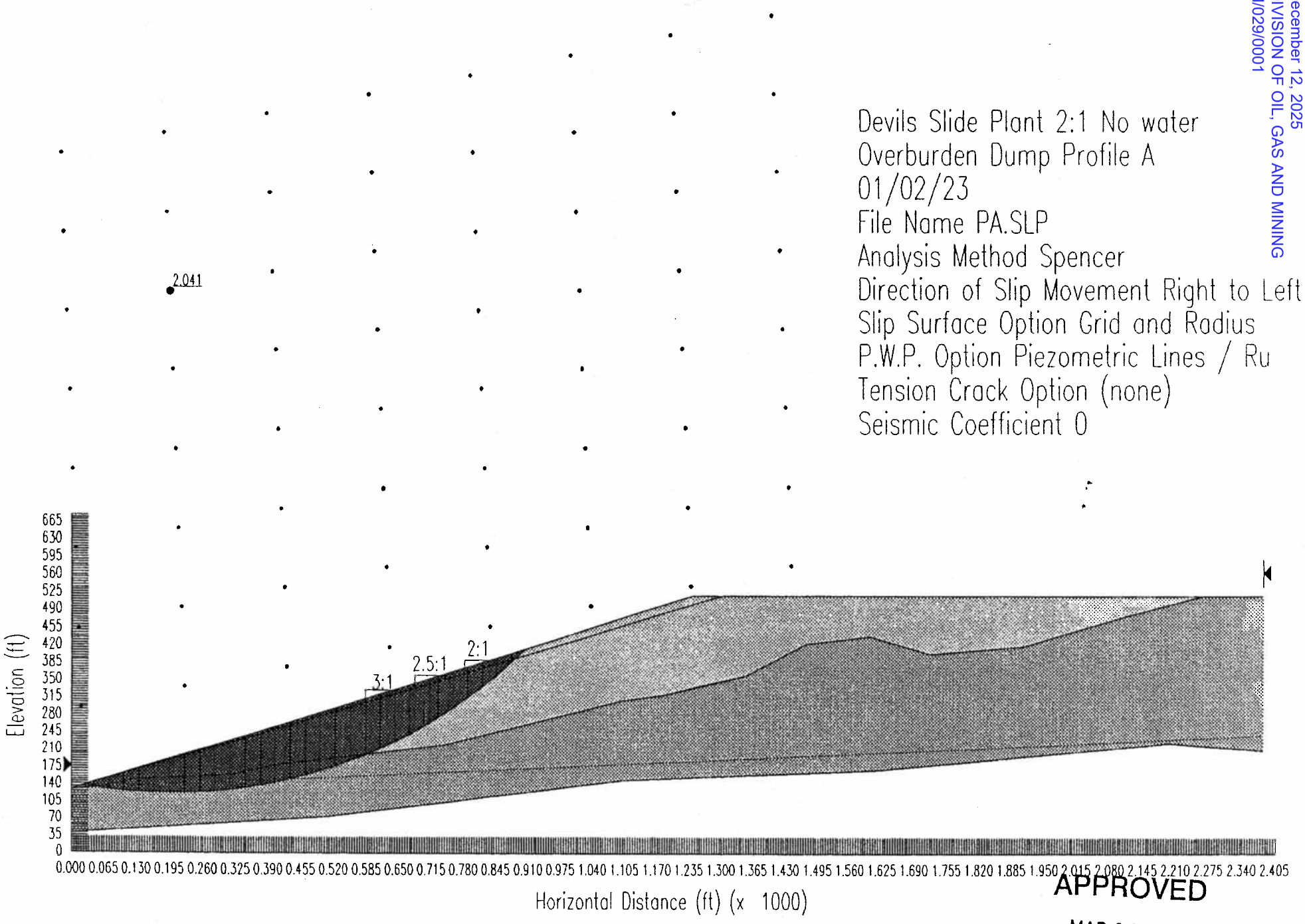
Devils Slide Plant 2:1 No water
Overburden Dump Profile A
01/02/23
File Name PA.SLP
Analysis Method Spencer
Direction of Slip Movement Right to Left
Slip Surface Option Grid and Radius
P.W.P. Option Piezometric Lines / Ru
Tension Crack Option (none)
Seismic Coefficient 0



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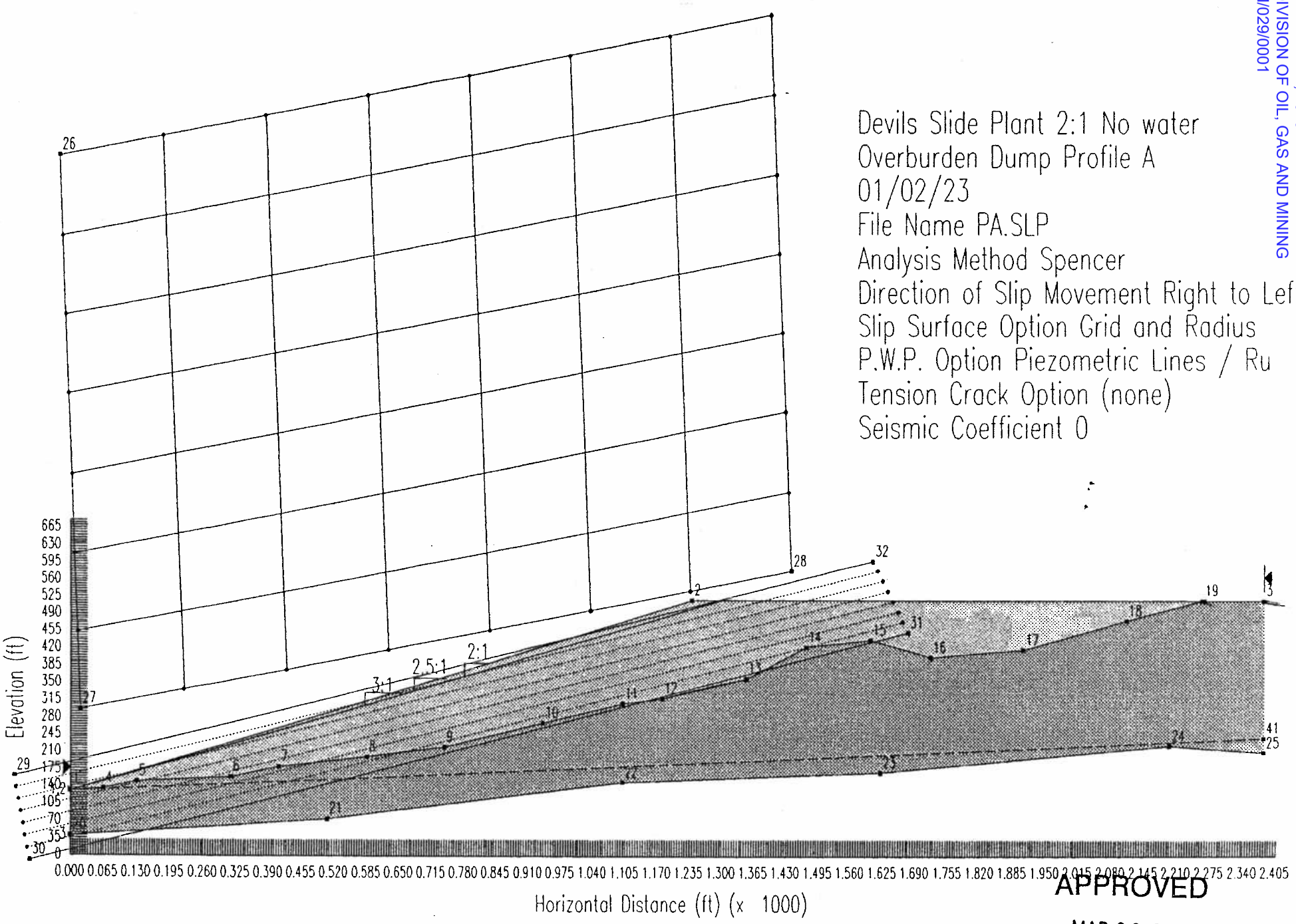

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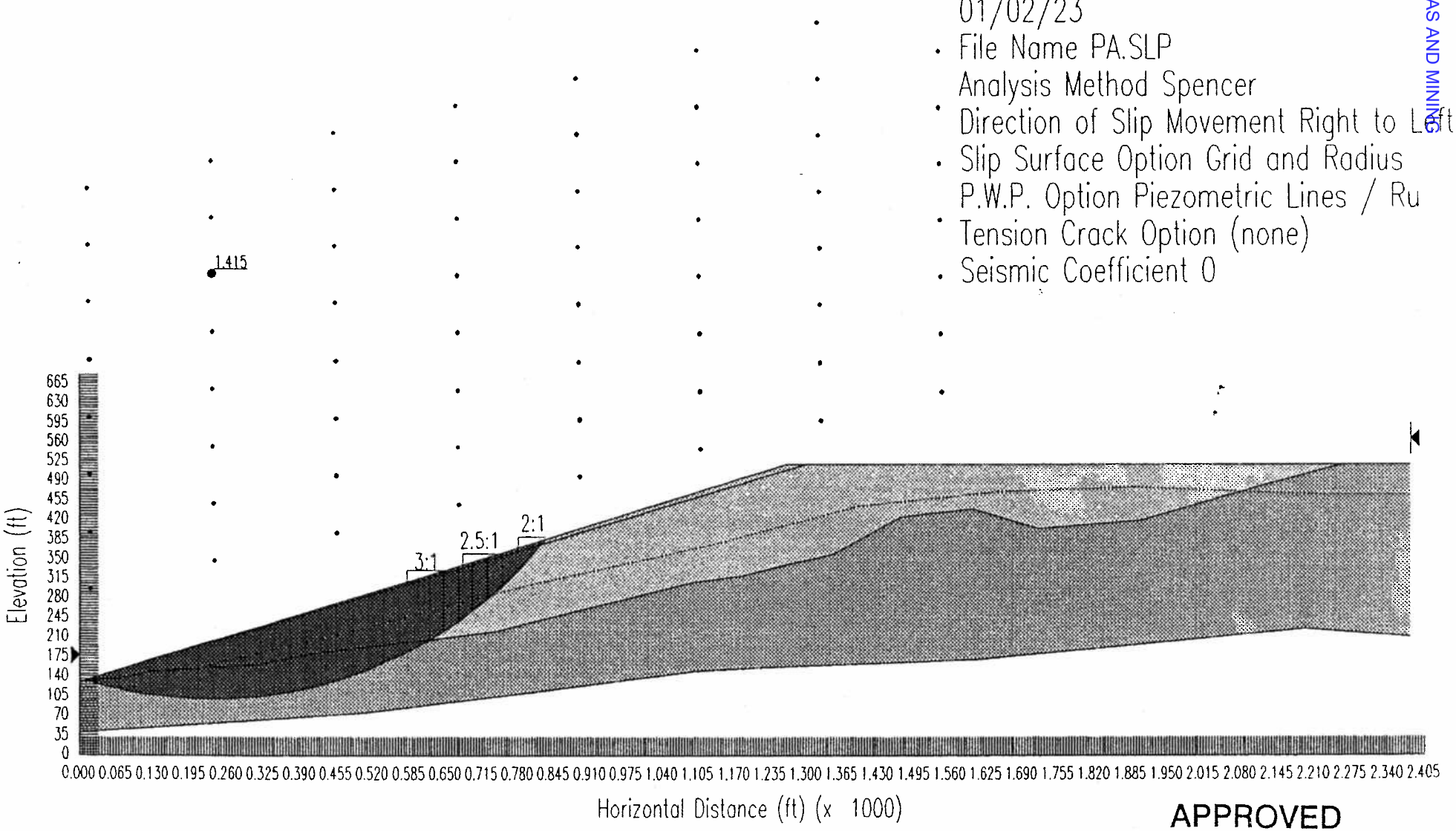

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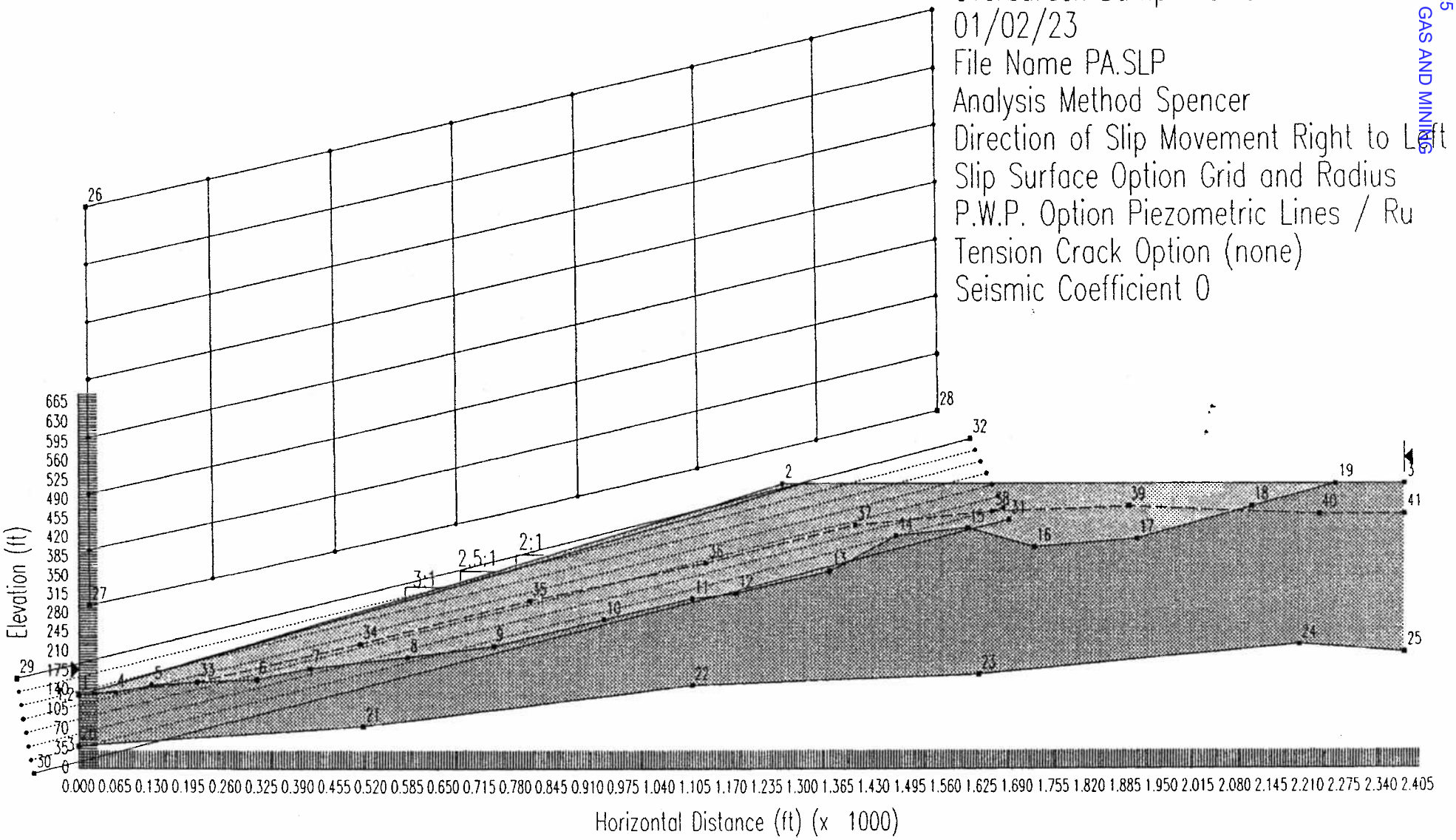
Tension Crack Option (none)
Seismic Coefficient 0



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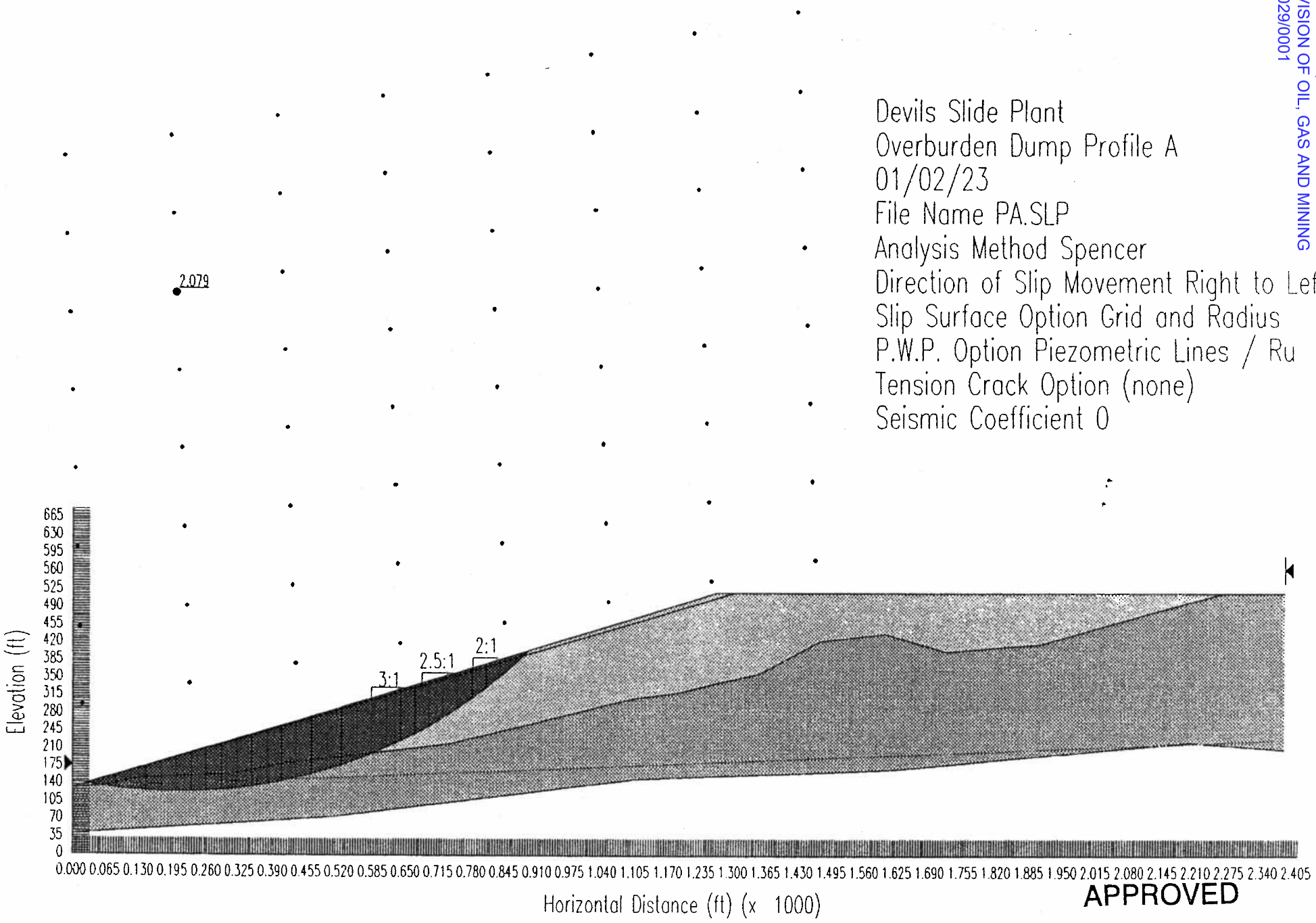
Tension Crack Option (none)
Seismic Coefficient 0



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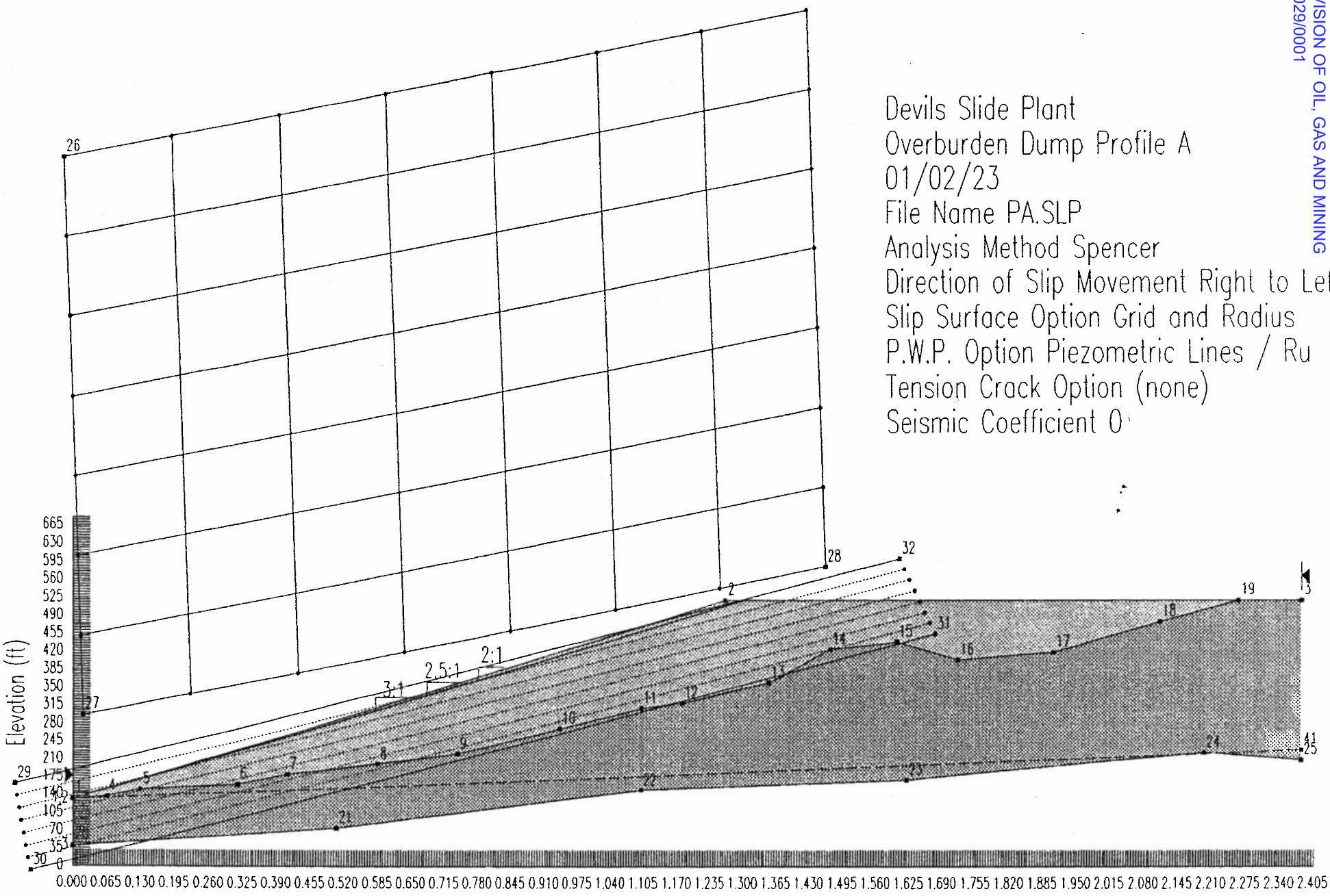

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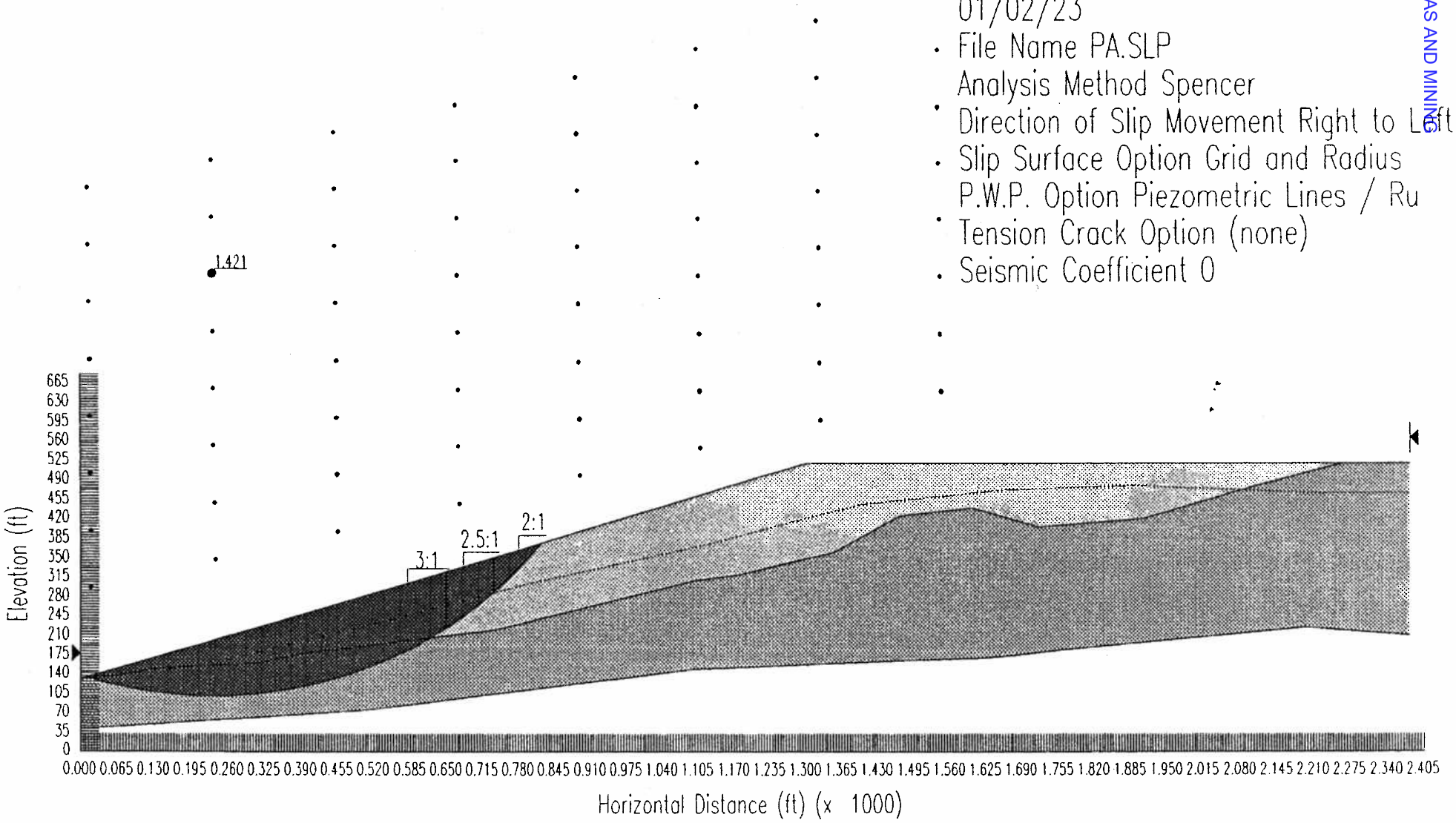
Devils Slide Plant3:1
Overburden Dump Profile A
01/02/23
File Name PA.SLP
Analysis Method Spencer
Direction of Slip Movement Right to Left
Slip Surface Option Grid and Radius
P.W.P. Option Piezometric Lines / Ru
Tension Crack Option (none)
Seismic Coefficient 0



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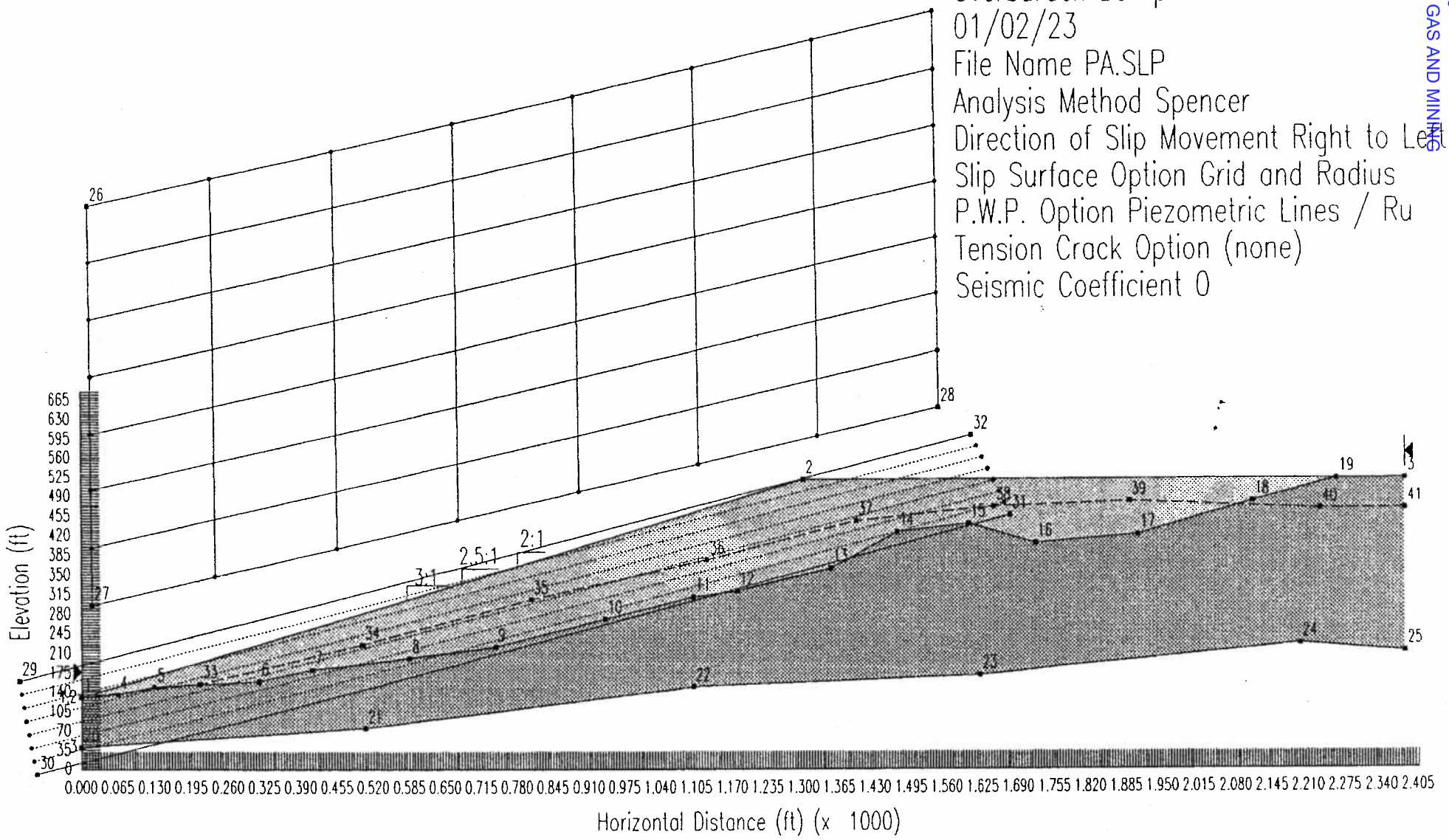
Devils Slide Plant3:1
Overburden Dump Profile A
01/02/23
File Name PA.SLP
Analysis Method Spencer
Direction of Slip Movement Right to Left
Slip Surface Option Grid and Radius
P.W.P. Option Piezometric Lines / Ru
Tension Crack Option (none)
Seismic Coefficient 0



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Devils Slide Plant3:1
Overburden Dump Profile A
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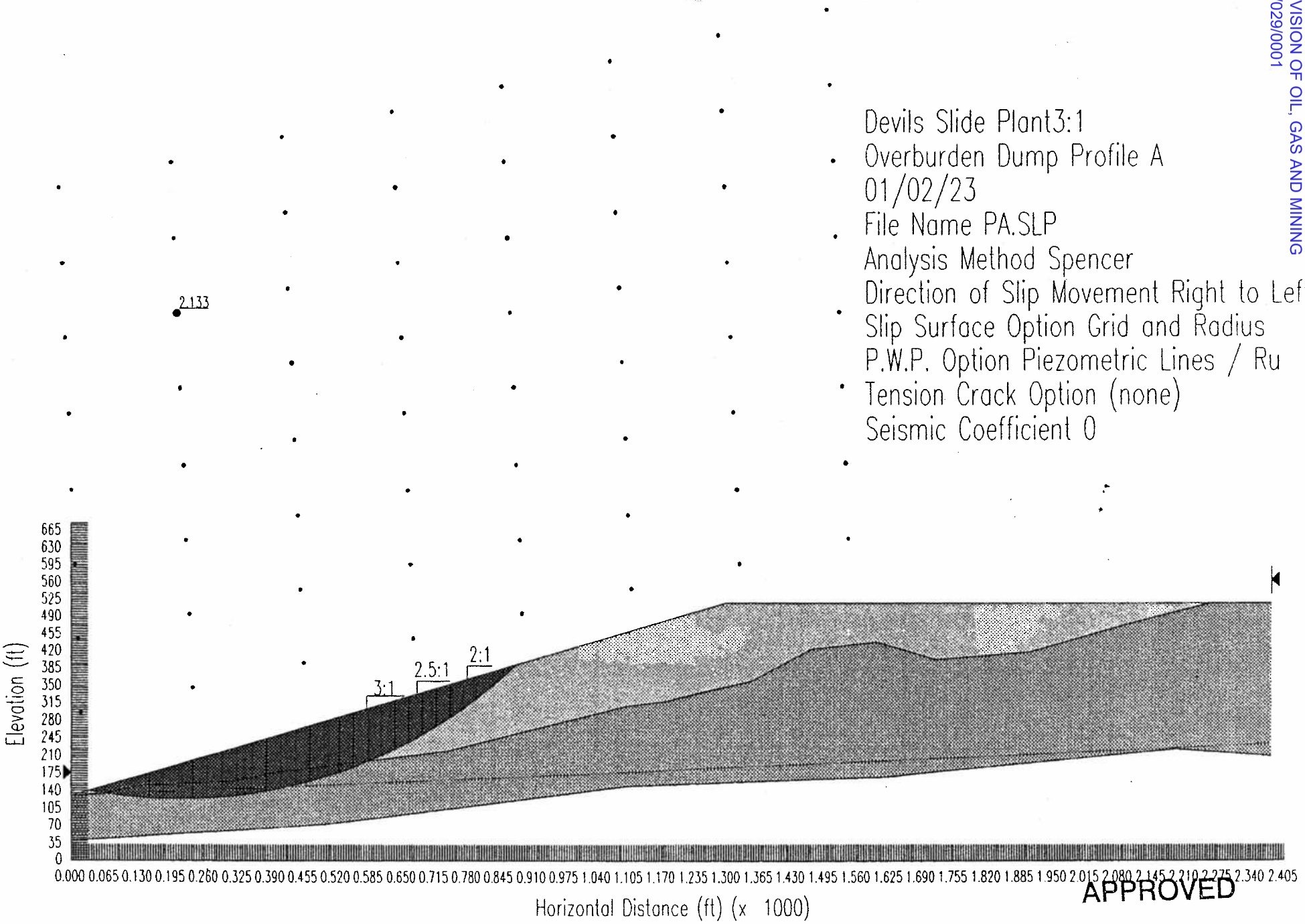
File Name PA.SLP
Analysis Method Spencer
Direction of Slip Movement Right to Left
Slip Surface Option Grid and Radius
P.W.P. Option Piezometric Lines / Ru
Tension Crack Option (none)
Seismic Coefficient 0



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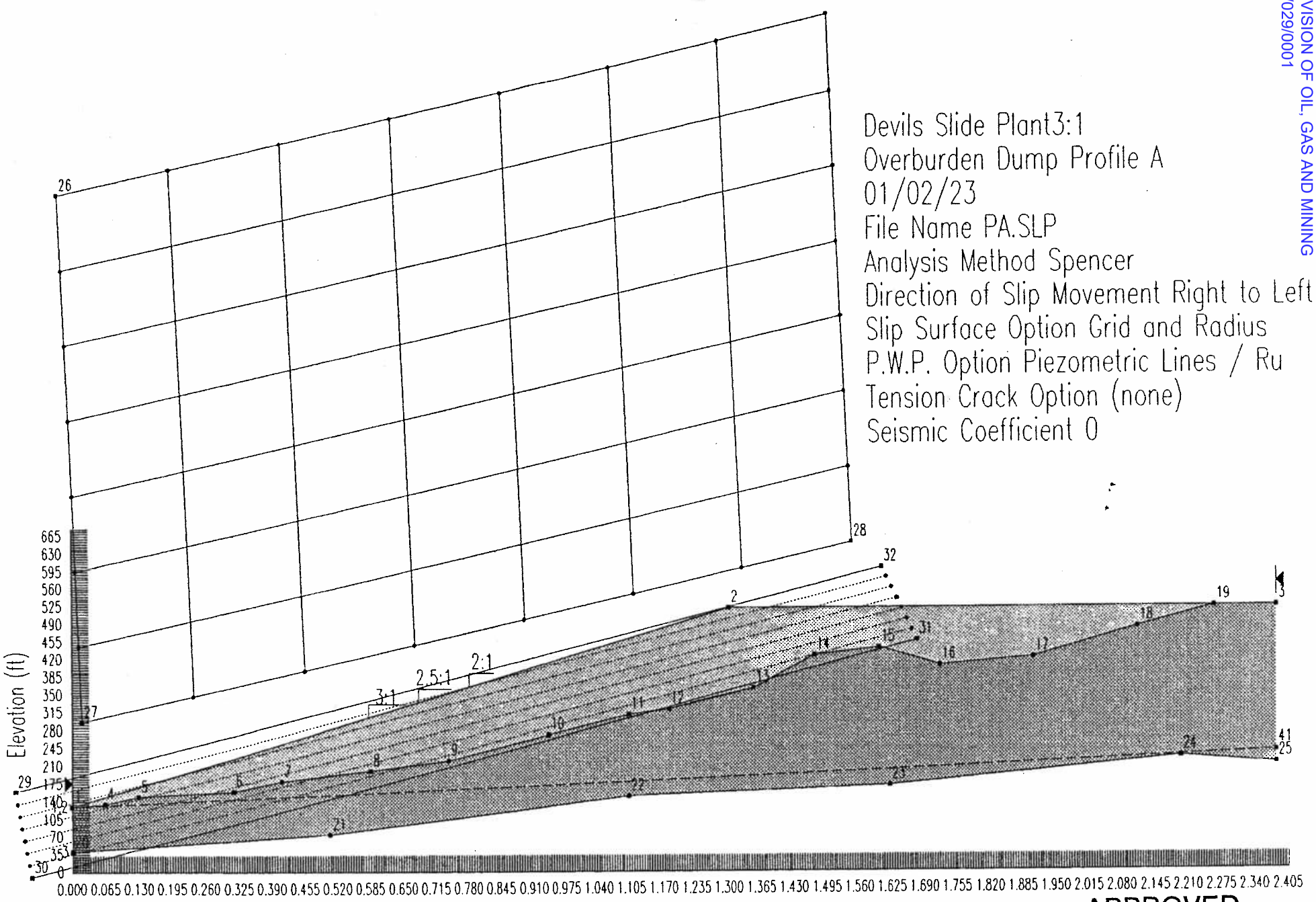

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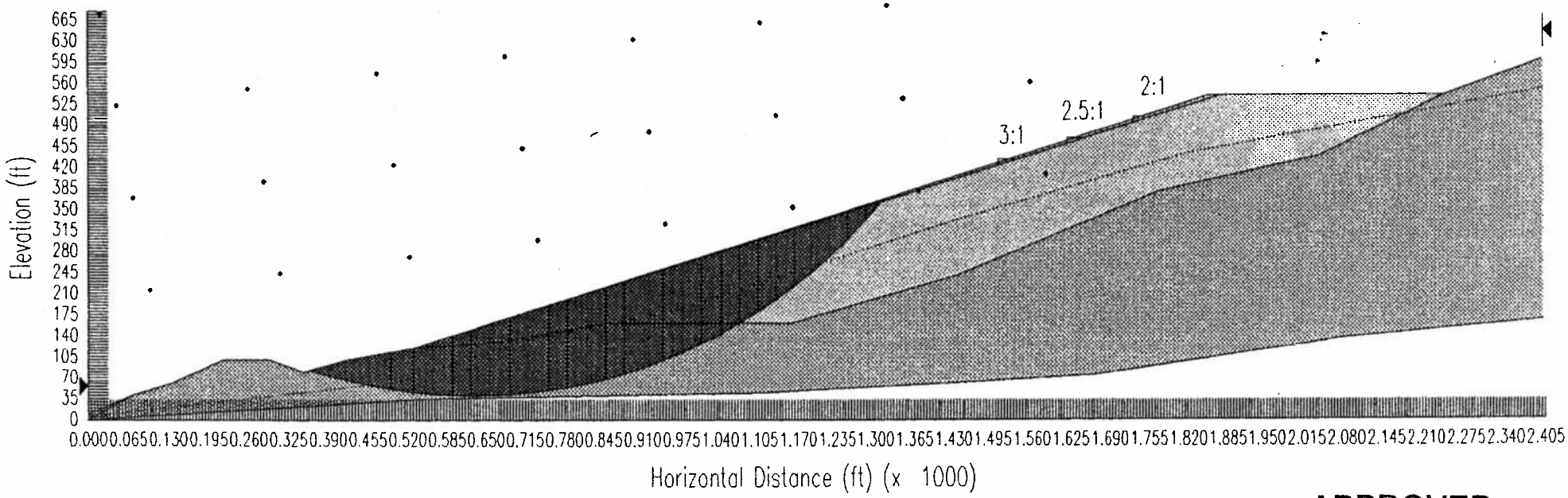
Devils Slide Plant 2:1
Overburden Dump Profile B
01/02/23
File Name PB.SLP
Analysis Method Spencer
Direction of Slip Movement Right to Lef
Slip Surface Option Grid and Radius
P.W.P. Option Piezometric Lines / Ru
Tension Crack Option (none)
Seismic Coefficient 0



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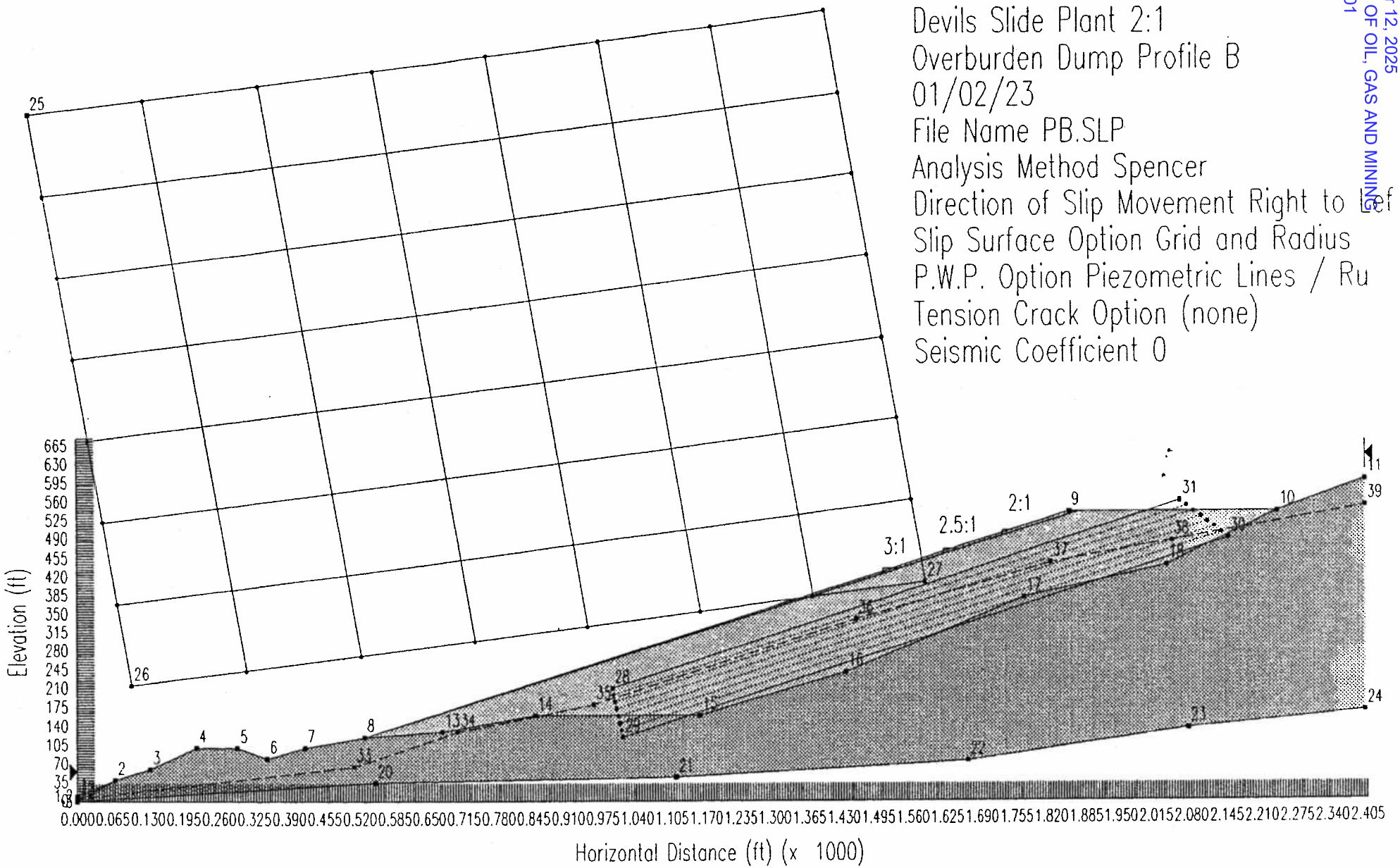
Devils Slide Plant 2:1
Overburden Dump Profile B
01/02/23
File Name PB.SLP
Analysis Method Spencer
Direction of Slip Movement Right to Lef
Slip Surface Option Grid and Radius
P.W.P. Option Piezometric Lines / Ru
Tension Crack Option (none)
Seismic Coefficient 0



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Devils Slide Plant 2:1
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01/02/23
File Name PB.SLP
Analysis Method Spencer
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Slip Surface Option Grid and Radius
P.W.P. Option Piezometric Lines / Ru
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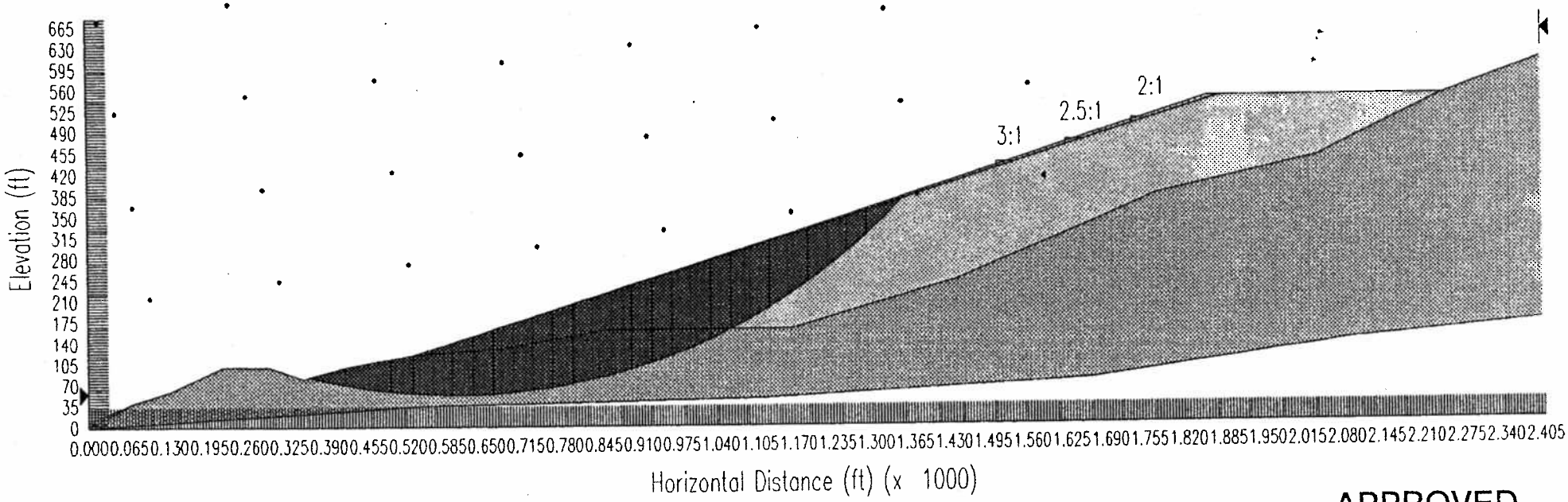

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Devils Slide Plant 2:1
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01/02/23
File Name PB.SLP
Analysis Method Spencer
Direction of Slip Movement Right to Left
Slip Surface Option Grid and Radius
P.W.P. Option Piezometric Lines / Ru
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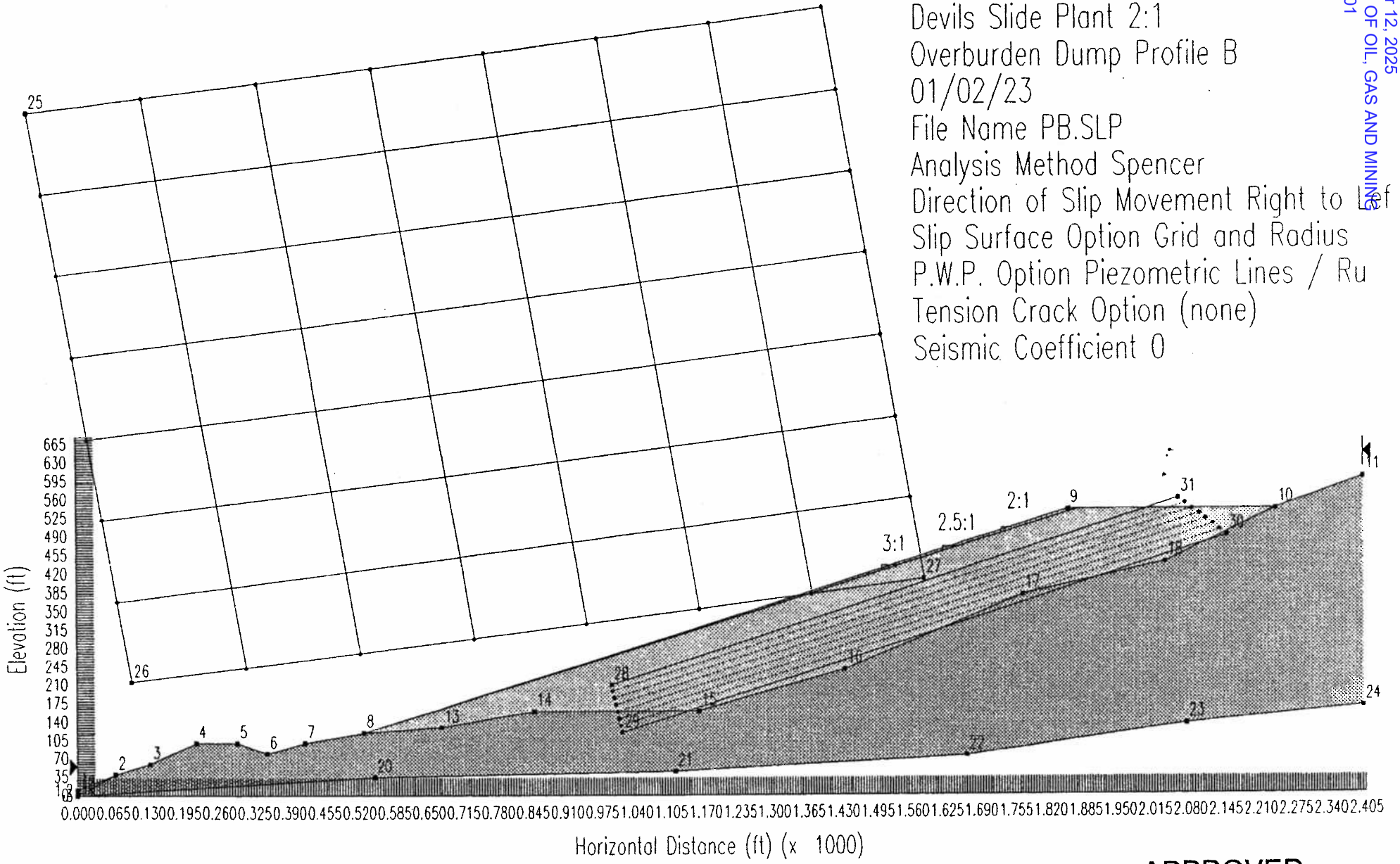

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Devils Slide Plant 2.5:1
Overburden Dump Profile B
01/02/23
File Name PB.SLP
Analysis Method Spencer
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Slip Surface Option Grid and Radius
P.W.P. Option Piezometric Lines / Ru
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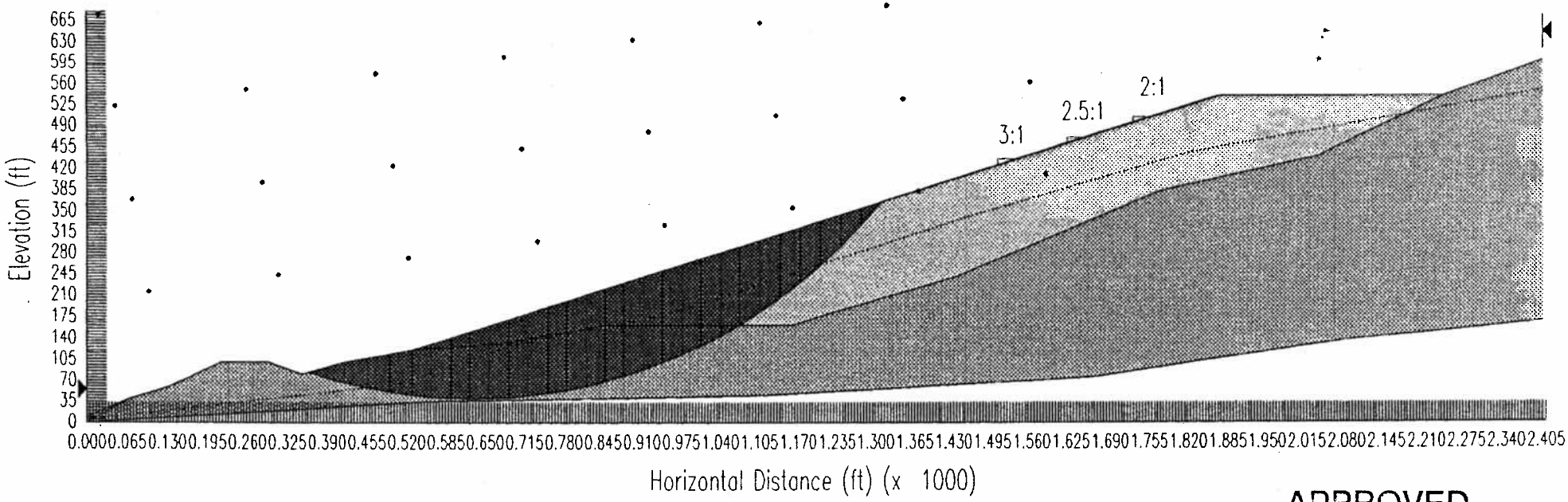

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Devils Slide Plant 2.5:1
Overburden Dump Profile B
01/02/23
File Name PB.SLP
Analysis Method Spencer
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Slip Surface Option Grid and Radius
P.W.P. Option Piezometric Lines / Ru
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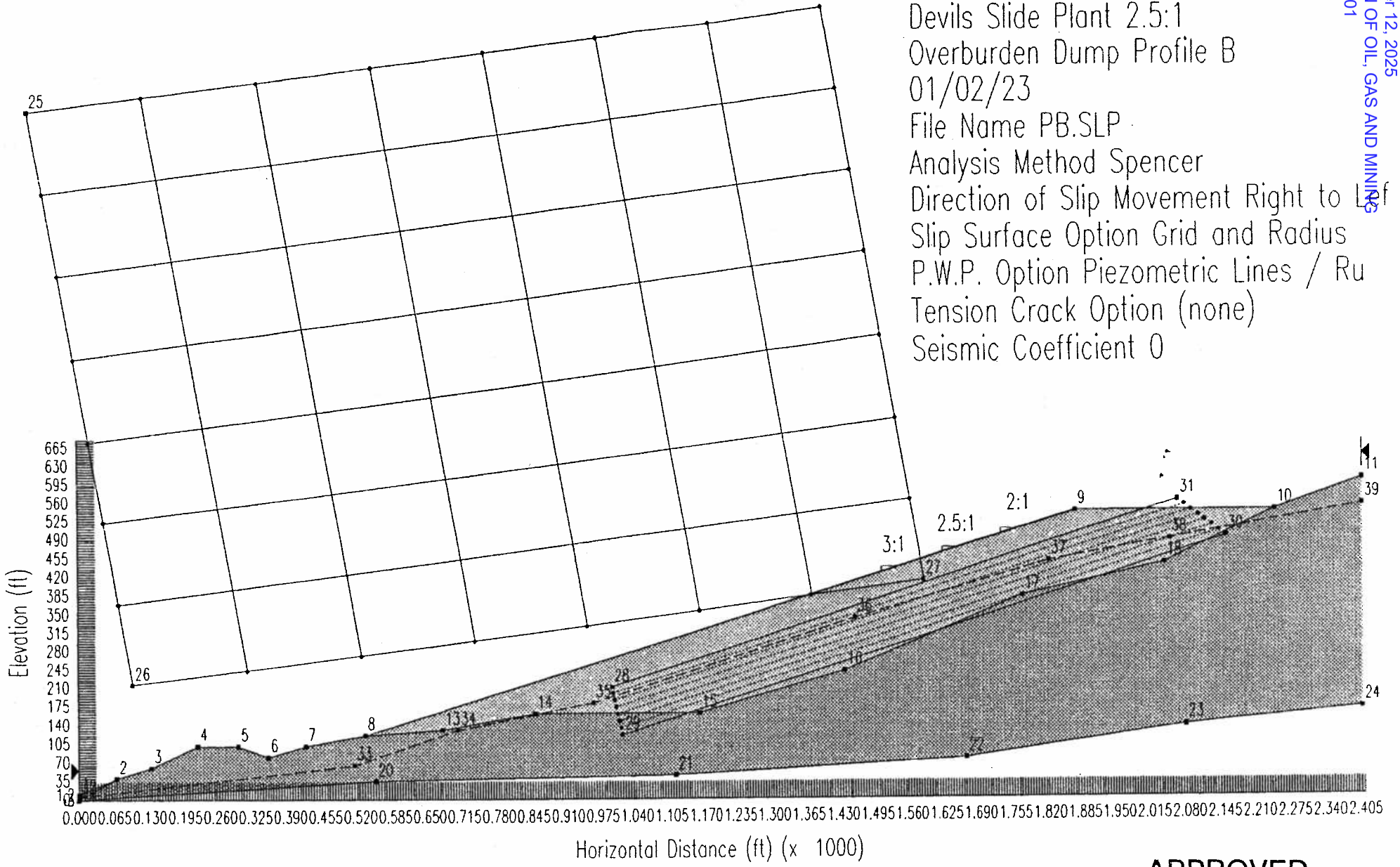

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Devils Slide Plant 2.5:1
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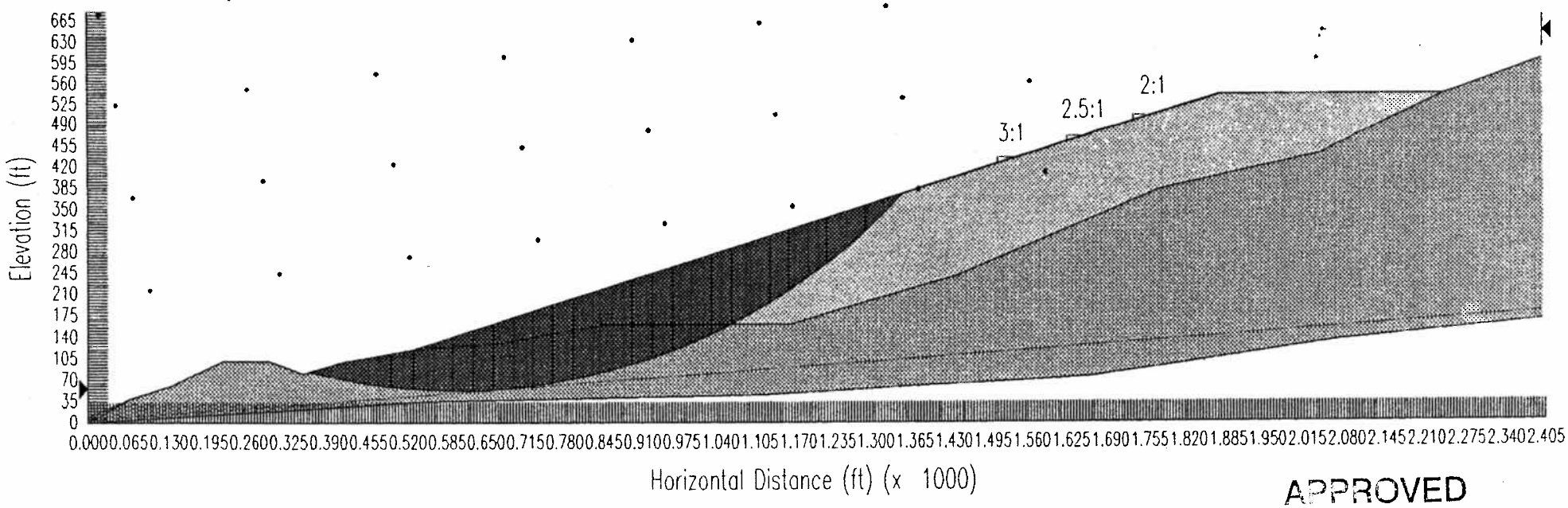
File Name PB.SLP
Analysis Method Spencer
Direction of Slip Movement Right to Lef
Slip Surface Option Grid and Radius
P.W.P. Option Piezometric Lines / Ru
Tension Crack Option (none)
Seismic Coefficient 0



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Devils Slide Plant 2.5:1
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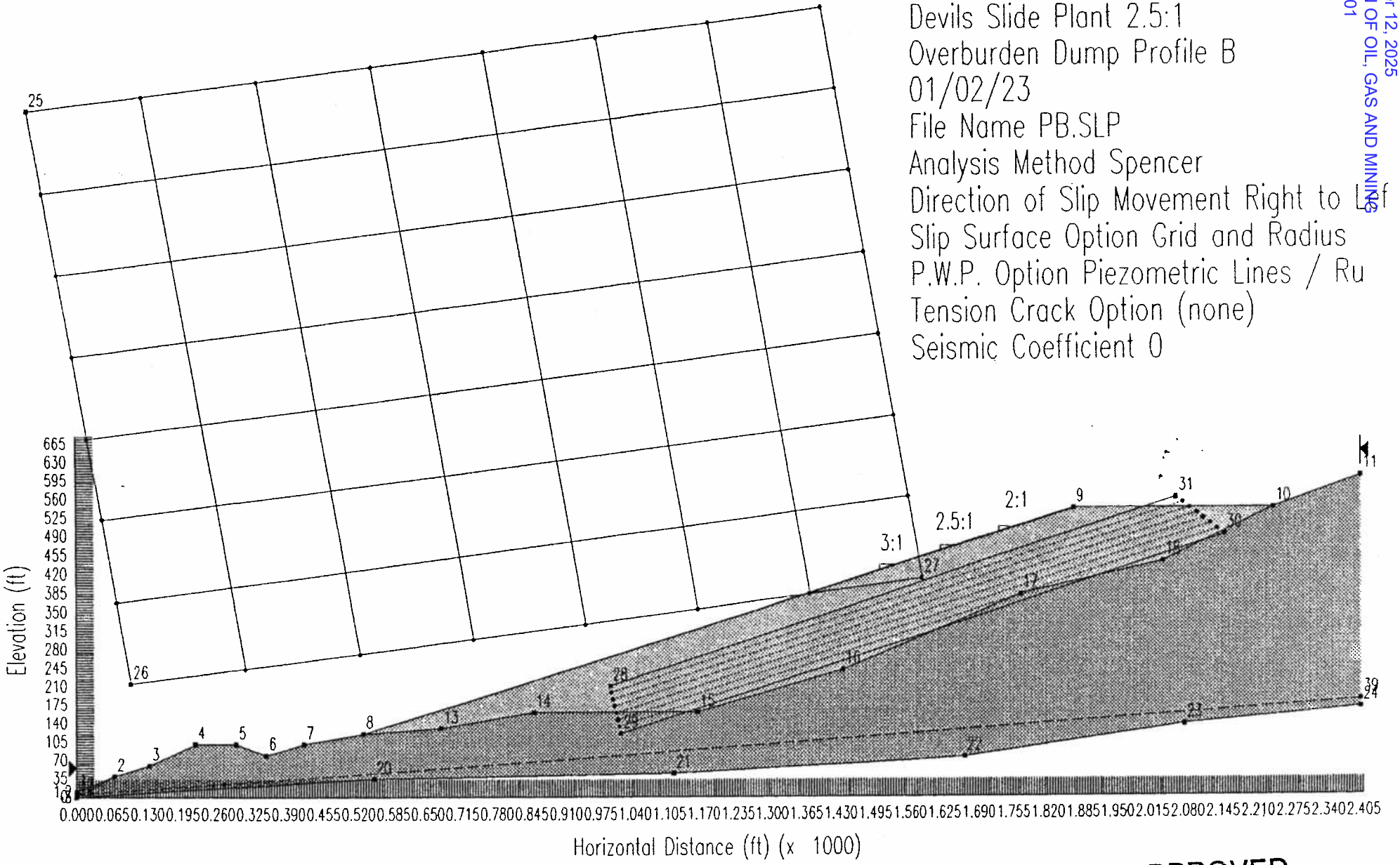
Analysis Method Spencer
Direction of Slip Movement Right to Left
Slip Surface Option Grid and Radius
P.W.P. Option Piezometric Lines / Ru
Tension Crack Option (none)
Seismic Coefficient 0



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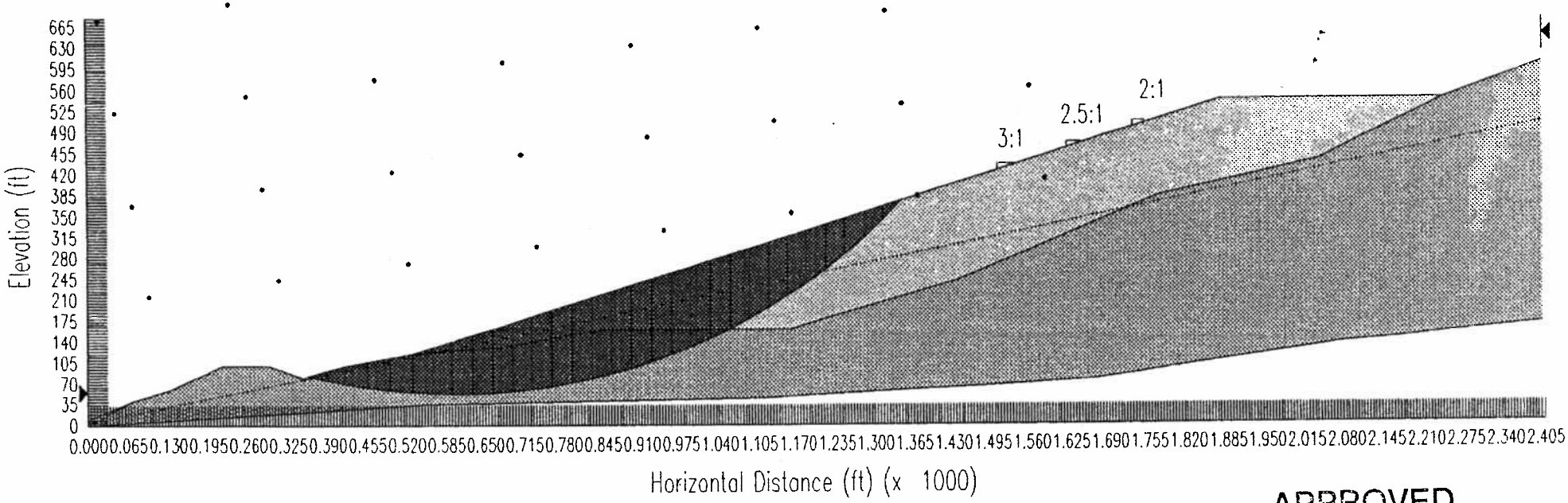
Devils Slide Plant 3:1
Overburden Dump Profile B
01/02/23
File Name PB.SLP
Analysis Method Spencer
Direction of Slip Movement Right to Lef
Slip Surface Option Grid and Radius
P.W.P. Option Piezometric Lines / Ru
Tension Crack Option (none)
Seismic Coefficient 0



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Devils Slide Plant 3:1
Overburden Dump Profile B
01/02/23
File Name PB.SLP
Analysis Method Spencer
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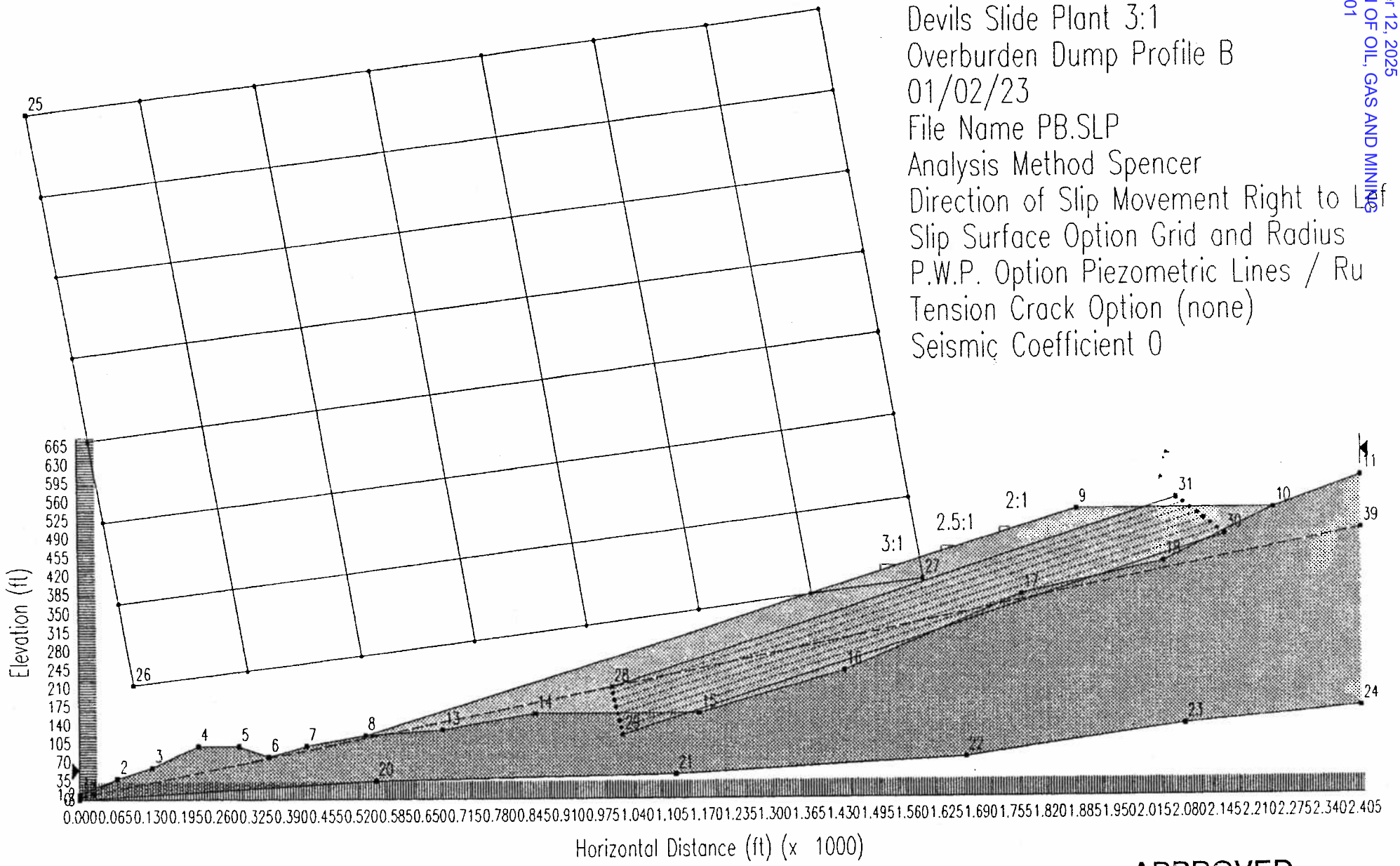
Slip Surface Option Grid and Radius
P.W.P. Option Piezometric Lines / Ru
Tension Crack Option (none)
Seismic Coefficient 0



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RECEIVED
December 12, 2025
DIVISION OF OIL, GAS AND MINING
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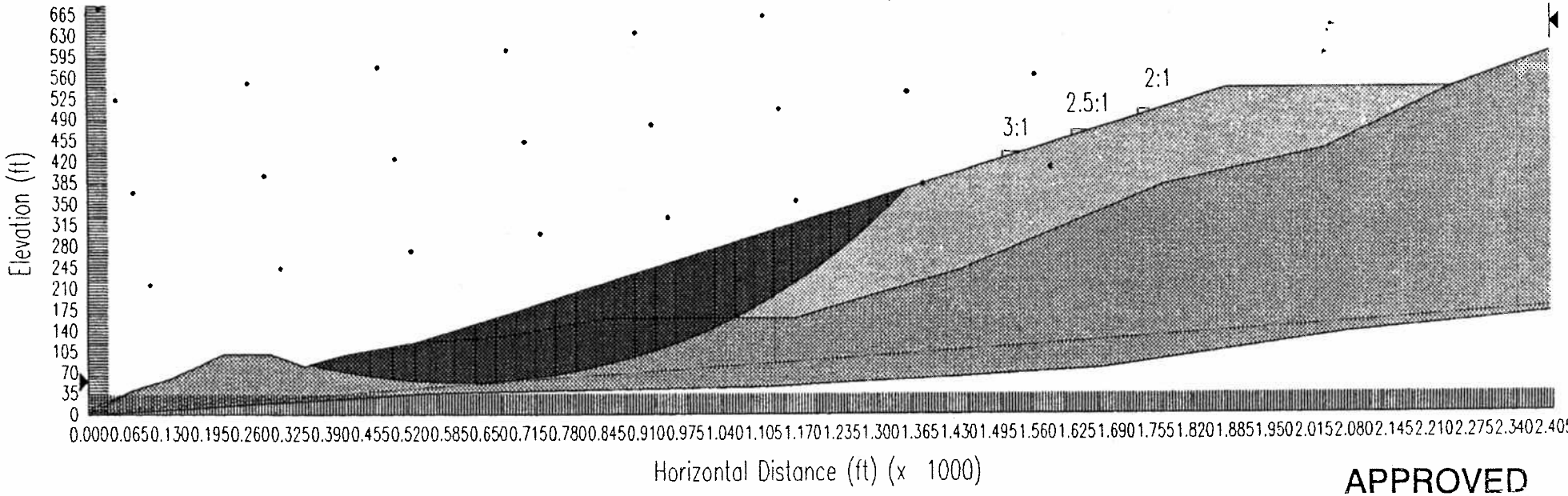
Devils Slide Plant 3:1 no water
Overburden Dump Profile B
01/02/23
File Name PB.SLP
Analysis Method Spencer
Direction of Slip Movement Right to Le
Slip Surface Option Grid and Radius
P.W.P. Option Piezometric Lines / Ru
Tension Crack Option (none)
Seismic Coefficient 0



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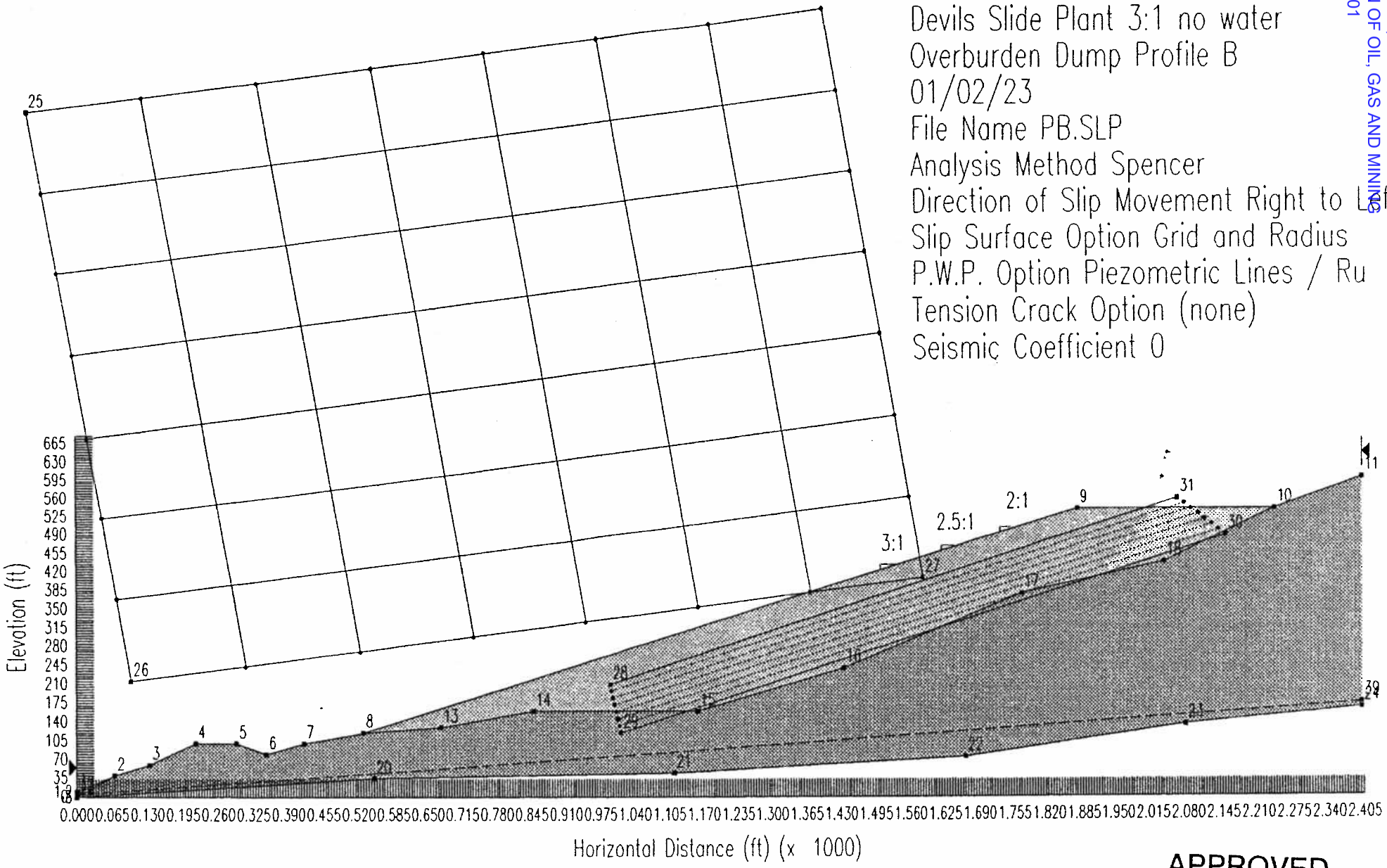
Devils Slide Plant 3:1 no water
Overburden Dump Profile B
01/02/23
File Name PB.SLP
Analysis Method Spencer
Direction of Slip Movement Right to Lef
Slip Surface Option Grid and Radius
P.W.P. Option Piezometric Lines / Ru
Tension Crack Option (none)
Seismic Coefficient 0



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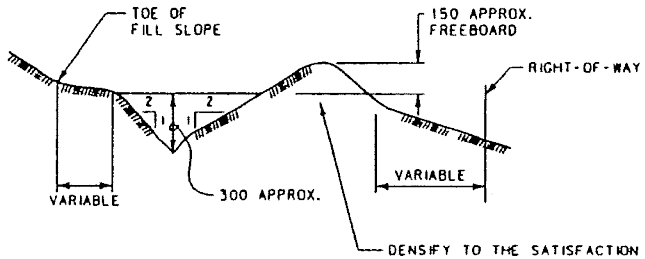
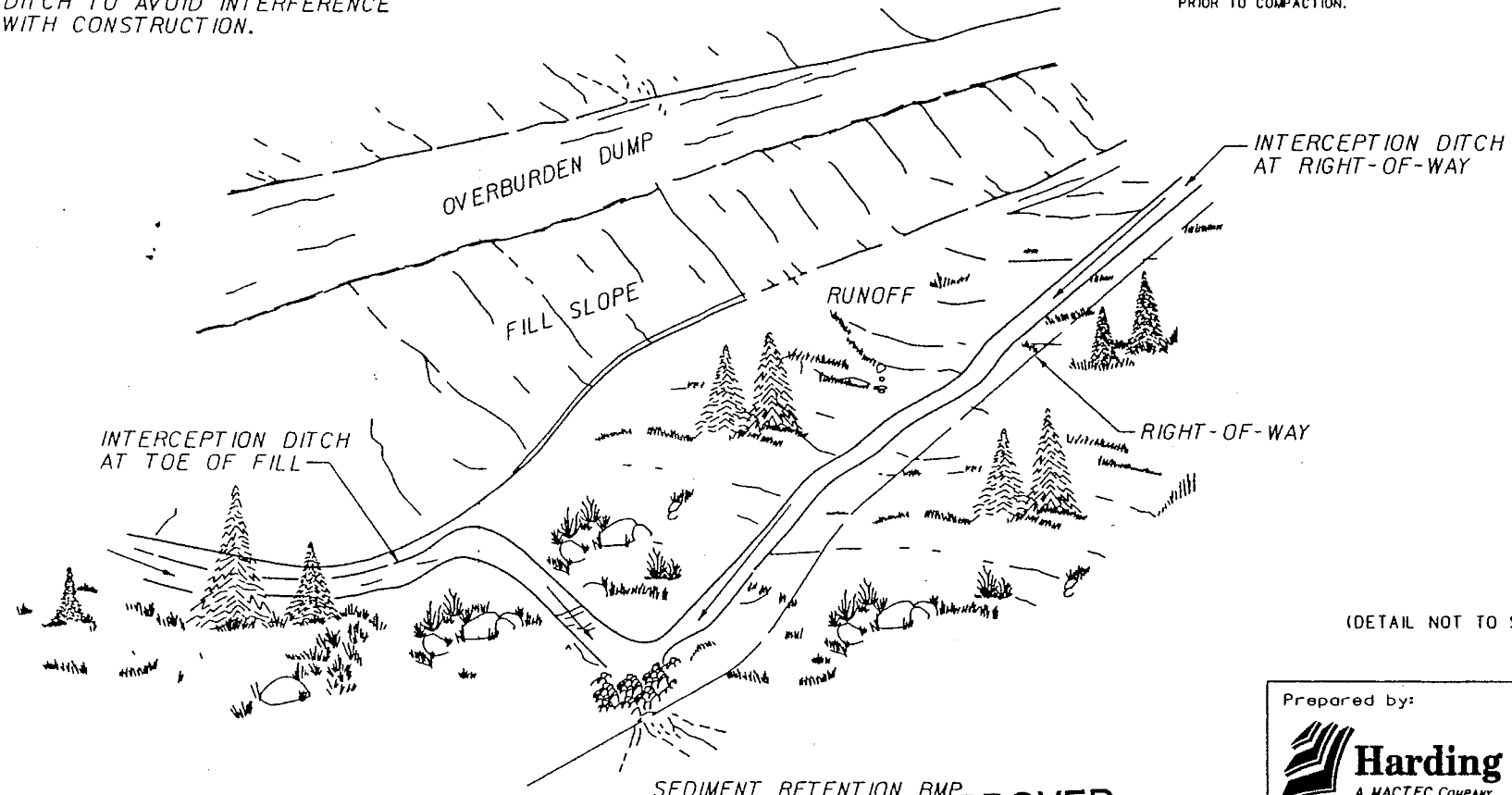
RUNOFF INTERCEPTION DITCH BMP R-07:

RUNOFF INTERCEPTION DITCHES (RID) INTERCEPT AND CONVEY SHEET FLOW RUNOFF TO SEDIMENT RETENTION BARRIERS. INTERCEPTED FLOWS PREVENT OFF-SITE DISCHARGE OF STORM WATER AND SEDIMENTATION.

USE RUNOFF INTERCEPTION DITCHES AT THE TOE OF SLOPES OR BETWEEN DISTURBED AREAS AND LIMITS OF OVERBURDEN DUMP TO PREVENT FLOWS FROM CARRYING SEDIMENT OFF-SITE. APPROPRIATE SUPPLEMENTS INCLUDE SLOPE DRAINS OR DITCH SEDIMENT TRAPS.



NOTE:
LOCATE RUNOFF INTERCEPTION DITCH TO AVOID INTERFERENCE WITH CONSTRUCTION.



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Prepared by:

Harding ESE
A MACTEC Company

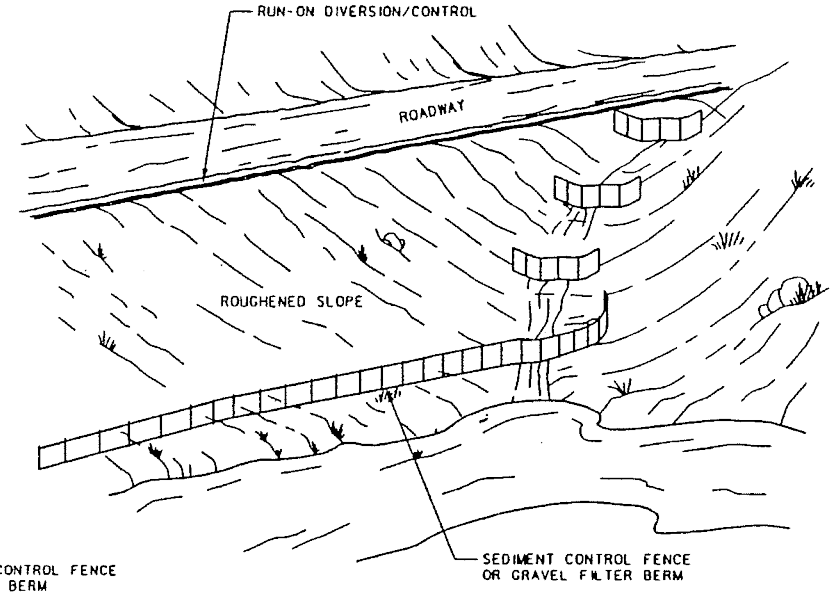
DETAILED DRAWING
RUNOFF INTERCEPTION DITCH
R647-4-107-OPERATING PRACTICES

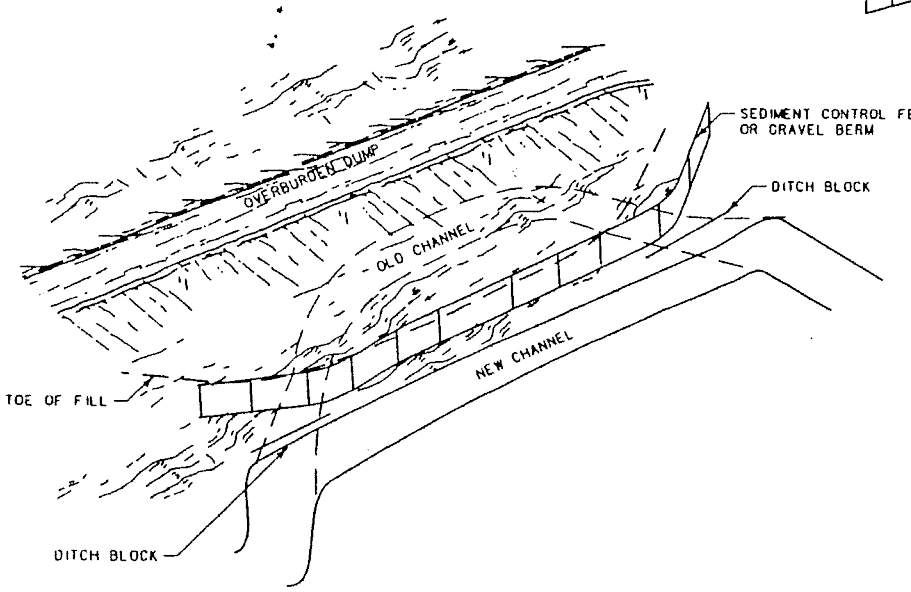
RECEIVED
December 12, 2025
DIVISION OF OIL, GAS AND MINING
M/029/0001

WATER RESOURCE PROTECTION BMP W-02:

WATER RESOURCE PROTECTION (WR) IS EROSION CONTROL FOR CONSTRUCTION ACTIVITIES ADJACENT TO WATER RESOURCES. WATER RESOURCE PROTECTION APPLIES TO PERENNIAL STREAMS, WETLANDS, CHANNEL CHANGES, STREAM BANK DISTURBANCES, IRRIGATION SYSTEMS OR OTHER IMPACTS TO WATER RESOURCES FROM ROAD CONSTRUCTION. IT CAN BE USED FOR CRITICAL RESOURCES. THE DESIGNER DENOTES "CRITICAL RESOURCE" ON THE PLANS AND PUTS WATER RESOURCE PROTECTION WITH IT.

APPROPRIATE BMP FEATURES INCLUDE EROSION MAT, GRAVEL FILTER BERM, SEDIMENT CONTROL FENCE, STRAW BALE BARRIER OR VEGETATIVE BUFFER STRIP. ADDITIONAL BMP FEATURES INCLUDE SLOPE ROUGHENING, RUN-ON DIVERSION/ CONTROL, DITCH SEDIMENT TRAP, DUGOUT DITCH BASINS AND RUNOFF INTERCEPTION DITCH.





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WATER RESOURCE PROTECTION
R647-4-107-OPERATING PRACTICES

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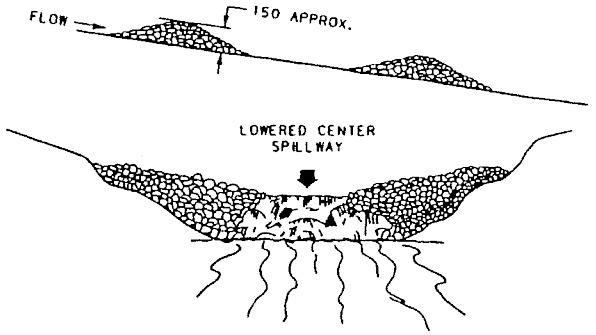
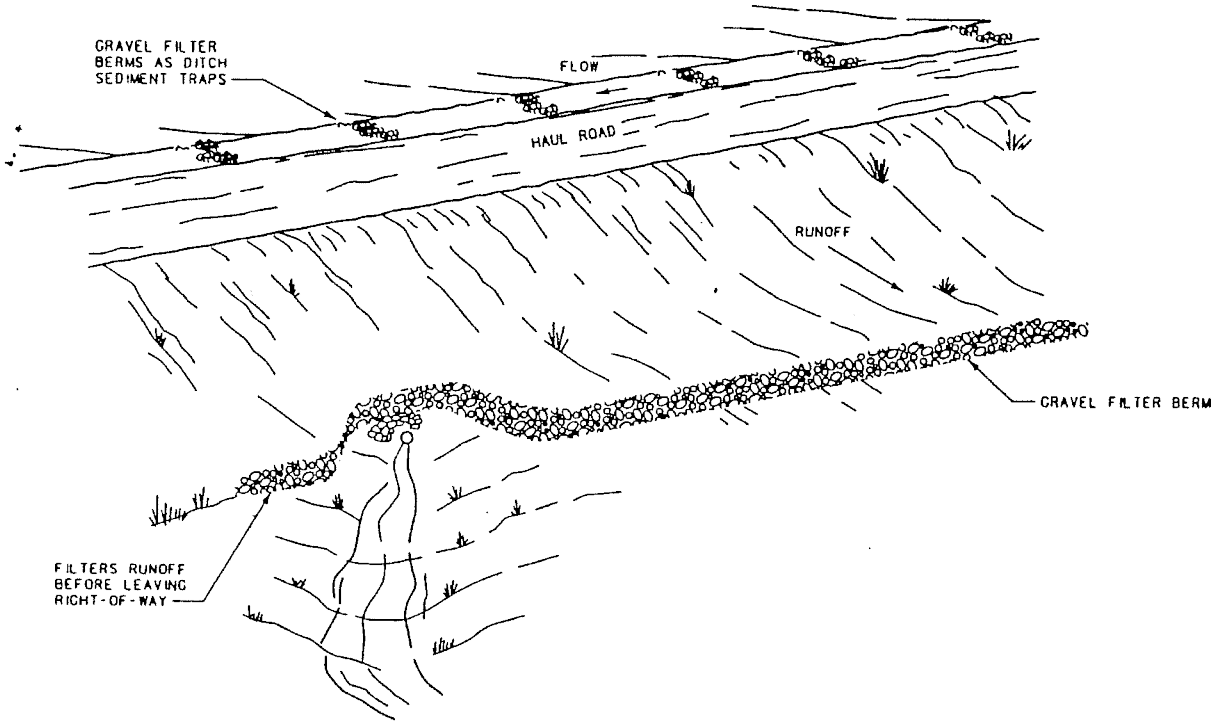
GRAVEL FILTER BERM BMP R-03:

GRAVEL FILTER BERMS (GFB) CONSIST OF A SINGLE OR SERIES OF GRAVEL BERMS TO REDUCE RUNOFF VELOCITIES AND RETAIN SEDIMENT. THE MAXIMUM HEIGHT FOR GRAVEL FILTER BERMS USED INSIDE THE CLEAR ZONE IS 150 mm.

BERM MATERIAL MUST BE 100% PASSING THE 50 mm SCREEN AND 10% MAXIMUM PASSING THE 4.75 mm SIEVE. BERM MATERIAL MAY BE PITRUN OR CRUSHED AGGREGATE.

GRAVEL FILTER BERMS ARE USED FOR SHEET OR CONCENTRATED FLOWS TO REDUCE RUNOFF VELOCITY, PROMOTE SEDIMENT RETENTION AND ALLOW SETTLING. APPLICATIONS INCLUDE DITCH SEDIMENT TRAPS, INLET/OUTLET PROTECTION AND TOE OF SLOPE PROTECTION. AS A DITCH SEDIMENT TRAP, THE END OF THE BARRIER MUST EXTEND A SUFFICIENT DISTANCE TO PREVENT END CUTTING. POSITION THE BARRIER TO PREVENT SEDIMENT FROM ENTERING DRAINAGE. DO NOT PLACE THE BARRIER ACROSS LIVE STREAMS. REMOVE SEDIMENT FROM BEHIND THE BERM WHEN IT ACCUMULATES TO ONE-HALF THE ORIGINAL HEIGHT UNLESS ITS DRAINAGE AREA HAS BEEN STABILIZED.





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DETAILED DRAWING
GRAVEL FILTER BERM
R647-107-OPERATING PRACTICES

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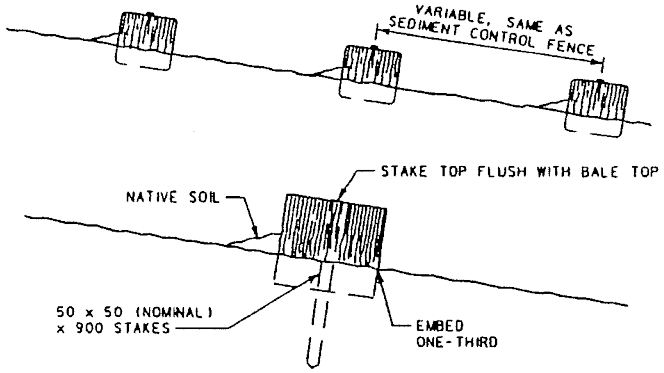
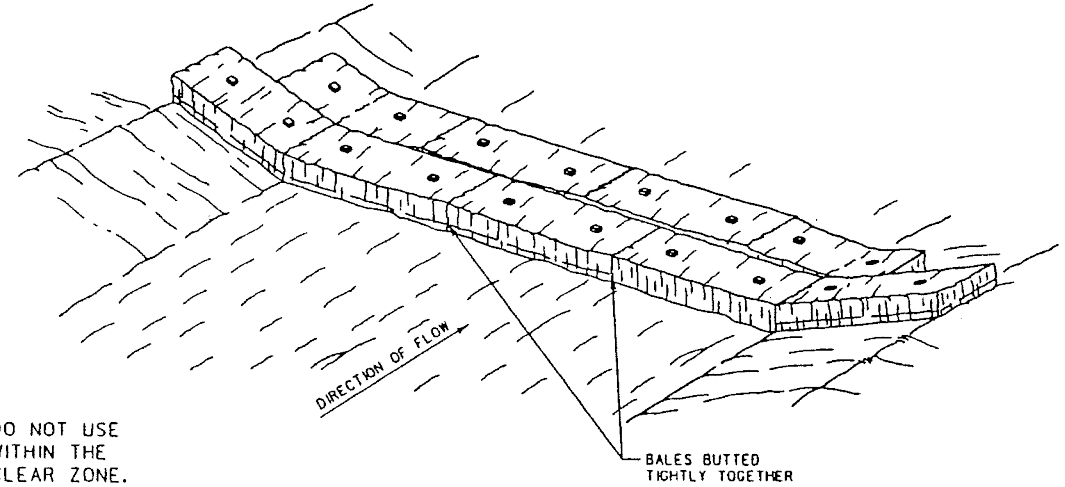
STRAW BALE BARRIER BMP R-05:

STRAW BALE BARRIER (SBB) IS A SEDIMENT BARRIER CONSISTING OF ENTRENCHED, OVERLAPPING AND ANCHORED STRAW BALES TO REDUCE RUNOFF VELOCITIES AND RETAIN SEDIMENT. DO NOT USE STRAW BALE BARRIERS INSIDE THE CLEAR ZONE. STRAW BALES MUST BE CERTIFIED WEED-FREE.

STRAW BALE BARRIERS ARE USED FOR SHEET OR CONCENTRATED FLOWS TO REDUCE RUNOFF VELOCITY, PROMOTE SEDIMENT RETENTION AND ALLOW SETTLING. ENTRENCH THE BARRIER APPROXIMATELY ONE-THIRD OF THE BALE'S HEIGHT AND BACKFILL ON THE UPHILL SIDE. USE 50 mm BY 50 mm (NOMINAL) BY 900 mm LONG WOODEN STAKES. DO NOT USE METAL STAKES. USE A MINIMUM OF TWO STAKES PER BALE.

AS A DITCH SEDIMENT TRAP, EXTEND THE END OF THE BARRIER TO SUCH AN EXTENT THAT THE BOTTOMS OF THE END BALES ARE HIGHER THAN THE TOPS OF THE LOWEST CENTER BALES. POSITION THE BARRIER TO PREVENT SEDIMENT FROM ENTERING THE DRAINAGE. DO NOT PLACE THE BARRIER ACROSS LIVE STREAMS. REPAIR OR REPLACE DAMAGED, UNDER-CUT OR END RUN BALES. APPLICATIONS INCLUDE (OUTSIDE THE CLEAR ZONE) DITCH SEDIMENT TRAPS, INLET/OUTLET PROTECTION, BANK PROTECTION AND TOE OF SLOPE PROTECTION.





DO NOT USE WITHIN THE CLEAR ZONE.

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DETAILED DRAWING
STRAW BALE BARRIER
R647-4-107-OPERATING PRACTICES

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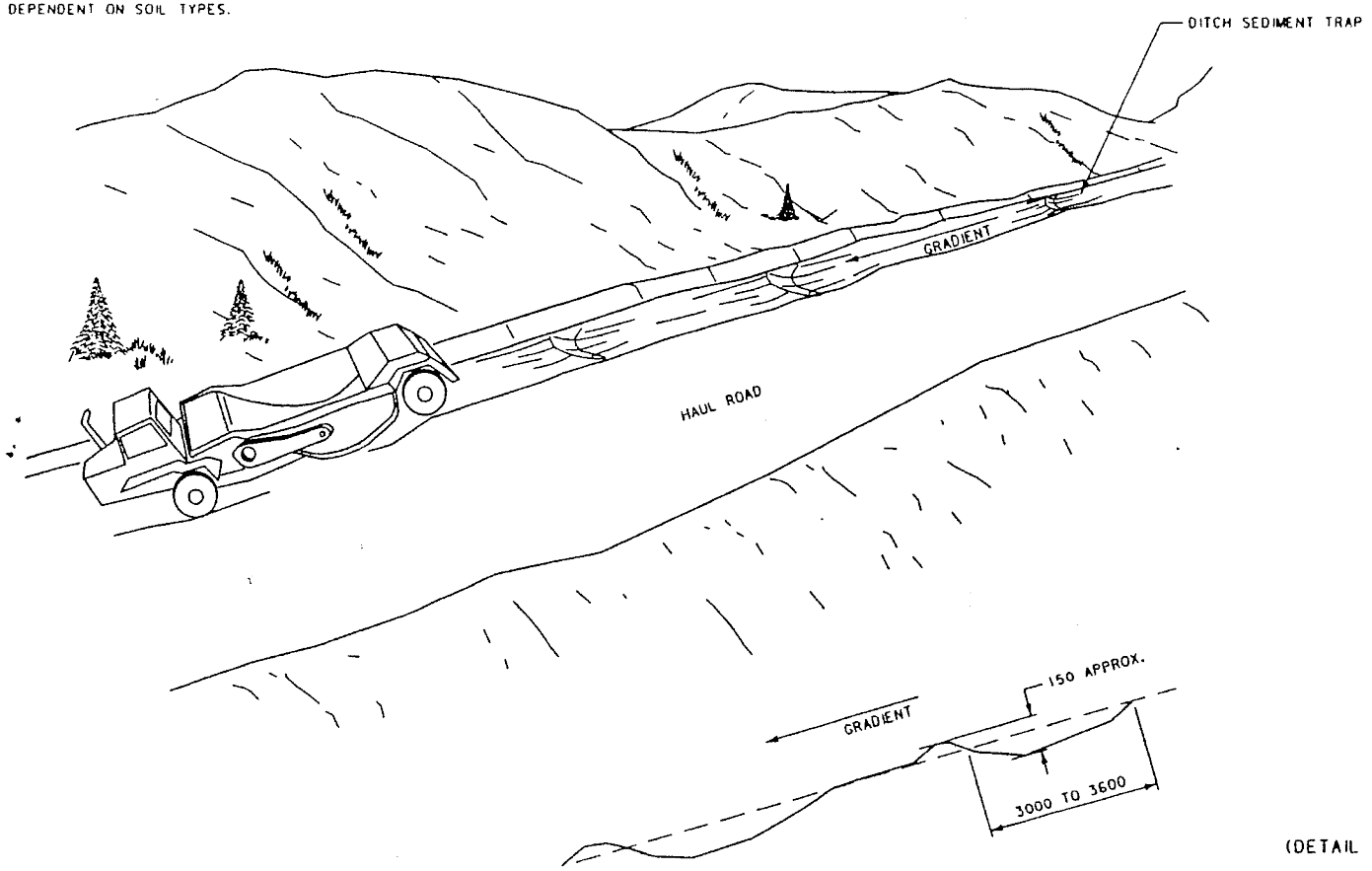
DUGOUT DITCH BASIN BMP R-02:

DUGOUT DITCH BASINS (DDB) CONSIST OF ONE OR A SERIES OF SMALL DUGOUT BASINS USED FOR CONCENTRATED FLOWS TO REDUCE RUNOFF VELOCITY, PROMOTE SEDIMENT RETENTION AND ALLOW SETTLING. THE MAXIMUM HEIGHT FOR DUGOUT DITCH BASINS USED INSIDE THE CLEAR ZONE IS 150 mm.

DUGOUT DITCH BASINS ARE USED FOR LONGITUDINAL SLOPE STEEPNESS (GRADE) SEDIMENT RETENTION. APPLICATIONS INCLUDE DITCH SEDIMENT TRAPS, INTERCEPTOR DITCHES AND TOE OF SLOPE PROTECTION. DISTANCES BETWEEN DUGOUT DITCH BASINS ARE SHOWN ON DTL. DWG. NO. 208-35 FOR USE IN DITCH SEDIMENT RETENTION. USE ON SLOPES IS DEPENDENT ON SOIL TYPES.



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DUGOUT DITCH BASIN
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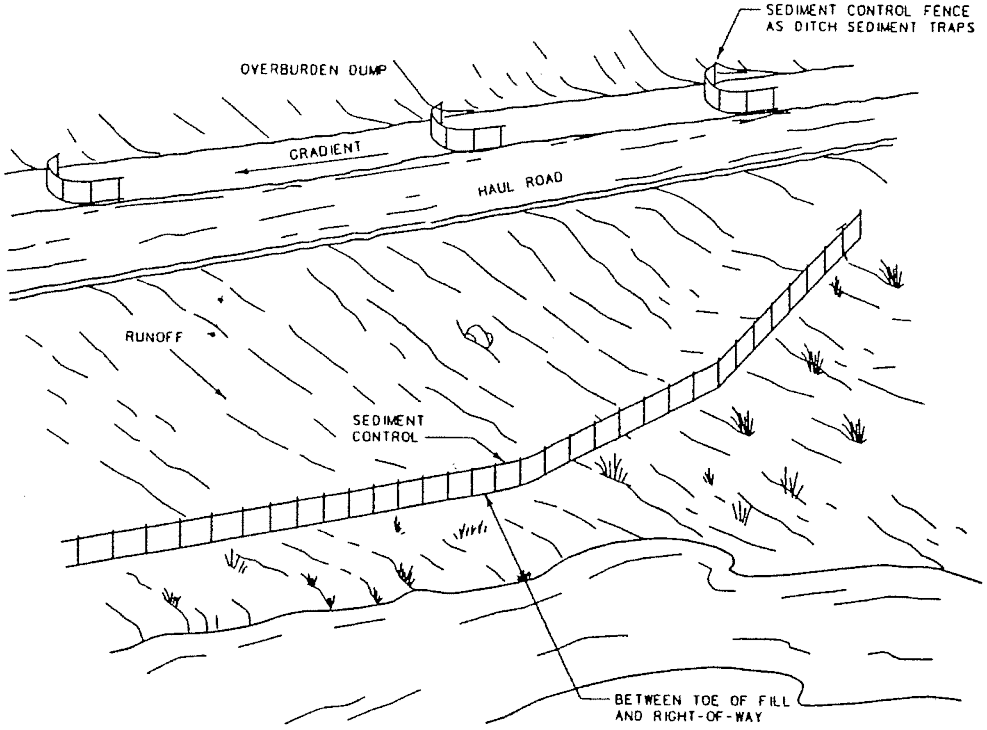
SEDIMENT CONTROL FENCE BMP R-04:

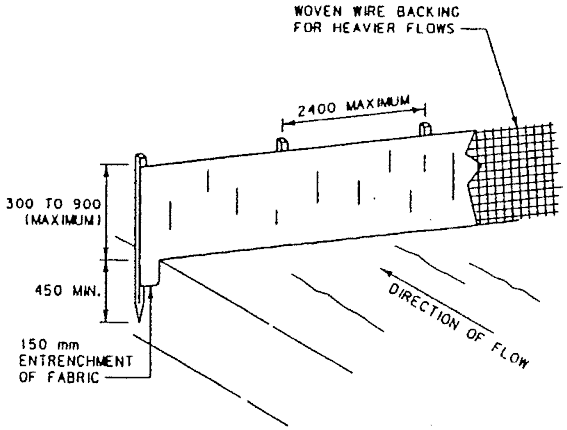
SEDIMENT CONTROL FENCE (SCF) IS A SINGLE OR SERIES OF FILTER FABRIC SEDIMENT BARRIER STRETCHED AND ATTACHED TO SUPPORTING POSTS. THE FENCE BOTTOM IS ENTRENCHED.

SEDIMENT CONTROL FENCES ARE USED FOR SHEET OR CONCENTRATED FLOWS TO ASSIST IN SEDIMENT CONTROL BY RETAINING SOME OF THE ERODED SOIL PARTICLES AND SLOWING THE RUNOFF VELOCITY TO ALLOW PARTICLE SETTLING. APPLICATIONS INCLUDE DITCH SEDIMENT TRAPS, WATER RESOURCE PROTECTION, INLET/OUTLET PROTECTION, BANK PROTECTION, TOE OF SLOPE PROTECTION AND CHANNEL CHANGES. INSTALL SEDIMENT CONTROL FENCES PRIOR TO DISTURBING AREAS REQUIRING THIS BMP OR AS SLOPE GRADES ARE ACHIEVED. MAXIMUM CUT OR FILL SLOPE FOR A SEDIMENT CONTROL FENCE IS 2:1. USE 50 mm BY 50 mm (NOMINAL) WOODEN STAKES. DO NOT USE METAL STAKES.

SEDIMENT CONTROL FENCES ARE USED BETWEEN THE EDGE OF OVERBURDEN DUMP DISTURBANCE AND A WATER RESOURCE. IN DITCHES AND SWALES THE ENDS OF THE FENCE CURVE UPSTREAM TO PREVENT FLOW FROM BY-PASSING THE FENCE. POSITION THE BARRIER TO PREVENT SEDIMENT FROM ENTERING THE DRAINAGE. DO NOT PLACE THE BARRIER ACROSS LIVE STREAMS. WOVEN WIRE BACKING IS NECESSARY WHEN DEALING WITH HEAVIER FLOW VELOCITIES AND SEDIMENT OR AS A ROCK BARRIER. DISTANCES BETWEEN SEDIMENT CONTROL FENCES ARE SHOWN ON DTL. DWG. NO. 208-35 FOR USE IN DITCH SEDIMENT RETENTION. REMOVE SEDIMENT FROM BEHIND THE FENCE WHEN IT ACCUMULATES TO ONE-THIRD THE ORIGINAL HEIGHT. EITHER GRADE AND SEED OR REMOVE THE SEDIMENT DEPOSITS PRIOR TO REMOVAL OF THE FENCE.



DITCH SEDIMENT TRAPS & PROTECTION OF LIVE STREAM



SILT FENCE CONSTRUCTION

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A MACTEC COMPANY

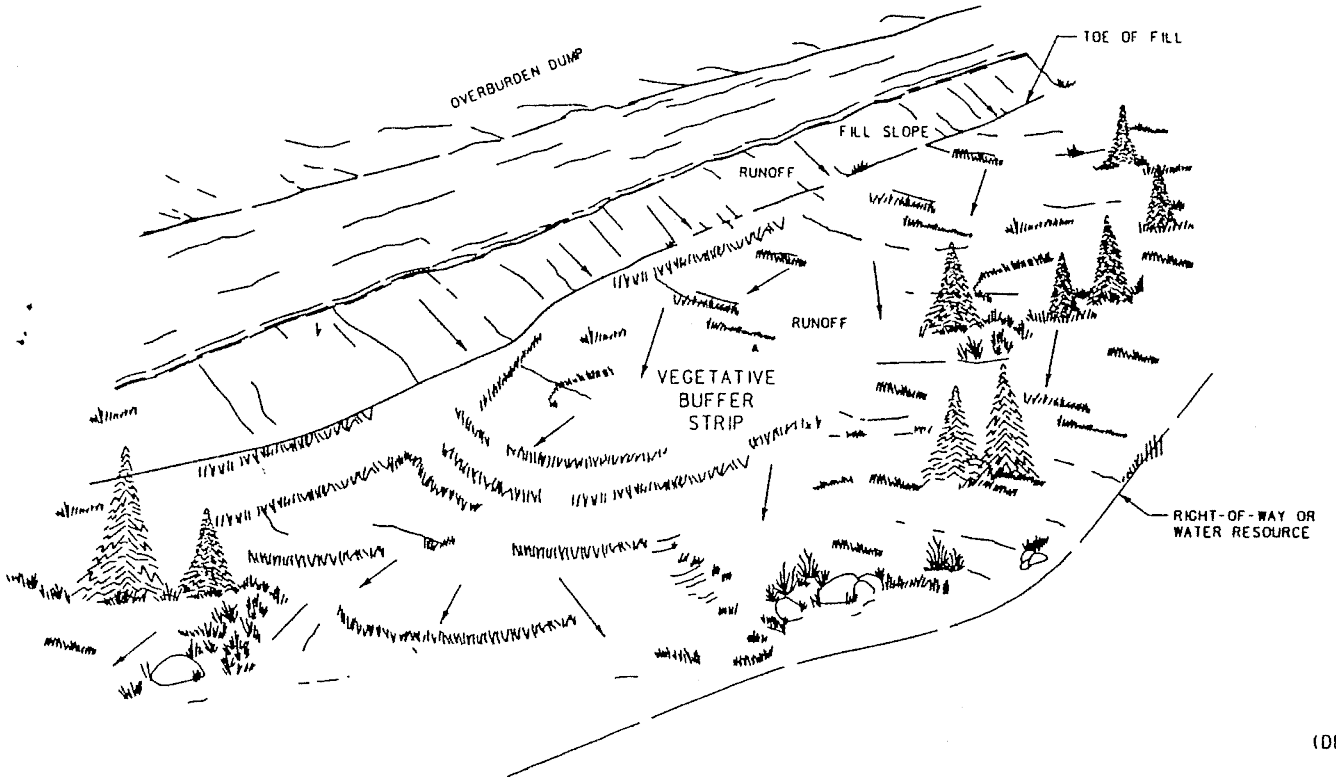
DETAILED DRAWING
SEDIMENT CONTROL FENCE
R647-4-107-OPERATING PRACTICES

RECEIVED
December 12, 2025
DIVISION OF OIL, GAS AND MINING
M/029/0001

VEGETATIVE BUFFER STRIP BMP R-06:

VEGETATIVE BUFFER STRIP (VBS) IS AN UNDISTURBED AREA OR STRIP OF ESTABLISHED NATURAL VEGETATION. A VEGETATIVE BUFFER STRIP PROVIDES A LIVING SEDIMENT FILTER TO REDUCE RUNOFF VELOCITIES AND ALLOW CAPTURE AND SETTLING OF COARSE-GRAINED SEDIMENT. VEGETATIVE BUFFER STRIPS REDUCE OR PREVENT SEDIMENTATION FROM LEAVING THE OVERBURDEN DUMP.

IDENTIFY VEGETATIVE BUFFER STRIPS WITH FLAGGING BEFORE SOIL STRIPPING OCCURS. KEEP EQUIPMENT AND FILL MATERIAL OFF OF VEGETATIVE BUFFER STRIPS. ALWAYS CONSIDER VEGETATIVE BUFFER STRIPS WHEN WATER RESOURCES ARE ADJACENT TO OR NEAR DISTURBANCES AND REQUIRE PROTECTION. THE MINIMUM WIDTH REQUIREMENT FOR A WELL-ESTABLISHED VEGETATIVE STRIP WITH A SLOPE OF 3:1 OR FLATTER IS 15 m. THE MINIMUM WIDTH REQUIREMENT FOR A WELL-ESTABLISHED VEGETATIVE STRIP WITH A SLOPE STEEPER THAN 3:1 IS 30 m. APPROPRIATE SUPPLEMENTS INCLUDE GRAVEL BERMS, SEDIMENT CONTROL FENCES AND OTHER SEDIMENT RETENTION BARRIERS.



(DETAIL NOT TO SCALE)

APPROVED

MAR 26 2002

DIV. OIL GAS & MINING

Prepared by:

Harding ESE
A MACTEC COMPANY

DETAILED DRAWING
VEGATATIVE BUFFER STRIP
R647-4-107-OPERATING PRACTICES

RECEIVED
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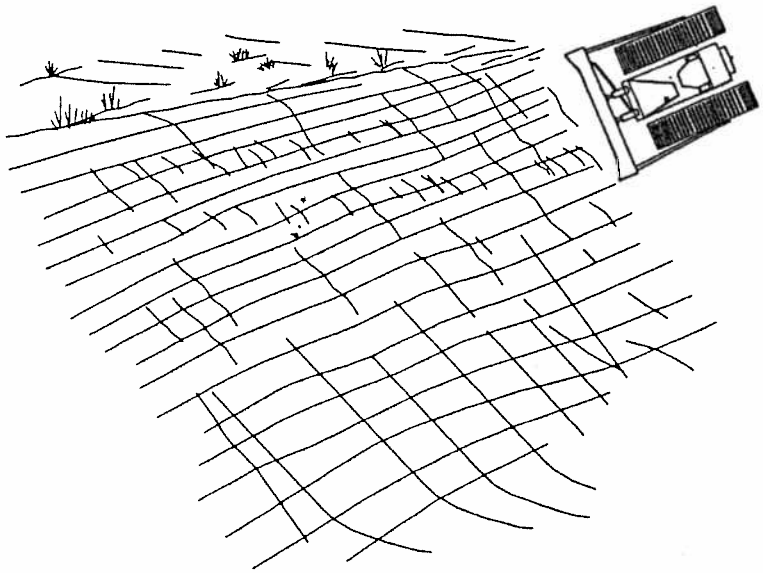
M/029/0001

SLOPE ROUGHENING:

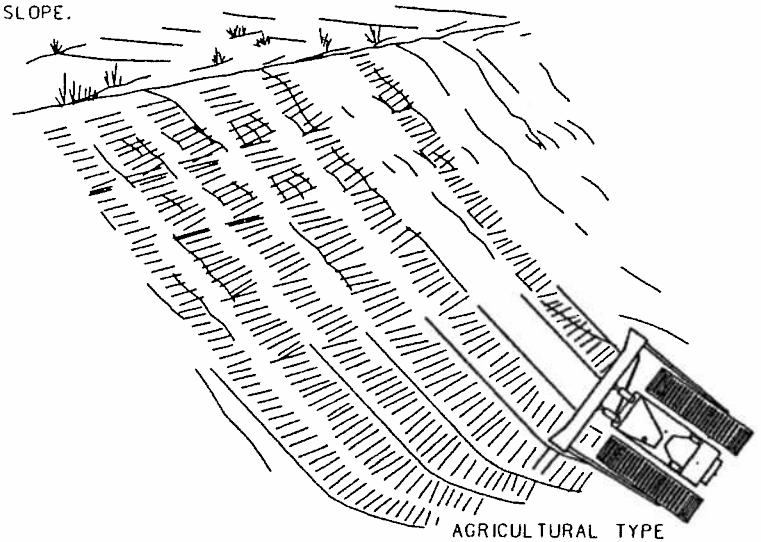
SLOPE ROUGHENING IS A VERY ROUGH SOIL SURFACE ON SLOPES RESULTING FROM CONSTRUCTION ACTIVITIES OR THE SYSTEMATIC ROUGHENING USING HEAVY EQUIPMENT TO CREATE RIDGES OR FURROWS PERPENDICULAR TO THE SLOPE. THE RIDGES OR FURROWS ARE TO BE EQUAL TO OR GREATER THAN 2 INCHES IN HEIGHT AND NO FURTHER THAN TWICE THE HEIGHT OF THE RIDGE OR FURROW APART. SLOPE ROUGHENING IS THE BEST FIRST LINE OF DEFENSE TO CONTROL EROSION AND SEDIMENT RUNOFF. DEGREE OF SLOPE ROUGHENING IS DEPENDENT ON THE GRADES AND PROXIMITY TO WATER RESOURCES.

ALL SLOPES STEEPER THAN 3:1 AND GREATER THAN 5 VERTICAL FEET REQUIRE SLOPE ROUGHENING, EXCLUDING ROCK SLOPES THAT CANNOT BE EXCAVATED BY RIPPING. APPROPRIATE SUPPLEMENTS INCLUDE TEMPORARY SEEDING OR EROSION SEEDING. WHEN FILL SLOPES ARE WITHIN 50 FEET OF SURFACE WATER, SEDIMENT RETENTION IS REQUIRED (SEDIMENT CONTROL FENCES OR RUNOFF INTERCEPTION DITCHES).

ROUGHEN SLOPES BY RIPPING PERPENDICULAR TO SLOPE WITH HEAVY EQUIPMENT.



ROUGHEN STEEPER SLOPES WITH HEAVY EQUIPMENT PARALLEL TO SLOPE.



AGRICULTURAL TYPE EQUIPMENT MAY BE USED.

(DETAIL NOT TO SCALE)

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Prepared by:

Harding ESE
A MACTEC COMPANY

DETAILED DRAWING
SLOPE ROUGHENING
R647-4-107-OPERATING PRACTICES

RECEIVED
December 12, 2025
DIVISION OF OIL, GAS AND MINING
M/029/0001

Question 111.2 Reclamation of Natural Channels

DUMP EXPANSION HYDRAULIC SUMMARY

HOLNAM IDEAL CEMENT PLANT - DEVIL'S SLIDE, UTAH

Drainage Area ID / Size / CN [1]	D1-N, Area = 179.9 acres, CN=55				D1-S, Area = 65.7 acres, CN = 71				D2, Area = 156.7 acres, CN = 71			
Storm Event [2]	2/24	10/24	50/24	100/24	2/24	10/24	50/24	100/24	2/24	10/24	50/24	100/24
Rainfall Intensity (inch) [3]	1.6	2.4	3.0	3.2	1.6	2.4	3.0	3.2	1.6	2.4	3.0	3.2
Peak Discharge (cfs)	0.0	1.6	9.5	13.1	2.4	33.2	64.8	76.3	5.7	79.3	154.5	182.0
Average Flow (cfs) [4]	0.0	1.0	2.7	3.4	0.6	2.4	4.0	4.6	1.5	5.7	9.6	11.0
Total Runoff Depth (inch)	0.0	0.1	0.2	0.3	0.1	0.4	0.8	0.9	0.1	0.4	0.8	0.9
Total Runoff Volume (acre-ft)	0.0	1.0	2.9	3.8	0.7	2.4	4.2	4.8	1.65	5.8	9.9	11.5
Basin Capacity (acre-ft) [5]	0.0	0.2	1.2	1.7	NA	2.0 [6]	NA	NA	0.76	3.5	6.4	7.5

[1] Drainage Areas	acres
DA-1	245.612
DA-2	156.707
Sub-Areas	
DA-1N	179.897
DA-1S (top)	65.715
DA-1S (slope)	14.538

[1] Curve Numbers derived from following information:

St. Marys	gravelly loam	medium to rapid runoff
Hoskin	cobbly loam	medium to rapid runoff
Henefer	silt loam	medium to slow runoff
Kilfoil	loam	medium runoff

Antecedent Moisture Condition II (avg moisture)

All are loam and well drained. Use SCS Hydrologic Soil Grouping B.

Drainage Area DA-1N (native)

Forest - good cover — CN 55 — (no grazing, good litter and brush cover soil)

Drainage Area DA-1S (top), DA-1S (slope) and DA-2. All dump expansion.

Finsihed dumps — CN 71 — (resemble cultivated fields with conservation treatment)

[2] 2/24 descibes the storm event, i.e., 2/24 is 2 year / 24 hour storm.

[3] Rainfall intensities taken from Utah Isopluvial (hyetograph) map, NOAA Atlas 2, Volume VI.

[4] Average flow from start of runoff. Takes into account infiltration and time of concentration.

[5] Construct basin to contain this volume.

[6] Basin capacity includes runoff from a dump section that is outside the dump expansion area (DA-1S(slope)). Value shown is volume for the combined area.

Notes:

During expansion activities, higher runoff values will come from dump tops (compacted surfaces).

Once vegetation is fully established, the CN for the finished dumps will be different and the runoff reduced.

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DUMP EXPANSION DITCH AND RIPRAP SIZING

HOLNAM IDEAL CEMENT PLANT - DEVIL'S SLIDE, UTAH

Ditch / Channel Location	Area of Runoff (ft^2)	Qmax (cfs)	Vtot (acre-ft)	Ditch Rise (ft)	Ditch Run (ft)	slope s (ft/ft)	depth of flow (ft)	area of flow (ft^2)	wetted perimeter (ft)	hydraulic radius (ft)	Vavg (eqn) (ft/s)	Vmax (Qmax/A) (ft/s)	Riprap Size (d50) (inch)
DA-1N (native)	7,836,309	1.6	1.0	No ditch.			-	-	-	-	-	-	
DA-1S (top)	2,862,530	33.2	2.4				-	-	-	-	-	-	
Ditch 1	10,698,839	34.8	3.4	10	1890	.0053	1.72	8.92	10.90	0.82	3.2	3.9	4
DA-1S (slope) [1]	633,283	7.4	0.5				-	-	-	-	-	-	
Ditch 2	11,332,122	42.2	3.9	400	1181	.3387	0.85	2.16	5.37	0.40	15.8	19.5	40 [2]
DA-2	6,826,151	79.3	5.8	No ditch.			-	-	-	-	-	-	

[1] DA-1S (slope) is outside of dump expansion area. It has been added for calculation of runoff for that segment of ditch.

[2] Recommend piping with energy dissipators at bottom of slope.

Ditches not required for drainage areas DA-1N and D2.

Hydraulic data was calculated separately for drainage ditch design. Upgradient drainage areas added in incrementally for each ditch section.

top ditch - runoff from DA-1N (native) and DA-1S (top of dump).

sloped ditch - runoff from all areas, including DA-1S (slope).

Riprap for sloped fill area DA-1S (ditch segment 2, Map) assumes west side dump-native interface already armored.

Qmax = maximum discharge

V(tot) = total storm runoff

depth of flow = (Q/(.56*(Z/n)*(s^.5))^.375

Z and n are ditch size coefficients

H.R. = hydraulic radius = area of ditch/ wetted perimeter

Vavg = velocity of flow = (1.49/n)*(R^(2/3))*(s^(1/2))

n = Mannings coefficient

R = hydraulic radius

s = ditch slope

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Picture 1: South view of Quarry Hollow proposed for overburden dump. (6/16/00)

Picture 2: Central view (due west) of Quarry Hollow proposed for the Overburden Dumps. (6/16/00)

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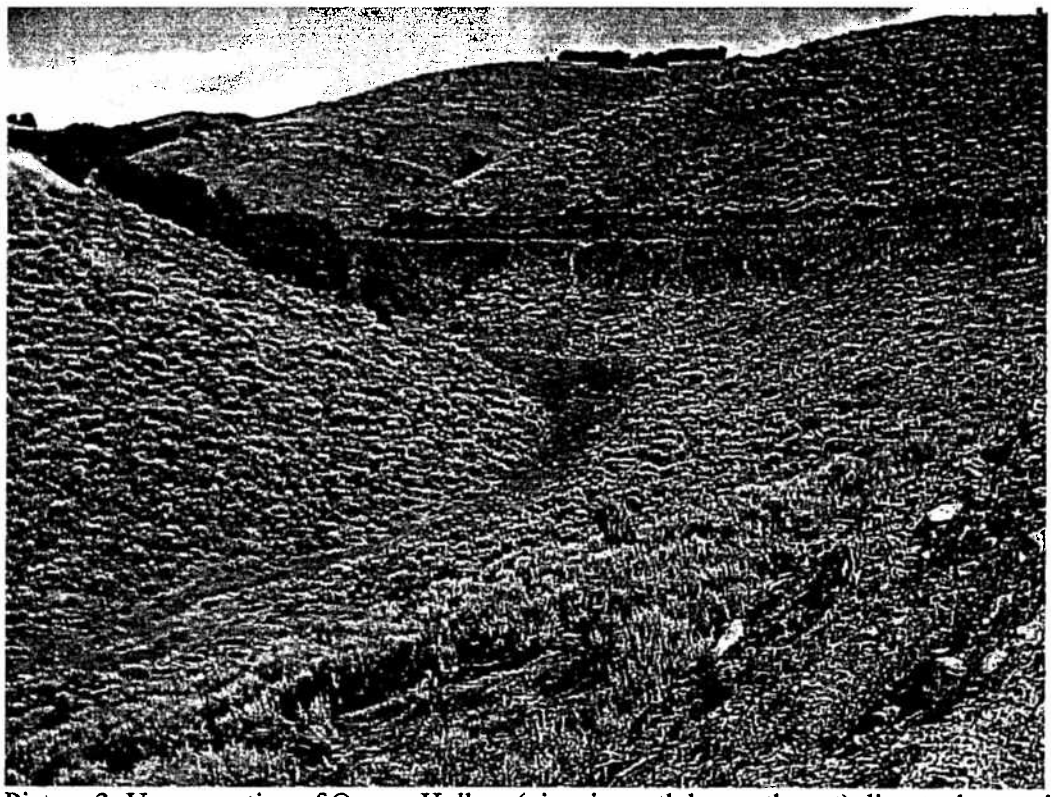
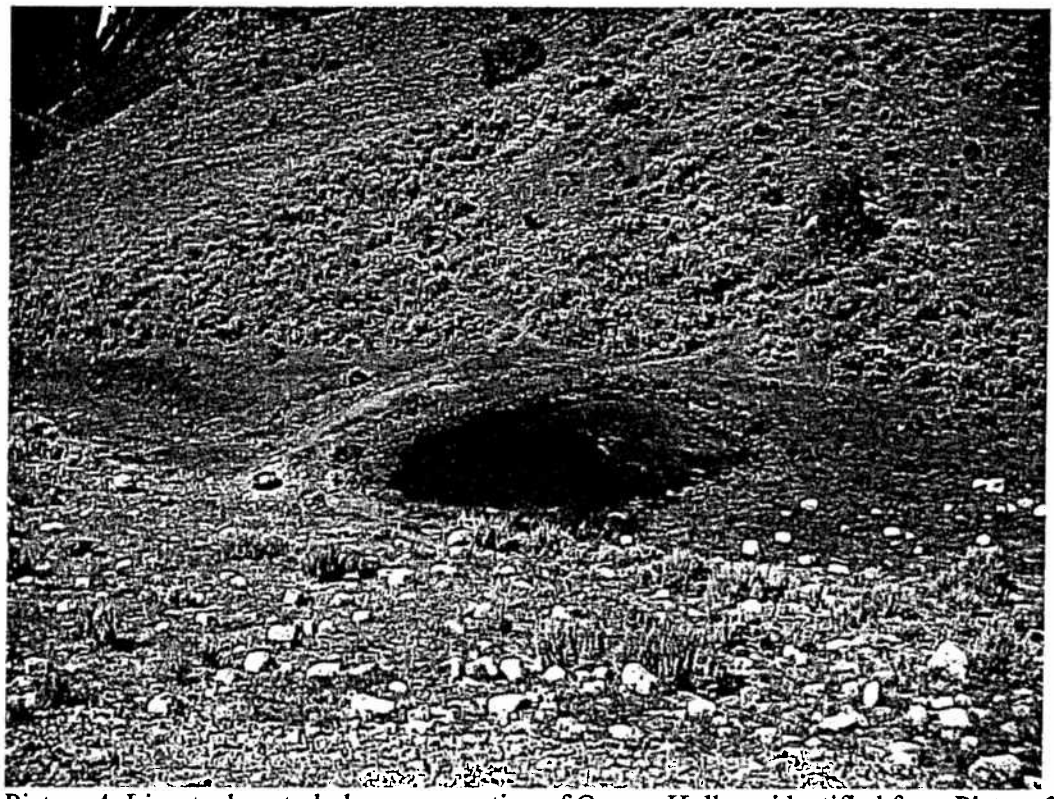


Picture 3: Upper portion of Quarry Hollow (view is north by northwest), livestock watering hole in center of photograph. (6/16/00)



Picture 4: Livestock waterhole, upper portion of Quarry Hollow, identified from Picture 3. (6/16/00)

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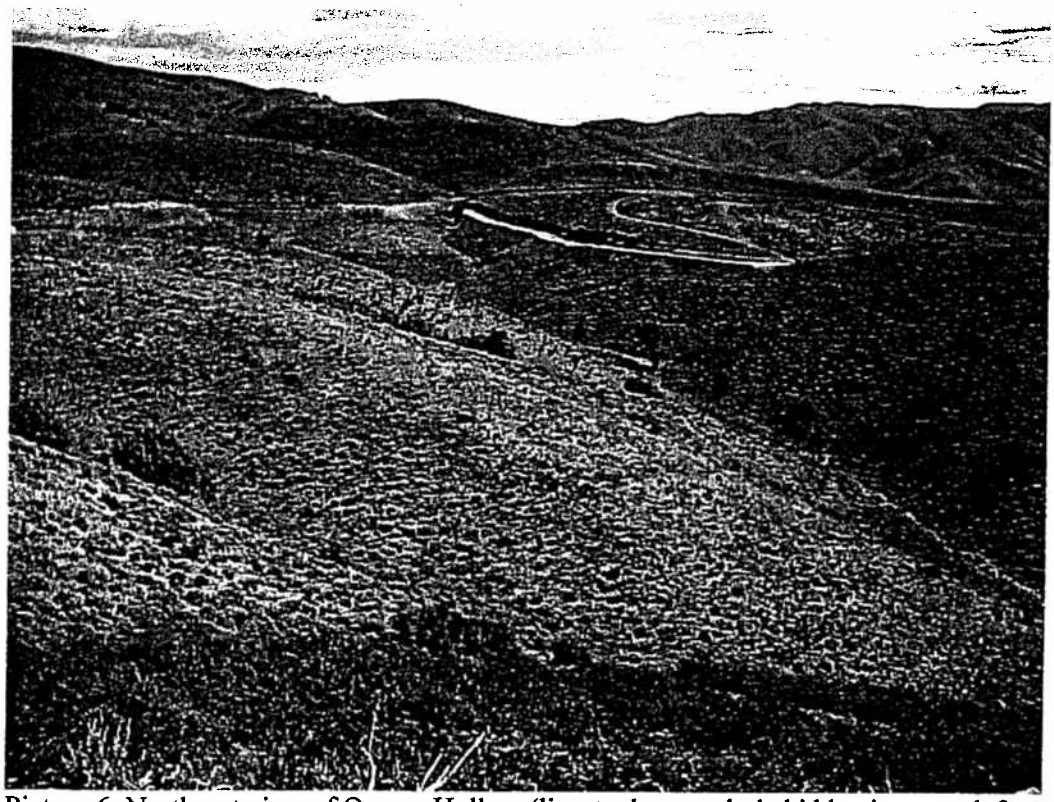
Picture 5: South view, from upper road, of entire Quarry Hollow proposed for Overburden Dumps. (6/16/00)



Picture 6: Northeast view of Quarry Hollow (livestock water hole hidden in upper left corner) proposed for Overburden Dumps. (6/16/00)

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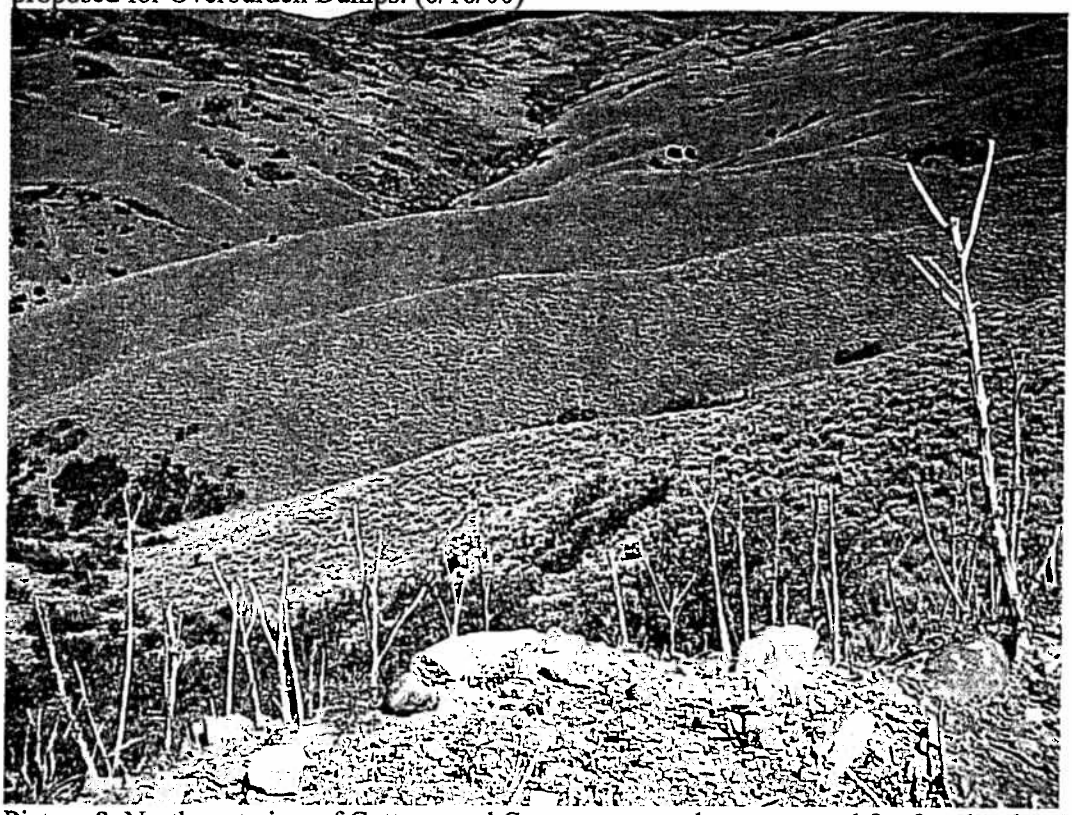
Picture 7: West view from top of slope, Cottonwood Canyon in center of photograph, this outside slope is proposed for Overburden Dumps. (6/16/00)



Picture 8: Northwest view of Cottonwood Canyon, upper slope proposed for Overburden Dumps. (6/16/00)

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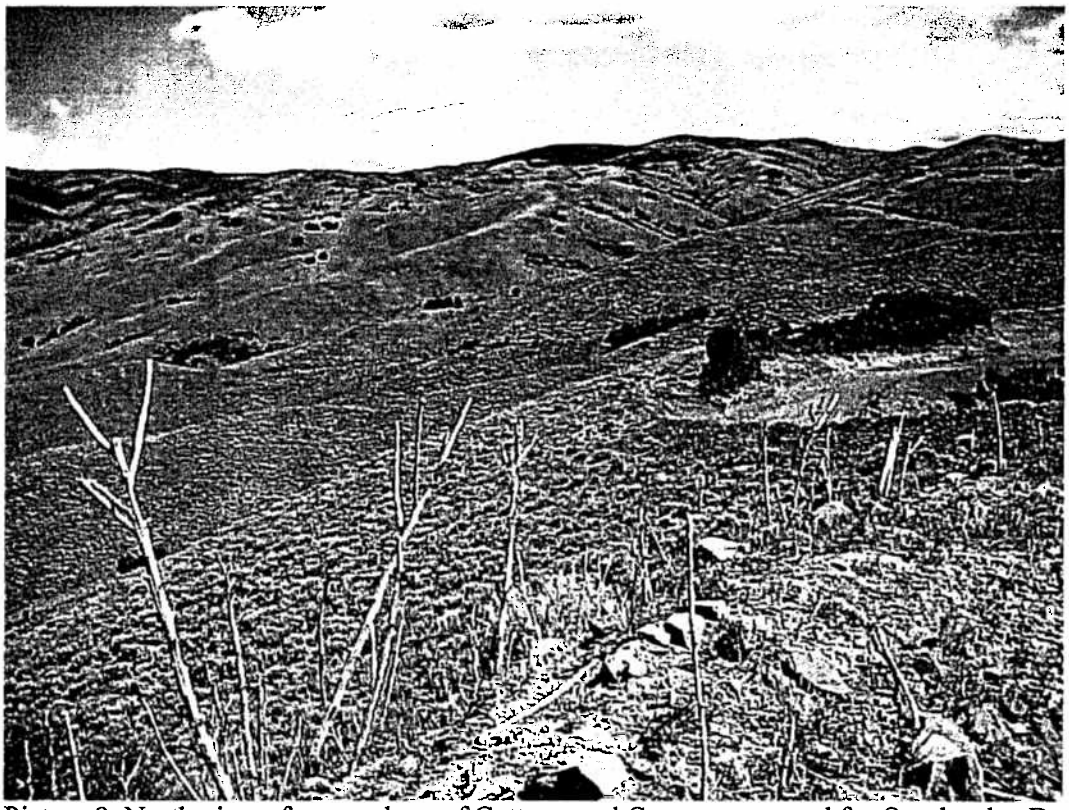

Picture 9: North view of upper slope of Cottonwood Canyon proposed for Overburden Dumps, Quarry Hollow with the livestock watering hole is to the right of this picture. (6/16/00)

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M/029/0001

ATTACHMENT B

FORM MR-5
January 19, 2000

Bond Number 103757982
Permit Number M/029/001
Mine Name Devil's Slide Quarry

STATE OF UTAH
DEPARTMENT OF NATURAL RESOURCES
Division of Oil, Gas and Mining
1594 West North Temple Suite 1210
Box 145801
Salt Lake City, Utah 84114-5801
Telephone: (801) 538-5291
Fax: (8010 359-3940

APPROVED
MAR 26 2002
DIV. OIL GAS & MINING

THE MINED LAND RECLAMATION ACT

SURETY BOND

* *

The undersigned Holcim (US) Inc., as Principal, and Travelers Casualty & Surety Company of America, as Surety, hereby jointly and severally bind ourselves, our heirs, administrators, executors, successors, and assigns, jointly and severally, unto the State of Utah, Division of Oil, Gas and Mining (Division) in the penal sum of One Million Six Hundred Eleven Thousand Four Hundred & 00/100---------- dollars ($ 1,611,400.00---).

Principal has estimated in the Mining and Reclamation Plan approved by the Division on the 26th day of March, 2002, that 184.5 acres of land will be disturbed by mining operation in the State of Utah.

A description of the disturbed land is attached as "Attachment A" to the Reclamation Contract, of which this document is an integral part.

The condition of this obligation is that if the Division determines that Principal has satisfactorily reclaimed the disturbed lands in accordance with the approved Mining and Reclamation Plan and has faithfully performed all requirements of the Mined Land Reclamation Act, and complied with the Rules and Regulations adopted in accordance therewith, then this obligation shall be void; otherwise it shall remain in full force and effect.

If the Mining and Reclamation Plan provides for periodic partial reclamation of the disturbed lands, and if the lands are reclaimed in accordance with such Plan, Act and regulations, then Principal may apply for a reduction in the amount of this Surety Bond.

In the converse, if the Mining and Reclamation Plan provides for a gradual increase in the area disturbed or the extent of disturbance, then, the Division may require that the amount of this Surety Bond be increased, with the written approval of the Surety.

This bond may be canceled by Surety after ninety (90) days following receipt by the Division and Principal of written notice of such cancellation. Surety's liability shall then, at the

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DIVISION OF OIL, GAS AND MINING
M/029/0001

Bond Number 103757982
Permit Number M/029/001
Mine Name Devil's Slide Quarry

expiration of said ninety (90) days, cease and terminate except that Surety will remain fully liable for all reclamation obligations of the Principal incurred prior to the date of termination.

Principal and Surety and their successors and assigns agree to guarantee said obligation and to indemnify, defend, and hold harmless the Division from any and all expenses (including attorney fees) which the Division may sustain in the collection of sums due hereunder.

Surety will give prompt notice to Principal and to the Division of the filing of any petition or the commencement of any proceeding relating to the bankruptcy, insolvency, reorganization, or adjustment of the debts of Surety, or alleging any violation or regulatory requirements which could result in suspension or revocation of the Surety's license to do business.

IN WITNESS WHEREOF, the Principal and Surety hereunto set their signatures and seals as of the dates set forth below.

Holcim (US) Inc.
Principal (Permittee)

By (Name typed):

Title

Signature

Date

Surety Company

Travelers Casualty and Surety Company of America
Surety Company Name

Latrecia R. Scott
Surety Company Officer

Attorney-In-Fact
Title/Position

Signature

One Tower Square
Street Address

Hartford, CT 06183-6014
City, State, Zip

(860) 277-0111
Phone Number

February 28, 2002
Date

RECEIVED
December 12, 2025
DIVISION OF OIL, GAS AND MINING
M/029/0001

Bond Number 103757982
Permit Number M/029/001
Mine Name Devil's Slide Quarry

SO AGREED this _____ day of _____, 20 _____.

AND APPROVED AS TO FORM AND AMOUNT OF SURETY:

_____
Lowell P. Braxton, Director
Utah State Division of Oil, Gas and Mining

*NOTE: Where one signs by virtue of Power of Attorney for a Surety, such Power of Attorney must be filed with this bond. If the Operator is a corporation, the bond shall be executed by its duly authorized officer.

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DIVISION OF OIL, GAS AND MINING
M/029/0001

Bond Number 103757982
Permit Number M/029/001
Mine Name Devil's Slide Quarry

AFFIDAVIT OF QUALIFICATION

On the 28th day of February, 20 02, Latrecia R. Scott personally appeared before me, who being by me duly sworn did say that he/she, the said Latrecia R. Scott is the Attorney-In-Fact of Travelers Casualty & Surety Co of A and duly acknowledged that said instrument was signed on behalf of said company by authority of its bylaws or a resolution of its board of directors and said Latrecia R. Scott duly acknowledged to me that said company executed the same, and that he/she is duly authorized to execute and deliver the foregoing obligations; that said Surety is authorized to execute the same and has complied in all respects with the laws of Utah in reference to becoming sole surety upon bonds, undertaking and obligations.

Signed: Latrecia R. Scott
Surety Officer

Latrecia R. Scott
Title: Attorney-In-Fact

STATE OF Michigan)
) ss:
COUNTY OF Wayne)

Subscribed and sworn to before me this 28th day of February, 20 02.

Notary Public
Residing at: _____

My Commission Expires:

_____, 20 ____

RECEIVED
December 12, 2025
DIVISION OF OIL, GAS AND MINING
M/029/0001

TRAVELERS CASUALTY AND SURETY COMPANY OF AMERICA
TRAVELERS CASUALTY AND SURETY COMPANY
FARMINGTON CASUALTY COMPANY
Hartford, Connecticut 06183-9062

POWER OF ATTORNEY AND CERTIFICATE OF AUTHORITY OF ATTORNEY(S)-IN-FACT

KNOW ALL PERSONS BY THESE PRESENTS, THAT TRAVELERS CASUALTY AND SURETY COMPANY OF AMERICA, TRAVELERS CASUALTY AND SURETY COMPANY and **FARMINGTON CASUALTY COMPANY**, corporations duly organized under the laws of the State of Connecticut, and having their principal offices in the City of Hartford, County of Hartford, State of Connecticut, (hereinafter the "Companies") hath made, constituted and appointed, and do by these presents make, constitute and appoint: **Kathy L. Lide, Latrecia R. Scott, B. Halthon, of Detroit, Michigan,** their true and lawful Attorney(s)-in-Fact, with full power and authority hereby conferred to sign, execute and acknowledge, at any place within the United States, the following instrument(s): by his/her sole signature and act, any and all bonds, recognizances, contracts of indemnity, and other writings obligatory in the nature of a bond, recognizance, or conditional undertaking and any and all consents incident thereto and to bind the Companies, thereby as fully and to the same extent as if the same were signed by the duly authorized officers of the Companies, and all the acts of said Attorney(s)-in-Fact, pursuant to the authority herein given, are hereby ratified and confirmed.

This appointment is made under and by authority of the following Standing Resolutions of said Companies, which Resolutions are now in full force and effect:

VOTED: That the Chairman, the President, any Vice Chairman, any Executive Vice President, any Senior Vice President, any Vice President, any Second Vice President, the Treasurer, any Assistant Treasurer, the Corporate Secretary or any Assistant Secretary may appoint Attorneys-in-Fact and Agents to act for and on behalf of the company and may give such appointee such authority as his or her certificate of authority may prescribe to sign with the Company's name and seal with the Company's seal bonds, recognizances, contracts of indemnity, and other writings obligatory in the nature of a bond, recognizance, or conditional undertaking, and any of said officers or the Board of Directors at any time may remove any such appointee and revoke the power given him or her.

VOTED: That the Chairman, the President, any Vice Chairman, any Executive Vice President, any Senior Vice President or any Vice President may delegate all or any part of the foregoing authority to one or more officers or employees of this Company, provided that each such delegation is in writing and a copy thereof is filed in the office of the Secretary.

VOTED: That any bond, recognizance, contract of indemnity, or writing obligatory in the nature of a bond, recognizance, or conditional undertaking shall be valid and binding upon the Company when (a) signed by the President, any Vice Chairman, any Executive Vice President, any Senior Vice President or any Vice President, any Second Vice President, the Treasurer, any Assistant Treasurer, the Corporate Secretary or any Assistant Secretary and duly attested and sealed with the Company's seal by a Secretary or Assistant Secretary, or (b) duly executed (under seal, if required) by one or more Attorneys-in-Fact and Agents pursuant to the power prescribed in his or her certificate or their certificates of authority or by one or more Company officers pursuant to a written delegation of authority.

This Power of Attorney and Certificate of Authority is signed and sealed by facsimile (mechanical or printed) under and by authority of the following Standing Resolution voted by the Boards of Directors of TRAVELERS CASUALTY AND SURETY COMPANY OF AMERICA, TRAVELERS CASUALTY AND SURETY COMPANY and FARMINGTON CASUALTY COMPANY, which Resolution is now in full force and effect:

VOTED: That the signature of each of the following officers: President, any Executive Vice President, any Senior Vice President, any Vice President, any Assistant Vice President, any Secretary, any Assistant Secretary, and the seal of the Company may be affixed by facsimile to any power of attorney or to any certificate relating thereto appointing Resident Vice Presidents, Resident Assistant Secretaries or Attorneys-in-Fact for purposes only of executing and attesting bonds and undertakings and other writings obligatory in the nature thereof, and any such power of attorney or certificate bearing such facsimile signature or facsimile seal shall be valid and binding upon the Company and any such power so executed and certified by such facsimile signature and facsimile seal shall be valid and binding upon the Company in the future with respect to any bond or undertaking to which it is attached.

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December 12, 2025
DIVISION OF OIL, GAS AND MINING
M/029/0001

TOTAL P.08

IN WITNESS WHEREOF, TRAVELERS CASUALTY AND SURETY COMPANY OF AMERICA, TRAVELERS CASUALTY AND SURETY COMPANY and FARMINGTON CASUALTY COMPANY have caused this instrument to be signed by their **Senior Vice President** and their corporate seals to be hereto affixed this 28th day of September 2001.

STATE OF CONNECTICUT
) SS. Hartford
COUNTY OF HARTFORD

TRAVELERS CASUALTY AND SURETY COMPANY OF AMERICA
TRAVELERS CASUALTY AND SURETY COMPANY
FARMINGTON CASUALTY COMPANY

By _____
George W. Thompson
Senior Vice President

On this 28th day of September, 2001 before me personally came **GEORGE W. THOMPSON** to me known, who, being by me duly sworn, did depose and say: that he/she is **Senior Vice President** of **TRAVELERS CASUALTY AND SURETY COMPANY OF AMERICA, TRAVELERS CASUALTY AND SURETY COMPANY and FARMINGTON CASUALTY COMPANY,** the corporations described in and which executed the above instrument; that he/she knows the seals of said corporations; that the seals affixed to the said instrument are such corporate seals; and that he/she executed the said instrument on behalf of the corporations by authority of his/her office under the Standing Resolutions thereof.

Marie C Tetreault
My commission expires June 30, 2006 Notary Public
Marie C. Tetreault

CERTIFICATE

I, the undersigned, **Assistant Secretary** of **TRAVELERS CASUALTY AND SURETY COMPANY OF AMERICA, TRAVELERS CASUALTY AND SURETY COMPANY and FARMINGTON CASUALTY COMPANY,** stock corporations of the State of Connecticut, DO HEREBY CERTIFY that the foregoing and attached Power of Attorney and Certificate of Authority remains in full force and has not been revoked; and furthermore, that the Standing Resolutions of the Boards of Directors, as set forth in the Certificate of Authority, are now in force.

Signed and Sealed at the Home Office of the Company, in the City of Hartford, State of Connecticut. Dated this 28th day of February, 2002.

By _____
Kori M. Johanson
Assistant Secretary, Bond

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December 12, 2025
DIVISION OF OIL, GAS AND MINING
M/029/0001

FORM MR-RC
Revised April 4, 2001
RECLAMATION CONTRACT

File Number M/029/001

Effective Date

Other Agency File Number

STATE OF UTAH
DEPARTMENT OF NATURAL RESOURCES
DIVISION of OIL, GAS and MINING
1594 West North Temple Suite 1210
Box 145801
Salt Lake City, Utah 84114-5801
(801) 538-5291
Fax: (801) 359-3940

RECLAMATION CONTRACT

---ooOoo---

APPROVED
MAR 26 2002
DIV. OIL GAS & MINING

For the purpose of this RECLAMATION CONTRACT the terms below are defined as follows:

"NOTICE OF INTENTION" (NOI): (File No.) M/029/001
(Mineral Mined) Limestone

"MINE LOCATION":
(Name of Mine) Devil's Slide Quarry
(Description) 6055 E. Croydon Rd.
Morgan, UT 84050

"DISTURBED AREA":
(Disturbed Acres) 79 acres - mine
184.5 acres - amended area
(Legal Description) (refer to Attachment "A")

"OPERATOR":
(Company or Name) Holcim (US) Inc.
(Address) 6055 E. Croydon Rd.
Morgan, UT 84050

(Phone) 801-829-2153

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December 12, 2025
DIVISION OF OIL, GAS AND MINING
M/029/0001

"OPERATOR'S REGISTERED AGENT":
(Name)
(Address) C T Corporation
50 West Broadway - 8th Floor
Salt Lake City, Utah 84101

(Phone) 801-364-5101

"OPERATOR'S OFFICER(S)": See Attached

"SURETY":
(Form of Surety - Attachment B) Surety Bond - Mine
Surety Bond - Amendment

"SURETY COMPANY":
(Name, Policy or Acct. No.) Mine - Travelers Casualty & Surety #24S103532270
Amend - Travelers Casualty & Surety #103757982

"SURETY AMOUNT":
(Escalated Dollars) $177,600.00 - Mine
$1,611,400.00 - Amendment

"ESCALATION YEAR": 2002 - Mine
2006 - Amendment

"STATE": State of Utah
"DIVISION": Division of Oil, Gas and Mining

"BOARD": Board of Oil, Gas and Mining

ATTACHMENTS:
A "DISTURBED AREA":
B "SURETY":

This Reclamation Contract (hereinafter referred to as "Contract") is entered into between Holcim (US) Inc. the "Operator" and the Utah State Division of Oil, Gas and Mining ("Division").

WHEREAS, Operator desires to conduct mining operations under Notice of Intention (NOI) File No. M/029/001 which has been approved by the Utah State Division of Oil, Gas and Mining under the Utah Mined Land Reclamation Act, Sections 40-8-1 et seq., Utah Code Annotated, (1953, as amended) (hereinafter referred to as "Act") and implementing rules; and

WHEREAS, Operator is obligated to reclaim that area described as the Disturbed Area as set forth and in accordance with Operator's approved Reclamation Plan, and Operator is obligated to provide surety in form and amount approved by the Division, to assure reclamation of the Disturbed Area.

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NOW, THEREFORE, the Division and the Operator agree as follows:

1. Operator agrees to conduct reclamation of the Disturbed Area in accordance with the Act and implementing regulations, the original Notice of Intention dated June 14, 1977, and the original Reclamation Plan dated June 14, 1977. The Notice of Intention as amended, and the Reclamation Plan, as amended, are incorporated by this reference and made a part hereof.

2. Concurrent with the execution hereof, Operator has provided surety to assure that reclamation is conducted, in form and amount acceptable to the Division. Such surety as evidenced by the Surety Contract is in the form of the surety attached hereto as Attachment B and made a part hereof. The Surety Contract shall remain in full force and effect according to its terms unless modified by the Division in writing. If the Surety Contract expressly provides for cancellation, then, within 60 days following the Division's receipt of notice that the Surety Company intends to cancel the Surety Contract, the Operator shall provide a replacement Surety Contract in a form and amount reasonably acceptable to the Division. If the Operator fails to provide an acceptable replacement Surety Contract, the Division may order the Operator to cease further mining activities and to begin immediate reclamation of the Disturbed Area.

3. Operator agrees to pay legally determined public liability and property damage claims resulting from mining to the extent provided in Section 40-8-7(1)(e) of the Act.

4. Operator agrees to perform all duties and fulfill all reclamation requirements applicable to the mine as required by the Act and implementing rules, the Notice of Intention, as amended and the Reclamation Plan, as amended.

5. The Operator's liability under this Contract shall continue in full force and effect until the Division certifies that the Operator has reclaimed the Disturbed Area in accordance with the Act and implementing rules, the Notice of Intention, as amended and the Reclamation Plan, as amended.

6. If reclamation of discrete sections of the Disturbed Area is completed to the satisfaction of the Division, and the Division finds that such sections are severable from the remainder of the Disturbed Area, Operator may request the Division to certify that Operator has reclaimed such discrete sections of the Disturbed Area in accordance with the Act and Implementing rules, the Notice of Intention, as amended and the Reclamation Plan, as amended. If the Division makes such certification, Operator may make request to the Division that the aggregate face amount of the Surety Contract provided pursuant to paragraph 2 be reduced to an amount necessary to provide for completion of the remaining reclamation. The Division shall hear Operator's

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request for such reduction in accordance with the Board's Procedural Rules concerning requests for Agency Action.

7. Operator agrees to indemnify and hold harmless the State, Board and the Division from any claim, demand, liability, cost, charge, suit, or obligation of whatsoever nature arising from the failure of Operator or Operator's agents and employees, or contractors to comply with this Contract.

8. Operator may, at any time, submit a request to the Division to substitute surety. The Division may approve such substitution if the substitute surety meets the requirements of the Act and the implementing rules.

9. This Contract shall be governed and construed in accordance with the laws of the State of Utah.

10. If Operator shall default in the performance of its obligations hereunder, Operator agrees to pay all costs and expenses, including reasonable attorney's fees and costs incurred by the Division and/or the Board in the enforcement of this Contract.

11. Any breach that the Division finds to be material of the provisions of this Contract by Operator may, at the discretion of the Division, result in an order to cease mining operations. After opportunity for notice and hearing, the Board of Oil, Gas and Mining may enter an order to revoke the Notice of Intention, order reclamation, or order forfeiture of the Surety Contract, or take such other action as is authorized by law.

12. In the event of forfeiture of the Surety Contract, Operator shall be liable for any additional costs in excess of the surety amount which are required to comply with this Contract. Any excess monies resulting from forfeiture of the Surety Contract, upon completion of reclamation and compliance with this Contract, shall be returned to the rightful claimant.

13. This Contract including the Notice of Intention, as amended and the Reclamation Plan, as amended, represents the entire agreement of the parties involved, and any modification must be approved in writing by the parties involved.

14. Each signatory below represents that he/she is authorized to execute this Contract on behalf of the named party.

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OPERATOR:

Holcim (US) Inc.
Operator Name

By Chester Goodson
Authorized Officer (Typed or Printed)

Plant Manager
Authorized Officer - Position

Chester Goodson
Officer's Signature

March 14, 2002
Date

STATE OF Utah)
) ss:
COUNTY OF Morgan)

On the 14 day of March, 2002, Chester Goodson personally appeared before me, who being by me duly sworn did say that he/she is the Plant Manager of Holcim (US) Inc and duly acknowledged that said instrument was signed on behalf of said company by authority of its bylaws or a resolution of its board of directors and said Chester Goodson duly acknowledged to me that said company executed the same.

J. Allen Jones
Notary Public
Residing at Henefer, Utah

9-15-2005
My Commission Expires:

T ALLEN JONES
NOTARY PUBLIC • STATE of UTAH
PO BOX 226
2845 NORTH WEST HENEFER ROAD
HENEFER UT 84033
COMM EXP 09-15-2005

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DIVISION OF OIL, GAS AND MINING:

By_____ _____
Lowell P. Braxton, Director Date

STATE OF _____)
) ss:
COUNTY OF _____)

On the____ day of _____, 20 __, _____ personally appeared before me, who being duly sworn did say that he/she, the said ____ _____ is the Director of the Division of Oil, Gas and Mining, Department of Natural Resources, State of Utah, and he/she duly acknowledged to me that he/she executed the foregoing document by authority of law on behalf of the State of Utah.

_____
Notary Public
Residing at: _____

_____
My Commission Expires:

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ATTACHMENT "A"

Holcim (US) Inc.
Operator

Devil's Slide Quarry
Mine Name

M/029/001
Permit Number

Morgan County, Utah

LEGAL DESCRIPTION

Include 1/4, 1/4, 1/4 sections, townships, ranges and any other descriptions that will legally determine where disturbed lands are located. Attach a topographic map of suitable scale (max. 1 inch = 500 feet; 1 inch = 200 feet or larger scale is preferred) showing township, range and sections and a clear outline of the disturbed area boundaries tied to this Reclamation Contract and surety.

The detailed legal description of lands to be disturbed includes portions of the following lands not to exceed 79 acres - mine ~~184.5 ac~~ - amendment **acres under the approved permit and surety, as reflected on the attached map labeled** Holnam-USGS Topography-Devil's Slide - Plant & Quarry Area **and dated** /drawn 7/19/00 :

Mine
239 permitted acres with 79 acres bonded. Disturbed area located in:

All of Section 19, T4N, R4E
E1/2 of E1/2 of Section 24, T4N, R3E

Amendment
184.5 acres to be disturbed is located in:

SE1/4 of Section 13, T4N, R3E
SW1/4 of Section 18, T4N, R4E

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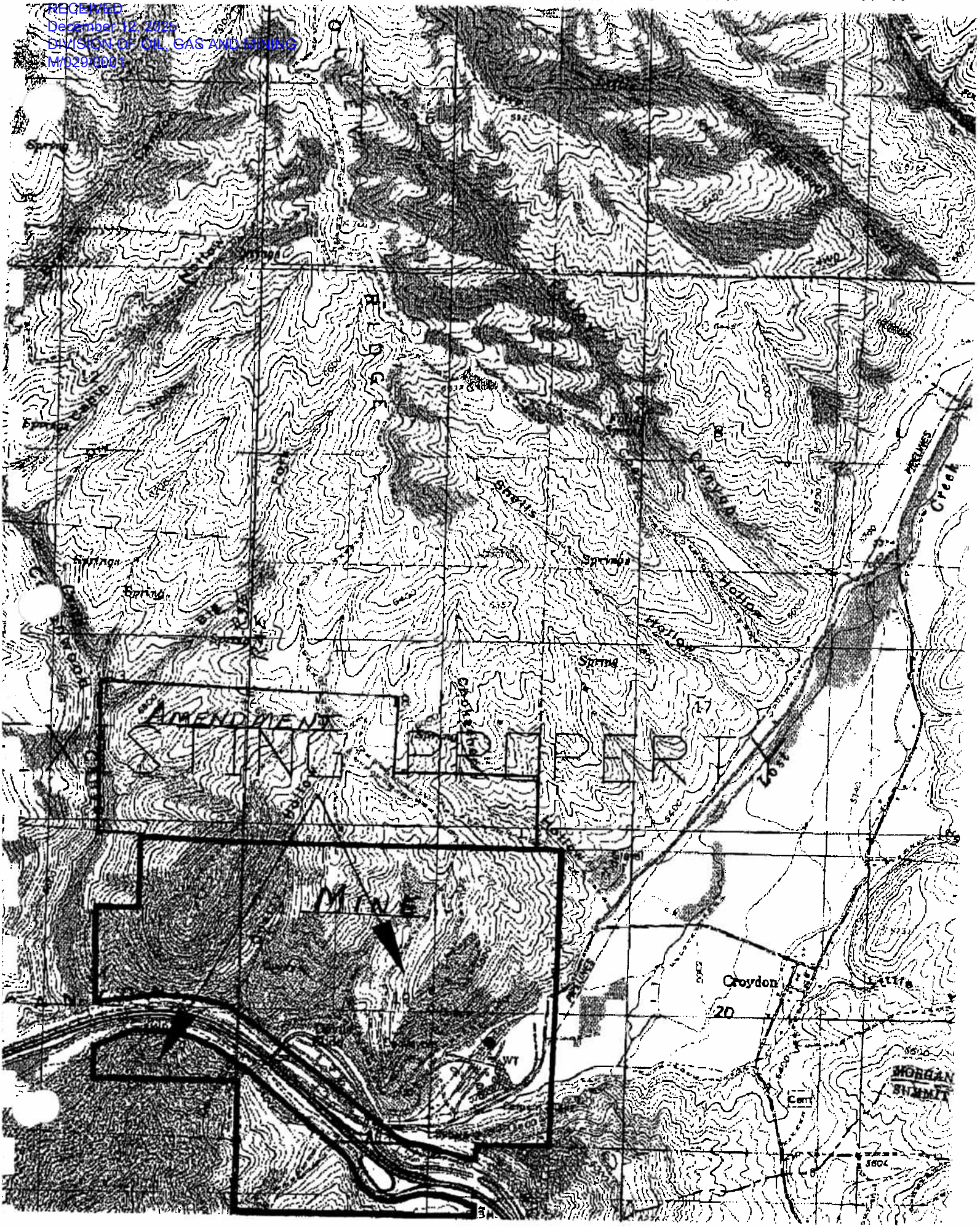

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Holcim (US) Inc.

Directors

Name	Address
Patrick Dolberg	St. Lawrence Cement Inc. 1945 Graham Boulevard Mount Royal (Quebec) H3R 1H1
Roderick D. Gillum	General Motors corporation M.C. 482-C27-D82 300 Renaissance Center P.O. Box 300 Detroit, MI 48265-3000
John R. Kennedy	JRK Financial Corp. 2801 Ocean Drive, Suite 303 Vero Beach, FL 32963
Benoit H. Koch	Avenue Louise 489, 12th Floor B-1050 Bruxelles, Belgium
Robert L. Livingston	The Livingston Group Suite 600 499 S. Capitol Street, SW Washington, DC 20003-4013
Theophil H. Schlatter	Zurcherstrasse 170 CH-8645 Jona, Switzerland
Dr. Anton E. Schrafl	Talstrasse 83 CH-8001 Zurich, Switzerland
George B. Weathersby	40 Duncan Lane Skillman, NJ 08558
Paul A. Yhouse	1100 Victors Way, Suite 50 Ann Arbor, MI 48108

APPROVED

MAR 26 2002

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Holcim (US) Inc.

Officers

Name	Title	Address
Lawrence J. Bacon	Vice President, Sales - Southeast Division	3051 Hamilton Blvd. Theodore, AL 36582
Randall J. Carlson	Vice President, Sales - Central Division	16401 Swingley Ridge Rd, Ste. 330 Chesterfield, MO 63017
Thomas A. Chizmadia	Vice President, Communications and Public Affairs	6211 N. Ann Arbor Road Dundee, MI 48131
Peter J. Deem	Vice President, Sales - West Division	3609 S Wadsworth Blvd, Ste. 200 Lakewood, CO 80235
Susan M. Diehl	Corporate Secretary	6211 N. Ann Arbor Road Dundee, MI 48131
Randy S. Dunlap	Vice President, Marketing	1100 Victors Way, Suite 50 Ann Arbor, MI 48108
David J. Feldman	Senior Vice President, Marketing and Sales	1100 Victors Way, Suite 50 Ann Arbor, MI 48108
Kenneth D. Herr	Vice President and Chief Information Officer	6211 N. Ann Arbor Road Dundee, MI 48131
Harry D. Javernick	Vice President, Manufacturing	3609 S Wadsworth Blvd, Ste 330 Chesterfield, MO 63017
Kent D. Jensen	Senior Vice President, Treasurer and Chief Financial Officer	6211 N. Ann Arbor Road Dundee, MI 48131
Barry L. Lower	Vice President, Manufacturing	16401 Swingley Ridge Road, Suite 330 Chesterfield, MO 63017
Robert J. Moir	Vice President, General Counsel and Assistant Secretary	6211 N. Ann Arbor Road Dundee, MI 48131

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Rassoul Navabpour	Vice President, Manufacturing	6211 N. Ann Arbor Road Dundee, MI 48131
Todd A. Richards	Counsel and Assistant Secretary	6211 N. Ann Arbor Road Dundee, MI 48131
Gary L. Sauer	Senior Vice President, Manufacturing	6211 N. Ann Arbor Road Dundee, MI 48131
Steven D. Spencer	Senior Vice President, Human Resources	6211 N. Ann Arbor Road Dundee, MI 48131
Looman F. Stingo	Senior Vice President, Logistics	1100 Victors Way, Suite 50 Ann Arbor, MI 48108
Russell L. Wiles	Vice President, Manufacturing	6211 N. Ann Arbor Road Dundee, MI 48131
Paul A. Yhouse	President and Chief Executive Officer	1100 Victors Way, Suite 50 Ann Arbor, MI 48108

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Material Analysis Report

Material: Cement Kiln Dust

Test Period: 01-Dec-2019 to 31-Dec-2019

Date Issued: 06-Jan-2020

Standard Test Results

General Information

Supplier:	Holcim (US) Inc. d/b/a LafargeHolcim US	Source Location:	Devils Slide Plant
Address:	8700 West Bryn Mawr Ave Chicago, IL 60631		6055 E. Croydon Road Devil's Slide, UT 84050
Contact:		Contact:	Doug Wilde / (801) 829-6821

The following is based on average test data during the test period. The data is typical of product shipped from this source; individual shipments may vary.

Chemical			Physical		
Item	**Limit [1]**	**Result**	**Item**	**Limit [1]**	**Result**
SiO_2 (%)	-	17.4			
Al_2O_3 (%)	-	3.7			
Fe_2O_3 (%)	-	3.0			
CaO (%)	-	54.3			
MgO (%)	-	2.6			
SO_3 (%)	-	7.0			
K_2O (%)	-	3.7			
Na_2O (%)	-	0.6			
TiO_2 (%)	-	0.18			
P_2O_5 (%)	-	0.06			
SrO (%)	-	-			
Mn_2O_3 (%)	-	0.05			
Cl (%)	-	2.75			
F (%)	-	-			
Loss on Ignition (%)	-	-			
Freelime (%)	-	-			

Chemical			Physical		
Item	**Limit [1]**	**Result**	**Item**	**Limit [1]**	**Result**

Notes (*1-9)

1 - Tested using methods as per ASTM D5050 "Standard Guide for Commercial Use of Lime Kiln Dusts and Porland Cement Kiln Dusts". There are no specification limits that exist for CKD.

2 - By providing this information, LafargeHolcim is not making and specifically disclaims any warranties or representations of any kind or character, express or implied, including any implied Warranty of Merchantability and any implied Warranty of Fitness for a particular purpose.

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Version: 180412

Doug Wilde,
Quality Manager

REMEDIAL SITE ASSESSMENT DECISION – EPA Region 08

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Site Name: IDEAL BASIC IND/CEMENT DIV
Alias(es): DEVILS SLIDE

City: CROYDON **County or Parish:** MORGAN **State:** UT
Refer to Report Dated: 01/30/2018 **EPA ID:** UTD089320121
Report Developed By: STATE **State ID:**
Report Type: Expanded Site Inspection #001 **Decision Date:** 01/30/2018

☑ **1. Further Remedial Site Assessment Under CERCLA (Superfund) is not required because:**
NFRAP-Site does not qualify for the NPL based on existing information

☐ **2. Further Assessment Needed Under CERCLA.**

☐ **3. Remedial study/cleanup needed.**

Decision/Rationale:

The site is located at 6055 East Croydon Road in Croydon, Utah. There is a cement plant (formerly Ideal Basic Cement Company) currently operating on site. Elevated levels of heavy metals including lead, arsenic, copper, selenium and zinc have been found in process waste (cement-kiln dust) and chromium IV in buried refractory bricks.

In 2015, the Utah Department of Environmental Quality (UDEQ) conducted sampling near the cement plant to evaluate the potential for off-site migration of contaminants. Results from this sampling are documented in the 2017 Ideal Basic Industries – Cement Division Expanded Site Inspection report. The results indicate the presence of heavy metals (primarily arsenic, selenium, copper and zinc) in soil, surface water and drinking water wells above naturally occurring background levels. There are no surface water intakes used for drinking water and the concentrations detected in off-site wells and soil samples are relatively low and below acceptable health-based benchmarks.

Based on the review of the 2017 report, the U.S. Environmental Protection Agency concurs with State of Utah's recommendation of No Further Remedial Action Planned (NFRAP).

The U.S. Environmental Protection Agency (EPA) has determined that no further remedial action by the Federal Superfund program is warranted at the referenced site, at this time. The basis for the no further remedial action planned (NFRAP) determination is provided above. A NFRAP designation means that no additional remedial steps under the Federal Superfund program will be taken at the site unless new information warranting further Superfund consideration or conditions not previously known to EPA regarding the site are disclosed.In accordance with EPA's decision regarding the tracking of NFRAP sites, the referenced site may be removed from EPA's Active site inventory and placed in a separate Archive site inventory as an historical record if no further Superfund interest is warranted.Archived sites may be returned to the Active site inventory if new information necessitating further Superfund consideration is discovered.

Site Decision Made By: Ryan Dunham

Signature: _____ **Decision Date:** 01/30/2018

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Holcim, Inc
Vegetation and Soil Baseline Assessment

Devil's Slide Mine

Prepared for:
Holcim, Inc
Devil's Slide
6055 E. Croydon Road
Morgan UT 84050

Prepared by:

WP Natural Resource Consulting, LLC
PO Box 520604
SLC, UT 84152

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INTRODUCTION

Holcim, Inc is required to submit a new LMO to the State of Utah Division of Oil Gas and Mining (DOGM) to continue mining operations at their Devil's Slide plant. The purpose of this report is to provide a baseline characterization of soils and vegetation according to the requirements set forth by DOGM as listed on Form MR-LMO. This information will assist in the design of a site appropriate and effective reclamation plan.

SITE DESCRIPTION

VEGETATION

The mine property lies on the eastern boundary of Morgan County along Highway 84 just west of Henefer. The area receives 17-20 inches of precipitation annually (79% of which comes in November – June) and slope steepness varies from 20 to 60%. The area is chiefly dominated by sagebrush (*Artemisia tridentata* var. *vaseyana*) occupying gentler slopes, with mountain shrub communities with species such as big toothed maple (*Acer grandentitatum*) and serviceberry (*Amelanchier utahensis* and *A. alnifolia*), inhabiting protected drainages between the open slopes. The understory includes perennial grasses such as bluebunch wheatgrass (*Agropyron spicatum*), Sandberg's bluegrass (*Poa secunda*), and muttongrass (*Poa fendleriana*), and perennial forbs such as lupine (*Lupinus sericeus*) and wild onion (*Allium cernuum*). Vegetation cover in the sagebrush community type is 39.4% +/- 9.5 and vegetation cover in the mountain shrub community averages 74.9% with a standard deviation of 11.3%. Vegetation cover jumps to 50.5% for the sagebrush community and 79.2% for the mountain shrub community if non-native annual grasses are included. From an ecological perspective, both vegetation communities in the area generally have good structure and age distribution. However, species diversity is somewhat low reflecting past land uses and conditions (grazing, drought) and invasive species (particularly musk thistle) are beginning to find their way into the vegetation communities. Figure 1 shows an overview of the undisturbed state of the vegetation communities surrounding Devil's Slide Mine.

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Figure 1.Location of Devil's Slide Cement Plant and Mine

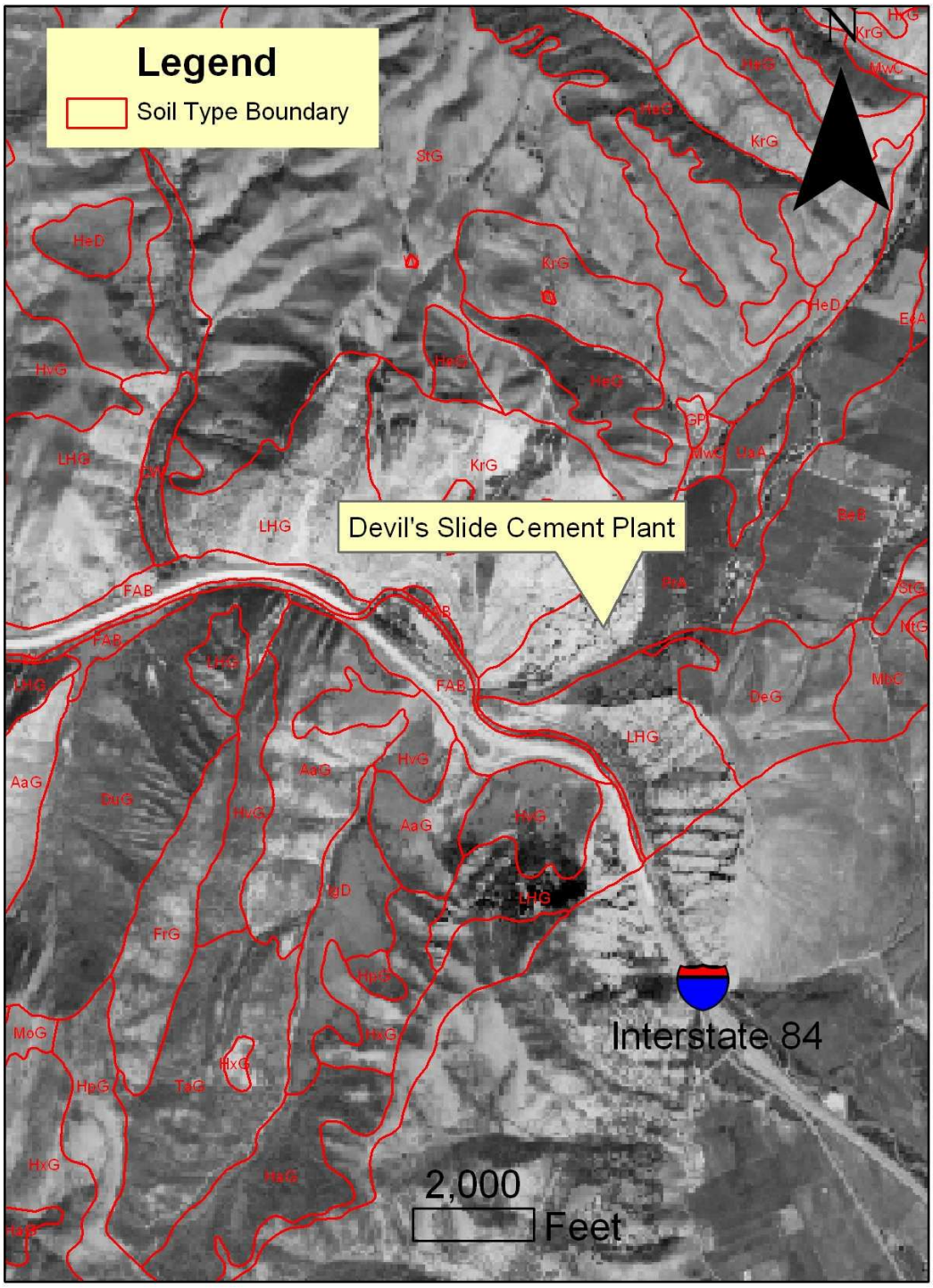

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Figure 2. Overview of vegetation communities at Devil's Slide.

Figure 3. Close up of vegetation communities at Devil's Slide

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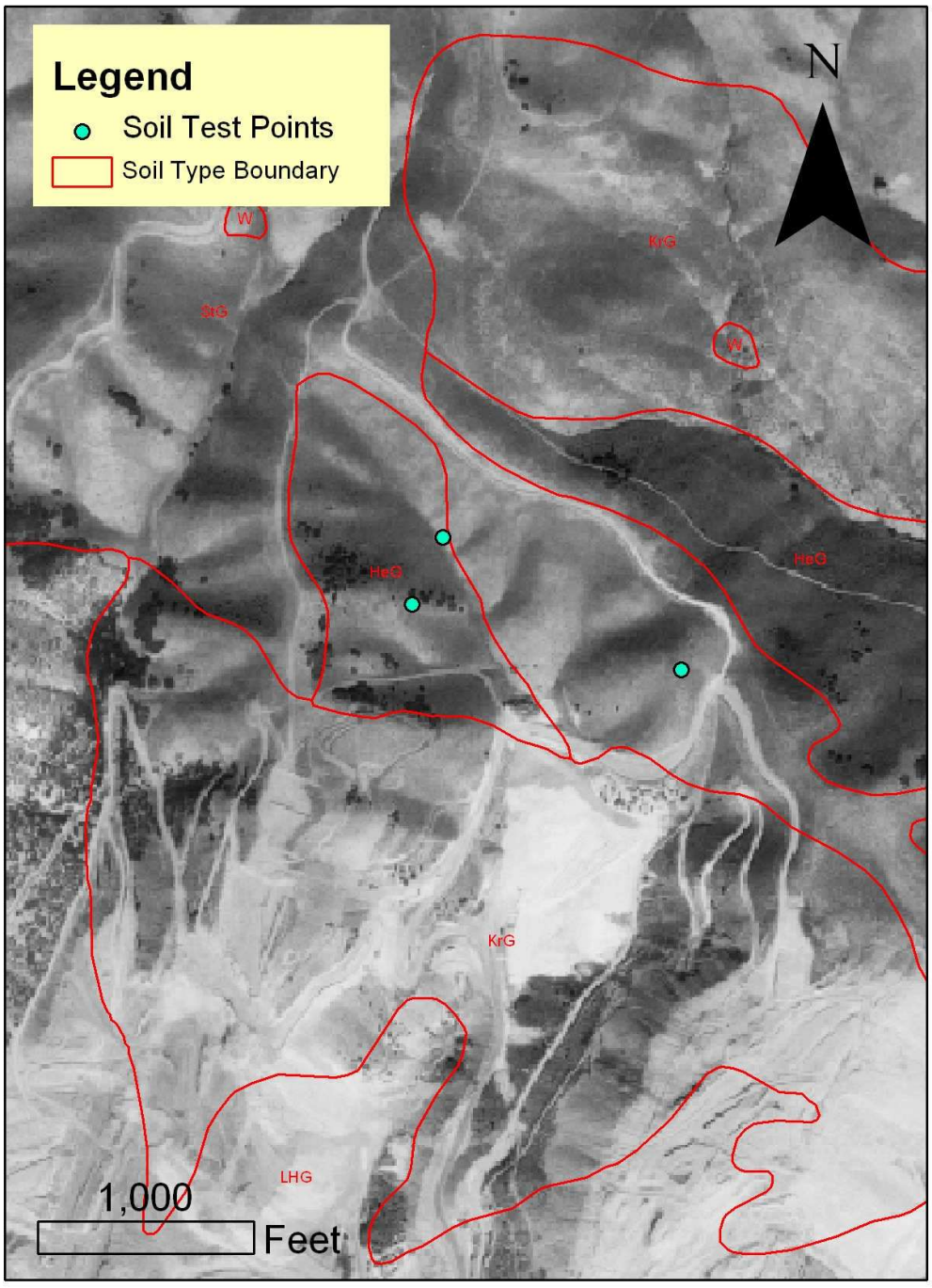
SOILS

The 1981 soil survey published by the Soil Conservation Service (now the Natural Resource Conservation Service) covers the area of the mine in their Morgan Area soil survey.

This soil survey was used in conjunction with soil tests in 3 areas to ascertain the character of the soils in the area. Three soil samples from the area were sent to the USU soils laboratory to determine pH, EC, CEC, %OM, N, P, SAR and K (see Figures 2 for soil type locations and sample locations).

Figure 4. Soil Type Boundaries and Soil Test Points



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The following are descriptions of the various soil types in the area:

Henefer loam –(HeG)
This soil is on the north and east facing slopes in the area on 40-60% slopes. It is very deep and well drained, and is formed from sandstone and quartzite. The surface layer is about 16 inches thick and is described as a very dark brown loam. The subsoil is dark brown gravelly silty clay loam or silty clay down to 60 inches deep. Rock fragment percentage increases as soil depth increases. Permeability is slow, available water capacity is moderately high, and erosion hazard is high, mainly due to slope. This soil is important for watershed health since it can hold significant amounts of water and supports dense vegetation to keep the soil in place. See Appendix for soil test results in this soil type (taken from the areas of transect 2 of the mountain shrub vegetation type.

St Mary's-Hoskin (StG)
This soil is a mixture of St. Mary's and Hoskin cobbly loams. These soils are generally found on south and west facing slopes in the area on slopes between 30 and 50% steepness, and occupies a large area within the mine property and north of the property. These soils originated from a weathered conglomerate of quartzite and sandstone. The soil is deep and well drained, with a surface layer of cobbly loam about 10 to 14 inches thick, and a subsoil layer of reddish brown very cobbly loam or very cobbly sandy clay loam 14 to 30 inches deep. Some soil in the area has a deeper layer of very cobbly sandy loam about 30 inches thick, but in some areas this stratum is not present. Therefore the bedrock can lie between 22 to 60 inches in depth. Permeability is moderate, available water capacity is low, and the erosion hazard high, mainly due to slope. See appendix B for soil test results in this soil type as well as the others.

Figure 5. Exposed soil profile in the St. Mary's Hoskin cobbly loams

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Kilfoil rock outcrop complex (KrG)
This soil is on south, west and east facing hillsides ranging from 40 to 60% slope. Most of this complex is the Kilfoil loam and the rock outcrop is interspersed within the Kilfoil loam and occurs on ridges and is exposed on ledges and outcroppings of bare rock. The Kilfoil loam was formed in materials weathered from sandstone and shale. The Kilfoil loam has a surface layer about 3 inches deep and the subsoil is a dark clay loam about 18 inches thick, and weathered fractured sandstone is at about 30 inches in depth. The surface layer is mildly alkaline and calcareous, whereas the subsoil is moderately calcareous and can be strongly alkaline. The erosion hazard high, and the water holding capacity is moderate. This soil is/was present under the upper areas of the active mine.

Lithic haploxerolls (LHG)
This is the soil type that was/is under much of the present mine property. Much of this soil type is considered a rock outcrop, but there are pockets of soil development within this type. The Kilfoil loam is within this type as well as the Hoskin cobbly loam. Within the LHG type, a typical surface layer is variable but is a brown stony loam about 6 inches thick with a stony clay loam underlying the surface layer. The bedrock is found between 10 and 20 inches. The soil is strongly calcareous and moderately alkaline, the water holding capacity is very low, and erosion hazard is high.

Agassiz rock outcrop (AaG)
This soil is generally on south and west facing mountainsides of 40-70% slopes. It is found on the south side of Highway 84 under sagebrush plot #10. The soil is shallow (bedrock is between 14 and 19 inches deep), and formed from materials that weathered from limestone. The surface layer is a silt loam about 8 inches, and the underlying layer is 6 inches of a cobbly silt loam. Limestone is found at about 14 inches, thus the water holding capacity is very low, and the erosion hazard high.

Horrock's rock outcrop complex (HvG)- south side of highway under MS
This soil complex is generally found on south and west facing mountainsides of 40-70% slopes. This soil type is on the The soil originated from materials weathered from limestone. The surface layer is a gravelly loam about 15 inches thick. The surface layer becomes more cobbly deeper in the profile. The subsoil is about 22 inches and is a very cobbly clay loam. Weathered shale lies at about 45 inches deep. Water holding capacity is low and erosion hazard is high.

METHODS

Data on vegetation cover and species richness (diversity) was collected on July 8, 2005. To ascertain the range of variability for vegetation cover, ground cover, and species composition, 10 transects of 100 feet in each vegetation type were established in areas determined to be representative of each of the vegetation types in the area (See Figures 6 and 7). Once within a stand of typical vegetation, a pin was spun to randomly determine the azimuth of the transect. Every foot, a point was taken and recorded (plant species, rock, litter, bare ground or gravel). Only aerial cover was determined in this manner, thus total ground cover plus bare ground must be equal to 100%. However, it is also important to consider the density of the understory vegetation stratum (grasses and forbs), particularly in the mountain shrub communities, which will bring the total vegetation cover over 100%. The photos of the mountain shrub community

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show the density of the grasses and forbs underneath the large shrubs. Ocular estimates of the understory vegetation ranged from 15 to 50% in the mountain shrub community.

Figure 6. Vegetation transect locations on the north side of Hwy 84

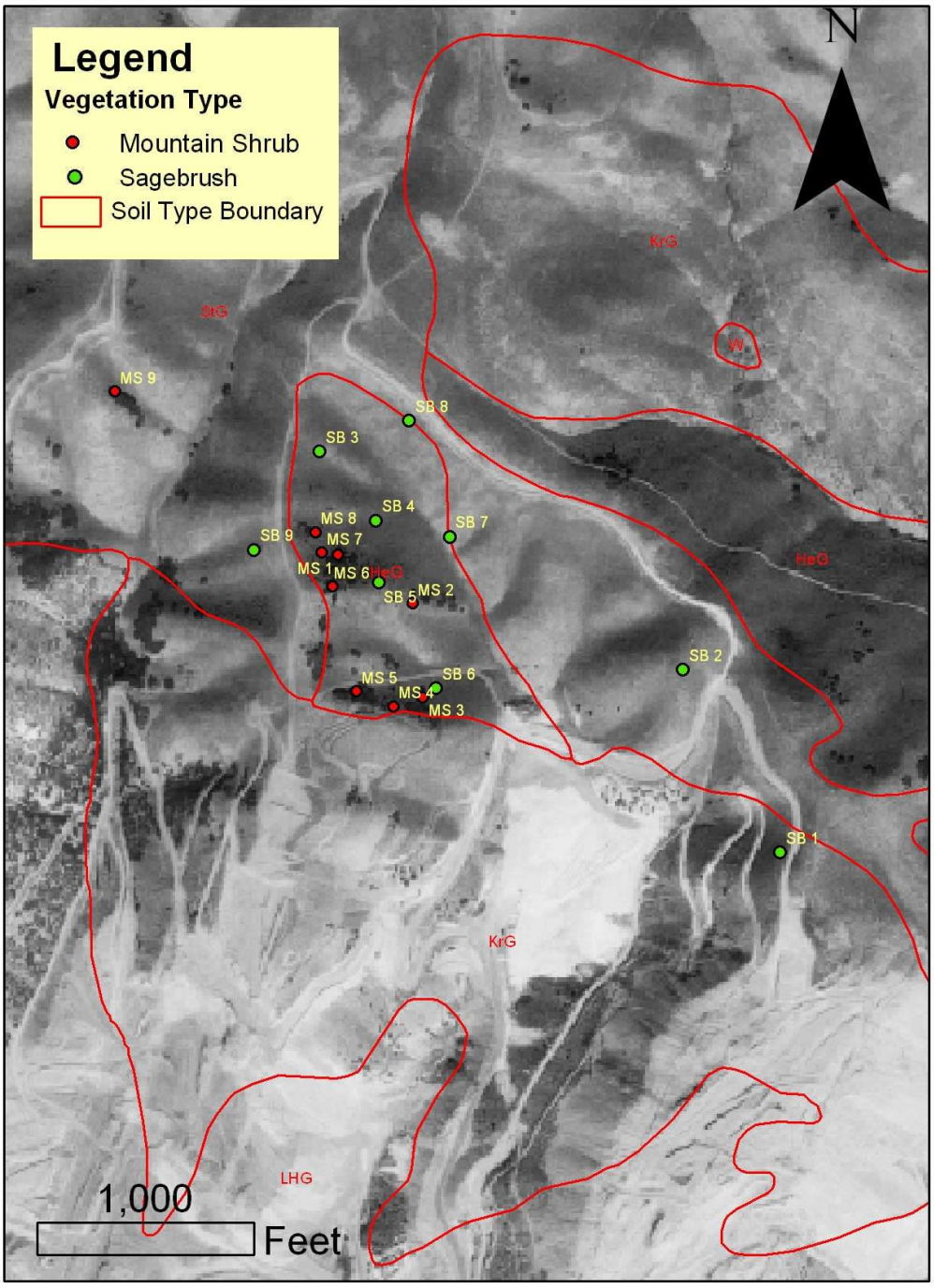

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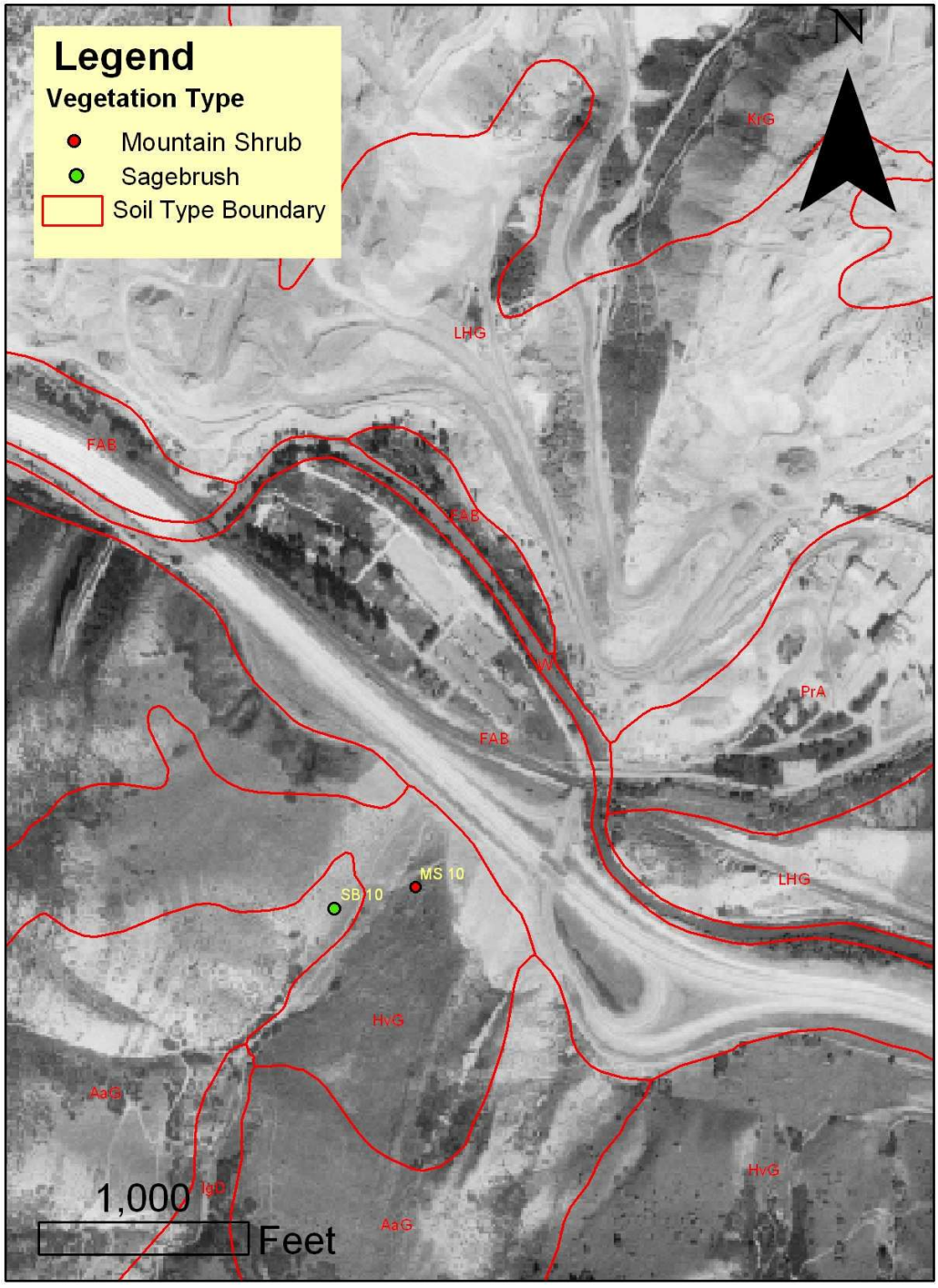
Figure 7. Vegetation transect locations on the south side of Highway 84



The results of the point intercept method for aerial cover for the ten transects in each vegetation type were then averaged and a standard deviation was determined. Vegetation species that were

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encountered outside transect boundaries were also recorded. Vegetation cover was calculated both including the non-native annual grasses and excluding them. Relative covers were also calculated with and without the inclusion of the weedy annual grasses. In many cases, the inclusion of weedy annual grasses in vegetation cover give artificially high cover values since it is better able to establish than its native counterparts.

RESULTS

Vegetation cover was tabulated both including and excluding annual non-native grasses. Non-native annual grasses can give artificially high vegetation cover estimates, since they are better able to establish than their native counterparts in the interspaces of the vegetation community. The sagebrush cover type had a cover of 39.4% +/- 9.5% excluding non-native annual grasses. If the annual grasses are included, the vegetation cover estimate jumps to 50.5%. Mountain big sagebrush (*Artemisia tridentata* var *vaseyana*) accounted for almost half of the vegetation cover at 45% relative cover, while cool season perennial grasses accounted for almost one quarter of the cover at 24%. Perennial forbs accounted for almost 8% of the cover. Litter accounted for 35% of the total cover, while rock accounted for about 9% of the total cover and bare ground was minimal at 7%.

The mountain shrub community averaged 74.9% +/- 11.3% aerial cover excluding annual grasses and 79.2% if annual grasses are included. Big toothed maple (*Acer grandentitatum*) dominated the vegetation cover at 62% of the relative cover. Shrubs such as snowberry (*Symphorocarpos oreophilus*) and sagebrush accounted for about 28% of the vegetation cover. Aerial cover of perennial grasses and forbs totaled 4% of the relative cover. The understory vegetation (not accounted for in aerial cover estimates) varied from 15 to 50% cover. Litter averaged 15% +/- 8%, rock was 14 +/- 5%, and bare soil was a minimal 3 +/- 1.5%. See Tables 1 and 2 for complete tabulated results.

DISCUSSION

The soils underlying the vegetation communities at the Devil's Slide property are relatively well developed and thus would serve as appropriate growth medium for revegetation activities. It is very helpful to salvage and/or direct haul soil for revegetation purposes. If it is necessary to store the soil until it is needed, it is best to store the topsoil in a separate stock pile than the subsoils. The topsoil is generally the most fertile and contains native seed propagules that can naturally establish in reclaimed areas to ultimately reduce the cost of revegetation.

The ranges of the vegetation cover estimates for both the sagebrush and mountain shrub communities at the Devils' Slide mine property are typical for these native communities. In order to achieve 70% of the native cover to be considered reclamation success, the combination of direct hauling topsoil and the following seed mixes for each of the vegetation communities is recommended.

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Table 3. Recommended seed mix for sagebrush community

Common Name	Scientific Name	Variety	PLS lbs	Seeds/ lb	Percent of mix
GRASSES					
Muttongrass	*Poa fendleriana*		0.5	890,000	13.3
Bluebuch wheatgrass	*Pseudoroegneria spicata var spicata*	P-7	4.5	170,000	18.8
Great Basin Wildrye	*Elymus cinereus*	Magnar	2	130,000	7.7
Bottlebrush squirreltail	*Elymus elymoides*		1.5	192000	8.6
Slender wheatgrass	*Elymus trachcaulus*	Pryor	4	159,000	21.3
FORBS					
Indian paintbrush	*Castilleja chromosa*		0.05	4,900,000	7.3
Yarrow	*Achillea lanulosa*		0.1	2,770,000	4.1
SHRUBS					
Sagebrush	*Artemisia tridentata var vaseyana*		0.25	2,500,000	18.6
TOTAL			12.8		

This seed mix averages to about 76 seeds per square foot.

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Table 4. Recommended seed mix for Mountain Shrub Community

Common name	Scientific name	Variety	PLS lbs	# seeds/ lb	Percent of mix
GRASSES					
Canada bluegrass	*Poa compressa*		0.2	2,500,000	16.8
Bluebuch wheatgrass	*Pseudoroegneria spicata*	p-7	4	140,000	18.9
Great Basin Wildrye	*Elymus cinereus*	Magnar	2	130,000	8.8
Slender wheatgrass	*Elymus trachcaulus*	Pryor	5	159,000	26.8
FORBS					
Indian paintbrush	*Castilleja chromosa*		0.02	4,900,000	3.3
Sulfur flower	*Eriogonum umbellatum*		0.5	209000	3.5
Yarrow	*Achillea lanulosa*		0.05	2,770,000	4.7
Showy golden eye	*Heliomerus multiflora*		0.5	1055000	3.6
SHRUBS					
Snowberry	Symphoricarpos oreophilus		1	75,000	5.1
Sagebrush	*Artemisia tridentata var vaseyana*		0.25	2,500,000	8.4
TOTAL			13.9		

This seed mix averages to about 68 seeds per square foot.

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APPENDIX A – PHOTOS OF SELECTED VEGETATION TRANSECTS

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Transect 2- Sagebrush Azimuth 305°

Transect 6-Sagebrush Azimuth 122°

Transect 4-Sagebrush Azimuth 228°

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Transect 8-Sagebrush Azimuth 314°

Transect 7-Sagebrush Azimuth 146°

Transect 10-Sagebrush Azimuth 34°

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Mountain Shrub Community- Transect 4

Understory of Mountain Shrub Community

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APPENDIX B- SOIL TEST RESULTS

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Soil Test Report
and
Fertilizer Recommendation

USU Analytical Labs
Utah State University
Logan, Utah 84322-4830
(435) 797-2217
(435) 797-2117 (FAX)
www.usual.usu.edu

Date Received: 7/18/2005
Date Completed: 8/1/2005

Name: MINDY WHEELER
Address: 4203 SUNRISE DR
PARK CITY UT 84098

Phone: 801-699-5459
County:

Lab Number: 5011618
Identification: 07-07-05 DEVILS SLIDE TRA 2
Crop to be Grown:

Grower's Comments: Soil type 5th

Acres in Field:

Soil Test Results			Interpretations	Recommendations
Texture		Sandy Loam		
pH		7.8	Normal	
Salinity - ECe	dS/m	0.5		
Phosphorus - P	mg/kg	36		
Potassium - K	mg/kg	325		
Nitrate-Nitrogen - N	mg/kg	2.64		
Zinc - Zn	mg/kg			
Iron - Fe	mg/kg			
Copper - Cu	mg/kg			
Manganese - Mn	mg/kg			
Sulfate-Sulfur - S	mg/kg			
Organic Matter	%	3.6		
SAR		0.72	Soil Not Sodic	

Notes
CEC: 14.6
CONTACT THE LAB WITH WHAT YOU ARE GROWING FOR RECOMMENDATIOINS

For further assistance, please see your County Agent --

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Soil Test Report
and
Fertilizer Recommendation

USU Analytical Labs
Utah State University
Logan, Utah 84322-4830
(435) 797-2217
(435) 797-2117 (FAX)
www.usual.usu.edu

Date Received: 7/18/2005
Date Completed: 8/1/2005

Name: MINDY WHEELER
Address: 4203 SUNRISE DR
PARK CITY UT 84098

Phone: 801-699-5459
County:

Lab Number: 5011619
Identification: 07-07-05 DEVILS SLIDE TRA 7
Crop to be Grown:

Grower's Comments: on border blw 4th + 5th

Acres in Field:

Soil Test Results			Interpretations	Recommendations
Texture		Sandy Loam		
pH		7.8	Normal	
Salinity - ECe	dS/m	0.65		
Phosphorus - P	mg/kg	24		
Potassium - K	mg/kg	231		
Nitrate-Nitrogen - N	mg/kg	2.86		
Zinc - Zn	mg/kg			
Iron - Fe	mg/kg			
Copper - Cu	mg/kg			
Manganese - Mn	mg/kg			
Sulfate-Sulfur - S	mg/kg			
Organic Matter	%	2.4		
SAR		0.65	Soil Not Sodic	

Notes
CEC: 11.8
CONTACT THE LAB WITH WHAT YOU ARE GROWING FOR RECOMMENDATIOINS

or further assistance, please see your County Agent --

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Soil Test Report
and
Fertilizer Recommendation

USU Analytical Labs
Utah State University
Logan, Utah 84322-4830
(435) 797-2217
(435) 797-2117 (FAX)
www.usual.usu.edu

Date Received: 7/18/2005
Date Completed: 8/1/2005

Name: MINDY WHEELER
Address: 4203 SUNRISE DR
PARK CITY UT 84098

Phone: 801-699-5459
County:

Lab Number: 5011620
Identification: 07-07-05 DEVILS SLIDE 1452
Crop to be Grown:

Grower's Comments:

Acres in Field:

Soil Test Results			Interpretations	Recommendations
Texture		Sandy Loam		
pH		7.7	Normal	
Salinity - ECe	dS/m	0.5		
Phosphorus - P	mg/kg	27		
Potassium - K	mg/kg	197		
Nitrate-Nitrogen - N	mg/kg	2.73		
Zinc - Zn	mg/kg			
Iron - Fe	mg/kg			
Copper - Cu	mg/kg			
Manganese - Mn	mg/kg			
Sulfate-Sulfur - S	mg/kg			
Organic Matter	%	4.0		
SAR		0.50	Soil Not Sodic	

Notes
CEC: 15.3
CONTACT THE LAB WITH WHAT YOU ARE GROWING FOR RECOMMENDATIOINS

For further assistance, please see your County Agent --

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IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

Morgan County, Utah

Local office

Utah Ecological Services Field Office

(801) 975-3330
(801) 975-3331

2369 West Orton Circle, Suite 50
West Valley City, UT 84119-7603

https://fws.gov/office/utah-ecological-services

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Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information. IPaC only shows species that are regulated by USFWS (see FAQ).
2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS
Canada Lynx Lynx canadensis There is **final** critical habitat for this species. Your location does not overlap the critical habitat. https://ecos.fws.gov/ecp/species/3652	Threatened
North American Wolverine Gulo gulo luscus Wherever found This species only needs to be considered if the following condition applies: • Species may be present based on transient occurrence as it moves through or too suitable habitat. Effects should be considered to species and projects should consult with the Service, however, depending on the project, consultation may not be necessary. No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/5123	Threatened

Birds

NAME	STATUS
Yellow-billed Cuckoo Coccyzus americanus There is **final** critical habitat for this species. Your location does not overlap the critical habitat. https://ecos.fws.gov/ecp/species/3911	Threatened

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Insects

NAME	STATUS
Monarch Butterfly Danaus plexippus Wherever found There is **proposed** critical habitat for this species. Your location does not overlap the critical habitat. https://ecos.fws.gov/ecp/species/9743	Proposed Threatened
Suckley's Cuckoo Bumble Bee Bombus suckleyi No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/10885	Proposed Endangered

Flowering Plants

NAME	STATUS
Ute Ladies'-tresses Spiranthes diluvialis Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/2159	Threatened

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

There are no critical habitats at this location.

You are still required to determine if your project(s) may have effects on all above listed species.

Bald & Golden Eagles

Bald and Golden Eagles are protected under the Bald and Golden Eagle Protection Act [2] and the Migratory Bird Treaty Act (MBTA) [1]. Any person or organization who plans or conducts activities that may result in impacts to Bald or Golden Eagles, or their habitats, should follow appropriate regulations and consider implementing appropriate avoidance and minimization measures, as described in the various links on this page.

Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide avoidance and minimization measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

There are Bald Eagles and/or Golden Eagles in your project area.

Measures for Proactively Minimizing Eagle Impacts
For information on how to best avoid and minimize disturbance to nesting bald eagles, please review the National Bald Eagle Management Guidelines. You may employ the timing and activity-specific distance recommendations in this document when designing your project/activity to avoid and minimize eagle impacts. For bald eagle information specific to Alaska, please refer to Bald Eagle Nesting and Sensitivity to Human Activity.

The FWS does not currently have guidelines for avoiding and minimizing disturbance to nesting Golden Eagles. For site-specific recommendations regarding nesting Golden Eagles, please consult with the appropriate Regional Migratory Bird Office or Ecological Services Field Office.

If disturbance or take of eagles cannot be avoided, an incidental take permit may be available to authorize any take that results from, but is not the purpose of, an otherwise lawful activity. For assistance making this determination for Bald Eagles, visit the Do I Need A Permit Tool. For assistance making this determination for golden eagles, please consult with the appropriate Regional Migratory Bird Office or Ecological Services Field Office.

Ensure Your Eagle List is Accurate and Complete

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If your project area is in a poorly surveyed area in IPaC, your list may not be complete and you may need to rely on other resources to determine what species may be present (e.g. your local FWS field office, state surveys, your own surveys). Please review the Supplemental Information on Migratory Birds and Eagles, to help you properly interpret the report for your specified location, including determining if there is sufficient data to ensure your list is accurate.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to bald or golden eagles on your list, see the "Probability of Presence Summary" below to see when these bald or golden eagles are most likely to be present and breeding in your project area.

Review the FAQs

The FAQs below provide important additional information and resources.

NAME	BREEDING SEASON
Bald Eagle Haliaeetus leucocephalus This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Dec 1 to Aug 31
Golden Eagle Aquila chrysaetos This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1680	Breeds Dec 1 to Aug 31

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "Supplemental Information on Migratory Birds and Eagles", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (■)

Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)

Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)

A week is marked as having no data if there were no survey events for that week.

Survey Timeframe

Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

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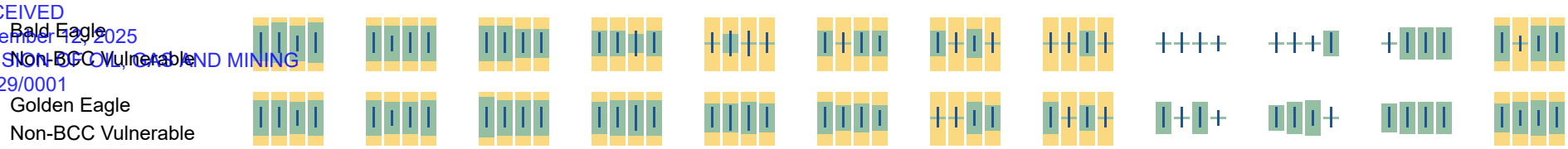

Bald & Golden Eagles FAQs

What does IPaC use to generate the potential presence of bald and golden eagles in my specified location?

The potential for eagle presence is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are an eagle (Bald and Golden Eagle Protection Act requirements may apply).

Proper interpretation and use of your eagle report
On the graphs provided, please look carefully at the survey effort (indicated by the black vertical line) and for the existence of the "no data" indicator (a red horizontal line). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort line or no data line (red horizontal) means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list and associated information help you know what to look for to confirm presence and helps guide you in knowing when to implement avoidance and minimization measures to eliminate or reduce potential impacts from your project activities or get the appropriate permits should presence be confirmed.

How do I know if eagles are breeding, wintering, or migrating in my area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating, or resident), you may query your location using the RAIL Tool and view the range maps provided for birds in your area at the bottom of the profiles provided for each bird in your results. If an eagle on your IPaC migratory bird species list has a breeding season associated with it (indicated by yellow vertical bars on the phenology graph in your “IPaC PROBABILITY OF PRESENCE SUMMARY” at the top of your results list), there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

Interpreting the Probability of Presence Graphs

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. A taller bar indicates a higher probability of species presence. The survey effort can be used to establish a level of confidence in the presence score.

How is the probability of presence score calculated? The calculation is done in three steps:
The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.

To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.

The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

Breeding Season ()
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort ()
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps.

No Data ()
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

Migratory birds

The Migratory Bird Treaty Act (MBTA) [1] prohibits the take (including killing, capturing, selling, trading, and transport) of protected migratory bird species without prior authorization by the Department of Interior U.S. Fish and Wildlife Service (Service).

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management

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- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide avoidance and minimization measures for birds
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

Measures for Proactively Minimizing Migratory Bird Impacts

Your IPaC Migratory Bird list showcases birds of concern, including Birds of Conservation Concern (BCC), in your project location. This is not a comprehensive list of all birds found in your project area. However, you can help proactively minimize significant impacts to all birds at your project location by implementing the measures in the Nationwide avoidance and minimization measures for birds document, and any other project-specific avoidance and minimization measures suggested at the link Measures for avoiding and minimizing impacts to birds for the birds of concern on your list below.

Ensure Your Migratory Bird List is Accurate and Complete

If your project area is in a poorly surveyed area, your list may not be complete and you may need to rely on other resources to determine what species may be present (e.g. your local FWS field office, state surveys, your own surveys). Please review the Supplemental Information on Migratory Birds and Eagles document, to help you properly interpret the report for your specified location, including determining if there is sufficient data to ensure your list is accurate.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, see the "Probability of Presence Summary" below to see when these birds are most likely to be present and breeding in your project area.

Review the FAQs

The FAQs below provide important additional information and resources.

NAME	BREEDING SEASON
Bald Eagle Haliaeetus leucocephalus This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Dec 1 to Aug 31
Black Rosy-finch Leucosticte atrata This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9460	Breeds Jun 15 to Aug 31
Broad-tailed Hummingbird Selasphorus platycercus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 25 to Aug 21
California Gull Larus californicus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Mar 1 to Jul 31
Cassin's Finch Haemorhous cassinii This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9462	Breeds May 15 to Jul 15
Clark's Grebe Aechmophorus clarkii This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Jun 1 to Aug 31
Clark's Nutcracker Nucifraga columbiana This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds Jan 15 to Jul 15
Evening Grosbeak Coccothraustes vespertinus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 15 to Aug 10
Golden Eagle Aquila chrysaetos This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1680	Breeds Dec 1 to Aug 31

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Lesser Yellowlegs Tringa flavipes — Breeds elsewhere

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9679

Lewis's Woodpecker Melanerpes lewis — Breeds Apr 20 to Sep 30

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9408

Pinyon Jay Gymnorhinus cyanocephalus — Breeds Feb 15 to Jul 15

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9420

Virginia's Warbler Leiothlypis virginiae — Breeds May 1 to Jul 31

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9441

Western Grebe aechmophorus occidentalis — Breeds Jun 1 to Aug 31

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/6743

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "Supplemental Information on Migratory Birds and Eagles", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (▪)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (▪)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

▪ probability of presence ▪ breeding season | survey effort – no data

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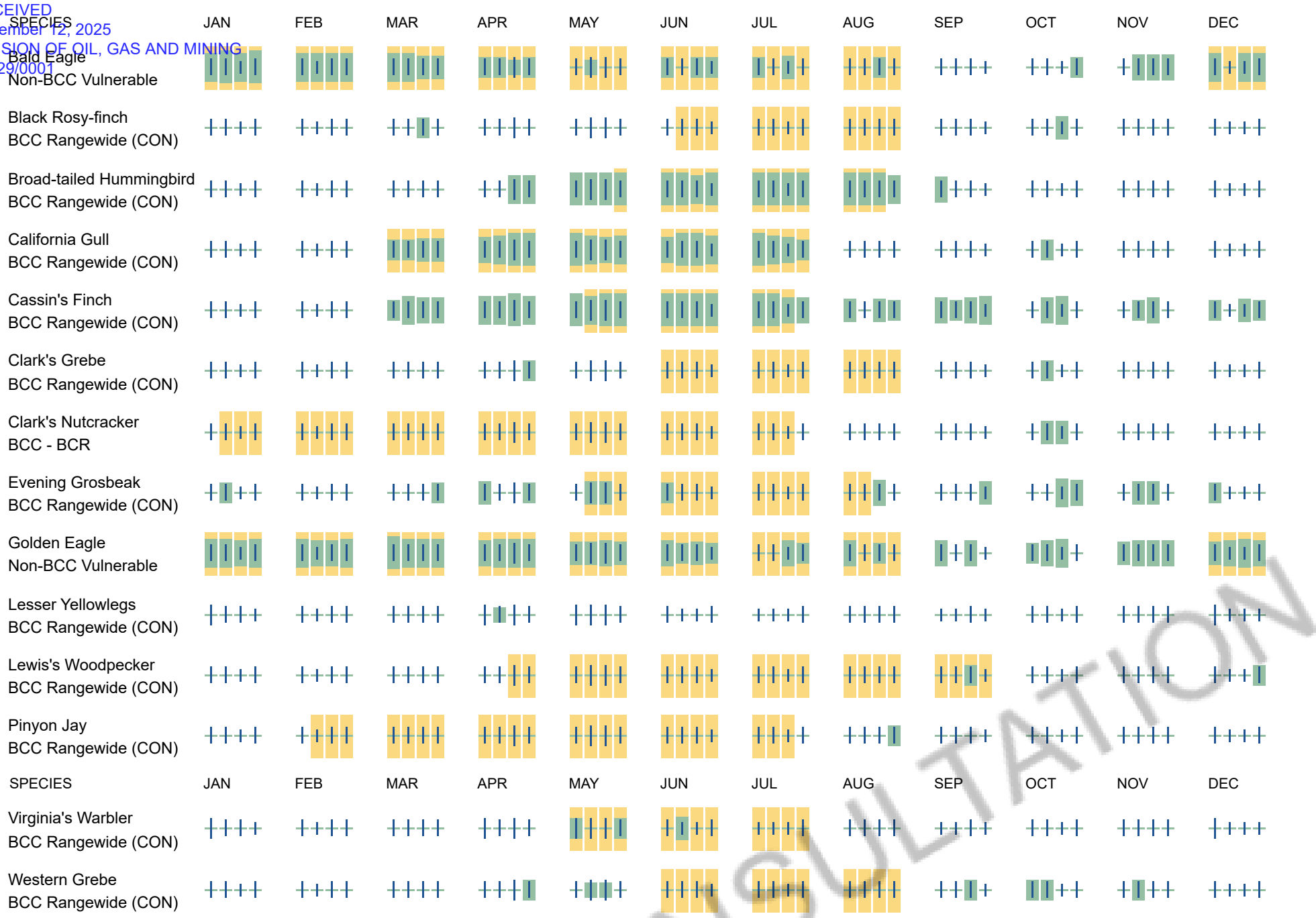

Migratory Bird FAQs

Tell me more about avoidance and minimization measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Avoidance & Minimization Measures for Birds describes measures that can help avoid and minimize impacts to all birds at any location year-round. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is one of the most effective ways to minimize impacts. To see when birds are most likely to occur and breed in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the list of migratory birds that potentially occur in my specified location?

The Migratory Bird Resource List is comprised of Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location, such as those listed under the Endangered Species Act or the Bald and Golden Eagle Protection Act and those species marked as “Vulnerable”. See the FAQ “What are the levels of concern for migratory birds?” for more information on the levels of concern covered in the IPaC migratory bird species list.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) with which your project intersects. These species have been identified as warranting special attention because they are BCC species in that area, an eagle (Bald and Golden Eagle Protection Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, and to verify survey effort when no results present, please visit the Rapid Avian Information Locator (RAIL) Tool.

Why are subspecies showing up on my list?

Subspecies profiles are included on the list of species present in your project area because observations in the AKN for **the species** are being detected. If the species are present, that means that the subspecies may also be present. If a subspecies shows up on your list, you may need to rely on other resources to determine if that subspecies may be present (e.g. your local FWS field office, state surveys, your own surveys).

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets.

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go to the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

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How do I know if a bird is breeding, wintering, or migrating in my area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating, or resident), you may query your location using the RAIL Tool and view the range maps provided for birds in your area at the bottom of the profiles provided for each bird in your results. If a bird on your IPaC migratory bird species list has a breeding season associated with it (indicated by yellow vertical bars on the phenology graph in your "IPaC PROBABILITY OF PRESENCE SUMMARY" at the top of your results list), there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Bald and Golden Eagle Protection Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially BCC species. For more information on avoidance and minimization measures you can implement to help avoid and minimize migratory bird impacts, please see the FAQ "Tell me more about avoidance and minimization measures I can implement to avoid or minimize impacts to migratory birds".

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Proper interpretation and use of your migratory bird report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please look carefully at the survey effort (indicated by the black vertical line) and for the existence of the "no data" indicator (a red horizontal line). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list does not represent all birds present in your project area. It is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list and associated information help you know what to look for to confirm presence and helps guide implementation of avoidance and minimization measures to eliminate or reduce potential impacts from your project activities, should presence be confirmed. To learn more about avoidance and minimization measures, visit the FAQ "Tell me about avoidance and minimization measures I can implement to avoid or minimize impacts to migratory birds".

Interpreting the Probability of Presence Graphs
Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. A taller bar indicates a higher probability of species presence. The survey effort can be used to establish a level of confidence in the presence score.

How is the probability of presence score calculated? The calculation is done in three steps:
The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.

To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.

The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

Breeding Season ()
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort ()
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps.

No Data ()
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

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Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

There are no refuge lands at this location.

Fish hatcheries

There are no fish hatcheries at this location.

Wetlands in the National Wetlands Inventory (NWI)

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Wetland information is not available at this time

This can happen when the National Wetlands Inventory (NWI) map service is unavailable, or for very large projects that intersect many wetland areas. Try again, or visit the NWI map to view wetlands at this location.

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate Federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

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Appendix G

2019 Cultural Study by SWCA, BLM Correspondence, Wetland Delineation

Five Star Engineers LLC
220 N 900 E
Hyde Park, Utah 84318
Tel: 435-881-5339
Issahamud@5starengineers.com

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Gmail

Issa Hamud <issahamud@5starengineers.com>

Devil's Slide Limestone

1 message

Lewis, Taylor W <tlewis@blm.gov> Mon, Oct 20, 2025 at 4:17 PM
To: Issa Hamud <issahamud@5starengineers.com>, "javier.sosa@amrize.com" <javier.sosa@amrize.com>
Cc: Kim Coburn <kcoburn@utah.gov>

Issa/Javier,

Thanks for meeting with me on Wednesday. I've done a little more research into your situation, and wanted to give you some concrete guidance on how mining might proceed on Section 18 of Township 4 North Range 4 East. As we discussed on the phone, this section was patented under the Stockraising Homestead Act of 1916, and as such BLM does retain the mineral rights, which makes things a little complicated, since there are some special rules which apply under the regulations. I've attached a copy of the 1930 land patent for your records.

First off, I have not been able to get in touch with the Salt Lake Field Manager yet to fully brief them on the situation, but I did consult with the mineral materials lead geologist for Utah, and he agreed with my interpretation that the excavation and stockpiling of overburden for the purpose of slope stabilization is a surface use and would not require BLM permitting or oversight, given that you have the consent of the surface owner and you are not producing any minerals from Federal estate. Second, I recall that Kim brought up, we discussed briefly, the matter of whether the target limestone deposit is of common or uncommon character. I want to lay out the full scope of the situation here for you to consider.

Limestone is most often disposed from Federal mineral estate under authority of the Materials Act of 1947. Under such authority, BLM will issue competitive or noncompetitive sales on a contract basis, with unit price (royalty) being determined based on a fair market valuation of the mineral material, typically 5-10% of the FOB price. I would encourage you to look over the BLM policy for mineral material disposal, which is found at 43 CFR 3600. BLM will almost always complete an environmental review and disclose their findings to the public prior to issuing a contract, even on split estate lands such as your case.

In certain situations, limestone cannot be disposed under the Materials Act because it meets certain requirements of purity or elemental composition which renders it subject to location and entry under the general mining laws (AKA "locatable"). The actually description of

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locatable limestone is found at 43 CFR 3830.12(d) as follows “Limestone of chemical or metallurgical grade, or that is suitable for making cement, is subject to location under the mining laws”. U.S. courts have interpreted “chemical” grade to mean having 95% or greater carbonate content. For your purposes, the difference between a locatable and common mineral is that locatable minerals are free and open to exploration and mining to all parties, and ownership of the mineral redounds to whoever holds the mining claim. The BLM collects no royalties on the production of locatable minerals, however there are fees for locating and maintaining claims.

As with common variety minerals, mining plans for locatable mineral operations are reviewed and approved on a case-by-case basis, to ensure compliance with surface management regulations found at 43 CFR 3809. However in this case, because the parcel was patented under the Homestead Act, if BLM determines that the target mineral of your operation is in fact locatable, a special rule would apply under 43 CFR 3809.31(d): “If your operations are located on lands patented under the Stock Raising Homestead Act and you do not have the written consent of the surface owner, then you must submit a plan of operations and obtain BLM's approval. Where you have surface-owner consent, you do not need a notice or a plan of operations under this subpart…”.

Common variety determinations (CVD) are routinely performed by the BLM, either on our own volition or at the request of operators/claim holders. They can be somewhat burdensome to operators because of the time and cost of preparing a determination. However in your case, receiving a favorable determination would mean that you would not have to pay any royalties or obtain any authorizations or permits from the BLM, assuming you can provide written consent of the surface owner for your activities.

I’m sure you’ll have follow-up questions, so don’t hesitate to reach out to me. I’ll respond as I am able.

Thanks,

Taylor Lewis

Geologist

Utah | Bureau of Land Management

95 E 500 N St

Fillmore, UT 84631

Office: (435) 743-3121

Cell: (435) 289-8098

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Salt Lake City 033043 4—1007-R.

The United States of America,

To all to whom these presents shall come, Greeting:

WHEREAS, a Certificate of the Register of the Land Office at Salt Lake City, Utah,

has been deposited in the General Land Office, whereby it appears that, pursuant to the Act of Congress of May 20, 1862, "To Secure Homesteads to Actual Settlers on the Public Domain," and the acts supplemental thereto, the claim of

John Conrad Irwin

has been established and duly consummated, in conformity to law, for the Lot four of Section four and the Section eighteen in Township four north of Range four east of the Salt Lake Meridian, Utah, containing six hundred four acres and twenty-two hundredths of an acre,

according to the Official Plat of the Survey of the said Land, on file in the GENERAL LAND OFFICE:

NOW KNOW YE, That there is, therefore, granted by the UNITED STATES unto the said claimant the tract of Land above described; TO HAVE AND TO HOLD the said tract of Land, with the appurtenances thereof, unto the said claimant and to the heirs and assigns of the said claimant forever; subject to any vested and accrued water rights for mining, agricultural, manufacturing, or other purposes, and rights to ditches and reservoirs used in connection with such water rights, as may be recognized and acknowledged by the local customs, laws, and decisions of courts; and there is reserved from the lands hereby granted, a right of way thereon for ditches or canals constructed by the authority of the United States. Excepting and reserving, however, to the United States all the coal and other minerals in the lands so entered and patented, together with the right to prospect for, mine, and remove the same pursuant to the provisions and limitations of the Act of December 29, 1916 (39 Stat., 862).

IN TESTIMONY WHEREOF, I, Herbert Hoover,

President of the United States of America, have caused these letters to be made Patent, and the seal of the General Land Office to be hereunto affixed.

GIVEN under my hand, at the City of Washington, the TENTH

(SEAL.) day of JANUARY in the year of our Lord one thousand

nine hundred and THIRTY and of the Independence of the

United States the one hundred and FIFTY-FOURTH

By the President: Herbert Hoover

By Viola B. Pugh, Secretary.

M. P. LeRoy

Recorder of the General Land Office.

RECORD OF PATENTS: Patent Number 1033541

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Devil's Slide Operation Special-Status Species Habitat Evaluation Report

JUNE 2019

PREPARED FOR

Holcim (U.S.) Ltd.

PREPARED BY

SWCA Environmental Consultants

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DEVIL'S SLIDE OPERATION SPECIAL-STATUS SPECIES HABITAT EVALUATION REPORT

Prepared for

Holcim (U.S.) Ltd.
6055 East Croydon Road
Croydon, Utah 84005
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SWCA Project No. 52891

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1 INTRODUCTION

Holcim (U.S.) Ltd. (Holcim) requested that SWCA Environmental Consultants (SWCA) conduct a habitat evaluation for special-status plant and wildlife species and prepare a report to support its ongoing Utah Division of Oil, Gas and Mining (DOGM) permitting for the expansion of the Devil's Slide Quarry (the project).

Field surveys were conducted on May 17, 2019. The surveys focused on identifying suitable habitat for any federally listed threatened, endangered, proposed, and candidate (TEPC) plant and wildlife species and state-listed sensitive wildlife species as well as potential habitat for raptors and migratory birds. Dominant plant species, raptor nests, migratory birds, and incidental wildlife species were also noted. Photographs from field surveys are provided in Appendix A and the Utah Natural Heritage Program (UNHP) findings report is provided in Appendix B.

2 PROJECT LOCATION AND SETTING

The project is located on privately owned lands in Morgan County, Utah (Figure 1). The project area is approximately 1,197-acres and the elevation ranges from 5,228 to 6,379 feet. The project area is in Sections 18, 19, and 30, Township 4 North, Range 4 East, and Sections 13 and 24, Township 4 North, Range 3 East, Salt Lake Base and Meridian. Table 1 summarizes the geology, soils, and dominant land cover types found in the project area.

Table 1. **Project Setting**

Project area	The project area consists of the Devil's Slide Quarry Limited Mining Operation (LMO) boundary.
Underlying geology*	Gray, very thick, bedded, ridge-forming, oolitic limestone to wackestone beds of the Boundary Ridge Member of Twin Creek Limestone (42 acres); light gray, clay-rich, micritic limestone with tan silt partings of the Leeds Creek Member of Twin Creek Limestone (121 acres), Nugget Formation (121 acres), and the Hams Fork Member of the Evanston Formation (346 acres)
Elevation range above mean sea level	5,228–6,379 feet
Topography	Hilly–mountainous
Slope steepness range	0% – 50%
Soil types present (Web Soil Survey)†	Lithic Haploxerolls-Rock outcrop complex, 40 to 80 percent slopes (30.3%), St. Marys-Hoskin cobbly loams, 30 to 50 percent slopes (26.4%), and Kilfoil-Rock outcrop complex, 40 to 60 percent slopes (16.0%)
Soil textures present	Very cobbly loam and loam
Vegetation description	Sagebrush, rabbitbrush, juniper, perennial grasses, and forbs
Dominant vegetation communities present (Southwest Regional Gap Analysis Project)‡	Rocky Mountain Gambel Oak-Mixed Montane Shrubland (26.3%); Developed, Open Space - Low Intensity (23.1%), Inter-Mountain Basins Montane Sagebrush Steppe (15.6%), and Inter-Mountain Basins Big Sagebrush Steppe (9.6%)

* U.S. Geological Survey (2013).

† Data from Natural Resources Conservation Service (2017).

‡ Data from U.S. Geological Survey (2004).

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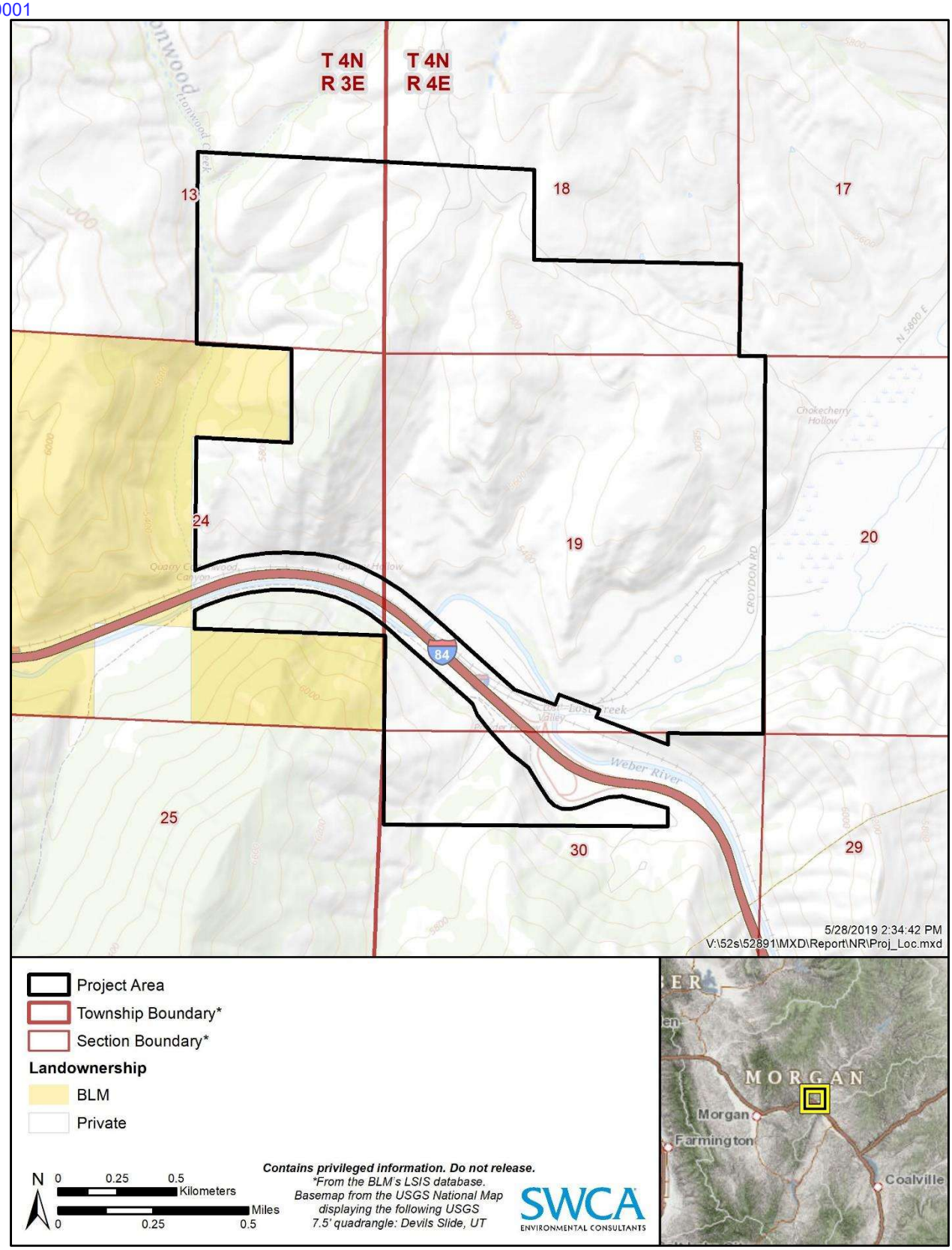

Figure 1. Project location.

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3 METHODS

3.1 Desktop Review

3.1.1 *Land Cover Types*

Southwest Regional Gap Analysis Project (SWReGAP) data were used to characterize the major land cover types (or vegetation communities) predicted to occur in the project area (U.S. Geological Survey [USGS] 2004).

3.1.2 *Special-Status Plant and Wildlife Species*

SWCA biologists completed a pre-field desktop review to evaluate and identify the potential for special-status species to occur in the project area. The project area was first evaluated for the presence of any potential TEPC plant and wildlife habitat.[1] The U.S. Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPaC) database (USFWS 2019a) was used to identify any potential for federally listed plant and wildlife species or designated critical habitats to occur within 1-mile of the project area. The characteristics of suitable habitat for each species were identified using descriptions available from the USFWS Environmental Conservation Online System (ECOS) (USFWS 2019b). The Utah Conservation Data Center database (Utah Division of Wildlife Resources [UDWR] 2017, 2019a) was used to identify state-listed sensitive wildlife species with the potential to occur in the project area. Additionally, biologists reviewed relevant USFWS and Utah Division of Natural Resources listing decisions, recovery plans, and status reviews, and contacted the Utah Natural Heritage Program (UNHP) of the Utah Division of Wildlife Resources (UDWR) for information pertaining to special-status species occurrences in and near the project area.

The USFWS has jurisdiction over all species listed under the Endangered Species Act (ESA), all migratory bird species (including raptors and eagles) protected under the Migratory Bird Treaty Act (MBTA), and eagles protected under the Bald and Golden Eagle Protection Act (BGEPA). These regulations uniformly apply to projects, whether federal land, money, or permits are involved.

3.1.3 *Greater Sage-Grouse, Raptors, and Migratory Birds*

Available geospatial data from UDWR sage-grouse management areas (UDWR 2019b, 2019c) were reviewed to identify potential distributions of greater sage-grouse (*Centrocercus urophasianus*) in the project area. Pre-field analysis for nesting raptors and migratory birds was not conducted. IPaC was used to generate a list of USFWS Birds of Conservation Concern (BCC) that have the potential to occur in or near the project area (USFWS 2019b).

3.2 Field Surveys

Before the habitat assessment was conducted for the project, an ArcGIS Online Collector map was created for the project area as well as an appropriate data dictionary to record habitat and observations. During the field surveys, dominant plant species were recorded, and photographs taken of the project area.

[1] *Potential habitats* are areas that satisfy the broad criteria of the species' habitat description; they are usually determined by pre-survey assessment. *Suitable habitats* are areas that exhibit the specific habitat features necessary for species persistence, as determined by field inspection and/or surveys, but that may or may not contain the species.

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3.2.1 *Special-Status Wildlife Species*

Habitat surveys were conducted from a Holcim escort vehicle along existing roadways and on foot in areas not visible from the road. A qualified SWCA biologist visually inspected (with the aid of binoculars and a spotting scope where necessary) 100% of the project area for presence or absence of suitable habitat characteristics throughout the project area; special emphasis was placed on threatened and endangered species habitat requirements. Additionally, incidental observations of wildlife species, including migratory birds, were recorded.

3.2.2 *Greater Sage-Grouse, Raptors, and Migratory Birds*

Suitable nesting substrate within the project area was scanned for existing nests and observed bird species were noted during the field surveys. Any observed nests were photographed, and the location was recorded using global positioning (GPS) units. Suitable habitat for greater sage-grouse was delineated during field surveys using GPS.

4 RESULTS

4.1 Desktop Review

4.1.1 *Land Cover Types*

A review of SWReGAP data identified 15 land cover types predicted to occur in the project area. The major land cover types and their acreages are described in Table 2.

Table 2. Acres of Southwest Regional Gap Analysis Project (SWReGAP) Land Cover Types in the Project Area

SWReGAP Land Cover Types	Acres
Rocky Mountain Gambel Oak-Mixed Montane Shrubland	314
Developed, Open Space - Low Intensity	276
Inter-Mountain Basins Montane Sagebrush Steppe	186
Inter-Mountain Basins Big Sagebrush Steppe	115
Developed, Medium – High Intensity	82
Colorado Plateau Pinyon-Juniper Woodland	75

Source: USGS (2004)

Other land cover types in the project area are Developed, Medium – High Intensity, Colorado Plateau Pinyon-Juniper Woodland, and Inter-Mountain Basins Big Sagebrush Shrubland. Adjacent land uses are transportation, transmission, grazing by sheep and other livestock, and mining. Much of the project area has been previously disturbed and is subject to blasting on a regular basis.

4.1.2 *Special-Status Wildlife Species*

USFWS TEPC species that have potential to occur within the project area are provided in Table 3. State-listed sensitive species with potential to occur in Morgan County are provided in Table 4. Species

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identified in Tables 3 and 4 were evaluated for their potential to occur in the project area based on their habitat requirements and the habitats present within the project area.

The UNHP was contacted for information regarding special-status species occurrences within 1-mile of the project area. Species occurrences within a 0.5-mile radius of the project include bluehead sucker (*Catostomus discobolus*), greater sage-grouse, bald eagle (*Haliaeetus leucocephalus*), Bonneville cutthroat trout (*Oncorhynchus clarkii utah*), western toad (*Anaxyrus boreas*), and Lewis's woodpecker (*Melanerpes lewis*). Additionally, lyrate mountainsnail (*Oreohelix haydeni*) occurrences have been documented within a 2-mile radius of the project. The findings report from the UNHP is provided in Appendix B.

4.1.2.1 FEDERALLY LISTED SPECIES

Species protected under the ESA were assessed for their potential to occur in the project area (see Table 3). According to the IPaC resource list, Canada lynx (*Lynx canadensis*) and yellow-billed cuckoo (*Coccyzus americanus*) are listed as potentially occurring within the project area. No designated critical habitats occur within the project area (USFWS 2019b).

Table 3. U.S. Fish and Wildlife Service Threatened, Endangered, and Candidate Species with the Potential to Occur in the Project Area

Species	Status	Habitat Requirements	Potential to Occur in the Project Area
Mammals			
Canada lynx (*Lynx canadensis*)	Threatened	Habitat generally moist boreal forests with cold, snowy winters and a high-density snowshoe hare prey base. Vegetation primarily species of spruce (*Picea* spp.) and fir (*Abies* spp.).	None. No suitable habitat is present in the project area.
Birds			
Yellow-billed cuckoo (*Coccyzus americanus*)	Threatened	Habitat includes riparian areas with a dense overstory of willows and cottonwoods.	Low. The project area lacks a dense cottonwood gallery.

4.1.2.2 SOURCE: USFWS (2019B) MORGAN COUNTY SENSITIVE SPECIES

A total of 14 state-listed sensitive species were identified as occurring within Morgan County (see Table 4). Based on the habitat requirements for these species, two were determined to have moderate potential of occurring within the project area, eight had a low potential to occur within the project area, and four species had no potential to occur within the project area.

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Table 4. State-Listed Sensitive Species with the Potential to Occur in Morgan County, Utah

Species	State Status*	Habitat Requirements	Potential to Occur in the Project Area
Birds			
Bald eagle (*Haliaeetus leucocephalus*)	SPC	Habitat generally is forested areas adjacent to large bodies of water. Throughout its range, selects large, super-canopy roost trees that are open and accessible.	Moderate. The southern boundary of the project area contains potential winter roosting and foraging habitat.
Bobolink (*Dolichonyx oryzivorus*)	SPC	Habitat generally is open areas, and this species prefers large fields with a mixture of grasses and broad-leaved plants, including hayfields and meadows.	Low. The project area lacks suitable habitat.
Ferruginous hawk (*Buteo regalis*)	SPC	Habitat generally is grassland and shrub-steppe, including pastures, haylands, and croplands.	Low potential for occurrence in the project area, but potential foraging habitat is present in adjacent lands.
Greater sage-grouse (*Centrocercus urophasianus*)	SPC	Habitat is the sagebrush steppe of the Intermountain West. Foraging areas include irrigated pastures, wet meadows, and alfalfa fields, in addition to sagebrush.	Moderate potential for greater sage-grouse to occur in foraging areas; sagebrush is sparse and heavily grazed by sheep.
Lewis's woodpecker (*Melanerpes lewis*)	SPC	Habitat generally is cottonwood groves, open pine-oak woods, and burned or cut-over woods.	Low. The project area lacks suitable habitat.
Northern goshawk (*Accipiter gentilis*)	CS	Habitat is coniferous and mixed forests.	None. No suitable habitat is present in the project area.
Columbian sharp-tailed grouse (*Tympanuchus phasianellus columbianus*)	SPC	Habitat is sagebrush steppe, including serviceberry, grasses, and low shrubs in summer on flat, expansive to steep, mountainous slopes.	Low. Some sagebrush steppe habitats are present in the project area.
Grasshopper sparrow (*Ammodramus savannarum*)	SPC	Habitat is grassland, hayfields, and prairies. Breeds in rather dry fields and prairies, especially those with tall grasses and weeds and a few scattered shrubs.	Low. Habitats adjacent to the project area may provide nesting and foraging habitat.
Fishes			
Bluehead sucker (*Catostomus discobolus*)	CS	Historically, this species occurred in streams and rivers in the Colorado River basin and the drainages of the upper Snake, Weber, and Bear Rivers.	None. No suitable habitat is present in the project area.
Bonneville cutthroat trout (*Oncorhynchus clarkii utah*)	CS	This species occupies clear, cold headwater lakes, streams, and rivers, and historically has inhabited the rivers and lakes of much of the western United States.	None. No suitable habitat is present in the project area.
Amphibians			
Western toad (*Bufo anaxyrus*)	SPC	This species is found in a variety of habitats, including slow-moving streams, wetlands, desert springs, ponds, lakes, meadows, and woodlands.	Low. Areas adjacent to the project area contain potential habitat.
Mollusks			
Deseret mountainsnail (*Oreohelix peripherica*)	SPC	This species is found in vegetation and associated leaf litter, specifically mountain maple (*Acer* sp.), scrub oak (*Quercus gambelii*), and balsamroot (*Balsamorhiza* spp.).	Low. Some scrub oak and balsamroot species are found in the project area; however, populations have not been documented recently in Morgan County.

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Species	State Status*	Habitat Requirements	Potential to Occur in the Project Area
Western pearlshell (*Margaritifera falcata*)	SPC	Habitat for the species is largely unknown. Species is associated with freshwater riparian habitats.	None. No suitable habitat is present in the project area.
Lyrate mountainsnail (*Oreohelix haydeni*)	SPC	This species is found on the edges of coarse, angular limestone talus protected from rapid evaporation by overhanging bushes and crevices among the rocks.	Low. Some exposed rocky cliffs are present in the project area but are highly disturbed.

Source: UDWR (2017)

* CS = species receiving special management under a conservation agreement in order to preclude the need for federal listing; SPC = wildlife species of concern.

4.1.3 *Greater Sage-Grouse, Raptors, and Migratory Birds*

BCCs were assessed for their potential to occur in the project area based on habitat conditions. Several BCCs have the potential to occur in the project area and are presented in Table 5.

Table 5. Birds of Conservation Concern (BCC) with the Potential to Occur in the Project Area

Species	Status	Habitat Requirements	Potential to Occur in the Project Area
Birds			
Bald eagle (*Haliaeetus leucocephalus*)	BCC	Habitat generally is forested areas adjacent to large bodies of water. Throughout its range, selects large, super-canopy roost trees that are open and accessible.	Moderate. Project area may provide winter roosting and foraging habitat.
Black rosy finch (*Leucosticte atrata*)	BCC	Breeding areas are cliffs and rockslides above tree line. Species roosts in rock crevices and caves at lower elevations in winter.	Moderate. Project area may provide potential roosting and foraging habitat.
Brewer's sparrow (*Spizella breweri*)	BCC	Species occupies sagebrush (*Artemisia* spp.) shrublands.	High. Sagebrush steppe land cover provides suitable nesting and foraging habitat.
Burrowing owl (*Athene cunicularia*)	BCC	Open areas with sparse vegetation.	None. No suitable habitat is present in the project area.
Clark's grebe (*Aechmophorus clarkii*)	BCC	Freshwater lakes and marshes.	None. No suitable habitat is present in the project area.
Golden eagle (*Aquila chrysaetos*)	BCC	Open mountain habitats with cliffs, shrubland, and forest vegetation.	High. This species was observed during the habitat assessment. Nearby cliff bands provide nesting habitat; however, no nesting habitat is present in the project area.
Lewis's woodpecker (*Melanerpes lewis*)	BCC	Habitat generally is cottonwood (*Populus* spp.) groves, open pine (*Pinus* spp.)-oak (*Quercus* spp.) woods and burned or cut-over woods.	None. No suitable habitat is present in the project area.
Pinyon jay (*Gymnorhinus cyanocephalus*)	BCC	Pinyon (*Pinus* spp.)-juniper (*Juniperus* spp.) woodlands, sagebrush, and ponderosa pine (*Pinus ponderosa*) forests.	None. No suitable habitat is present in the project area.
Rufous hummingbird (*Selasphorus rufus*)	BCC	Species breeds in open, shrubby areas. Winter habitat includes oak, pine, and juniper woodland habitats.	Moderate. This species may utilize the project area as foraging and nesting habitat.

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Species	Status	Habitat Requirements	Potential to Occur in the Project Area
Birds			
Willow flycatcher (*Empidonax traillii*)	BCC	Breeds in shrubs and willows (*Salix* spp.) along riparian habitats.	None. No suitable habitat is present in the project area.

Source: USFWS (2019b)

The project area is located in a UDWR greater sage-grouse management area (UDWR 2019b, 2019c) and a portion of the project area is located in a Bureau of Land Management (BLM) Priority Habitat Management Area. Portions of the project area are located in UDWR-designated occupied habitat, winter habitat, summer habitat, and brooding habitat for greater sage-grouse (Figure 2). Table 6 lists the greater sage-grouse habitat types and acreages in the project area.

Table 6. Greater Sage-Grouse Habitat Types Present in the Project Area

Greater Sage-Grouse Habitat Type	Acres
Utah Division of Wildlife Resources (UDWR) Sage-Grouse Management Area	1,197
Bureau of Land Management Sage-Grouse Priority Habitat Management Area	478
UDWR Greater Sage-Grouse Occupied Habitat	478
UDWR Greater Sage-Grouse Winter Habitat	32
UDWR Greater Sage-Grouse Summer Habitat	31
UDWR Greater Sage-Grouse Brooding Habitat	1

Source: UDWR (2019b, 2019c)

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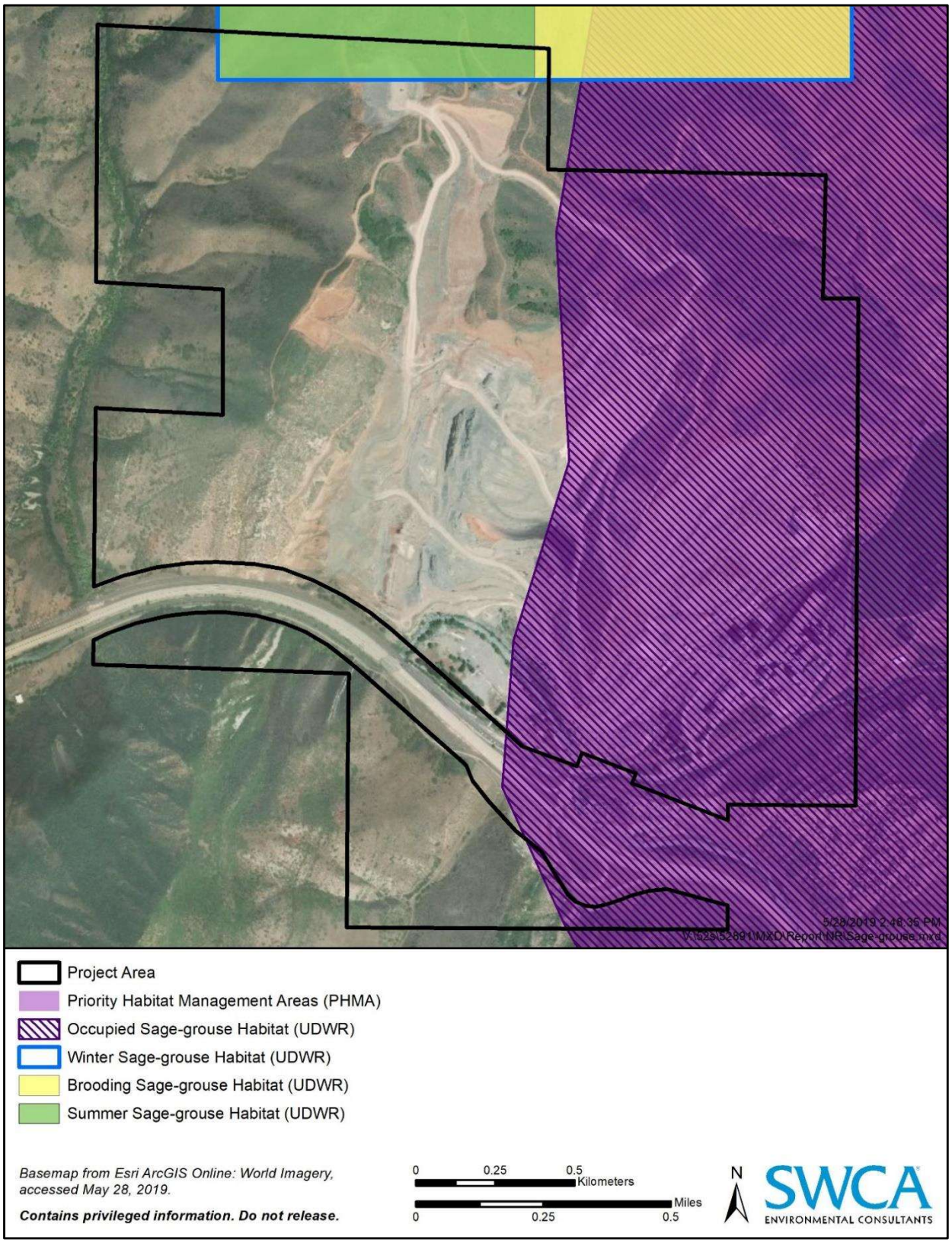

Figure 2. Utah Division of Wildlife Resources designated greater sage-grouse habitat within and adjacent to the project area.

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4.2 Field Surveys

Field surveys were conducted on May 17, 2019. Vegetation in the project area is dominated by Gambel oak (*Quercus gambelii*), yellow rabbitbrush (*Chrysothamnus viscidiflorus*), Utah serviceberry (*Amelanchier utahensis*), big sagebrush (*Artemisia tridentata*), and juniper species (*Juniperus* spp.) at higher elevations. Other species identified in the project area include perennial grasses such as Great Basin wild rye (*Leymus cinereus*) and forbs such as *Castilleja* species and arrowleaf balsamroot (*Balsamorhiza sagittata*). Some invasive species, including mustard species and musk thistle (*Carduus nutans*), are present in areas with disturbed soils.

A significant portion of the project area has been disturbed by historical and present mining practices. Ongoing operations at the mine, such as blasting, heavy machinery use, and human presence, serve to deter wildlife from utilizing the project area and areas immediately adjacent to the project area. Wildlife species that utilize these areas may be habituated to the disturbances and are not affected by the operations. Photographs of the project area are included in Appendix A.

4.2.1 *Special-Status Wildlife Species*

No USFWS threatened, endangered, or candidate species individuals or suitable habitats were identified during the field survey. Suitable habitat for several state-listed sensitive species occurs throughout the project area. Based on habitat characteristics observed, there is moderate potential for bald eagle and greater sage-grouse to occur in and adjacent to the project area, and low potential for bobolink (*Dolichonyx oryzivorus*), Columbian sharp-tailed grouse (*Tympanuchus phasianellus columbianus*), ferruginous hawk (*Buteo regalis*), Lewis's woodpecker, grasshopper sparrow (*Ammodramus savannarum*), western toad, Deseret mountainsnail (*Oreohelix peripherica*), and lyrate mountainsnail to occur in or near the project area.

In general, habitats conducive for these species in the project area consisted of sparse sagebrush shrubland, mixed perennial grasslands, and riparian habitat along the southern border of the project area.

4.2.2 *Greater Sage-Grouse, Raptors, and Migratory Birds*

Although there were no nests observed during the survey, one adult golden eagle was observed soaring over the Devil's Slide feature on the south side of Interstate 84, which is not in the project area.. No greater sage-grouse individuals or sign were observed during the surveys; however, potential habitat for greater sage-grouse was observed along the northwestern and eastern portion of the project area.

Vegetation in the project area provides potential nesting substrate for migratory birds; however anthropogenic disturbances may discourage birds from nesting adjacent to project facilities, such as roads. Bird species observed in the project area included black-billed magpie (*Pica hudsonia*), American robin (*Turdus migratorius*), western kingbird (*Tyrannus verticalis*), house finch (*Haemorhous mexicanus*), white crowned sparrow (*Zonotrichia leucophrys*), and rock pigeon (*Columba livia*).

5 SUMMARY

During the field surveys, no USFWS or state-listed special-status species were observed in the project area. One BCC, the golden eagle (*Aquila chrysaetos*), was observed outside the project area during the survey: however, nesting substrate was not present in the project area. Based on the data reviewed and the field surveys, two state-listed sensitive species (bald eagle and greater sage-grouse) were identified as having moderate likelihood of occurring in or adjacent to the project area based on the presence of

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suitable habitat and eight state-listed sensitive species (bobolink, Columbian sharp-tailed grouse, ferruginous hawk, Lewis's woodpecker, grasshopper sparrow, western toad, Deseret mountainsnail, and lyrate mountainsnail) were identified as having low likelihood of occurring in or adjacent to the project area based on a general lack of suitable habitat.. One federally listed species, western yellow-billed cuckoo, was determined to have low likelihood of occurring in or adjacent to the project area based on the presence of suitable habitat, including a general lack of dense willow and/or cottonwood trees and riparian vegetation.

Ongoing operations at the mine, such as blasting, the use of heavy machinery, and human presence, serve to deter wildlife from utilizing the project area. Wildlife species that utilize these areas may be habituated to the disturbances and are likely not affected by the ongoing operations.

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Appendix H

Slope Stability and Geotechnical Reports
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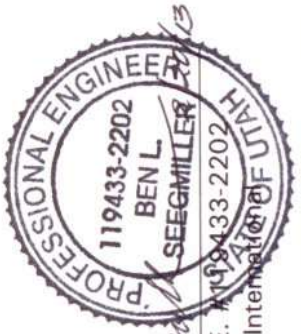
SLOPE STABILITY EVALUATION
INTERIM QUARRY SLOPES
QUARRY 3
Devil's Slide Quarry
Morgan County, Utah

Prepared for

HOLCIM INC. (U.S.)
Croydon, Utah



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by
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EXECUTIVE SUMMARY

The slope stability of the Interim Quarry 3 at the Devil's Slide Quarry, Croydon, Morgan County, Utah is addressed in this report. The Quarry is located adjacent to I-84 near Exit 111, approximately 10 miles east of Morgan, Utah. The present stability evaluation is a follow-up study to previous studies performed by *Seegmiller* in 2008-2010. Field and laboratory data collected directly from the final highwall rock materials, as well as subsequent analyses, form the basis of the present conclusions/recommendations.

Mining plans for the Interim Quarry 3 were developed jointly by *Seegmiller* and HOLCIM. These plans call for 50-foot bench heights in all locations. In the North Endwall bench face angles of 90° are to be used with bench widths of 50 feet resulting in a quarry wall angle of 45°. In the West Sidewall the bench face angles follow the bedding planes and range from 77° to 85°. Bench widths are 25 feet yielding a quarry wall angle of approximately 54° when the bench face angles are 77°. In the East Sidewall the bench faces are to be presplit at an angle of 81°. Bench widths are 25 feet yielding a quarry wall angle of approximately 57° to 58°.

Field data were collected from 2008-2012 including geologic discontinuity information from more than 50 surface sites around the planned quarry area. Four core holes were drilled and the intersecting discontinuities were examined. The majority of the discontinuity orientations found on the surface were favorably oriented. Many of the bedding discontinuities had dips averaging about 85°-90°. Joint orientations were either very steep or relatively flat up to about 25°. Only one major fault discontinuity is known to exist.

A series of strength related tests were performed on drill cores from the four core holes. These tests included uniaxial compression, elastic modulus, point load and bulk density. Detailed core logging to obtain strength related parameters was also undertaken. The logging included estimated compressive strength, joints per meter, average piece size, broken percentage, recovery, rock quality designation [RQD], discontinuity intercept angle, geotechnical character, potential stability and estimated stable slope angle. All data were combined and a consensus of rock and rock mass strength was developed for the quarry area. The rock mass was concluded to have a moderately high strength for the limestones and relatively low for the shales. Discontinuities were estimated to have moderate shear strength in the limestones.

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Groundwater pressurization was addressed as part of the present study. Groundwater is not known to exist in most subsurface locations. Consequently, groundwater pressurization may be very low or non-existent. For purposes of the present study, it was assumed that any adverse groundwater pressurization will be remedied through dewatering and the slope may be assumed to be effectively dry. In any event, the groundwater elevation must not exceed the 5300-foot elevation or a reevaluation of slope stability must be made to ensure that a minimum slope stability static safety factor of 1.25 is maintained.

Devil's Slide Quarry 3 is located in Seismic Zone 3 based on the Uniform Building Code. According to the U.S. Army Corps of Engineers this zone designation indicates that a 0.3 seismic coefficient may be used with a minimum safety factor of 1.1. However, the location of Quarry 3 is in a peak ground acceleration zone of approximately 0.24 for a 2% probability of being exceeded in 50 years. Under cyclic loading various researchers have shown that when subjected to an earthquake of magnitude 7.3 (approximate upper end of scale of the Quarry 3 location), the acceptable seismic coefficients range from 0.072 to 1.12 and the minimum acceptable pseudo-static safety factors are 1.1 to 1.15.

Detailed and comprehensive stability analyses were undertaken for the quarry slopes. Bedding and joint stereographic analyses were completed for planar, joint and toppling failure modes. Computer assisted limiting equilibrium analyses were also performed for Quarry 3 slopes. Deterministic safety factors with and without earthquake loading were computed for each individual quarry wall.

A summary of the resulting study conclusions/recommendations is as follows:

CONCLUSIONS

- Adversely oriented discontinuities are very few
- Rock mass strengths are relatively high in limestones
- Rock mass strengths are relatively low in clay/shales
- Groundwater pressurization may be very low to non-existent
- Seismic loading should have a design level of 0.10 g
- Overall slope and bench stability should be good with safety factors > 1.25, e.g.,

	North Endwall	West Sidewall	East Sidewall
Static	1.59	1.76	1.66
Pseudo-static	1.28	1.51	1.44

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RECOMMENDATIONS

- Collect discontinuity data periodically to ensure that a minimum static slope stability safety factor of 1.25 is maintained
- Prevent blast damage and related rock falls
- Do not overdig bench faces
- Cleanup bench debris
- Use bench crest berms
- Divert surface water runoff
- Place water level monitoring wells to ensure that groundwater does not exceed the 5300-foot elevation. If it does, a reevaluation of slope stability must be made to ensure that a minimum static safety factor of 1.25 is maintained.
- Have periodic stability/safety reviews
- Undertake long term displacement monitoring
- Perform daily visual safety monitoring
- Do not allow personnel on bench crests or under bench faces
- Implement safety rules/procedures for highwalls

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INTRODUCTION

A slope stability evaluation of "Interim Quarry 3 slopes" of the Devil's Slide Quarry 3, Croydon, Utah, is the subject of this report. The study was undertaken at the request of HOLCIM (US) INC. (HOLCIM) and was authorized as per Purchase Orders 4500661378 and 4500729017. Mr. Michael Toelle, HOLCIM Sr. Mining and Raw Materials Specialist-MPC coordinated the study and Mr. Kenneth S. George, HOLCIM Manager - Quarry Operations provided assistance in site data collection.

The Devil's Slide Quarry 3 has had slope stability studies performed on it by Seegmiller International *Seegmiller* in 2008[1], 2009[2] and 2010[3]. These studies basically involved a detailed evaluation of whether or not the planned overall Quarry 3 slopes could be increased from 63.4° (1:2) to 71.6° (1:3). For these three studies evaluations of geologic discontinuities, rock/rock mass strength, groundwater pressurization and seismicity were conducted. Using the evaluated data, slope stability analyses were preformed and the results were discussed. After those studies, HOLCIM modified the Quarry 3 mining plans and decided to reduce the size of the existing Quarry 3 and mine only to a depth represented by the 5300 elevation. The three major quarry slopes, the North Endwall, the West Sidewall and the East Sidewall, have all been modified in terms of bench height, bench width, bench face angle and overall slope angle. The present mine quarry is referred to in this report as the Interim Quarry 3. Complete mining of this interim quarry will take an estimated 15 to 17 years. During Interim Quarry 3 mining, a new pushback is being prepared for the upper portion of the North Endwall. Mining life using the new pushback to expand Quarry 3 will take an estimated 27 to 28 years.

The purpose of the present study is to prepare a report to be submitted to Utah Department of Oil, Gas and Mining (DOGM) to (1) meet the requirements specified for an LMO permit for the Interim Quarry 3 and (2) to show that the proposed plan has a minimum slope safety factor of 1.25, which will be maintained over the mine life. The sources of information for this study include all previous data developed for the earlier studies[1,2,3] and additional geologic discontinuity data collected specifically for this study. The study is limited to only the Interim Quarry 3 plan as presented in this report. It does not address the planned future expansion of Quarry 3 to the northeast.

The report begins with a presentation of applicable stability data. A stability analysis follows and recommendations for safe, successful mining are then outlined. The study results show that the quarry will meet the slope stability safety factor requirements (static safety factor > 1.25) specified by DOGM.

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STABILITY PARAMETERS

Mining Plans

General. The Interim Quarry 3 mining plan is shown in Figure 1. This figure also shows the Endwall and Sidewall profile locations. Major components of the quarry are the high endwall on the north-northeast side (North Endwall), the west-northwest sidewall (West Sidewall) and the east-southeast sidewall (East Sidewall). On the south-southwest side of the quarry the slope will feather-out at the 5300-ft elevation and there will be no highwall. The following paragraphs show details of the slope angles and minimum bench widths that will be maintained.

North Endwall. The North Endwall consists of (1) the existing approximately 45°, 580-ft upper highwall which has been mined over many years past; (2) a flat minimum 75-foot wide catch bench / safety bench with a minimum 8-ft high berm at the front edge; and (3) a 45º (1:1) overall slope 200-ft high. The 45º slope has 50-foot high benches and 50-foot wide benches with 90º bench face angles. A profile of the endwall is presented in Figure 2.

West Sidewall. The West Sidewall is planned to be a maximum of approximately 350-ft high from the 5300-ft quarry floor to the intersection with the sidewall topography at approximately the 5650-ft elevation. The slope consists of 50-ft high benches, 25-ft wide catch-benches and bench face angles of approximately 77º. These bench faces are planned to coincide with bedding planes which run approximately parallel to the strike of the bench faces. During 2012, on-going site measurements have shown that locally the bedding dip may increase up to as much as 85°. With bench face angles of 77° the approximate interramp slope angle is 53.9º (1:1.37) and the overall slope angle is approximately 56.3º (1:1.5). The plan for the West Sidewall requires that the mined bench faces follow exactly the strike and dip of the bedding planes, regardless of how that strike and dip may vary. The profile of the West Sidewall is presented in Figure 3. The figure shows the sidewall at its highest point which is just in front of the North Endwall.

East Sidewall. The East Sidewall is planned to be a maximum of approximately 400-ft high above the 5300-ft quarry floor elevation. The maximum slope height occurs just in front of its intercept with the North Endwall. The slope consists of 50-ft bench heights with 81° (1:6.31) bench face angles. The width of the

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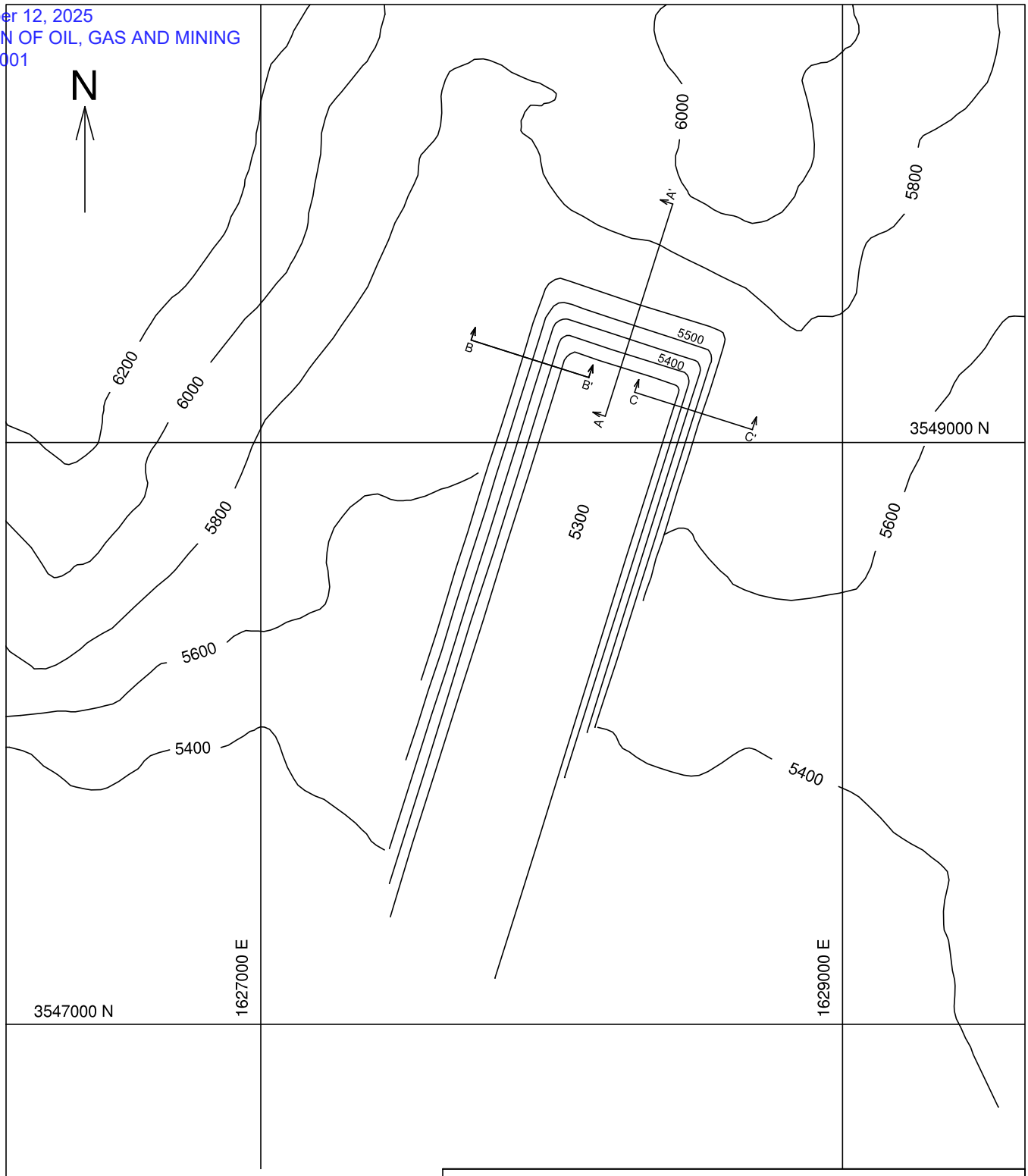

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Quarry Bench Toe

Slope Profile Location

Elevation Contour 5600

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FIGURE 1

Quarry 3 Mining Plan

Devils Slide - Quarry 3

0 250 500 1000 1500

Scale in Feet (Approx.)

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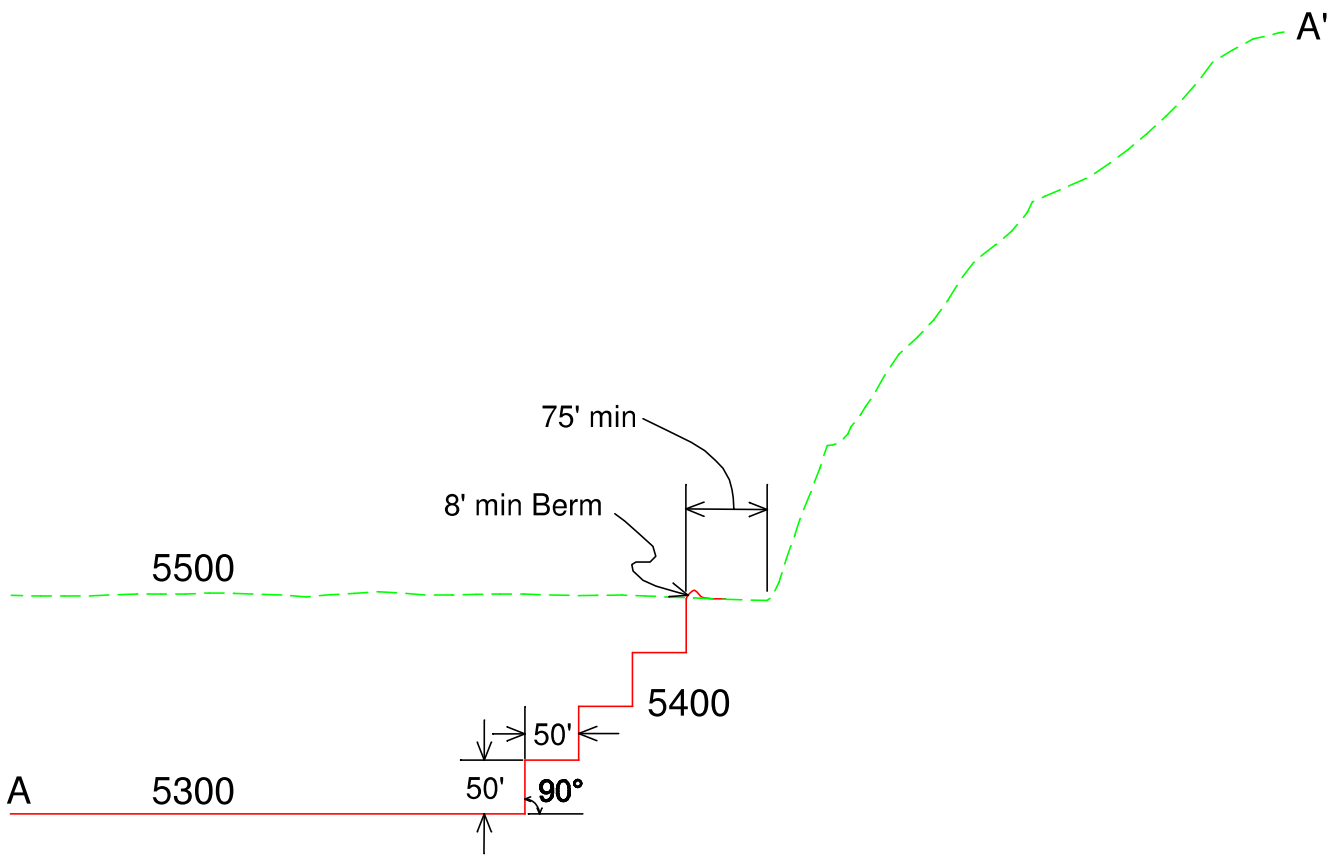

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Existing Profile (4-4-12)

Planned Profile

Seegmiller International

FIGURE 2

North Endwall Slope Profile AA'
Looking Northwest

0 100 200 400

Scale in Feet (Approx.)

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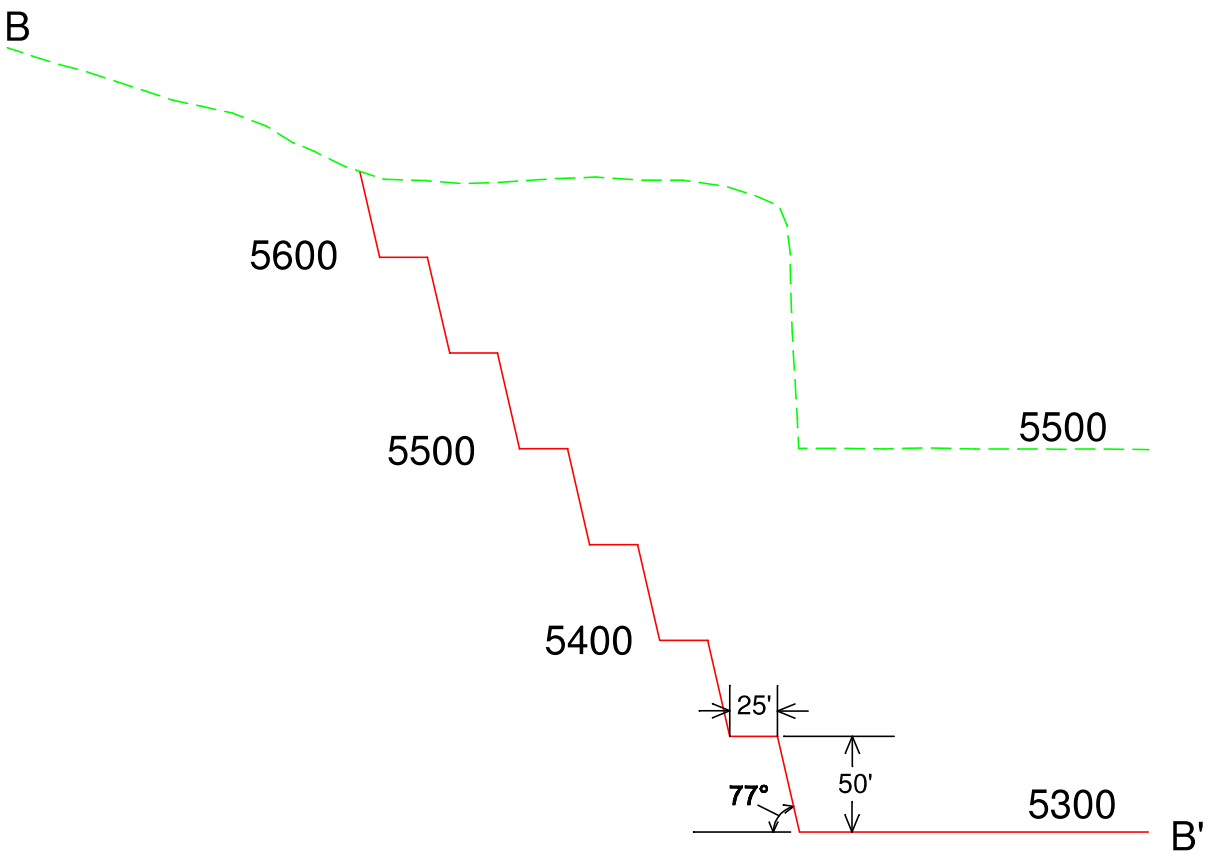

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Existing Profile (4-4-12)

Planned Profile

Seegmiller International

FIGURE 3

West Sidewall Slope Profile BB'
Looking Northwest

0 50 100 200

Scale in Feet (Approx.)

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catch bench is 25-ft. The approximate interramp slope angle is 56.7° (1:1.52) and the overall slope angle is approximately 57.8º (1:1.59). To create the 81° bench face angles, the East Sidewall will be pre-split at 9° off from vertical during mining. During 2012, on-going site measurements have shown that the bedding planes dip at approximately 85º E to 90°, and do not apprear to undercut the planned East Sidewall. The profile of the East Sidewall is presented in Figure 4.

Geology/Geologic Discontinuities

Quarry Area Geology. The Quarry 3 deposit occurs within the Jurassic age Twin Creek Limestone, which is approximately vertically oriented, striking NE-SW. Usable limestone limits are bounded on the northwest by the Lower Unit of the Twin Creek Limestone, which includes Green Claystone and Red Sandy Siltstone. On the southeast side, various argillaceous, calcareous and sandy limestones of the Middle Unit of the Twin Creek Limestone bound the useable limestone strata.

Major Rock Types. The major rock types in the Interim Quarry 3 include limestone and clay/shale. The thicknesses[3] of the 13 individual rock units or bands in the quarry vary from about 5 ft to more than 300 ft. The North Endwall encounters all rock types from the High Mag Limestone on the northwest corner of the quarry to the E Band Limestone on the northeast quarry corner. The West Sidewall consists of High Mag Limestone, with the Red Marker Shale at the overall slope toe. The East Sidewall consists primarily of C Band Limestone, D Band Limestone and E Band Limestone. The projected rock type locations in the interim quarry are shown in Figure 5.

Discontinuity Studies (2008). Studies[1] undertaken for the future Quarry 3 in June-July 2008 in the form of an initial assessment of slope stability, examined general geology, major discontinuities and field sites. The Quarry 3 deposit occurs in the Jurassic Age Twin Creek Limestone, which strikes NE-SW and has a steep almost vertical dip. One significant fault occurs in the Red Shale Unit, striking and dipping approximately parallel to the shale unit bedding. Field data on bedding and joints were examined at 20 sites in the existing quarry area. A summary of typical discontinuity data is given in Table I.

Discontinuity Studies (2009-2010). Some 19 surface sites were examined during slope steepening studies[2,3] in 2009-2010. A summary of this data is presented in Table II. Core holes were drilled in each major slope, but the core was not oriented, so no discontinuity strikes and dips could be collected from the core.

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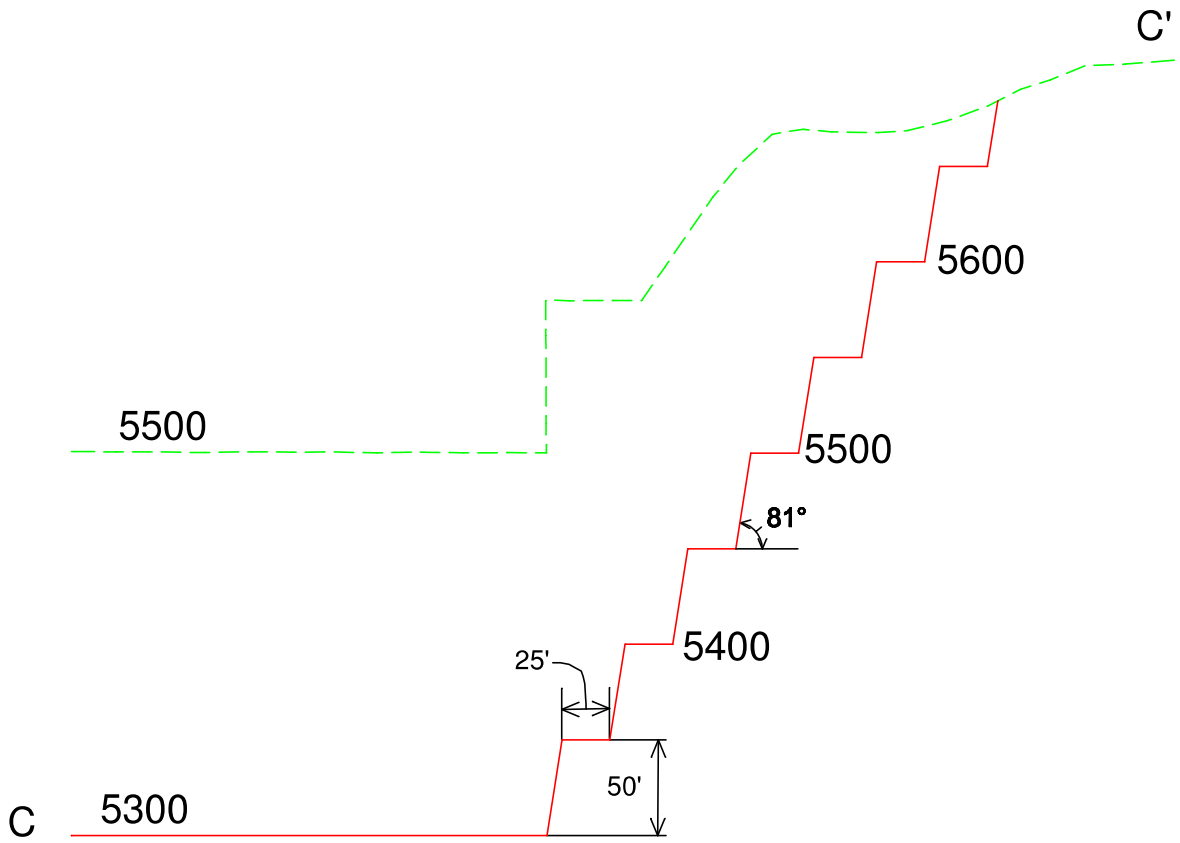

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Existing Profile (4-4-12)

Planned Profile

Seegmiller International

FIGURE 4

East Sidewall Slope Profile CC'
Looking Northeast

0 50 100 200

Scale in Feet (Approx.)

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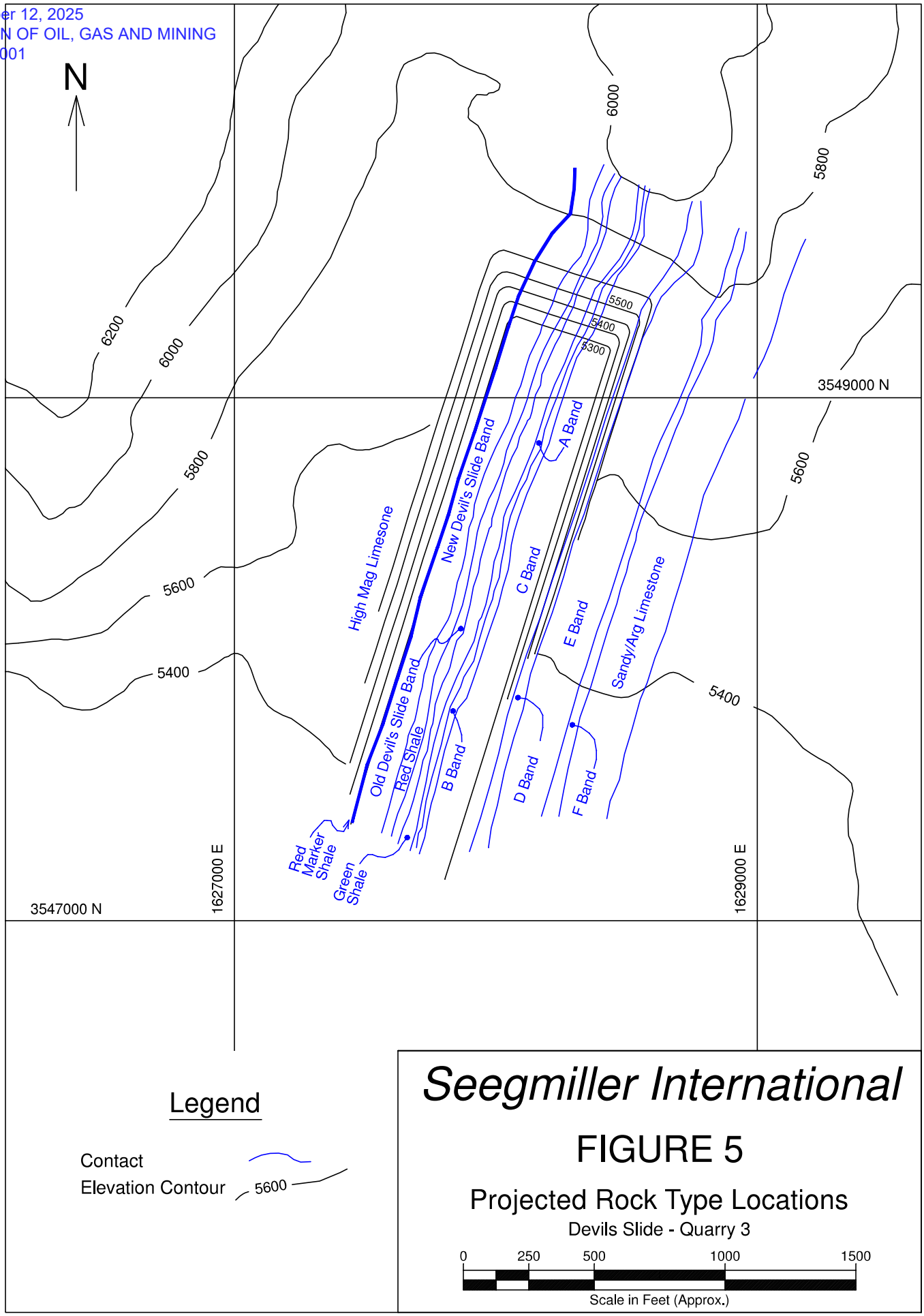

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Contact

Elevation Contour 5600

Seegmiller International

FIGURE 5

Projected Rock Type Locations

Devils Slide - Quarry 3

0 250 500 1000 1500

Scale in Feet (Approx.)

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TABLE I

SITE DISCONTINUITY DATA (2008)

PARAMETER	BEDDING	FLAT JOINT	STEEP JOINT
Strike	N20E	N66W	N68W
Dip	85E	23E	67W
Spacing, ft.	0.7	1.0	1.3
Strike Length, ft.	25	4	10
Dip Length, ft.	25	4	10

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TABLE II

SITE DISCONTINUITY DATA (2009-2010)

SITE	BEDDING		FLAT JOINT		STEEP JOINT	
	STRIKE	DIP	STRIKE	DIP	STRIKE	DIP
2009-1	N20E	86E	N65W	25E	N65W	75W
2009-2	N15E	87E	N75W	25E	N70W	65W
2009-3	N25E	90	N70W	5E	N70W	85W
2009-4	N25E	90	N70W	5E	N70W	80W
2009-5	N20E	85E	N50W	5W	N60W	60W
2009-6	N25E	85E	N70W	50E	N70W	45W
2009-7	N20E	85E	N75W	30E	N80W	80W
2009-8	N30E	70E	N70W	15E	N80W	80E
2009-9	N20E	90	N70W	0E	N70W	85W
2009-10	N20E	75E	N80W	40E	N75W	60W
2009-11	N20E	90	N70W	35E	N70W	55W
2009-12	N30E	90	N55W	40E	N55W	70W
2009-13	N30E	85W	N60W	30E	N60W	65W
2009-14	N30E	90	N70W	10W	N70W	80W
2009-15	N30E	90	N70W	30E	N70W	50W
2009-16	N20E	85W	N20W	35E	N60W	55W
2009-17	N20E	90	N70W	5E	N70W	85W
2009-18	N20E	90	N60W	15E	N60W	75W
2009-19	N20E	90	N70W	40W	N80W	90
Typical NW Wall	N25E	80E	N70W	25E	N75W	80W
Typical NE Wall	N25E	85E	N70W	35E	N70W	65W
Typical SE Wall	N20E	90	N70W	25E	N70W	75W
Typical Quarry 3	N23E	86E	N70W	25E	N70W	70W

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Discontinuity Studies (2012). In January 2012 discontinuity data were collected at 10 field sites along the existing West Sidewall and at 10 field sites along the existing East Sidewall. The site locations for the West Sidewall were all on the 5500-ft bench, the lowest existing bench at that time. The sites were located at approximately equal spacing in what would be the north two-thirds of the quarry. For the East Sidewall there were six locations at the 5500-ft bench and four sites on the 5575-ft bench. These ten sites were concentrated along existing bench faces in what would represent the highest slopes for the final Quarry 3 East Sidewall. Approximate locations of all sites are shown in Figure 6. A data summary for these two sidewalls and the North Endwall (combination of five sites from the northeast portion of each sidewall) is shown in Table III. On-going site measurements during 2012 indicate that many of the bedding dips appear to be steepening as greater depths are reached in the quarry. Further details relative to the data collected at the 20 sites are given in Appendix I. Polar equal area projections for the highest concentrations of poles for the beds, flat joints and steep joints have been developed. They are presented, respectively, in Figures 7, 8 and 9 for the North Endwall; Figures 10, 11 and 12 for the West Sidewall; and Figures 13, 14 and 15 for the East Sidewall. The 2012 data show the bedding to be the strongest discontinuity set compared to the two joint sets. The only significant difference in the bedding, when the West and East Sidewalls are compared, is that the bedding dip tends to steepen from the west to the east, particularly with quarry depth. The Flat Joint Set is quite variable, somewhat irregular and generally dips less than about 23º. The Steep Joint Set is oriented somewhat similar from one sidewall to the other and has very steep, almost vertical, dips. It tends to be a moderately strong set.

Discontinuity Consensus. The discontinuity data collected in 2008, 2009-2010, and 2012, show the bedding to be a major set and the strongest set. The strike is about N 20º-25º E and the dip is approximately 80º E to vertical. The 2012 studies show that the dip steepens with quarry depth and from the locations in the West Sidewall to the East Sidewall. This change may require the bench face angles on the West Sidewall to be flatter than those on the East Sidewall. The studies show that the Flat Joint Set is a variable and somewhat irregular set. This joint set is a relatively flat dipping set whose dips range from 9º W to about 23º W. The strike of this set varies greatly from the NW to NE. The Steep Joint Set is a moderately strong set with strikes averaging about N 70º W. Dips for this set typically vary about 10-15º. The data collected during each study show that usually there were three approximately orthogonal discontinuity sets. Owing to the fact that the 2012 data were collected directly on the planned highwalls, they are considered the most significant for the current mining plan. The earlier study data were collected over a

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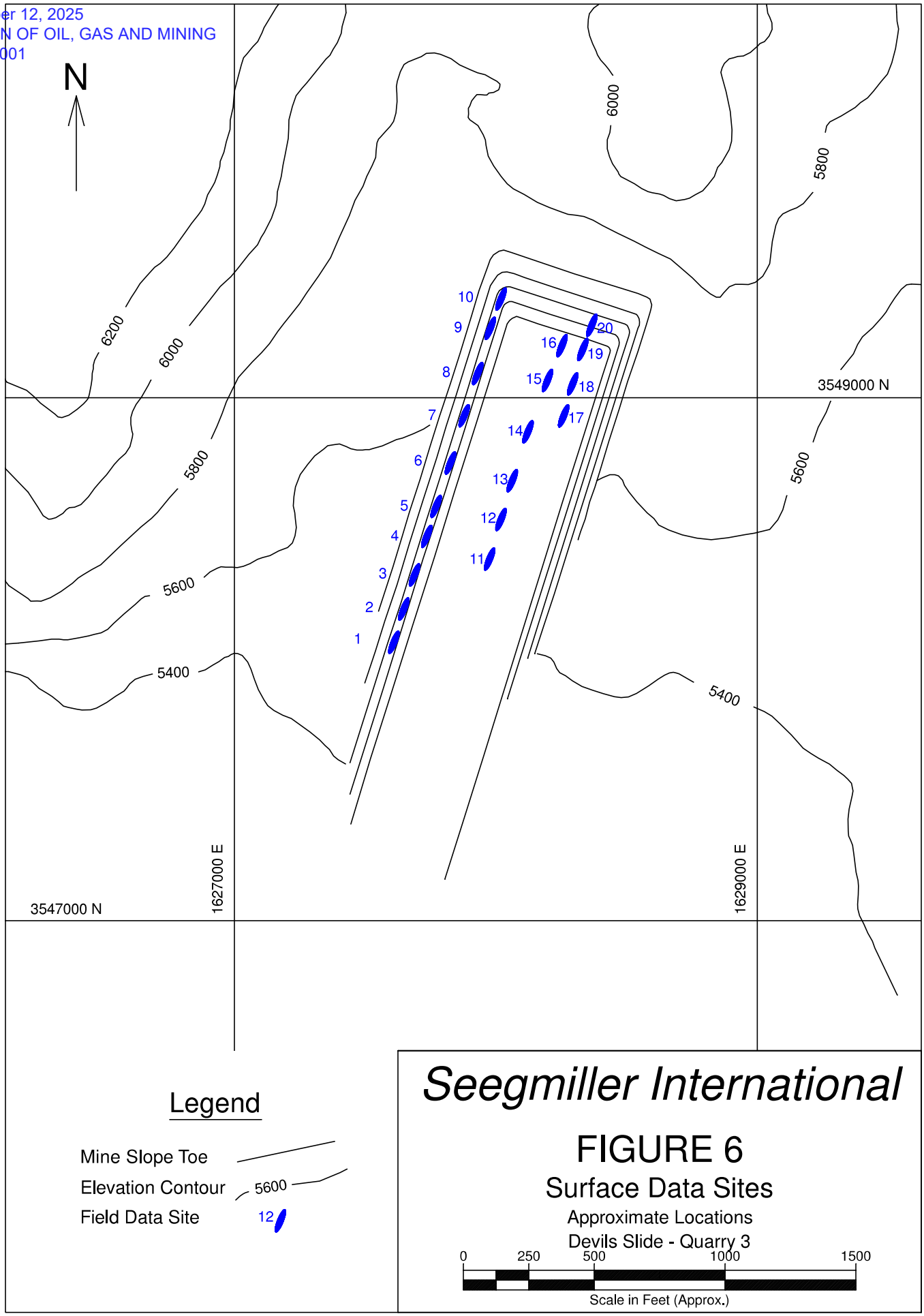

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Mine Slope Toe

Elevation Contour 5600

Field Data Site 12

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FIGURE 6

Surface Data Sites

Approximate Locations

Devils Slide - Quarry 3

0 250 500 1000 1500

Scale in Feet (Approx.)

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TABLE III

DISCONTINUITY STRIKE/DIP DATA (2012 QUARRY SITES)

PIT WALL	BEDDING	FLAT JOINT	STEEP JOINT
West Sidewall	N 20 E; 80 E	N 48 W; 18 W	N 68 W; 90
East Sidewall	N 23 E; 87 E	N 75 E; 09 W	N 75 W; 85 W
North Endwall	N 22 E; 82 E	N 40-75 W; 09-23 E	N 68 W; 90

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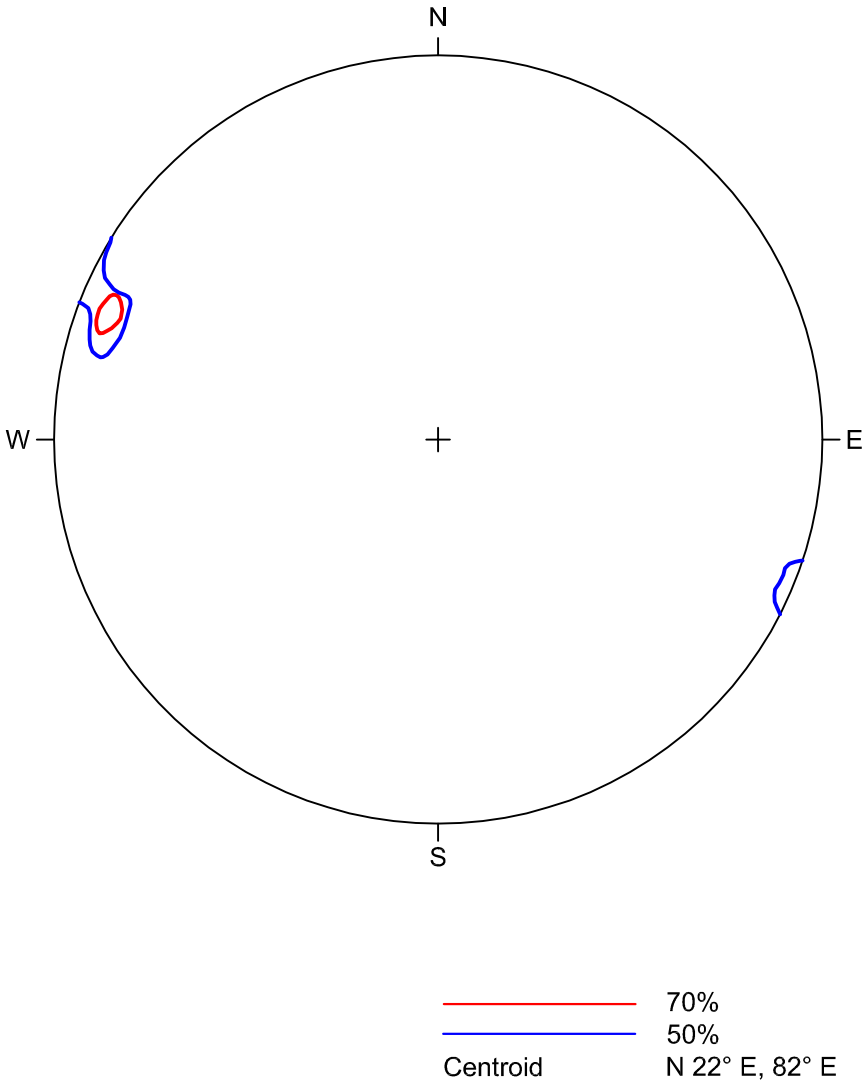

Figure 7

Polar Equal Area Projection
Holcim Quarry 3 - 2012
North Endwall - Bedding

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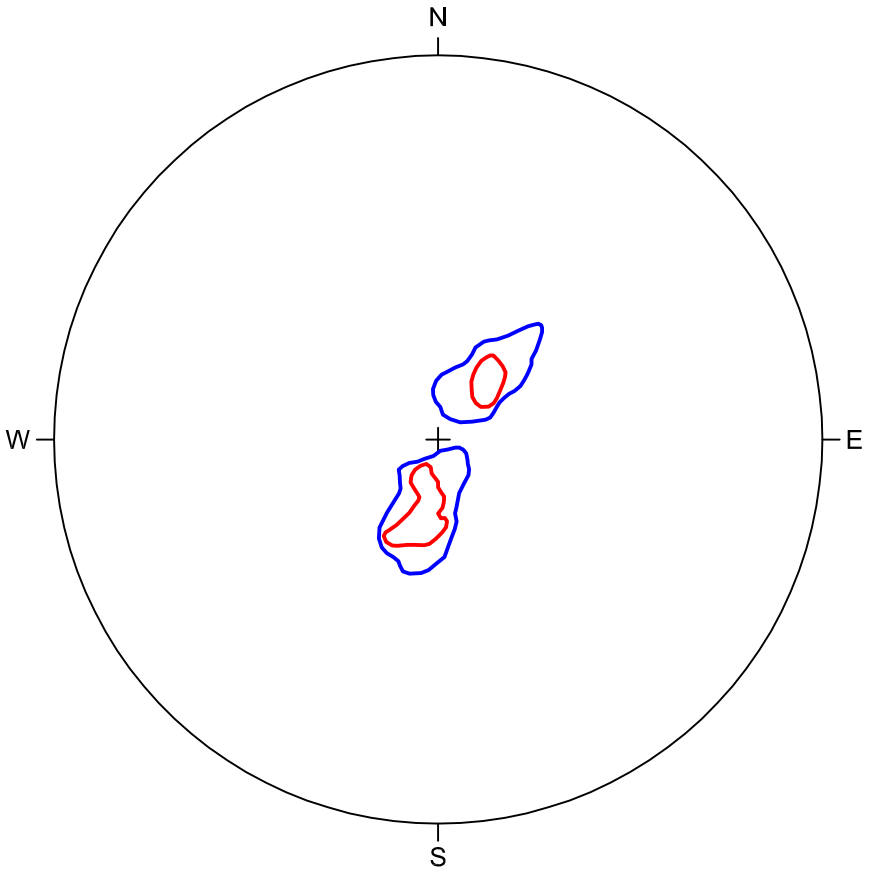

Figure 8

Polar Equal Area Projection
Holcim Quarry 3 - 2012
North Endwall - Flat Joints

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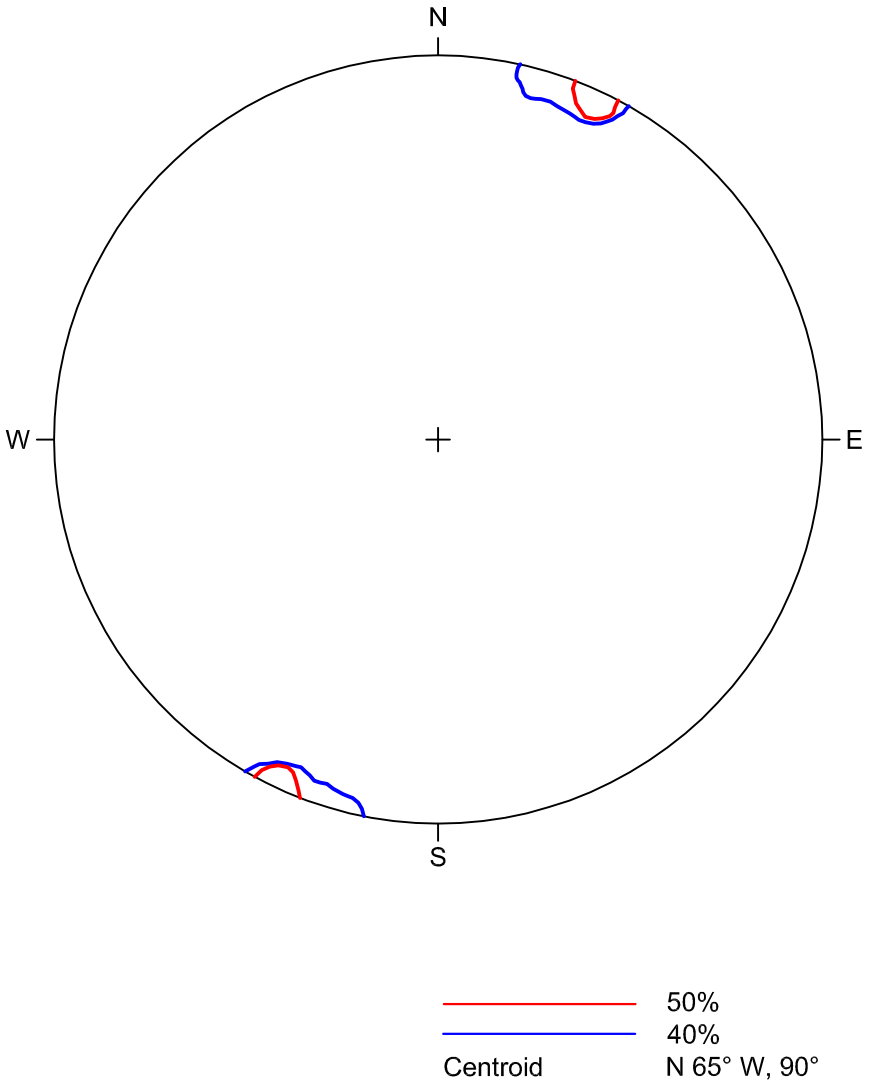

Figure 9

Polar Equal Area Projection
Holcim Quarry 3 - 2012
North Endwall - Steep Joints

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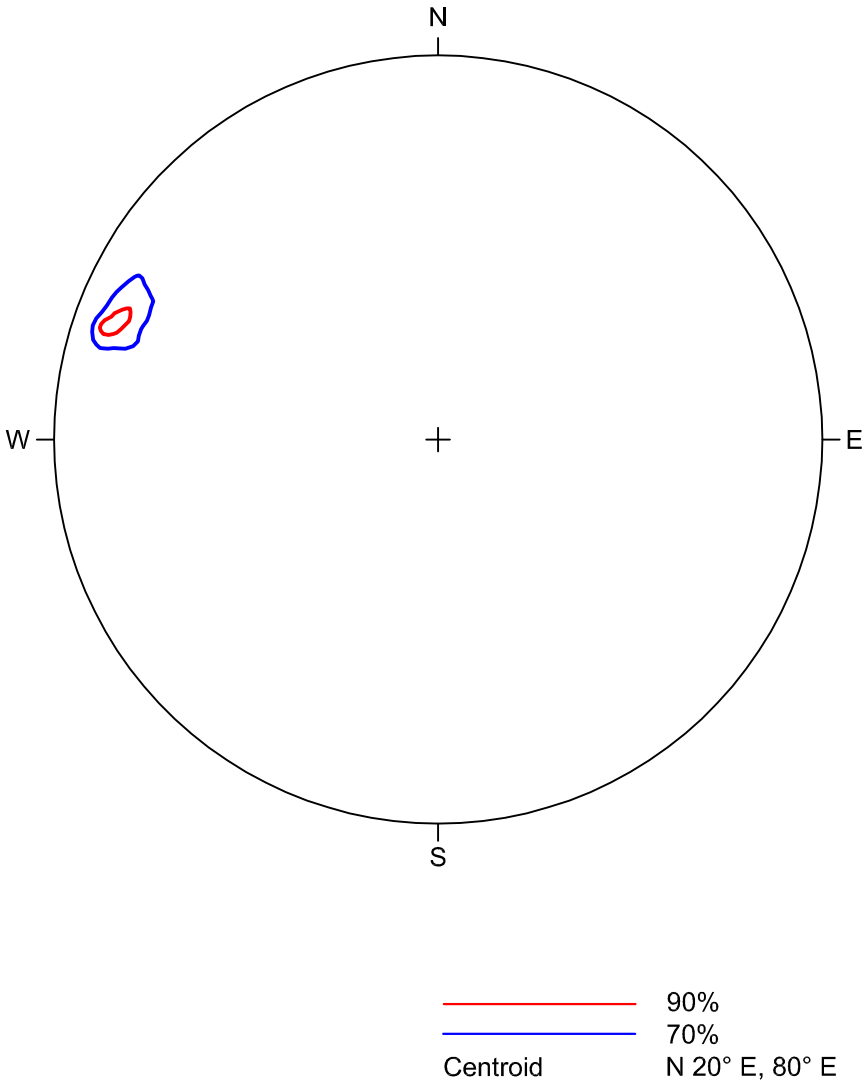

Figure 10

Polar Equal Area Projection
Holcim Quarry 3 - 2012
West Sidewall - Bedding

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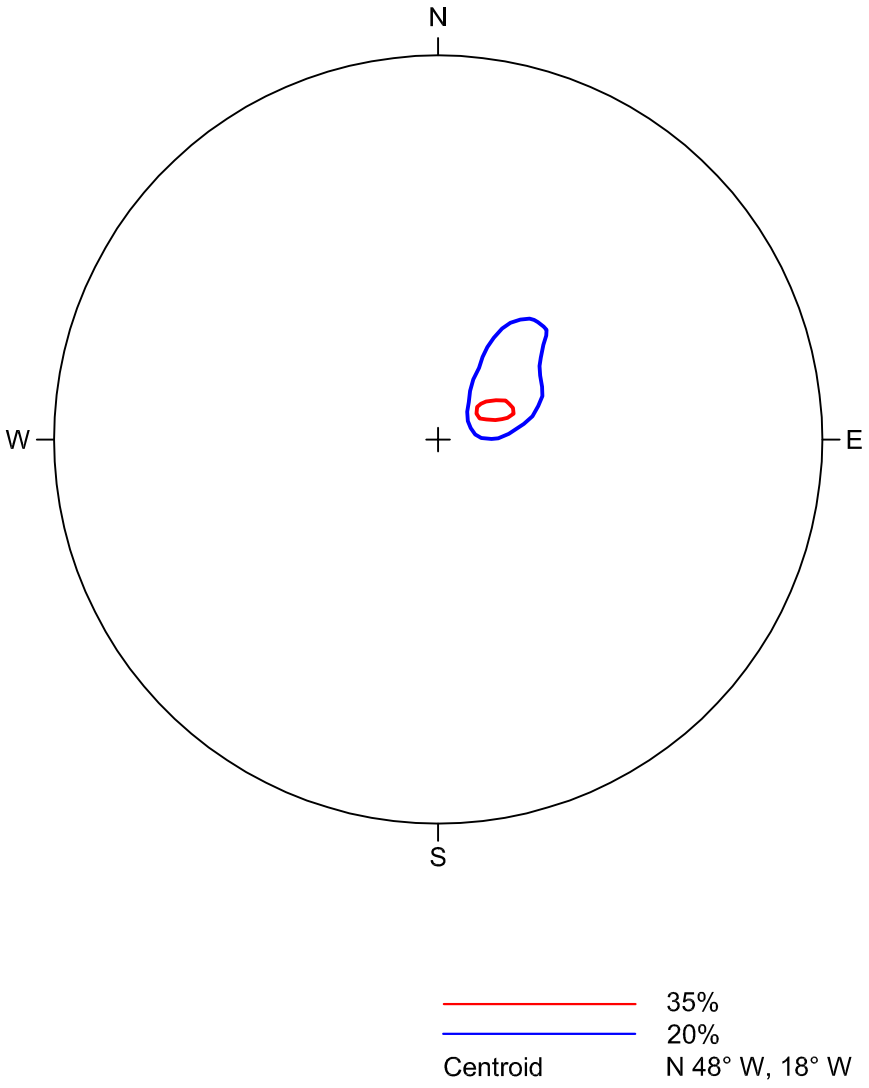

Figure 11

Polar Equal Area Projection
Holcim Quarry 3 - 2012
West Sidewall - Flat Joints

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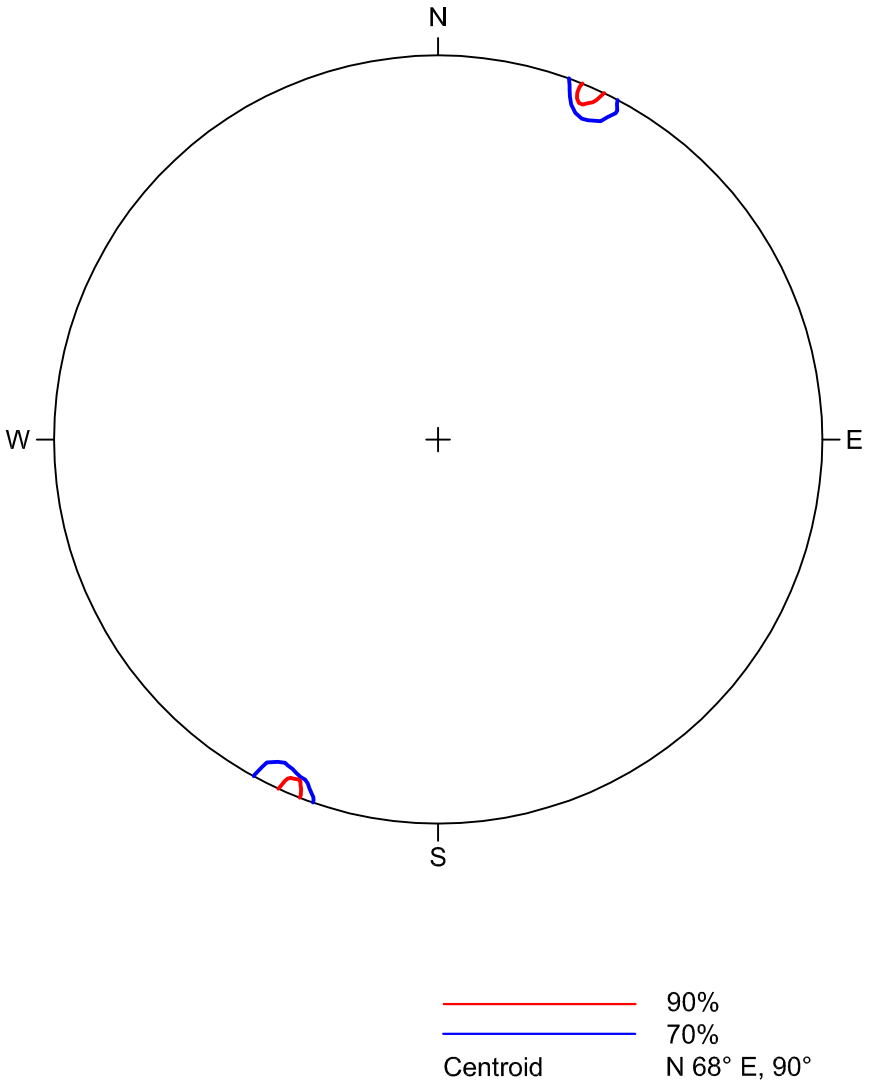

Figure 12

Polar Equal Area Projection
Holcim Quarry 3 - 2012
West Sidewall - Steep Joints

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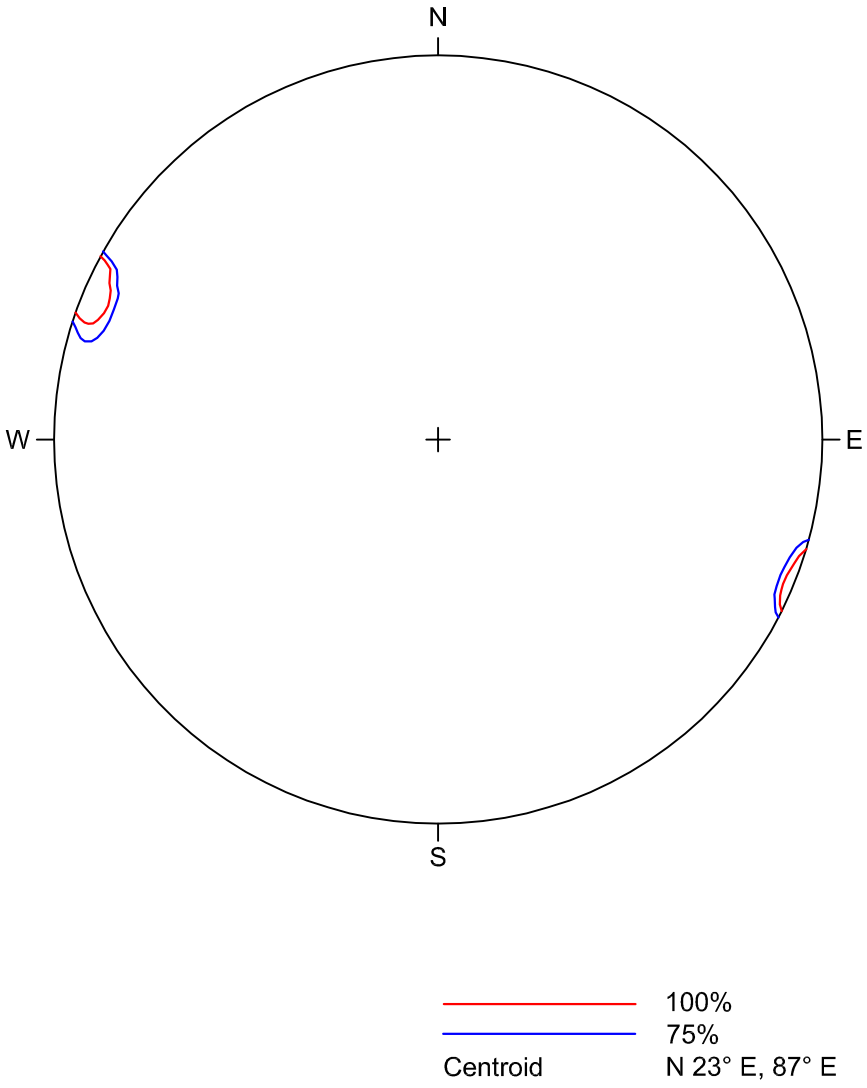

Figure 13

Polar Equal Area Projection
Holcim Quarry 3 - 2012
East Sidewall - Bedding

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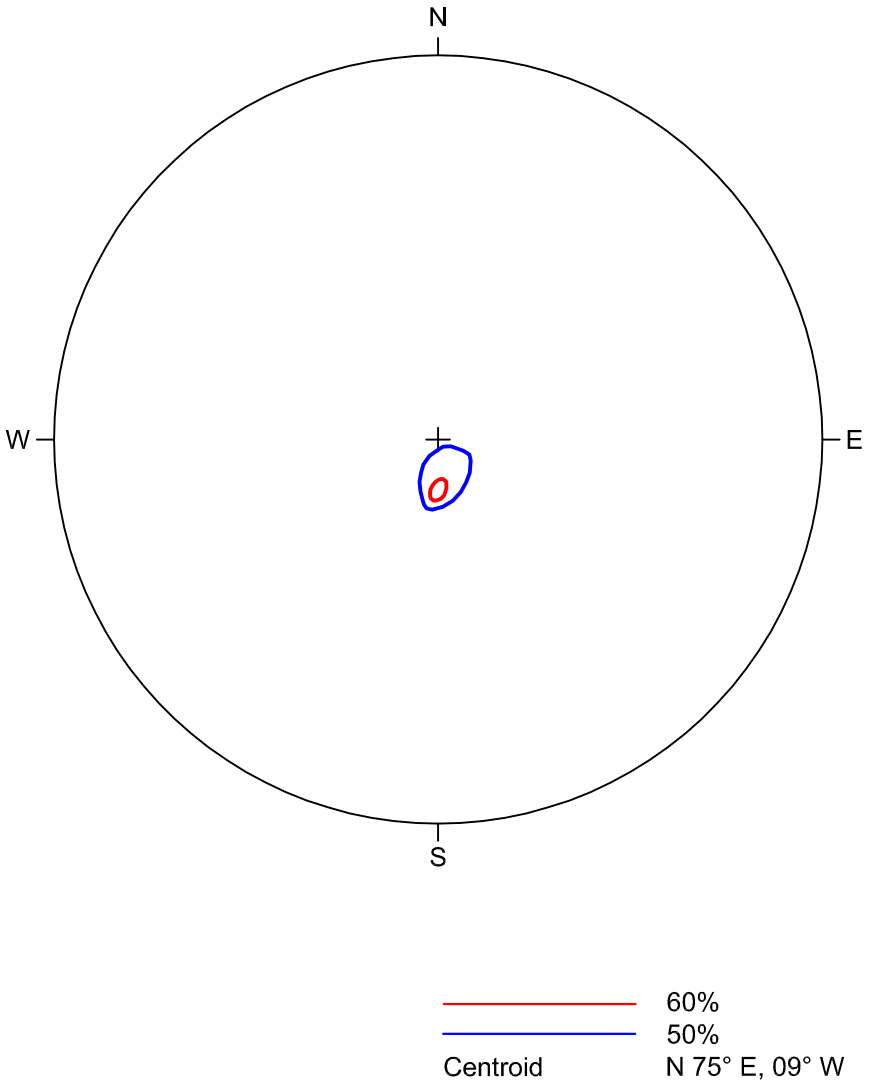

Figure 14

Polar Equal Area Projection
Holcim Quarry 3 - 2012
East Sidewall - Flat Joints

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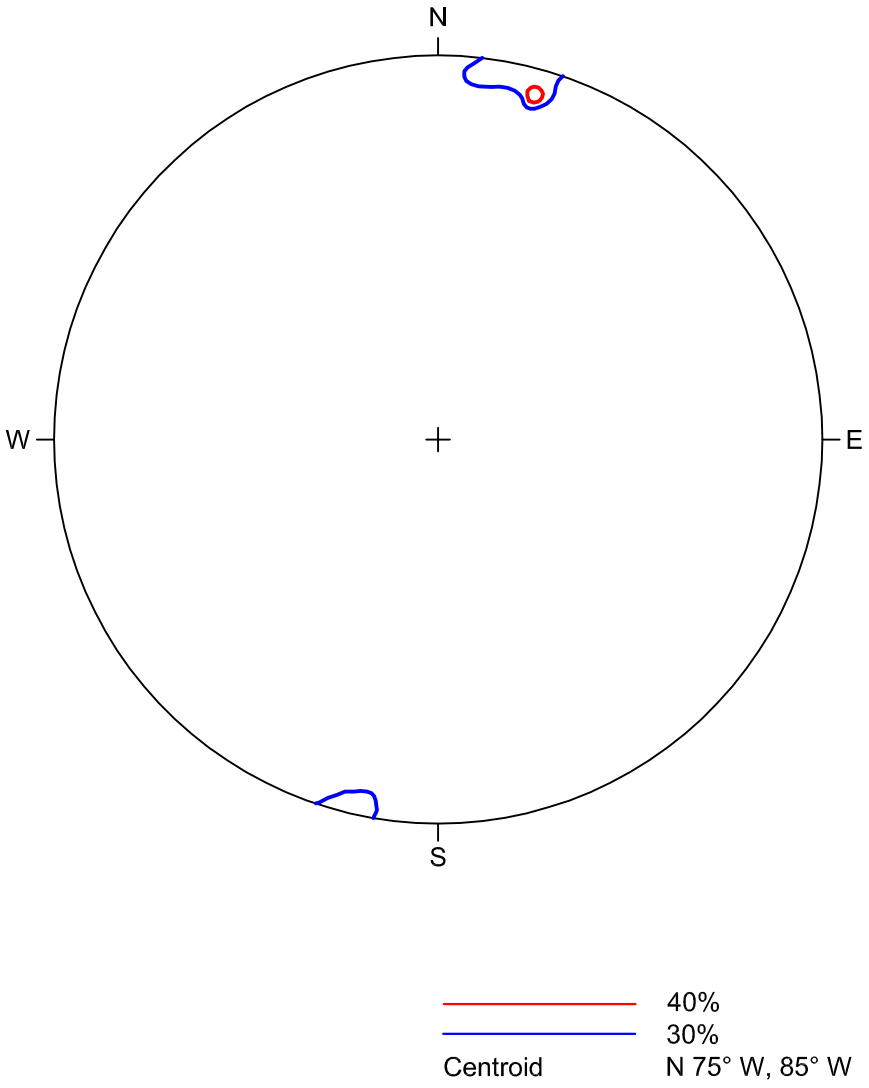

Figure 15

Polar Equal Area Projection
Holcim Quarry 3 - 2012
East Sidewall - Steep Joints

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large area and are not necessarily going to reflect the specific highwalls being investigated in the present study. Upon occasion joints related in orientation to the Flat Joints have been observed to form potential wedge mode failures in the general area of the East Sidewall. While no wedge failures have been observed to date, future mining should include an on-going review of these possible future instabilities.

Rock Mass Strength

Past Studies. The *Seegmiller* 2009-2010 studies[2,3] involved the evaluation in detail of the rock mass properties that would be encountered in Quarry 3. Surface site data were collected, core holes were drilled/evaluated and laboratory strength tests were performed. A summary of 2009-2010 rock strength property data for each of the three highwalls in Quarry 3 is presented in Table IV. Each of the three highwalls have generally similar rock strength parameters.

2012 Studies. The field sites examined for discontinuity orientation in the present study also had strength parameter data recorded. A summary of estimated compressive strength, joint spacing and RQD for these sites is given in Table V. Further details are given in Appendix I. Comparing these new data to the 2009-2010 data reveals that the joint spacings and RQD's are very similar. However, the new strength data are about twice the magnitude of the older data. This relates to the fact that the older data are a consensus of strength values from a wide variety of field sites, core holes and laboratory testing. The 2012 sites were collected directly from locations comprised of actual quarry bench faces. Consequently, a consensus of all data has been developed for use in designing the Interim Quarry 3 slopes. These magnitudes are conservative, particularly the compressive strength value, which represents the lowest magnitude opined to exist in the planned slopes. A summary of these characteristics, which reflect all strength data from the past and present studies, is presented in Table VI.

Rock Mass Friction. The method employed to estimate the rock mass friction angle was developed by Bieniawski[4], when he worked at the CSIR group in South Africa in the mid-1970's. This method is the original RMR (Rock Mass Rating) method commonly employed today in many rock engineering projects. The method has been found by *Seegmiller* to give useful information concerning rock mass friction angles. The method consists of an analysis of six different material characteristics which are evaluated, rated and totaled. The rock mass friction angle is then determined from the total rating. For the present study, the rock mass friction angle for the interim quarry slopes has been estimated using this method. A summary of results is presented in Table VII.

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TABLE IV

ROCK STRENGTH PROPERTIES - 2010 STUDIES

STRENGTH FACTOR	WEST SIDEWALL	EAST SIDEWALL	NORTH ENDWALL
Uniaxial Strength, psi	5000	6500	5500
Joints per meter (j/m)	3	3	3
RQD %	85	90	85

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TABLE V

ROCK STRENGTH PROPERTIES - FIELD ESTIMATES (2012)

STRENGTH FACTOR	WEST SIDEWALL	EAST SIDEWALL	NORTHENDWALL
Uniaxial Strength, psi	10,200	10,850	10,800
Joints per meter (j/m)	2.6	3.2	2.5
RQD %	81	77	81

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TABLE VI

MINIMUM ROCK STRENGTH PROPERTIES - 2012

CHARACTERISTIC	INTERIM QUARRY SLOPES
Compressive Strength, psi	5000
Cohesion, psi	650
Bulk Density, pcf	165
RQD %	80
Joint Spacing (j/m)	3
Joint Condition	Slightly Rough
Joint Orientation	Favorable

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TABLE VII

ROCK MASS FRICTION – Rock Mass Rating (RMR) Methodology

FACTOR	RMR RATING
Rock Strength	4
RQD	10.5
Joint Spacing (j/m)	15
Joint Condition	18.5
Groundwater	10
Strike/Dip Adjustment	-5
Total RMR	53
Rock Mass Friction Angle (RMR + 100)/4	38.3

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Rock Mass Cohesion. The rock mass cohesion may be estimated using the RMR methodology. However, more than 45 years of experience in determining rock mass cohesion has led *Seegmiller* to the conclusion that the RMR method overestimates the rock mass cohesion. Another method developed in East Europe in the late 1960's by Manev and Avramova-Tacheva[5] uses the intact rock cohesion and the joint frequency to get the rock mass cohesion. Basically, the rock mass cohesion (C_m) would approach about one-third of the intact rock cohesion (C_i), if there were no joints. The more joints there are per meter (j/m), the lower the rock mass cohesion down to a minimum value of 0.02 times the intact rock cohesion. This method has been found by *Seegmiller* to give reasonable estimates of the rock mass cohesion. The equation used to calculate the rock mass cohesion uses only the intact rock cohesion (C_i) and the j/m. It may be stated as follows:

$$C_m = C_i\,[0.114e^{-0.48(I-2)} + 0.02]$$

where C_m = rock mass cohesion

C_i = intact rock cohesion

I = joints per meter

For the Interim Quarry 3 slopes the rock mass cohesion is computed to be as shown in Table VIII.

Rock Mass Strength Consensus. To conduct overall stability analysis of a quarry highwall, a consensus of the total rock mass strength needs to be developed. Based on all data and all strength related factors, the rock mass strength consensus for the present study is given in Table IX.

Discontinuity Shear Strength

The shearing strength[6] (τ), at a given normal stress (σ), of one rock surface sliding on another rock surface, may be stated as

$$\tau = \sigma \text{ Tan } (\phi + i)$$

where ϕ = sliding friction angle

i = effective roughness angle

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TABLE VIII

ROCK MASS STRENGTH COHESION–Manev & Avramova-Tacheva Methodology

FACTOR	INTERIM QUARRY SLOPES
j/m	3
C_i, psi	650
C_m, psi	58
C_m, psf	8,400

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TABLE IX

ROCK MASS STRENGTH CONSENSUS
Interim Quarry Slopes

STRENGTH FACTOR	TYPICAL SLOPE MAGNITUDES
Rock Mass Friction (ϕ_m)	38°
Rock Mass Cohesion (C_m) psf	8,500
Rock Mass Unit Weight (γ_m) pcf	165

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The effective roughness angle (i) may be estimated using the following emperical[7] equation

$$i = \text{JRC} \log U_j / \sigma$$

where JRC = joint roughness coefficient

U_j = joint surface compressive strength

For the Quarry 3 limestones the basic friction angle (ϕ) may be assumed[8] to be 30°. The joint surface compressive strength will be assumed to be 5000 psi (see Table VI), JRC magnitudes for each discontinuity surface type is given in Table X.

Groundwater Pressurization

Slope Stability Effects. The primary effects of groundwater are: (1) loss of the effective shear strength, and (2) adverse horizontal thrust forces in tension cracks. In addition, there are several secondary effects, including: (1) accelerated weathering, (2) pressure buildups due to freezing, and (3) erosional effects. The removal of the groundwater and/or the reduction of the water pressure may be referred to as depressurization. Depressurization may be accomplished by: (1) diversion of surface runoff, (2) vertical wells, (3) horizontal drains, and/or (4) subsurface drainage galleries.

Site Conditions. Annual atmospheric moisture is 19.6 inches, from snowfall and rain showers. In 2010 the annual moisture dropped[9] to about 16 inches and was even lower in 2011. According to governmental records[10] the winter of 2011-2012 was considered a drought. The Weber River, located about 1000 ft southwest of the planned Quarry 3, has an elevation of 5260 ft or about 40 ft below the lowest planned quarry level. The subsurface groundwater level in hole GT-4, drilled in the quarry floor in the summer of 2009, was below[3] the bottom of the hole. The hole bottom had an elevation of 5050 ft or about 250 ft below the planned Quarry 3 final floor elevation of 5300 ft.

Groundwater Consensus. Except for very minor seeps, believed to be perched water or surface atmospheric moisture, no groundwater is known to exist in the planned Quarry 3 North Endwall or West/East Sidewalls. The low water level under the final quarry floor, that was found in the summer of 2009, has in all likelihood, not risen due to the drought conditions that have since prevailed. Consequently, the use of a dry stability model for the Quarry 3 slopes in opined to be reasonable. However,

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it is recommended that at least one permanent groundwater monitoring well be placed near Quarry 3. This will allow changes in highwall pressurization to be noted should they occur. Groundwater elevations exceeding the 5300-foot elevation will require HOLCIM to reevaluate the slope safety factor to see that the required minimum of 1.25 is maintained.

Seismicity Considerations

Devil's Slide (Quarry 3) is located in a Seismic Zone 3, according to the Uniform Building Code[11]. The U.S. Army Corps of Engineering manual for seismic design states that a seismic coefficient of 0.3 is acceptable in Seismic Zone 3. According to Pyke[12], the work of Newmark in 1965 and Seed in 1979 have led to an interesting conclusion for slopes comprised of materials which show no significant loss of strength under cyclic loading. They concluded that a pseudo-static stability analysis, using a seismic coefficient of 0.1 for magnitude 6.5 earthquake or 0.15 for a magnitude 8.25 earthquake, and a safety factor of approximately 1.15, would ensure that slope displacements would be acceptably small. Furthermore, Quarry 3 is located[13] in a peak ground acceleration zone of approximately 0.23, for a 2% probability of being exceeded in 50 years. Pyke[12] has developed a method of relating seismic coefficient, peak ground acceleration and earthquake magnitudes. Using his "Magical Curve", the seismic coefficient for Quarry 3 would be computed as $\alpha = 0.23 \times 0.31 = 0.071$. A summary of these methods of determining seismic coefficient yields the results shown in Table XI. It is assumed that the rock slopes will show no significant loss of strength under cyclic loading and that the slopes are subjected to an earthquake of about 7.3 magnitude, which is presumed to be on the upper limit of the scale for this area in Utah. The Corps of Engineering methodology is the most conservative and more applicable to soil slopes, soil foundations and/or buildings. Newmark/Seed and Pyke are more site specific and more applicable to hard rock mine slopes, such as Quarry 3. For the present study the stability analysis will be conducted using a seismic coefficient of 0.1 and a minimum pseudo-static safety factor of 1.1.

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TABLE X

JOINT ROUGHNESS COEFFICIENT DATA

JRC: WEST SIDEWALL				JRC: EAST SIDEWALL			
SITE	BEDDING	FLAT JOINT	STEEP JOINT	SITE	BEDDING	FLAT JOINT	STEEP JOINT
1	8	12	12	11	6	10	15
2	6	12	15	12	6	12	15
3	3	15	15	13	10	15	10
4	2	5	8	14	7	8	8
5	8	15	12	15	10	12	10
6	3	12	10	16	8	12	15
7	3	15	15	17	6	15	12
8	6	12	14	18	15	12	12
9	4	15	15	19	6	8	12
10	3	10	18	20	8	10	8
Ave JRC	4.6	12.3	13.4	---	8.2	11.4	11.7

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TABLE XI

SEISMIC COEFFICIENT FOR QUARRY 3

DETERMINATION METHOD	SEISMIC COEFFICIENT	MINIMUM SAFETY FACTOR
Uniform Building Code/Corps of Engineers	0.100	1.1
Newmark and Seed	0.12	1.15
Pyke	0.072	1.1

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STABILITY ANALYSIS

Failure Mode Analysis

General. There are several common modes of failure that could occur in Quarry 3. Those controlled by the various discontinuities include planar (failure on a single plane), wedge (failure controlled by two or three discontinuities) and toppling (failure controlled by three discontinuities). There is also the possibility that the rotational shear mode of failure could occur in a slope. This mode of failure is influenced by the discontinuity intensity and orientation, as well as other outside factors. Other slope failure modes could occur in a mine, including shallow flow slides, foundation slides and slope buckling. These failure modes are, however, not deemed possible in Quarry 3 owing to the high limestone compressive strength. In the North Endwall the Red Marker Shale, the Red Shale and the Green Shale are all relatively weak and unstable units. They may become minor rubble zones due to weathering over the long term. Such created debris needs to be contained on the 50 foot wide catch benches and not permitted to cause safety problems.

Planar Mode. The general conditions[14] for planar failure or failure or a single plane include the following:

- the failure plane angle (ψ_p) must undercut the slope face angle (ψ_f) or $\psi_f > \psi_p$
- the failure plane angle (ψ_p) must be greater than the friction angle (ϕ) of the failure plane or $\psi_p > \phi$
- the failure plane must strike within ±20° of the slope face strike
- the failure plane has lateral “release” surfaces in the slope

The use of stereographic projection methods may be employed to determine if planar mode failure can occur according to the above conditions. If it can, then further analysis is needed to compute a safety factor against failure. Safety factors less than the established minimum may require slope redesign.

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Wedge Mode. The general conditions for wedge failure on two intersecting planes include the following:

- the dip (ψ_i) of the line of intersection of the two planes must undercut the slope face angles (ψ_f) or $\psi_f > \psi_i$
- the dip (ψ_i) of the line of intersection of the two planes must be greater than the friction angle along the two planes or $\psi_i > \phi$

Conditions that influence the wedge mode failure include:

- the included angle between planes affects the potential for failure as follows:
  - included angle >135°, results in an increased potential for failure
  - included angle between 90° and 135°, causes increased frictional resistance on both planes
  - included angle < 90° dramatically causes high frictional resistance, as it lessens below 90°
- the dip direction of the line of intersection, which when it is within ±20° of the slope dip direction, will have the greatest potential for failure
- the dip direction of the line of intersection, which when it is at high angles (45°-90°) to the slope dip direction will have greater friction resistance to wedge failure

As in the case of planar failure, the use of stereographic projection is a preferred methodology to evaluate potential wedge failure. If the wedge failure mode appears probable, more detailed evaluations are required to compute a safety factor against failure. Safety factors less than the established minimum may require slope redesign.

Toppling Mode. The toppling mode failure mode is not a common failure mode, but may occur in a mine slope under certain conditions. First, tabular shaped blocks must be created by the structural sets. Second, the blocks must be positioned on a discontinuity base that tilts or slopes out of the mine wall. For a single tabular

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block of height (h) and width (w) positioned on a base tilted at an angle (ψ) from the horizontal, the following must be true for the block to topple in the direction of base tilt

$$b/h < \text{Tan } \psi$$

In an actual mine slope the situation is usually much more complex, because there may be many tabular blocks resting against one another. End tabular block reacts to the adjacent block and frictional resistance from one block to another affects the stability. Consequently, each mine slope must be individually evaluated for the occurrence of tabular blocks resting on outward tilting bases. If such blocks are potentially created on a base, which tilts into the mine, further analysis and/or slope redesign is warranted. The obvious creation of potentially unstable blocks in a mine slope is not an acceptable mining practice.

Rotational Shear Failure. The possibility that some rotational shear failure could occur always exists in a slope. Such rotational shear may be influenced by various discontinuities and may, in fact, be a complex multi-mode failure potential. Major stability factors include the slope height, slope angle, rock mass strength, groundwater pressurization and seismic loading. Consequently, rotational shear evaluation in generally appropriate[15] to make judgements regarding potential stability.

Limiting Equilibrium Methodology

Basic Concepts. The analysis method that is employed is based on limiting equilibrium concepts. At limiting equilibrium, the forces tending to create stability are exactly in balance with the forces tending to cause slope failure and, therefore, a safety factor of 1.00 exists. Greater or lesser safety factors allow the relative degree of slope safety to be measured. The computer code used for rotational shear is MCSLOPE. This code was created using the popular code PCSTABLE5 developed[16] at Purdue University as a basis. The PCSTABLE5 code is used by many U.S. state highway departments to evaluate highway slope stability. The MCSLOPE code calculates a deterministic static safety factor (SF_d) to judge the safety of a proposed slope. In addition, it can evaluate pseudo-static conditions as well.

Stability Criteria. The magnitude of the selected safety criteria depends on many factors including the risk of failure, quality of input data, regulatory requirements and the person doing the analyses. The standard mining industry static safety factor considered prudent for highwall stability is usually 1.20 to 1.30. For the

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present study, a minimum static safety factor of 1.25 has been specified by the state of Utah DOGM[17]. For seismic loading conditions, the standard minimum safety factor of 1.1 will be considered safe.

Quarry Slope Evaluation

Overview. Each of the three quarry slopes (West Sidewall, North Endwall and East Sidewall) are separately evaluated. For each slope a stereographic analysis is made to evaluate planar/wedge failure modes. Next, the potential for toppling mode failure will be examined and slope will be analyzed. Lastly, a rotated shear analysis is conducted for the highest, steepest slope profile. The three major quarry slopes have different geometries, but description terms for individual slope elements are common. Various slope angle terms used in this report have been visually defined. These terms, including overall slope angle, interramp slope angle and bench face angle, are shown in Figure 16.

North Endwall.

PLANAR MODE. A stereographic plot of the North Endwall slope (bench and overall slope) and the four sets of structures (bedding and three joint sets) is presented in Figure 17. The only structure set undercutting this quarry slope is the joint set designated Joint (Flat 1). Planar failure will not occur on this joint set because (1) the joint set does not strike within ±20° of the strike of the Endwall slopes i.e., 68°-40° > 20°; and (2) the dip of the undercutting structure is much less than the basic joint friction angle i.e., 9° < 30°. Consequently, planar failure is not expected in this quarry slope.

WEDGE MODE. Referring again to Figure 17, there are 6 wedge modes created. These are designated on the stereographic projection as 1,2,3,4,5 and 6. A summary of these wedges is given in Table XII. The only wedge that undercuts the slope is designated “No. 2" and is created by the bedding and the joint designated as Joint (Flat 1). Failure will not occur on this wedge because the intersection line dips at only 8°, which is 22° less than the base friction angle of 30° (without considering JRC). Wedge mode failure should not occur in this quarry slope.

TOPPLING MODE. As noted in the stereographic projection depicted in Figure 17, the only joint set on which toppling mode failure could occur is Joint (Flat 1). The field notes (Appendix 1) notes that the set of joints is relatively weak, subtle and irregular. These “flat” joints are intersected by the very strong bedding set and

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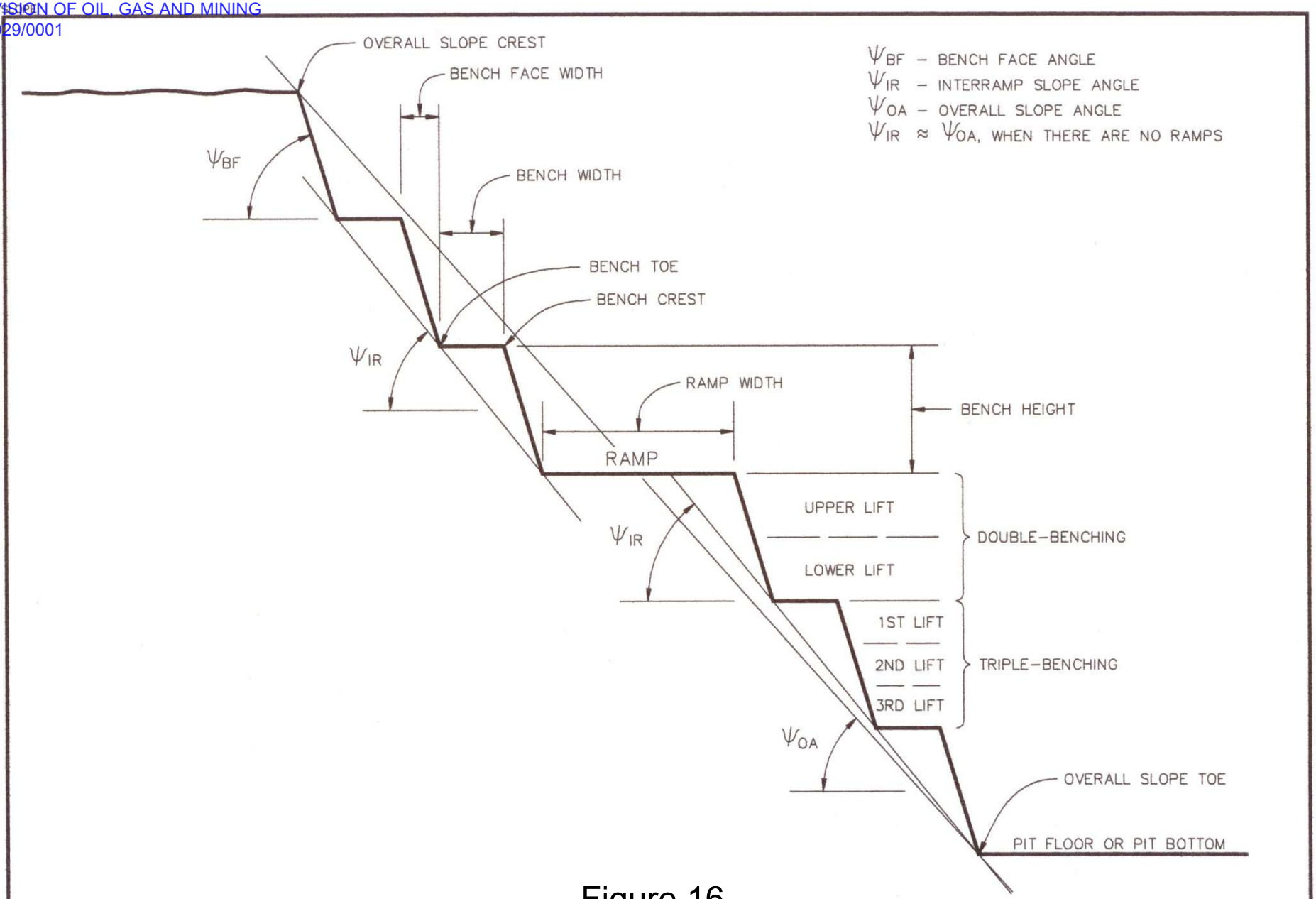

Figure 16
QUARRY SLOPE ANGLE DEFINITIONS

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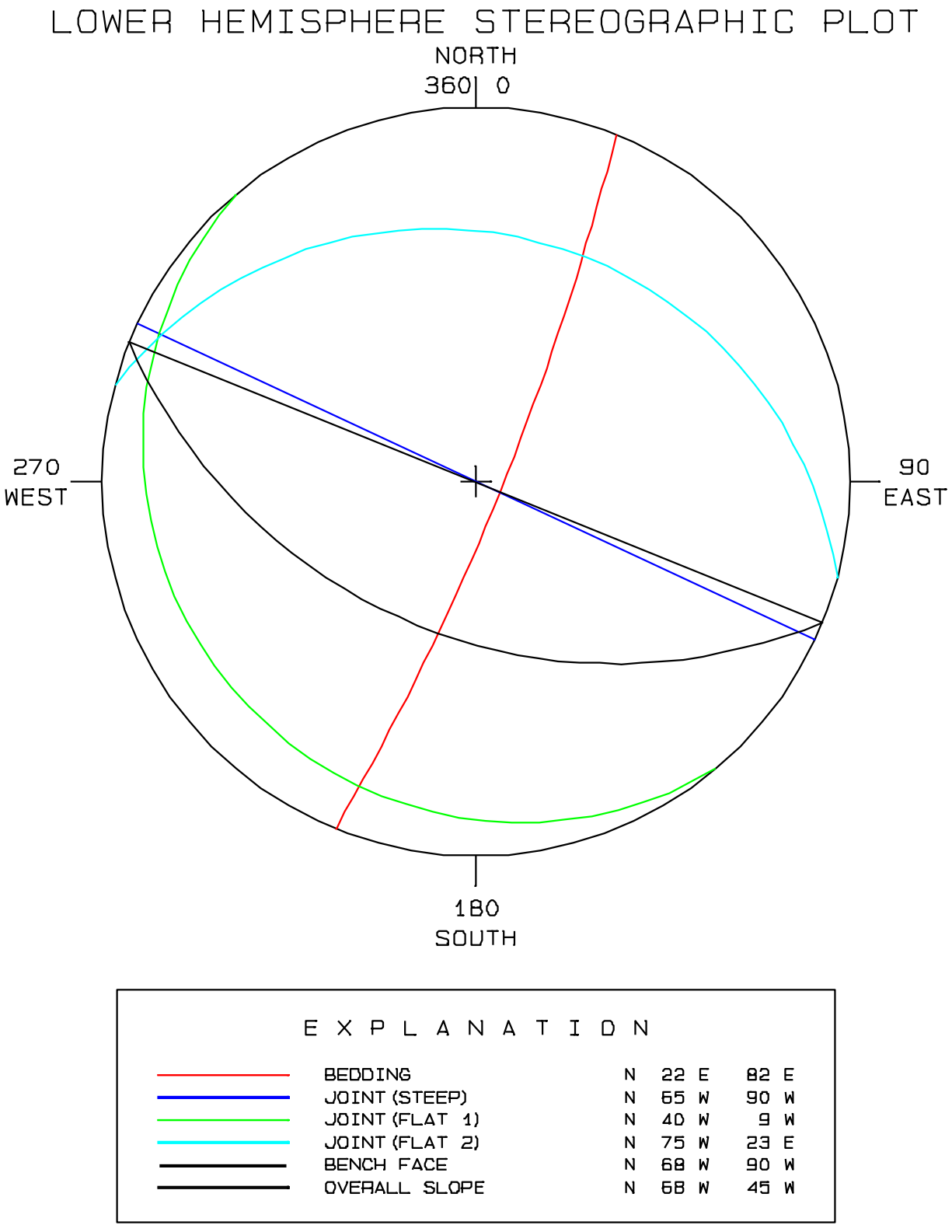

FIGURE 17
NORTH ENDWALL - STRUCTURE AND SLOPES

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TABLE XII

NORTH ENDWALL – Stereographic Wedge Analysis Results

CALCULATED INTERSECTIONS							
	PLANE 1		PLANE 2		INTERSECTION LINE		
NUMBER	STRIKE	DIP	STRIKE	DIP	STRIKE	DIP	ENCLOSED ANGLE
1	N 22 E	82 E	N 65 W	90 W	S 65 E	82 E	93
2	N 22 E	82 E	N 40 W	09 W	S 21 W	08 W	94
3	N 22 E	82 E	N 75 W	23 E	N 25 E	23 E	95
4	N 65 W	90 W	N 40 W	09 W	N 65 W	04 W	82
5	N 65 W	90 W	N 75 W	23 E	N 65 W	04 W	113
6	N 40 W	09 W	N 75 W	23 E	N 66 W	04 W	149

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the strong "steep" joint set, both of which have relatively close spacing. Consequently, very few tabular slabs are being created in the existing or planned quarry slopes. No examples of toppling mode failures have been noted to occur on the relatively weak, irregular joint set designated Joint (Flat1) in the existing Quarry 3. Toppling failure along the North Endwall is therefore unlikely.

ROTATIONAL SHEAR MODE. The North Endwall is more complex than the West Sidewall or the East Sidewall because it has previously been mined over many years. The previous mining has been done from about the 6000 foot elevation down to the 5500 bench. From the 5500 Bench down to the 5300 Bench the mining will be done in accordance with the planes specified in this report. The plans specify that a 75-foot stepout will be made on the 5500 Bench. In addition an 8-10 foot berm will be placed on the crest of the 5500 Bench to prevent rock falls from passing to lower benches. Consequently, rotational shear analyses has been conducted for the upper slope and new lower slope (slope between the 5500 Bench and the 5300 Bench) as a total single slope. Also, a similar analyses has been conducted on the new 45° slope between the 5500 Bench and the 5300 Bench. The analysis results yield a static safety factor or 1.59 for the total slope and a safety factor or 2.79 for the new lower 45° slope. Under earthquake loading (pseudo-static) conditions the entire slope has a safety factor or 1.28. Under similar conditions the lower new slope safety factor of 2.41. These analyses results indicate that the North Endwall satisfies the minimum safety factors required.

BENCH SHALE UNIT WEATHERING. The Red Marker Shale, the Red Shale and the Green Shale found in the North Endwall have historically been relatively stable when initially mined. After exposure to atmospheric moisture they tend to ravel and form rubble piles below on each bench at the angle of repose. Such raveling is expected to continue in the future, but is not a major safety concern. The wide catch benches and periodic bench cleaning should minimize any related rock fall safety problems.

West Sidewall.

PLANAR MODE. A stereographic plot of the West Sidewall showing the quarry slopes and bench face angle, as well as the three prominent structure sets is presented in Figure 18. There are no structures (bedding nor joints) that undercut or daylight this sidewall. Consequently, planar failure is not expected in this quarry area.

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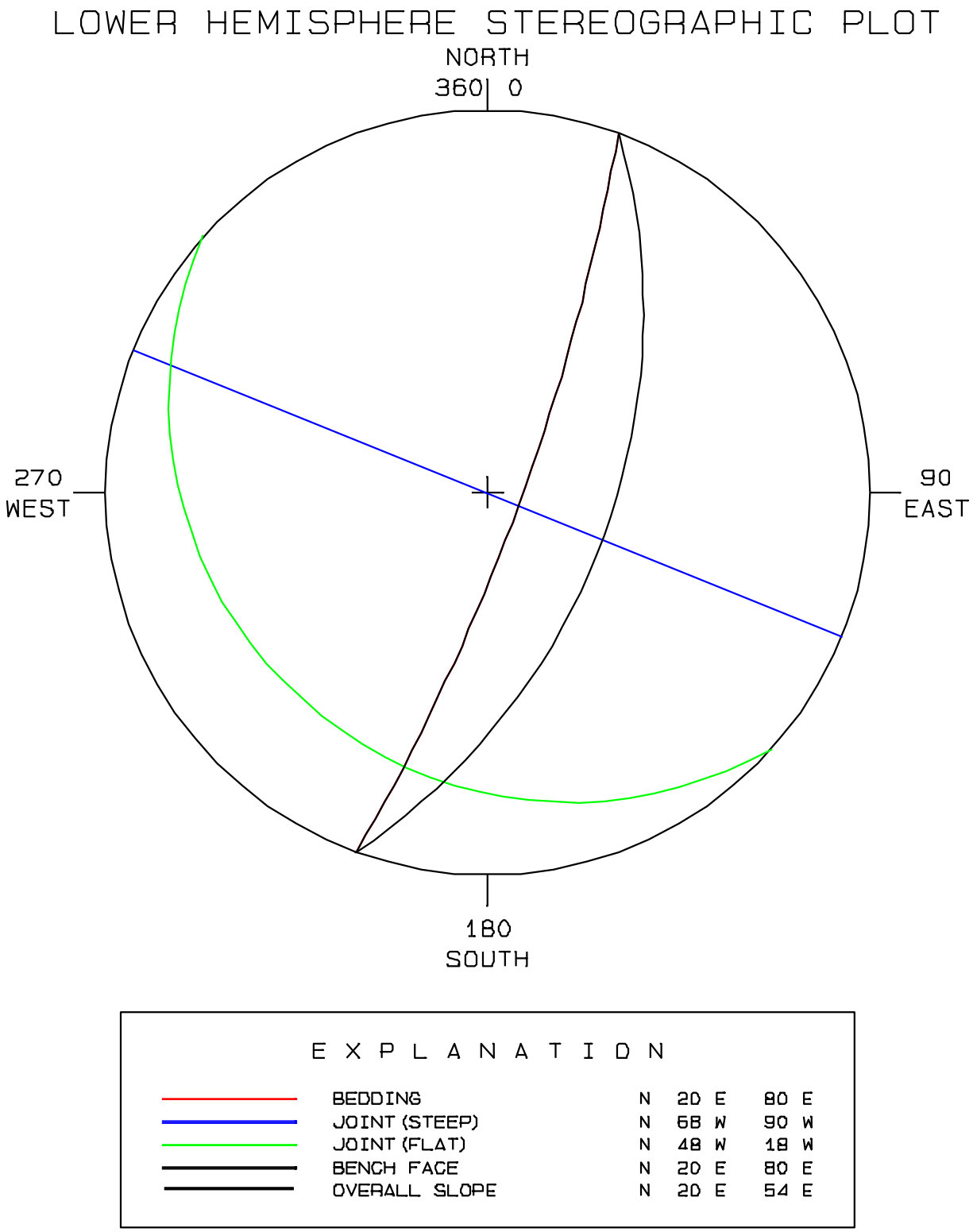

FIGURE 18
WEST SIDEWALL - STRUCTURE AND SLOPE

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WEDGE MODE. The stereographic plot in Figure 18 shows three sets of intersecting structures, labeled 1, 2 and 3. None of these wedges undercut the quarry slope as shown in the summary of the wedge analyses presented in Table XIII. Therefore, no wedge failure is expected in these slopes.

TOPPLING FAILURE. Further review of Figure 18 shows that the bedding and bench face dip in the same direction and at exactly the same angle of 80°. Tabular blocks are created along the benches and they lean against one another tilting off vertical 10° into the slope wall. However, there are no orthogonal structures that create an outward sloping base on which toppling into the quarry could occur. Consequently, toppling failures are not expected in this sidewall nor have they been observed during on-going mining.

ROTATIONAL SHEAR MODE. Analysis of the sidewall using the computer code MCSLOPE yields a safety factor of 1.76 for static conditions. Under earthquake loading conditions (pseudo-static) a safety factor of 1.51 is calculated. Both of these magnitudes meet the minimum required safety factor magnitudes. Therefore, rotational shear failure is not expected in this sidewall.

East Sidewall.

PLANAR MODE. The stereographic plot of this sidewall is presented in Figure 19. The flat joint set, Joint (Flat1), undercuts the overall and bench face slopes. However, the joint strike direction is not within the required ±20° of the slope strike, i.e., 52° > 20°. Furthermore, the dip of the joint plane is 21° less than the assumed joint base friction angle, i.e., 9° < 30°. No other structure undercuts the East Sidewall and consequently, planar mode failure is not expected and has not been observed to date.

WEDGE MODE. The Figure 19 stereographic plot shows that there are three wedge sets created in this sidewall. The ones created that involve the bedding, numbers 1 and 2 in Figure 19, are not daylighted in this slope. The wedge (number 3), which results when the Joint (Steep) intersects the Joint (Flat), has an intersection that dips some 26° less than the base friction angle, i.e., 4° < 30°. A summary of the wedge analysis results is given in Table XIV. Wedge mode failures, consequently, are not expected in this sidewall.

TOPPLING MODE. In reference to Figure 19, the strongest set of discontinuities, the bedding, tilts out of the bench face about 3° from vertical.

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TABLE XIII

WEST SIDEWALL – Stereographic Wedge Analysis Results

CALCULATED INTERSECTIONS							
	PLANE 1		PLANE 2		INTERSECTION LINE		
NUMBER	STRIKE	DIP	STRIKE	DIP	STRIKE	DIP	ENCLOSED ANGLE
1	N 20 E	80 E	N 68 W	90 W	S 68 E	80 E	92
2	N 20 E	80 E	N 48 W	18 W	S 17 W	16 W	93
3	N 68 W	90 W	N 48 W	18 W	N 68 W	06 W	73

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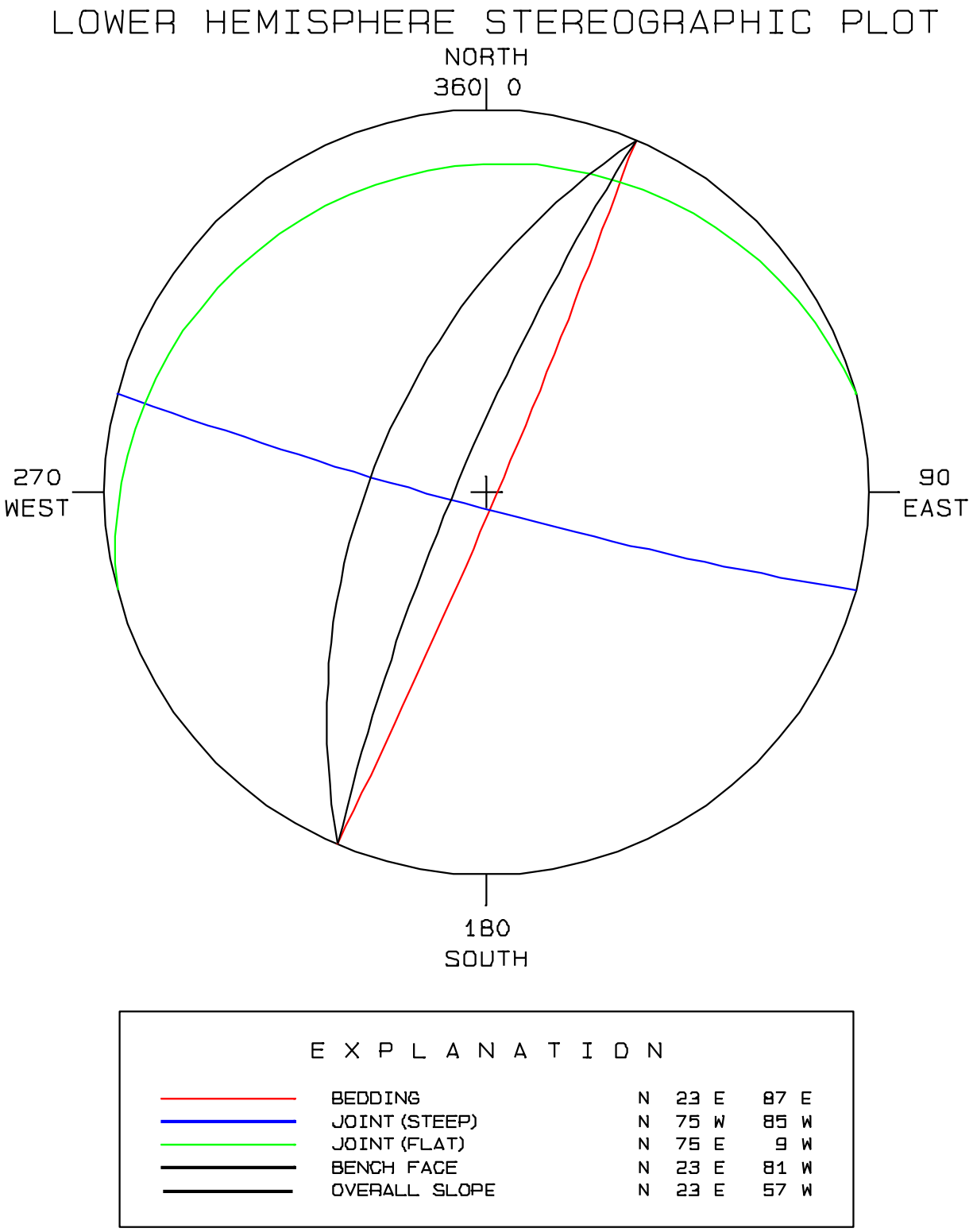

FIGURE 19
EAST SIDEWALL - STRUCTURE AND SLOPE

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TABLE XIV

EAST SIDEWALL – Stereographic Wedge Analysis Results

CALCULATED INTERSECTIONS							
	PLANE 1		PLANE 2		INTERSECTION LINE		
NUMBER	STRIKE	DIP	STRIKE	DIP	STRIKE	DIP	ENCLOSED ANGLE
1	N 23 E	87 E	N 75 W	85 W	S 10 E	84 E	98
2	N 23 E	87 E	N 75 E	09 W	N 23 E	07 E	87
3	N 75 W	85 W	N 75 E	09 W	N 75 W	04 W	87

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Furthermore, the bedding is cut by the joint set, Joint (Steep), at almost 90°. These joint intersections provide ample "release" surfaces for potential toppling slabs. Joint set, Joint (Steep), and joint set, Joint (Flat), have an intersection line striking N 75° W and dipping 4° W. In essence, these conditions suggest that tabular slabs may topple out of the bench faces. To understand the potential toppling problems in Quarry 3 consider a theoretical block model of a bench where the bedding has a vertical dip, the bench face angle is 90° and the tabular blocks rest on a base tilting out of the quarry wall at ψ equal to 4°. For such a model, toppling would occur when the block width (b) to block height (h) ratio is less than Tan ψ or Tan 4°. For various bench block heights stable and unstable blocks would occur when the block width falls under the toppling failure envelope shown in Figure 20. For example, with a 50-foot high block (full bench height), the width of the block cannot be more than approximately 3½ feet. For a 25ft high block the block width must be less than approximately 1¾ feet. In other words, the tall slender blocks will fail while the short width ones will not. The key is that the centroid gravity vector must pass through or be beyond the lower quarry side corner of the block or mathematically b/h $<$ Tan ψ. Now consider the block toppling model shown in Figure 21. This model represents approximately a cross-section in the East Sidewall in Quarry 3. The benches will be 50 feet high, 25 feet wide and have presplit 81° bench face angles. The bedding dips at 87° E (3° off vertical). The flat joint set, Joint (Flat 1), will create a bench tilt at 4° above horizontal (as per the wedge intersection line number 3 in Table XIV). The triangular block ABC will be one of the tallest bench size blocks created. This block ABC has a centroid at "x" with gravity acting down vertically. As noted, the gravity vector does not pass through point A or to the left of A, but rather passes through line AC. This means the triangular block will not topple. Smaller versions of triangular blocks such as block ADE, likewise will not topple. Had the bench face angle been at 90°, rectangular blocks would have been created and toppling may have occurred on small width blocks approximately as demonstrated in Figure 20. Consequently, it is imperative that the planned 81° bench face angle be implemented along the East Sidewall. Such a bench face angle will greatly reduce or even eliminate the potential for bench face block toppling.

ROTATIONAL SHEAR MODE. Analysis of the East Sidewall using the computer code MCSLOPE yields a safety factor of 1.66 for static conditions. Under earthquake (pseudo-static) loading conditions a safety factor of 1.44 is computed. Both of these magnitudes meet the minimum required safety factor magnitudes. Therefore, rotational shear failure should not be expected in the East Sidewall.

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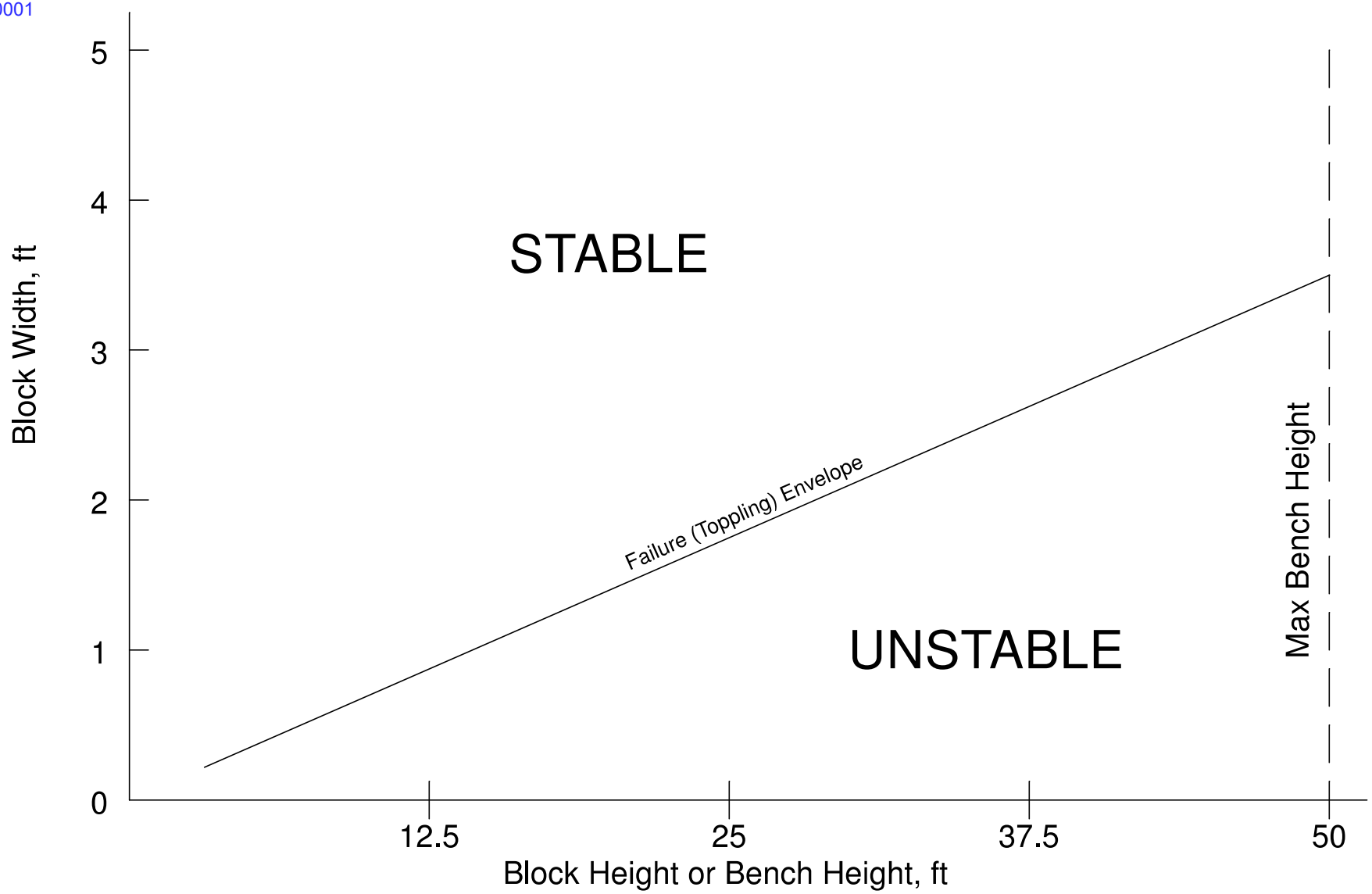

Figure 20

East Sidewall - Theoretical Toppling Block Model

4° Base tilt, 90° Bench Face Angle & 90° Bed Dip

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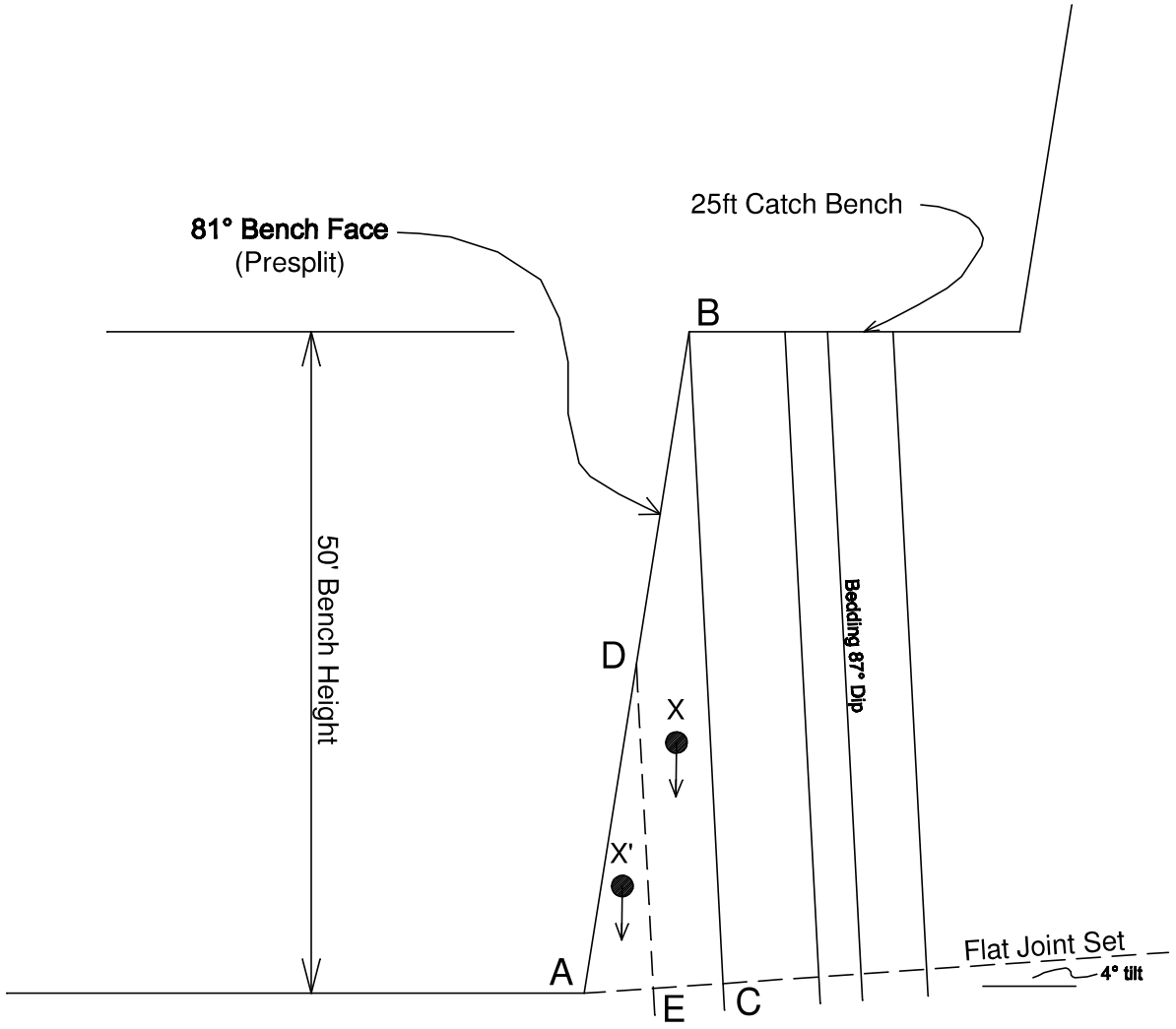

Figure 21

East Sidewall - Bench Toppling Model

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Quarry 3 Analysis Summary. Significant planar or wedge mode failures are not expected in the North Endwall nor the West Sidewall based on the mining plan HOLCIM has proposed. In the East Sidewall no planar mode failure potential is known to exist. However, some wedge-forming structures have been noted in the past (as mentioned in the discontinuities consensus section in this report). These noted wedges may or may not occur in the future, but caution should be used and the slopes should be periodically examined for adversely oriented structures. Significant toppling mode failure is not expected in the North Endwall nor in the West Sidewall. Some minor potential exists in the East Sidewall, owing to the dip of the bedding and the flat joint set, Joint (Flat). Periodic structural evaluations, on a monthly to bi-monthly, schedule should be conducted to ensure that safe working conditions prevail. Rotational shear failure should not occur in any of the slopes, based on the fact that the safety factors relative to slope failure far exceed those required by the regulatory authorities. A summary of all the analyses results is presented in Table XV.

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TABLE XV

QUARRY 3 ANALYSIS SUMMARY

	FAILURE POTENTIAL OR SAFETY FACTOR		
Failure Mode	**North Endwall**	**West Sidewall**	**East Sidewall**
Planar	None	None	None
Wedge	None	None	Minor
Toppling	None	None	Minor
Rotational Shear (Static)	1.59	1.76	1.66
Rotational Shear (Pseudo-Static)	1.28	1.51	1.44

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STABILITY AND SAFETY IMPROVEMENT PROCEDURES

Discontinuity Data Collection-An Ongoing Necessity

Perhaps the single most-important item that should be addressed is the continued collection of discontinuity data. If significant future slope failures occur, they are very likely to be related to the bedding/joint discontinuities. Consequently, such data should be collected. These data should include, as a minimum, strike and dip, mapped location, trace length and infilling type/thickness. Such information should be stereographically evaluated on an on-going basis and used to predict potential problem zones in the quarry walls. Such data should be collected as each new bench face is exposed or more often, if needed, to continually monitor potential instability. Adversely oriented structures will require HOLCIM to reevaluate the slope stability to ensure that a minimum static safety factor of 1.25 is maintained.

Blast Damage Reduction

As the Interim Quarry 3 mining phases continue and final benches are developed in the North Endwall, West Sidewall and East Sidewall, the use of blast damage reduction techniques will become important to preserve bench stability. As HOLCIM now plans, the East Sidewall will be presplit on each 50-foot bench as the final wall is developed. The bench face slopes are to be mined at 9° off vertical to produce an 81° bench face angle. Success of the presplit rock is imperative to achieving stable bench faces and eliminating rock falls in the East Sidewall. Along the North Endwall, presplitting is not considered absolutely necessary, because the slopes are not final slopes and will be mined again in the future. Each bench will have a 50-foot width to contain rockfalls. However, the elimination of sub-grade drilling is recommended as the highwall is developed. Blast holes along the bench faces should be buffered to reduce bench face damage. In the West Sidewall mining will follow the bedding and good, smooth bench faces have so far been developed. The procedures used to achieve these benches in the West Sidewall need to be continued. In all Quarry 3 slopes that will stand for a number of years, buffer blasting should be used as well as elimination of sub-grade drilling. The damage reduction techniques shown in Figure 22 need implementation in Quarry 3.

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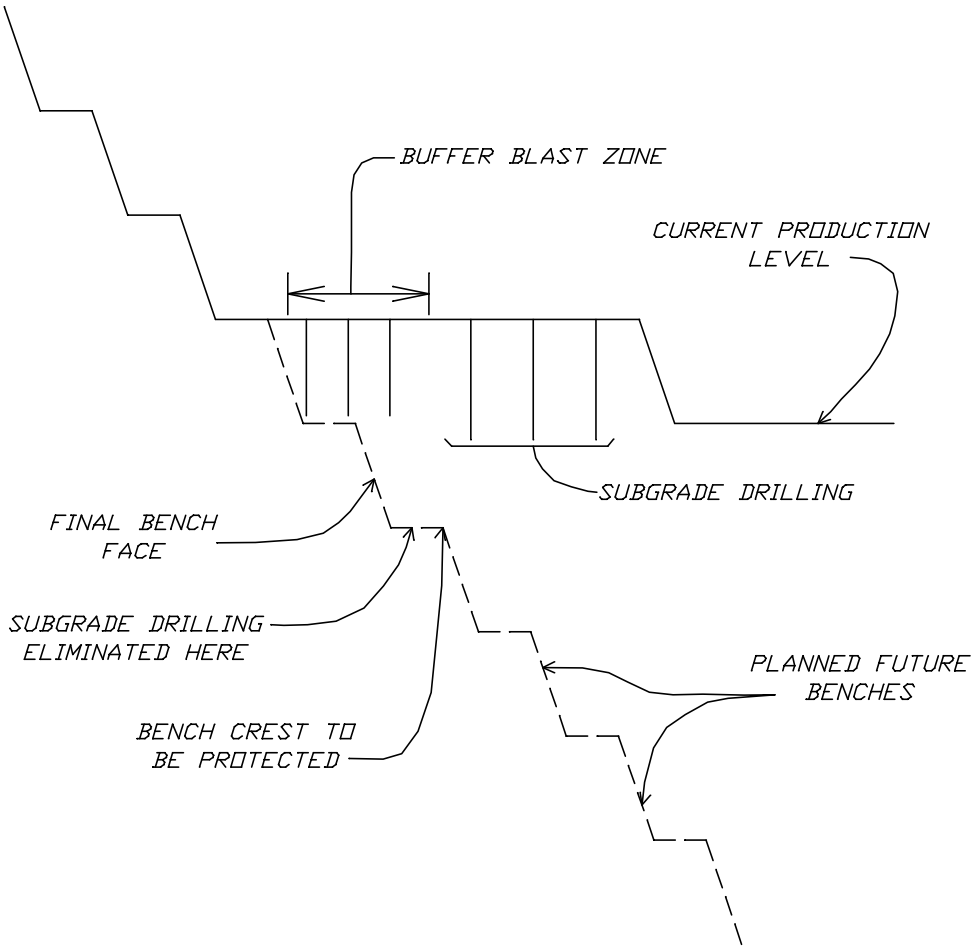

Figure 22

Typical Blast Damage Reduction Techniques

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Catch Bench Overdigging and Rockfalls

During the past five years, the mining process in Quarry 3 has resulted in overdigging[18] individual benches causing bench width to be reduced to as little as five feet or less. Such overdigging almost completely eliminates the catch benches which must exist to impede rock falls. With the mining plans presently in place, no overdigging should occur in any highwall. However, equipment operators must be made aware by mine management of the safety problems created by bench overdigging. One of the most dangerous safety issues in the future Quarry 3 highwalls will be rock falls. Any overall slope at an angle in excess of 45° is potentially susceptible to unstable material falling far down the quarry slopes. The highly jointed and closely bedded limestones will naturally result in the creation of many potentially unstable rock blocks. A major effort to lesson and prevent dangerous rock falls can be augmented with careful blast damage control and bench overdigging elimination.

Catch Bench Cleaning and Berming

One problem that has existed for years in Quarry 3 is that the catch benches have filled with rock fall rubble. Consequently, lower catch benches have lost much effectiveness in stopping rock falls from upper benches. This problem was discussed with HOLCIM personnel and they have assured[19] *Seegmiller* that periodic bench cleaning with be undertaken as part of future Quarry 3 mining. In addition, the use of a bench crest berm on each catch bench would further impede rock falls passing over more than one bench.

Surface Water Runoff Diversion

Surface runoff water should be diverted from the quarry and not allowed to enter the final slopes. A slope with marginal safety could fail catastrophically if runoff water were to enter it. Little adverse surface drainage is expected due to the site geometry. However, any diversion ditches used at the site must drain water *away* from the quarry and not serve as catchment channels allowing water to seep into the quarry slope crest.

Groundwater Depressurization and Monitoring

The stability conclusions and slope safety factors developed in this study are based on achieving effective depressurization in the highwalls. Based on the present

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data, groundwater is not expected in the quarry slopes. However, should groundwater be encountered it needs to be removed, if possible. Saying that it will be done is easy but, in actuality, effective depressurization may not be achieved. The question arises as to what slope angle should be used if getting the desired depressurization is impossible, impractical and/or uneconomical. To determine what slope angles should be used, when drainage is only partially effective, further stability analysis is required. For a given slope zone of relatively constant height and realistic water drawdown, an evaluation of proper slope angle or angles can be made. However, in order to show that groundwater pressurization is not a problem over the life of Quarry 3, the placement of monitoring wells or piezometers is strongly recommended. Such piezometer placement has been discussed[19] with HOLCIM and they have agreed to do it. The location of these monitoring devices should be in a location that both HOLCIM and Qualified Personnel, chosen by HOLCIM, agree to. Groundwater elevations in the highwalls must not exceed an elevation of 5300 feet. If that elevation is exceeded in the monitoring wells, further stability analyses will be required by HOLCIM to ensure that a static slope safety factor of 1.25 is maintained.

Daily Visual Monitoring and Periodic Stability/Safety Reviews

As the quarry slopes are created, they should be inspected daily for tension cracks and other signs of instability. Instability signs also may include slope dribbling, increased rock falls, bench displacement or water seeps. Depending on the severity of the instability, MSHA and /or an outside stability consultant should be contracted to inspect the incident and provide safety recommendations. In any event bi-monthly stability/safety reviews should be conducted by an outside stability consultant to ensure that a dangerous rock instability problem is not developing in the quarry.

Long Term Displacement Monitoring

As the highest quarry slopes are developed, a small network of displacement monitoring points should be established on the upper benches. All points should be monitored at least every other month to start and then the schedule should be adjusted, as necessary, based on ground movement trends (i.e., more closely spaced monitoring intervals would be needed due to adverse ground movement). The monitoring points should be fixed and spaced about 50m apart along the slope crest. Collected data should be plotted on a time versus cumulative displacement graph and on a time versus average daily velocity graph. Upward-tending curves may suggest potentially adverse displacement. A second set of monitoring points may be desired

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at ⅓ to ½ the way down the highest quarry walls. Recommended procedures[20] for handling displacement data and learning the meaning of the data relative to stability are outlined in the cited reference.

Safety Precautions

As mining takes place, management should give the highest priority to safety. Adequate safety measures should be in place to prevent injuries/fatalities to individuals on safety benches or near highwalls. In no event should any personnel be allowed to go on a bench crest, which could fail, or near the toe of a highwall, where rock falls could occur.

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RECOMMENDATIONS

The following items summerize the stability safety recommendations for the Interim Quarry 3 mining

- *Collect discontinuity data* as each bench is exposed or if adversely oriented structures are observed in the quarry benches. Of particular importance are the existence of any such structures in the East Sidewall. If adversely oriented structures are found, a safety reevaluation will be required to ensure that a minimum static slope safety factor of 1.25 is maintained.

- *Prevent blast damage and related rock falls* on each bench using presplit, buffer and/or other procedures.

- *Do not overdig bench faces* reducing bench widths and contributing to rock falls.

- *Cleanup bench debris* periodically to reduce rock falls

- *Use bench crest berms to reduce rock falls*

- *Divert surface water runoff*

- *Place water level monitoring wells* to ensure that the groundwater elevation does not exceed the 5300-foot elevation. If it does, a reevaluation of slope stability must be undertaken to ensure that a minimum static slope safety factor of 1.25 is maintained.

- *Have periodic stability/safety reviews* by qualified personal

- *Perform daily visual stability monitoring*

- *Undertake long term slope displacement monitoring*

- *Do not allow mine personal* on potentially unstable bench crests nor directly under potentially unstable bench faces

- *Implement safety rules and procedures* relative to highwall stability

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2010

Holcim (US) Devils Slide Quarry Interim Drainage Study

Prepared For:

Holcim

Holcim (US)

6055 E. Croydon Rd.

Devils Slide, UT 84050

Prepared By:

InfoMaption, Inc.

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3/29/2010

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Appendix A – Hydrology

Appendix B – Hydraulic Calculations

Appendix C – Typical Details

Appendix D – Holcim (US) Devils Slide Best Management Practices

Appendix E – Plate H

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Ph. 970-581-3131

March 29, 2010

Mr. Mike Toelle
Senior Mining and Raw Materials Specialist
3500 Highway 120
Florence, CO 81226

RE: Devils Slide Quarry Interim Drainage Plan

Dear Mr. Toelle

Provided herewith is the interim drainage plan for the Holcim Quarry Area in Devils Slide, Utah. This study was conducted based on the scope of work as presented to you on December 11, 2009.

InfoMaption Inc. appreciates the opportunity to provide engineering consulting services for this project. If you have any questions or if we can be of further service please contact us at (970) 581-3131.

Sincerely,

InfoMaption Inc.

PROFESSIONAL ENGINEER
No. 7325473-2202
TIMOTHY R. MATHER
STATE OF UTAH

Timothy R. Mather PE

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1 Introduction

This Study identifies interim drainage improvements for the Holcim (US) Devil Slide Quarry (project site). The Holcim (US) Devil Slide Quarry is located in Morgan County, Utah. The area of Devils Slide is in reference to a prominent geologic limestone formation running North-West South East through the quarry area. Figure 1.1 shows the project area including both Holcim Quarry and Plant areas.

The Holcim Devils Slide mining and cement production facility has been in operation since 1907 and produces Portland Cement and clinker. The project site is situated at the confluence of the Weber River and Lost Creek more specifically located within Township 4 North, Range 4 East, Sections 18 and 19. The interim drainage plan includes the detailed analysis of drainage for the site and makes recommendations for drainage improvements to control stormwater runoff and erosion during the period of active mining within quarry.

The interim drainage study project site includes the Holicm Quarry area only and does not consider drainage for the Holcim Plant area. Figure 1.2 shows the extent of the quarry area including the Holcim property boundaries.

2 Historic Drainage

Historically, runoff from the project site was in the form of overland sheet flow concentrating in small rills, gullies and intermittent streams in route to the Weber River and Lost Creek. Currently quarry terrain directs all stormwater to the Weber River. An intermittent stream named Quarry Hollow transects the Devils Slide Quarry area. Quarry Hollow historically concentrated much of the runoff on the western portion of the quarry and discharged to the Weber River. Native vegetation within the project site includes perennial grasses and sage brush.

Flows of both Weber River and Lost Creek are controlled by the United States Bureau of Reclamation's (USBR) Weber Basin Project. This USBR project built several dams on both the Weber River and Lost Creek. Peak flows in the Weber River have been significantly reduced by the construction of Echo Reservoir and Wanship Reservoir (a.k.a. Rockport Lake). In addition, the USBR's construction of Lost Creek Dam in 1967 now controls flow within Lost Creek upstream of the Holcim quarry. Currently there is no Federal Emergency Management Agency (FEMA) Regulatory Floodplain for either the Weber River or Lost Creek near the project area.

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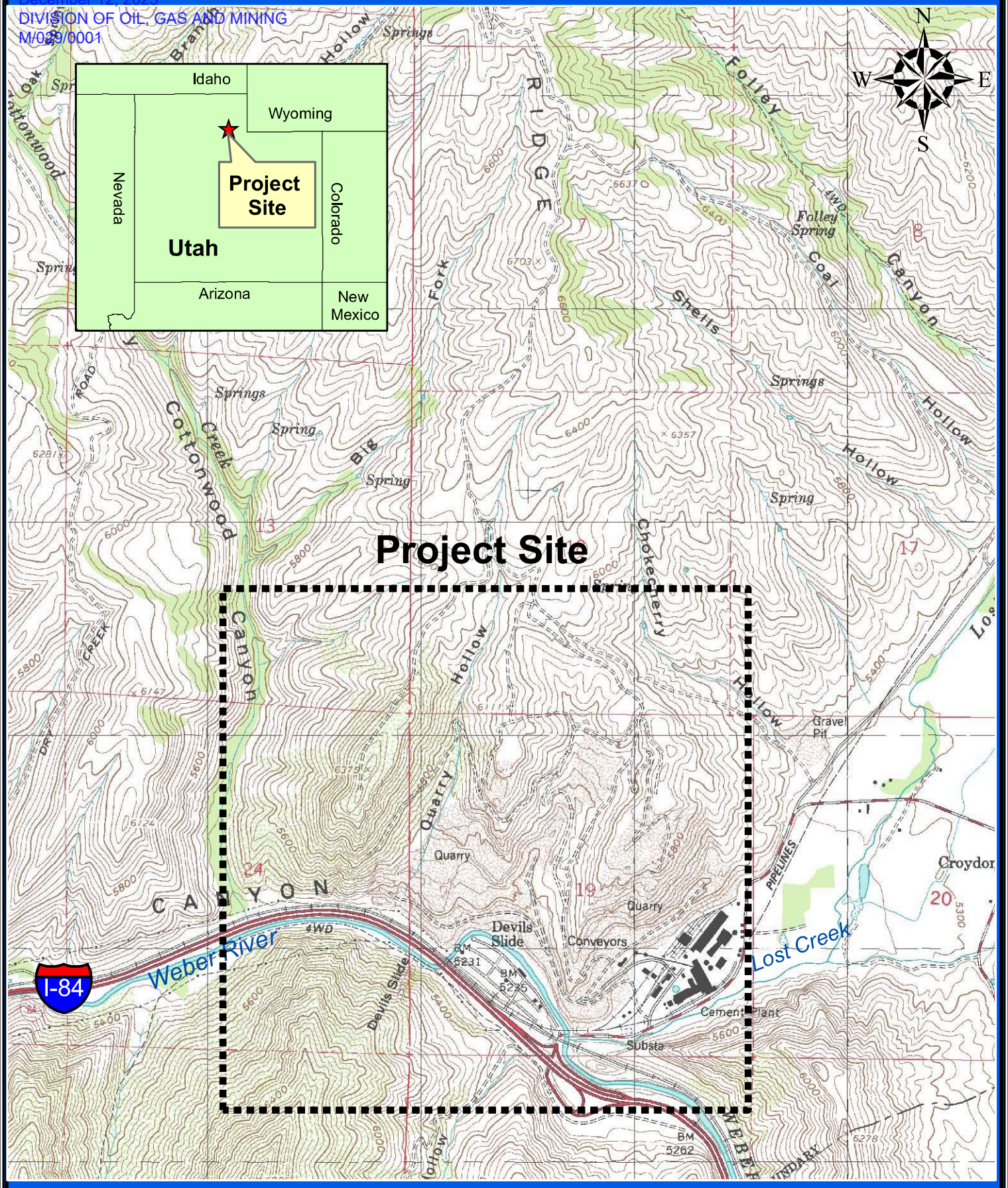

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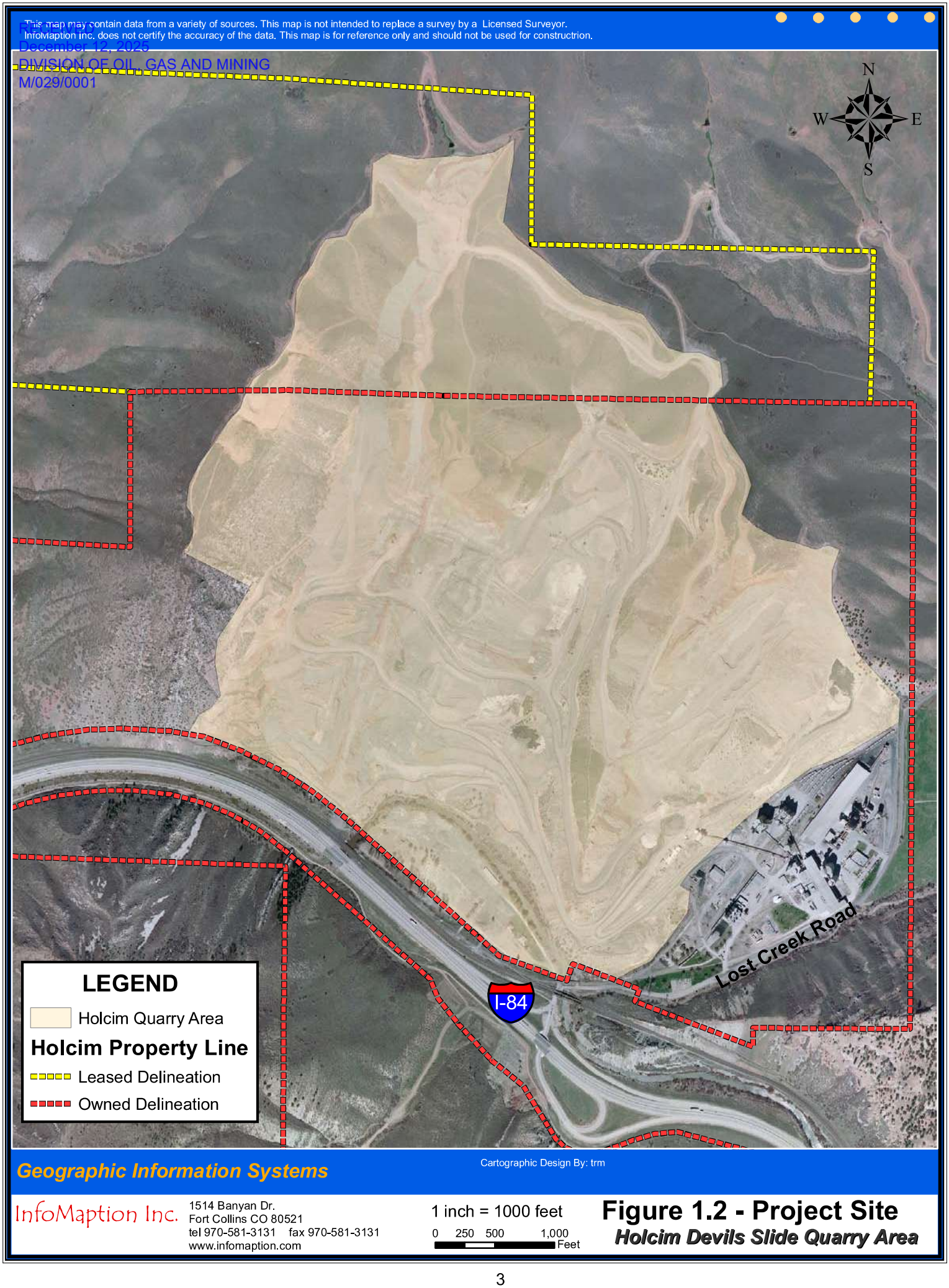
Figure 1.1 - Area Map

Holcim Devils Slide Interim Drainage Study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LEGEND
Holcim Quarry Area
Holcim Property Line
Leased Delineation
Owned Delineation
I-84
Lost Creek Road
Geographic Information Systems
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1 inch = 1000 feet
0 250 500 1,000
Feet
Figure 1.2 - Project Site
Holcim Devils Slide Quarry Area

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3 Existing Drainage

The existing drainage area for the Holcim Devils Slide quarry is approximately 570 acres and includes both disturbed and undisturbed areas. All stormwater drainage from the project site is directed to existing detention ponds. Stormwater flows in the form sheet flow and shallow gutter flow in gulley, haul road side ditches and overland to existing detention ponds.

The quarry consists of excavation areas, overburden fill areas, haul roads and undisturbed areas with native vegetation. The quarry incorporates two existing detention ponds to catch stormwater before it exits the site. Detention pond PND-7BE is approximately 0.5 acres in area with an average depth of about five (5) feet. This pond accepts stormwater runoff from central and eastern portion of the quarry between the plant area and the Quarry Hollow drainage. Inflow to the pond is channelized alongside the southern edge of the access road leading down to the pond.

Existing detention pond PND-8E received stormwater mainly from the Quarry Hollow drainage portion of the quarry area. Pond PND-8E is approximately 0.15 acres in area with a depth of about 3 feet. The pond lacks a well defined channel to concentrate flow and receives flow in the form of shallow gutter flow and overland flow. Figure 1.3 shows the locations for ponds PND-7B and PND-8.

3.1 Previous Studies

Previous studies include a memorandum report produced by Holcim (formally Ideal Cement) dated May 8, 1987 (ACT/029/001). This report detailed the site hydrology and reporting requirements of the Mined Land Reclamation Act, Title 40-8 and rules established by the Utah Division of Oil, Gas and Mining (DOGM). A second report entitled “Application to Revise Mining Operation Permit, Holcim (formally Holnam), Inc. Devils Slide Mine, M/029/001, Morgan County Utah” was produced in 2001 outlining an expansion to the quarry area and details for an amendment to the Large Mining Operation (LMO) permit.

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1 inch = 300 feet

0 50 100 200 300 Feet

Figure1.3 - Existiing Devils Slide Drainage

Quarry Area Existing Detention Ponds

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4 Design Criteria

Design criteria for the interim drainage plan were formulated through coordination with the Utah DOGM. The design storms used for the Devils Slide Interim Drainage Plan were based on the 25 and 50-year 6-hour statistical rainfall event. Conveyance elements for the interim drainage design were sized for the 50-year storm event. Stormwater drainage improvements incorporate detention and retention ponds to capture stormwater run-off and hold it or treat it before leaving the site.

Department of the Interior's Surface Mining Water Diversion Design Manual was used in the design of hydraulic structures and some conveyance facilities. Urban Drainage and Flood Control District (UDFCD) Drainage Criteria Manuals 1, 2 and 3 were also referenced for sizing conveyance facilities, identifying erosion control measures and Best Management Practices (BMP). Finally, the Utah Department of Transportation Roadway Design Criteria was reference in developing roadway profiles to allow proper drainage across haul roads.

5 Hydrology

As a part of the study, hydrologic modeling was performed in order to evaluate the precipitation-runoff relationship for the site. The precipitation-runoff characteristics consider:

- Statistical rainfall depths,
- Terrain,
- Land use and land cover,
- Time of Concentration and
- Soil types.

For this study, the Army Corps of Engineers HEC-HMS model was used to evaluate the hydrology of the site. The Natural Resources Conservation Service (NRCS) (formally the Soil Conservation Service) SCS Unit Hydrograph method was used to estimate the peak runoff rates and total flow volumes for different return intervals for each sub-basin within the site. The SCS Unit Hydrograph Method is one of the most widely accepted synthetic unit hydrograph methods and was determined appropriate for the Holcim Devils Slide drainage analysis. This method uses a dimensionless single-peak unit hydrograph developed empirically from a large number of small watersheds throughout the United States. Loss rates for the site were determined using the Green and Ampt Loss Method.

The hydrologic model incorporates different parameters that account for and quantify runoff rates and total volumes for each sub-basin. In constructing the HEC-HMS model, many parameters were extracted from Geographic Information Systems (GIS) data sources. The following is a list of data used with sources in order to establish many of the parameter in the hydrologic model.

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- Terrain
  - 2009 Orthographic mapping from Aero-Metric.
  - National Elevation Dataset (NED) provided by the USGS.
- Soils Data – Natural Resources Conservation Service (formally Soil Conservation Service).
- Orthographic Aerial Photographs – Aero-Metric.
- NOAA Atlas 14 Precipitation for Arizona, Nevada, New Mexico, Utah and Southern California- National Oceanic and Atmospheric Administration.

The hydrologic analysis determined runoff peak flow rate and volumes from quarry area for the 10, 25, and 50-year 6 hours statistical rainfall events.

Stormwater ponds and conveyance facilities including channels and spillways were size using the US Environmental Protection Agency's (EPA) Stormwater Management Model (SWMM). The SWMM model for the project was developed to rout flows through the detention ponds establishing inflow and outflow hydrographs for each pond flow were routed through.

6 Project Site Hydrology

The project site was broken down into five (5) sub-basins, each draining a defined area of the site. Figure 1.4 illustrates the sub-basin boundaries for the quarry area. The HEC-HMS model was populated with characteristic parameters for each sub-basin in order to establish outflow hydrographs for each sub-basin and boundary conditions for the SWMM model.

Sub-basins for the project site include current and projected future mining area and offsite areas draining through the project site. Portions of the Holcim Devils Slide property that will remain undisturbed and drain off site were not included in the hydrologic analysis. Sub-basin SB-10 and SB-11 are undisturbed areas contributing offsite flows though the quarry and were included in the hydrologic model.

For each sub-basin, hydrologic parameters were determined and input into the HEC-HMS model with the aid of a GIS. The GIS was used to leverage public domain information, such as soils data and precipitation information, and was used to streamline the synthesis of basin parameter for input into the hydrologic model.

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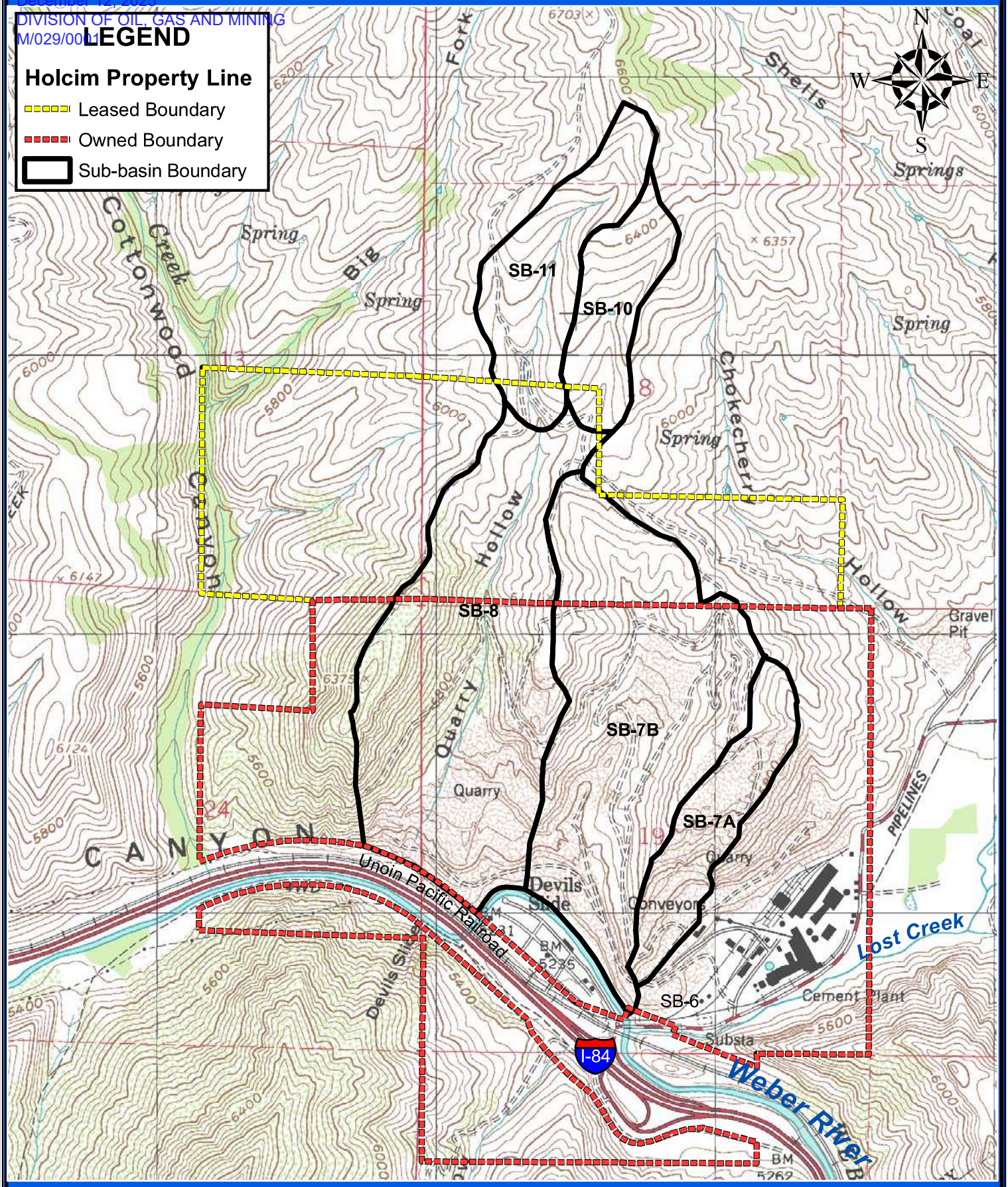

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Figure 1.4 -Quarry Sub-basin Boundaries

Devils Slide Interim Drainage Study

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6.1 Precipitation Data

Average annual rainfall totals for the project site are approximately 18-inch per year. Precipitation data incorporated into the hydrologic analysis was from the NOAA Atlas 14 for Arizona, Nevada, New Mexico, Utah and South Eastern California. Rainfall data from NOAA Atlas 14 supersede the NOAA Atlas 2 as of August 6, 2003 and was determined to be the best available information precipitation data. Table 1.1 lists rainfall depths and durations for the 10, 25 and 50-year return intervals in inches.

Table 1.1 – NOAA Atlas 14 Precipitation Depths for Devils Slide, Utah

	Statistical Rainfall Depths (in)		
Frequency	10 Year	25 Year	50 Year
5 min	0.29	0.379	0.46
15 min	0.54	0.715	0.87
60 min	0.90	1.181	1.44
2 hr	1.07	1.383	1.67
3 hr	1.18	1.491	1.77
6 hr	1.48	1.793	2.05

Aerial adjustments for the reported precipitation depths were not made because all sub-basins were less than 10 square miles which is generally considered acceptable.

6.2 Soils Information

Soils data was obtained from the NRCS for Morgan County Utah with an original publication date of 1976. Data includes both tabular and spatial formats that were overlaid on the project site in a GIS. A report of soil types for the site with descriptions can be found in Appendix B.

NRCS Soils Survey information was used to evaluate soil characteristics for the site including Hydrologic Soil Group. Hydrologic Soil Group is a classification of a soils runoff potential. The classification schema includes A, B, C and D types with A having the lowest runoff potential (highest infiltration rates) and D the highest runoff potential (lowest infiltration rates). For project site, the upper elevation areas are dominated by Type C soils while lower elevations are mostly composed of Type D soils. Figure 1.5 shows the distribution of Hydrologic Soil Group types for the project site including soils identification abbreviations.

6.3 Initial loss and Infiltration

Initial precipitation loss and infiltration effect how much precipitation will effectively runoff the site. Initial precipitation losses include the amount of rainfall captured by vegetation and stored

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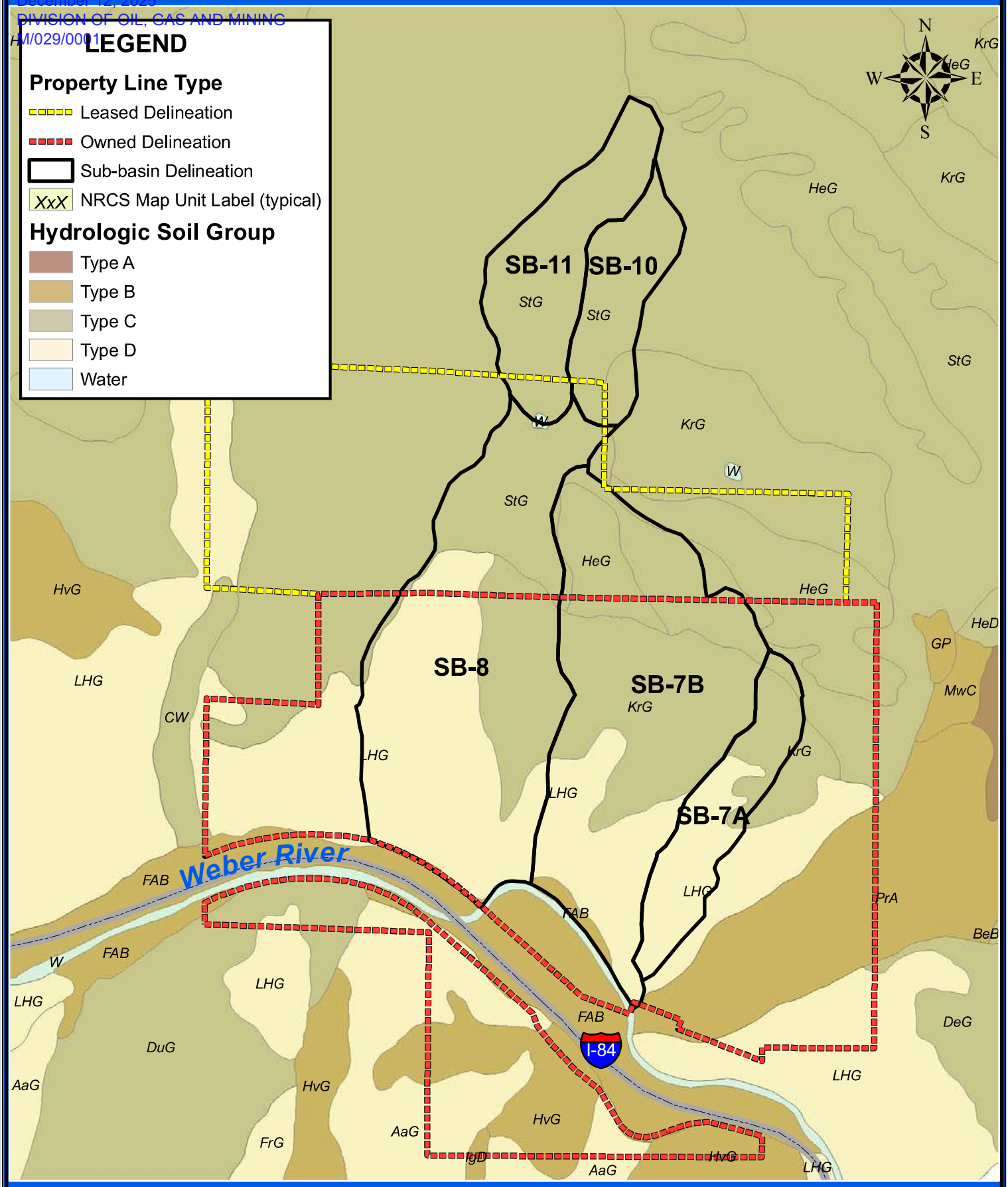

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Figure 1.5 - NRCS Soil Survey Map

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in small depressions and is not translated as effective runoff. Infiltration is the amount of precipitation that directly percolates into the soil as a function of the soil matrix over the course of the rainfall event. Initial loss and infiltration subtract from the total precipitation that falls to yield the effective precipitation that will runoff the site usually measured in inches.

For this study, the Green-Ampt Loss method was used to calculate initial and infiltration losses. The Green-Ampt method considers several variables and was considered the most appropriate method considering the amount of disturbed area and exposed soils within quarry areas. The following is the Green-Ampt Loss method equation:

$$f_t = K\left[\frac{1 + (\emptyset - \theta)S_f}{F_t}\right]$$

Where:

f_t = loss during period t;

K = saturated hydraulic conductivity (in/hr);

$(\emptyset - \theta)$ = volume moisture deficit;

$\emptyset$ = porosity;

θ = moisture deficit;

S_f = wetting suction front (in)

F_t = cumulative loss at time t.

Soil parameters for the Green-Ampt method were derived from area weighting reported values per sub-basin and from publish values for soil types founds on site. Several conservative assumptions were made with respect to initial loss and soils moisture deficit. Due to the sparse vegetation within the project area an initial loss value of 0.1 inches was used for all sub-basin with the exception of SB-10 and SB-11 were native vegetation exists. For those sub-basins an initial loss of 0.2 inches was used as the amount of precipitation than would be held in the vegetation cover and small depressions. A moisture deficit of 0.1 inches was used indicating high moisture content within the soil matrix prior to the storm event.

Infiltration rates used in the hydraulic model were derived from the NRCS soils data for the site. The low value reported in the soil survey data was used to estimate infiltration rates used in the Green-Ampt method. Infiltration rates used for the Green-Ampt method ranged from 0.4 to 0.6 in/hr.

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6.4 Time of Concentration and Basin Lag

The Time of Concentration (tc) is the time from the start of initial rainfall until 100% of the drainage basin is contributing flow to the outlet. Many methods for calculating time of concentration have been formulated, each for a specific application or set of assumptions.

For the Holcim Devils Slide drainage study, the Upland Method was used to determined time of concentration. The Upland Method was developed to estimate velocities of overland flow and shallow gutter flow for different land cover types base on terrain slope. The Upland Method was developed by the US Department of Agriculture (USDA) for basins up to 2000 ac (3.1 mi^2). This method was chosen because of the relatively small sub-basin size (0.19 mi^2 average) and the lack of well defined channels to support a concentrated flow regime. The land cover type use for determining the Time of Concentration was "Nearly bare and untilled (overland flow and alluvial fans western mountain region)".

Also, one of the most significant basin characteristics used in the NRCS Unit Hydrograph method is basin lag. Basin lag is the time from the center of mass of rainfall excess to the hydrograph peak. The NRCS has derived an empirical relationship between time of concentration and basin lag and is as follows:

$$L = 0.6\ tc$$

Where L = Basin lag (min)
tc = Time of concentration (min)

Time of concentration, basin lag and associated basin parameters are listed in Table 1.2 for each sub-basin within the project site.

Table 1.2 Basin Parameters, Time of Concentration and Basin Lag Time

Basin ID	Area (acres)	Flow Path Length (ft)	Top Elev. (ft)	Bottom Elev. (ft)	Elev. Change (ft)	Average Slope (%)	Velocity (ft/s) *	Time of Concentration T_c (min)	Basin Lag Time (min)
SB-7A	57.2	4560.0	5968	5340	628	13.8	3.7	20.5	12.32
SB-7B	219.4	6201.9	6065	5250	815	13.1	3.6	28.7	17.23
SB-8	235.1	4913.0	6010	5311	699	14.2	3.7	22.1	13.28
SB-10	49.5	3312.4	6550	6025	525	15.8	3.9	14.2	8.49
SB-11	76.4	4186.0	6625	6013	612	14.6	3.8	18.4	11.02

* Velocity per Upland Method (R. H. McCuen 2004)

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6.5 Channel Routing

Channel routing is a method used for combining sub-basin hydrographs for two or more basins. The channel routing method used in the HEC-HMS model was the Lag Method. The Lag Method does not account for attenuation of flows and simple lags one hydrograph by the routing time after the first. Channel routing between sub-basins was performed for Sub-basins SB-7A and SB-7B. Flow for SB-7A flow via haul road side ditch to the concentration point of SB-7B. Table 1.3 shows parameters used for calculating the lag time.

Table 1.3 – Lag Method Calculated Lag Times.

Reach Between SB-7A and SB-7B					
Flow Length (ft)	Upstream Elevation (ft)	Downstream Elevation (ft)	Slope (%)	Channel Velocity (ft/s)*	Routing Lag Time (min)
2940	5340	5245	3.23	3.7	13.24

* Velocities Determined by USDA Upland Method

For routing through proposed detention ponds via overflow weirs and interconnecting channels, EPA SWMM was used. The Kinematic Wave Routing Method was used to rout flows through consecutive detention ponds and calculate attenuation for flow and outflow hydrographs for each pond.

7 Interim Drainage Plan

The interim drainage plan sized stormwater ponds for the 25 and 50-year storms events. Ponds were sized depending on available space with respect to future mining operations, property boundaries and water courses. Conveyance element including detention pond spillways and channels including the outlet to the Weber River were sized for the 50-year storm event. The drainage plan incorporates five (5) stormwater ponds including 3 detention ponds (PND-7B2.1, PND7B2.2 and PND-8) located by the Weber River and two retention ponds (PND-10 and PND-11) at the upper end of the quarry. Plate H in Appendix E shows the location of proposed stormwater retention and detention facilities within the project site. The detention ponds located next to the Weber River were size for the 25-year storm because of the limited area for ponds sized to capture the 50-year event. Retention ponds at the upper end of the quarry were future mining is not projected and had no limitations on extents were sized for the 50-year storm.

The HEC-HMS model was used to establish hydrographs for sub-basins within the quarry area and the SWMM model for routing hydrographs through detention ponds at the lower end of the quarry. The objective of the interim drainage plan was for ponds that could not be sized for the 50-year storm, stormwater would be routed through consecutive detention ponds in order to

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provide water quality enhancement and attenuation of stormwater flow before discharging to the Weber River.

Sub-basin hydrographs from the HEC-HMS model were input into SWMM model to establish the boundary conditions. Ponds PND-7B2.1, PND-7B2.2 and PND-8 were sized to retain the 25-year storm event with a spillway weir section capable of passing the 50-year flow. Stormwater pond storage-area curves were derived from ponds designs and input into the SWMM model. For flows exceeding the 25-year storm, weir sections were design to outlet stormwater to channels providing conveyance to the next sequential pond. The outlet to the Weber River was sized for the attenuated 50-year flow.

Retention ponds PND-10 and PND-11 were size to retain the 50-year storm event as predicted by the HEC-HMS model. These ponds were located at the top of the quarry area to catch offsite flow from sub-basin SB-10 and SB-11 before entering the active mining area.

7.1 Hydrologic Model Results

The HEC-HMS model was run to establish outflow hydrographs and total stormwater volumes for each sub-basin. Table 1.4 summarizes HEC-HMS model results including peak flow and total volume for each sub-basin for each storm event analyzed. Peak flows are reported in cubic feet per second (cfs) and volumes in acre-feet (ac-ft). Input model parameters can be found in Appendix A. Model Element JNCT-7 combines flows from sub-basins SB-7A and SB-7B through routing reach RCH-7B.

Table 1.4 – HEC-HMS Hydrologic Model Peak Flow and Runoff Volumes

			10-Year Event		25-Year Event		50-Year Event	
Model Node ID	Model Node Type	Contributing Area (mi^2)	Peak Flow (cfs)	Outflow Total Volume (ac-ft)	Peak Flow (cfs)	Outflow Total Volume (ac-ft)	Peak Flow (cfs)	Outflow Total Volume (ac-ft)
SB-7A	Sub-basin	0.089	32.4	0.9	65.6	1.8	94.8	2.6
SB-7B	Sub-basin	0.343	91.7	3.3	189.2	6.7	275.6	9.8
RCH-7B	Reach	0.089	32.4	0.9	65.6	1.8	94.8	2.6
JNCT-7	Junction	0.432	109.9	4.2	227.3	8.5	332.0	12.4
SB-8	Sub-basin	0.367	124.1	3.6	253.6	7.2	366.6	10.5
SB-10	Sub-basin	0.077	26.9	0.5	61.5	1.2	93.2	1.9
SB-11	Sub-basin	0.119	20.1	0.6	59.8	1.5	98.3	2.4

The SWMM model was used for routing the 50-year storm hydrographs through ponds PND-7B2.1, PND-7B2.2 and PND-8 to the outlet. Figure 1.6 illustrates schematically the routing paths and associated 50-year inflow and outflow hydrographs. Table 1.5 details the SWMM model results for each model element.

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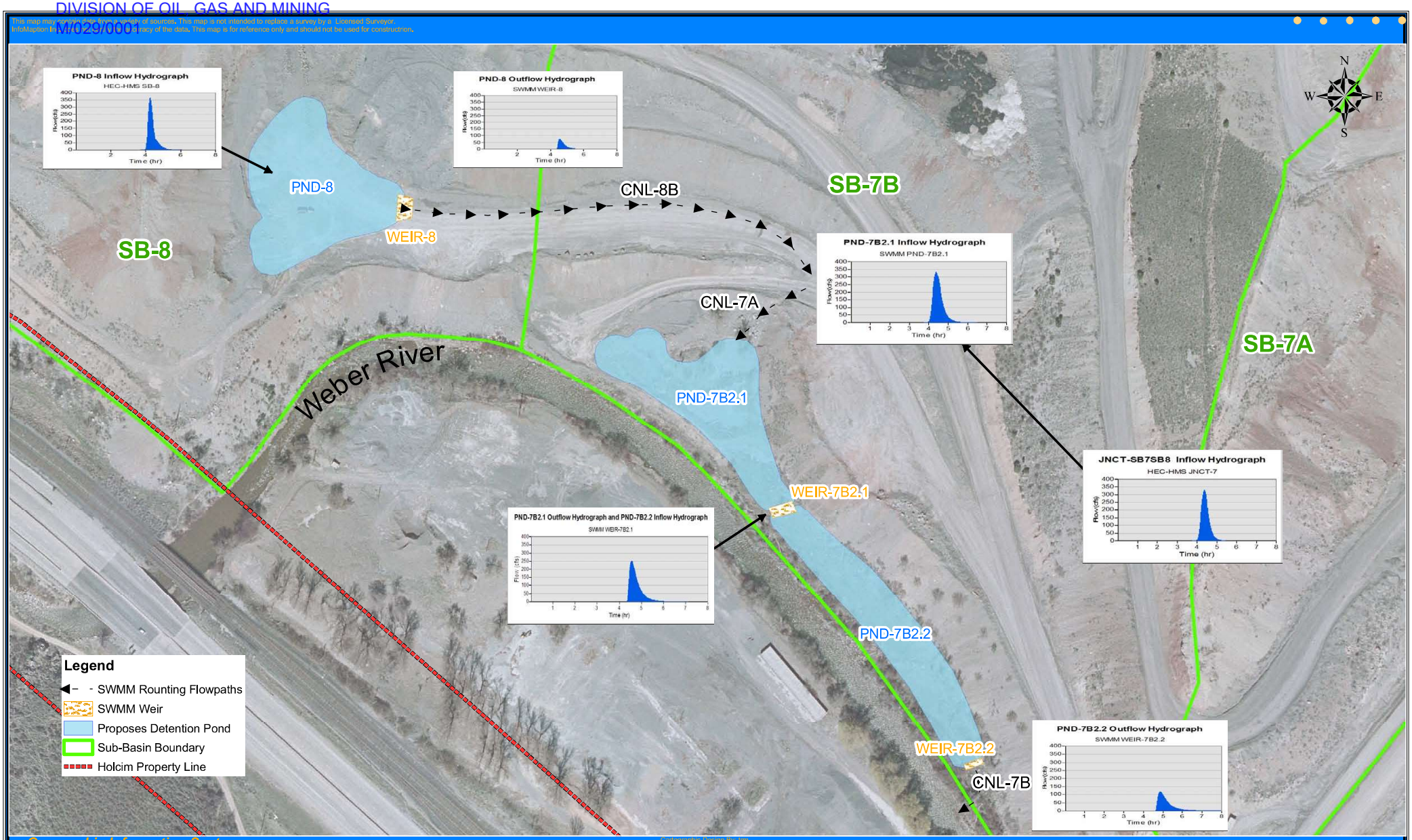

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C:\Geodatabase\Utilities\100119_GIS SWMM Model Schematic 1.4

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Figure 1.6 - SWMM Model Schematic
50-Year Return Period Routed Hydrographs

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Table 1.5 – EPA SWMM Hydrologic Model Results

Model Element ID	Peak Inflow (cfs)	Pond Peak Storage Volume (ac-ft)	Peak Outflow (cfs)
PND-8	366.6	7.2	75.7
WEIR-8	75.7		75.7
NODE-8B	75.7		75.7
CNL-8B	74.4		74.4
JNCT-SB7SB8	332.0		332.0
CNL-7A	331.8		331.8
PND-7B2.1	331.8	4.6	253.4
WEIR-7B2.1			253.4
PND-7B2.2	253.4	3.9	
WEIR-7B2.2			118.9
NODE-7B	118.9		118.9
CNL-7B	118.9		118.9
WR-OUTFALL			118.9

Detailed SWMM model output can be found in Appendix A.

7.1.1 Conveyance Facilities

7.1.1.1 Conveyance Channel, Cross-pans and Weirs Spillways

The interim drainage plan includes drainage channels, haul road cross-pans and weir sections to direct stormwater to desired locations. Channels were located to provide conveyance between storage facilities and for erosion control. Cross-pans were proposed to keep stormwater within the sub-basin in which it was generated from and convey stormwater across haul roads. Weir sections were designed to providing outlets to detention ponds while maintaining a required storage volume.

The Devils Slide Interim Drainage Plan incorporates five (5) proposed drainage channels, two (2) structural cross-pan sections and three (3) overflow weir sections. Drainage channels and weirs integrate riprap to provide channel stability. Channels and weirs were designed to convey runoff from the 50-year statistical flows as predicted by the both the HEC-HMS and SWMM models. All conveyance elements are illustrated on Plate H located in Appendix E.

Channels were sized using the both Urban Drainage Flood Control District (UDFCD) Open Channel Design Workbook and the Simplified Design Procedure as documented in the Surface Mining Water Diversion Design Manual. For channels slopes less than 5%, the UDFCD Open

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Channel Design Workbook was used and performs hydraulic calculations based on Manning's equation. For channel slope greater than 5%, the Simplified Design Procedure developed for steep channel associated with mining activities was used.

Channels were designed with 0.5 foot of freeboard. Table 1.6 details the design flow, design flow depth and dimensions for each of the conveyance channels. Detail calculations and curve information can be found in Appendix B.

Table 1.6 – Conveyance Channel Design Flows and Dimensions

Channel ID	Design Flow (cfs)	Channel Slope (ft/ft)	Bottom Width (ft)	Channel Side Slopes V:H	Flow Depth (ft)	Channel Depth (ft)*
CNL-7A	331.79	0.416	20	2:1	0.3	0.8
CNL-7B	118.90	0.015	10	2.5:1	2.0	2.5
CNL-8A	271.2	0.315	20	2:1	0.4	0.9
CNL-8B	75.7	0.010	4	2:1	1.8	2.3
CNL-10	93.2	0.096	6	2:1	0.8	1.3
* Channel depth is equal to the flow depth plus 0.5 ft of freeboard.						

Two (2) structural cross-pans located up-stream of channels CNL-7A and CNL-8A are proposed to direct stormwater across haul roads. Cross-pans were identified because they tend to require less maintenance than culvert crossings in a mining environment. Haul roads profiles in the vicinity of cross-pans will incorporate vertical curves to channel stormwater to associated conveyance facilities. Conveyance across the haul road was estimated using the UDFCD Channel Design Workbook using a cross-pan width of 16 feet with a 2% cross-slope. A detail of the proposed cross-pan can be found in Appendix C.

Weir sections are proposed at outlets to detention ponds PND-7B2.1, PND-7B2.2 and PND-8. The weir sections were modeling in SWMM. The theoretical weir equation use for the analysis takes the following form:

$$Q = 2.96 * L * H^{3/2}$$

Where: Q is the 50-year design flow (cfs).

L is the length of the weir section (ft).

H is the depth of flow over the weir (ft).

The length and height of the proposed weir outlet structures were based on the 50-year flows routed through each detention pond. Ponds were design to retain the 25-year storm flow event and discharge flows exceeding the 25-year event. Table 1.7 weir design information including peak flows for the 50-year routed storm and designed weir dimensions.

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Table 1.7 – Weir Design Parameters and Geometry

Weir ID	Design Discharge (cfs)	Weir Length (L)	Flow Depth (H)	Weir Height (ft)*
WEIR-7B2.1	253.4	30	2.0	2.5
WEIR-7B2.2	118.9	20	1.6	2.1
WEIR-8	75.7	20	1.2	1.7

* Weir height is equal to the flow depth plus 0.5 ft of freeboard.

7.1.1.2 Riprap for Channels and Weir Spillways

Riprap was identified for channels and weirs within the project area in order to provide a stable channel and resistance again soil erosion. Riprap used for the project should be dense, durable and able to withstand exposure to weathering. Rock used for riprap should be blocky in shape providing the tendency to inter-lock and resist movement. The gradation of riprap should be such that riprap has a good distribution of sizes providing a tight rock matrix were the spaces of larger stones can be filled with smaller sizes. A good gradation of riprap counters the uplifting hydraulic forces created when flow velocities are high.

The design of steep conveyance channels that are stable is critical in a mining environment were channels are often steeper than naturally occurring channels. Riprap design for steep channel and weir spillways was base on the Simplified Design Procedure. For channels less than 5%, the UDFCD Riprap Sizing Calculation Worksheet was used.

In addition, an important component to sable riprap installation is the incorporation of proper filter or bedding material. A blanket of well-graded gravel should be placed over the channel before riprap is installed. The thickness of the bedding material should be 10-inches minimum as prescribed by the design method.

The Simplified Design Procedure uses to size riprap for steep channels was developed based on experimental data. As a part of this work, design curves were developed from the relationship of flow in steep channels and stable riprap size. As a part of this experimental study, design curves were developed for channel bottom width of 0, 6, 10, 14 and 20 feet with 2 to 1 side slopes relating flow to D_{50} riprap size and flow depth (d). The method relates riprap gradation to the D_{50} and includes the following relationships:

- $D_{10} = D_{50} / 3$
- $D_{20} = D_{50} / 2$
- $D_{max} = 1.25 * D_{50}$

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Riprap channel design curves and worksheets for riprap sizing are detailed in Appendix B. Table 1.8 outlines riprap gradation required for proposed channel and weir spillways.

Table 1.8 – Riprap Size Specification for Channels and Weirs

	Rip Rap Diameter (ft) - Gradation Distribution by Weight					
Channel ID	D_{max}	D_{50}	D_{20}	D_{10}	Rip Rap Layer Thickness (ft)	Filter Material Thickness (in)
CNL-7A	3.5	2.8	1.4	0.9	3.6	10
CNL-7B	1.9	1.5	0.8	0.5	2.0	10
CNL-8A	2.8	2.2	1.1	0.7	2.9	10
CNL-8B	0.6	0.5	0.3	0.2	0.7	10
CNL-10	1.6	1.3	0.7	0.4	1.7	10
WEIR-7B2.1	3.3	2.6	1.3	0.9	3.4	10
WEIR-7B2.2	2.4	1.9	1.0	0.6	2.5	10
WEIR-8	2.3	1.8	0.9	0.6	2.3	10
WEBER OUTFALL	2.8	2.2	1.1	0.7	2.9	10

8 Erosion Control

Structural BMP's have been and will continue to be used in and around mining activity within the Holcim Devils Slide project site to control and contain erosion and protect the water quality of surrounding water courses. Additional erosion measures will be implemented in conjunction with proposed drainage features and facilities.

Erosion control structures will be designed, developed and managed to stabilize soils and control flow velocities. Where concentrated flows will occur, channel designs include proper riprap size specification for stable channels. As a general management practice and further detailed in the Best Management Practices portion of the drainage plan (Appendix D), haul road grade and overburden fill areas will be maintained as to prevent rill and gully erosion. Berms, diversions and retention ponds will be constructed in accordance with professionally recognized standards such as provided by the Utah Division of Water Quality, United State Environmental Protection Agency and the Natural Resources Conservation Service in order to minimize and contain soil erosion. Stormwater pond will be clean out regularly to maintain design volume requirements.

Haul road ditched will incorporated check dams to limit the migration of sediments and be routinely maintained to ensure proper function. Short-term erosion control measures such as silts fences, hay bales and wattles will be put in place to control erosion for interim periods were fills slope areas or temporary haul roads create steep slopes of disturbed or unconsolidated soils.

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9 Summary of Drainage Improvements

The following is a summary of proposed drainage improvements for Holcim's Devils Slide quarry area. Plate H in Appendix E of the drainage study illustrates the overall drainage plan including proposed pond facilities, conveyance structure and overflow weirs within project site.

9.1 Exhibit 9.1 –Proposed Retention Ponds PND-7B2.1, PND-7B2.2 and PND-8B

Proposed Improvements

Exhibit 9.1 shows proposed retention ponds PND-7B2.1, PND-7B2.2 and PND-8. Ponds PND-7B2.1 and PND-7B2.2 are designed to contain runoff generated from sub-basins SB-7A and SB-7B. These ponds combine for a total required retention volume of 8.5 ac-ft, 4.6 ac-ft for PND-7B2.1 and 3.9 ac-ft for PND-7B2.2.

Proposed retentions ponds PND-7B2.1 and PND-7B2.2 will work in tandem with pond PND-7B2.1 filling first and settling out sediments. If stormwater volumes exceed the capacity of pond PND-7B2.1, storm water will spill over via weir section WEIR-7B2.1 into pond PND-7B2.2. This will limit the amount of stormwater receive by pond PND-7B2.2 along with the reduction of sediment deposition and associated maintenance. Because these ponds are in close proximity to the Weber River, berms will require an impermeable layer of clay or geofabric to prevent stormwater infiltration through the berm into the river.

Proposed detention pond PND-8B concentrates and retains flows generated from sub-basin SB-8. Flow conveyed across proposed cross-pan CP-8 provides conveyance across the haul road and contains runoff generated from SB-8B with the sub-basin. Design flows to this point were proportioned by sub-basin area.

A riprap channel section CNL-8A has been design to convey the 50-year 6 hour storm event to detention pond PND-8B.

9.1.1 Design Summary

- PND-7B2.1– Design retention volume equal to 4.6 ac-ft.
- PND-7B2.2 – Design retention volume equal to 3.9 ac-ft. Required retention volume of 8.5 ac-ft for the 25-year, 6 hour rainfall event in combination with PND-7B2.1.
- PND-8 – Required retention volume of 7.2 ac-ft for the 25-year, 6 hour rainfall event.
- CP-7 – 50-year design flow of 331.8 cfs.
- CP-8 – 50-year design flow of 271.2 cfs.
- CNL-7A – 50-year design flow of 331.8 cfs.
- CNL-7B – 50-year design flow of 118.9 cfs.
- CNL-8A – 50-year design flow of 271.2 cfs.
- CNL-8B - 50-year design flow of 75.7 cfs.
- WEIR-7B2.1 – 50-year design discharge of 253.4 cfs.

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- WEIR-7B2.2 – 50-year design discharge of 118.9 cfs.
- WEIR-8 – 50-year design discharge of 75.7 cfs.

9.1.2 Improvement Summary

1. PND-7B2.1 - Proposed pond area is 1.34 acres with an average depth of 7.0 feet. Berm section will incorporate an impermeable layer of clay or geofabric.
2. PND-7B2.2 – Proposed pond area of 1.36 acres with an average depth of 6.0 feet. Berm section will incorporate an impermeable layer of clay or geofabric.
3. PND-8B – Proposed pond area is 1.47 acres with an average pond depth of 7 feet.
4. CP-7 - Proposed 1,920 sf of 10 thick reinforced concrete cross-pan (60 cy).
5. CP-8 - Proposed 1,120 sf of 10 thick reinforced concrete cross-pan (35 cy).
6. CNL-7A - 24 ft wide 140 ft long riprap channel. Riprap D_{50} of 34" 3.6 feet thick (448 cy).
7. CNL-7B - 18 ft wide 120 ft long riprap channel. Riprap D_{50} of 18" 2.0 feet thick (160 cy).
8. CNL-8A – 24 ft wide 480 ft long riprap channel. Riprap D_{50} of 26" 2.9 feet thick (1,237 cy).
9. CNL-8B – 16.5 ft wide 830 ft long riprap channel. Riprap D_{50} of 6" 0.7 feet thick (355 cy).
10. WEIR-7B2.1 –30-foot wide 50-ft long broad crested weir with 2:1 side slopes. Riprap D_{50} of 31" 3.4 feet thick (220 cy).
11. WEIR-7B2.2 –20-foot wide 25-ft long broad crested weir with 2:1 side slopes. Riprap D_{50} of 23" 2.5 feet thick (56 cy).
12. WEIR-8 –20-foot wide 30-ft long broad crested weir with 2:1 side slopes. Riprap D_{50} of 22" 2.3 feet thick (65 cy).

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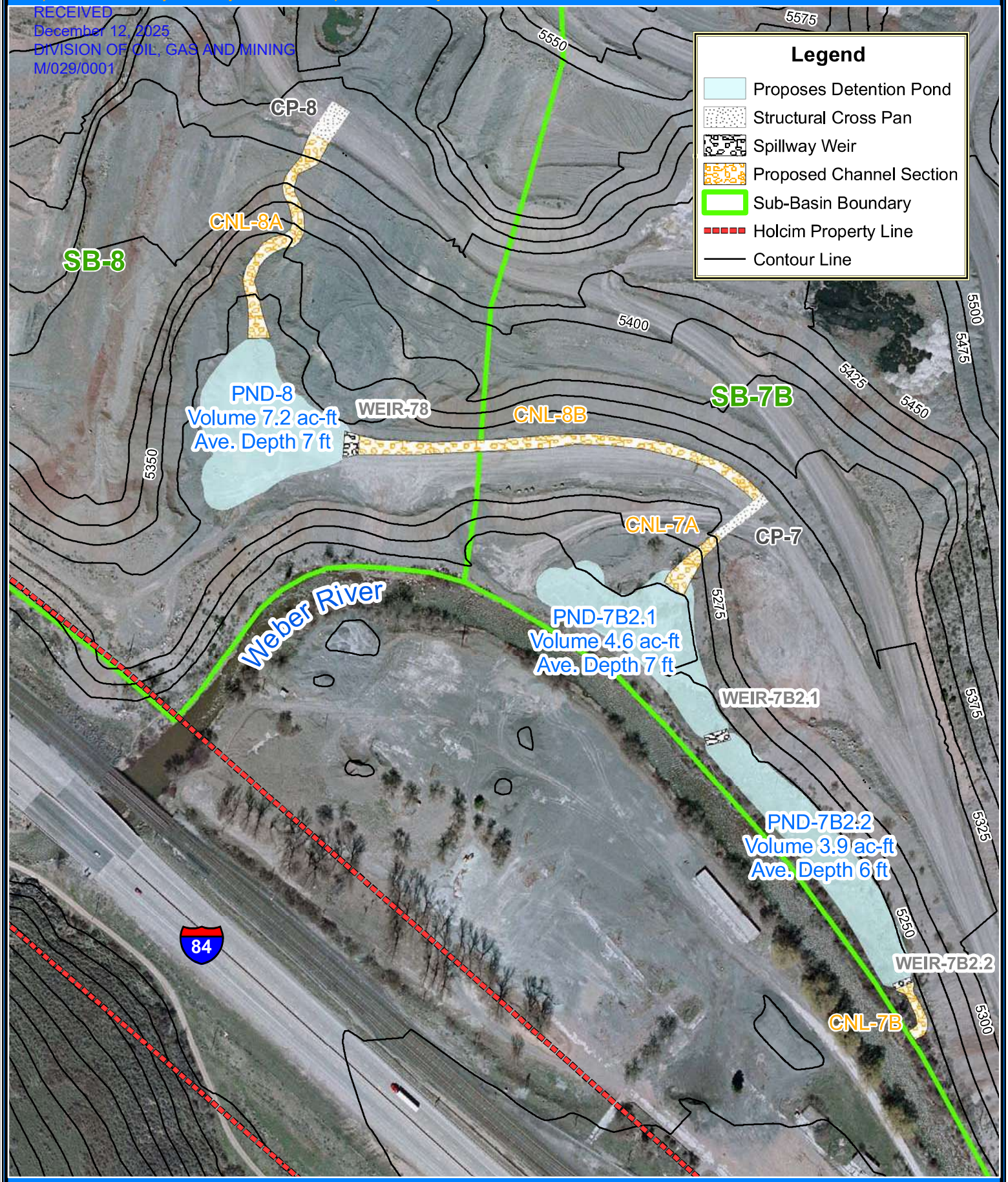

Geographic Information Systems

Holcim Devils Slide Interim Drainage Plan

Cartographic Design By: trm

InfoMaption Inc.
1514 Banyan Dr.
Fort Collins CO 80521
tel 970-581-3131
www.infomaption.com

25 foot Contour Interval

0 75 150 300 Feet

N W E S

Exhibit 9.1 - Interim Drainage Improvements

Ponds PND-7B2.1, 7B2.2, 8

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9.2 Exhibit 9.2 –Proposed Retention Ponds PND-10 and PND-11

Proposed Improvements

Exhibit 9.2 shows proposed retention ponds PND-10 and PND-11. Both retention ponds are designed for the 50-year 6-hours storm event. Ponds PND-10 and PND-11 collects stormwater runoff from the undisturbed offsite areas of sub-basin SB-10 and SB-11. Concentrated flow will be conveyed to pond PND-10 via riprap channel CNL-10. CNL-10 is designed for the 50-year, 6 hour storm event. Both retention ponds will need to be established by reshaping overburden fill areas to account for the required 50-year retention volumes.

9.2.1 Design Summary

- PND-10– Required retention volume of 1.9 ac-ft for the 50-year, 6 hour rainfall event.
- PND-11– Required retention volume of 2.4 ac-ft for the 50-year, 6 hour rainfall event.
- CNL-10 – 50-year design discharge of 93.2 cfs for the 50-year, 6-hour rainfall event

9.2.2 Improvement Summary

1. PND-10 - Proposed pond area is 0.4 acres with an average depth of 5.0 feet.
2. PND-11 – Proposed pond areas is 0.7 acres with an average depth of 3.5 feet.
3. CNL-10 – 6 ft wide 100 ft long riprap channel. Riprap D_{50} of 15” 1.6 feet thick (66 cy).

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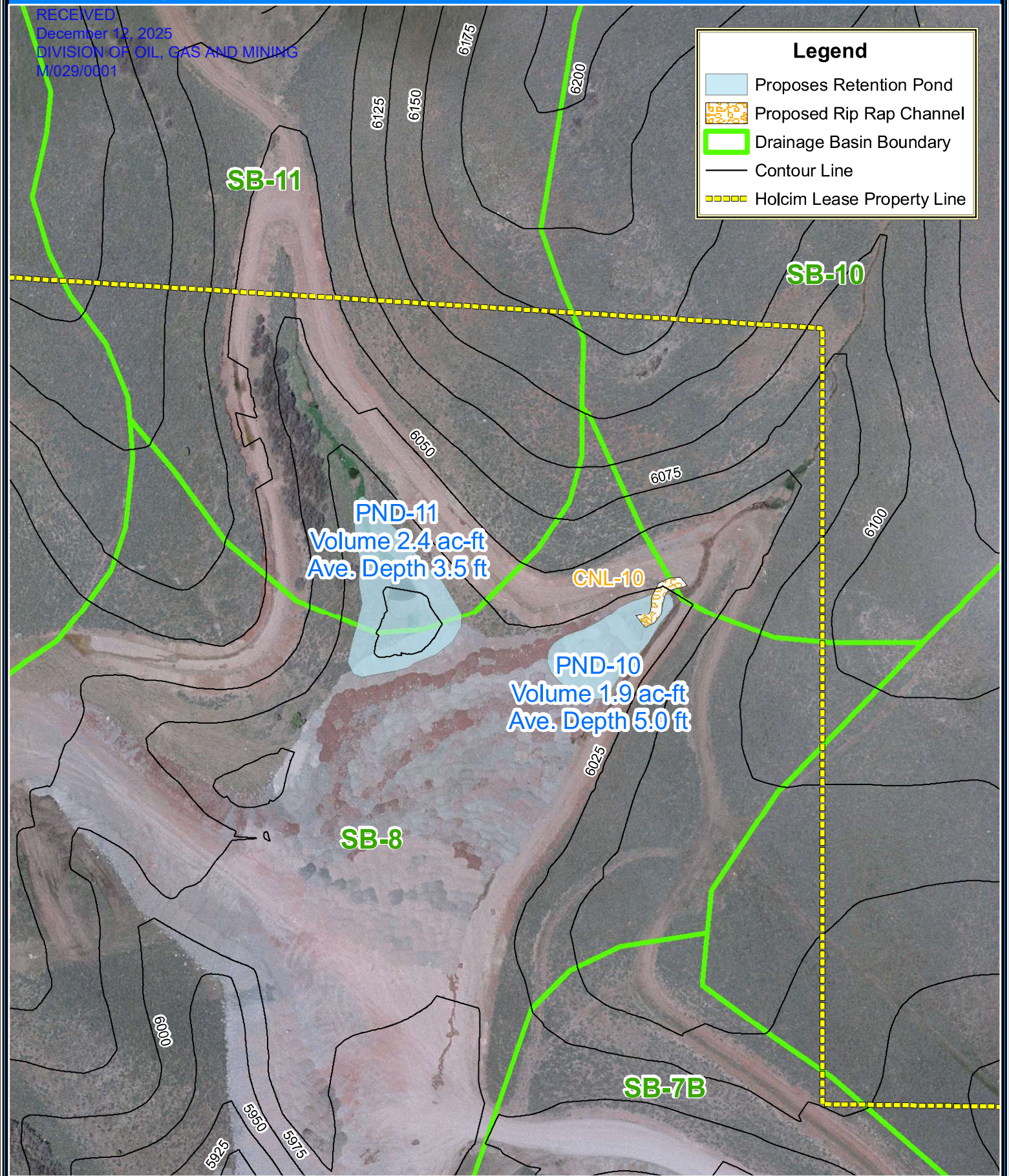

Geographic Information Systems

Holcim Devils Slide Interim Drainage Plan

Cartographic Design By: tm

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1514 Banyan Dr.
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N W E S

Exhibit 9.2 - Interim Drainage Improvements

25 foot Contour Interval

0 50 100 200 Feet

Pond PND - 10 & 11

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Appendix A - Hydrology

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Soils Texture Class

Texture Class	Porosity, ϕ (cm^3/cm)	Wetting front suction (cm)
Sand	0.437	10.6
Loamy sand	0.437	14.2
Sandy loam	0.453	22.2
Loam	0.463	31.5
Silt loam	0.501	40.4
Sandy clay loam	0.398	44.9
Clay loam	0.464	44.6
Silty clay loam	0.471	58.1
Sandy clay	0.430	63.6
Silty clay	0.479	64.7
Clay	0.475	71.4

Texture Class Estimates (Rawls, et al. 1982)

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Brief Soil Descriptions (UT)

Morgan Area, Utah - Morgan County and Part of Weber County

[Absence of an entry indicates that the feature is not a concern or that data were not estimated. Data applies to the entire extent of the map unit within the survey area. Map unit and soil properties for a specific parcel of land may vary somewhat and should be determined by onsite investigation]

CW--Cumulic Haploborolls, wet

Composition

- Cumulic Haploborolls, WET and similar soils: 90 percent of the unit
- Fluvaquentic Haploborolls and similar soils: 3 percent of the unit
- Canburn and similar soils: 2 percent of the unit

Setting

Landform(s): drainageways, flood plains
Elevation:
Precipitation: 18 to 22 inches
Slope gradient: 1 to 6 percent
Air temperature: 39 to 45 ºF
Frost-free period: 70 to 100 days

Characteristics of Cumulic Haploborolls, WET and similar soils

Average total avail. water in top 5 feet (in.):
Available water capacity class: NA
Parent material: alluvium derived from mixed sources
Restrictive feature(s): none
Depth to Water table: 24 inches
Drainage class: poorly drained
Flooding hazard: frequent
Ponding hazard: none
Soil loss tolerance (T factor): 5
Wind erodibility group (WEG):
Wind erodibility index (WEI):
Land capability class, irrigated:
Land capability class, nonirrigated: 6w
Hydric soil: yes
Hydrologic group: C
Runoff class:
Potential frost action: high
Farm Class: Not prime farmland

Saturated hydraulic conductivity class: Moderately High

Representative soil profile:

Horizon -- Depth (inches)	Texture	Available water capacity (inches)	pH	Salinity (mmhos/cm)	SAR
H1 -- 0 to 60	Stratified silty clay to silt loam to very fine sand			Null	Null

Ecological class(es): NRCS Rangeland Site - Semiwet Fresh Streambank (Narrowleaf Cottonwood)

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FAB--Fluvaquentic Haploborolls-Fluventic Haploxerolls complex, 1 to 6 percent slopes

Composition

- Fluvaquentic Haploborolls and similar soils: 50 percent of the unit
- Fluventic Haploxerolls and similar soils: 30 percent of the unit
- Cumulic Haploborolls, WET and similar soils: 4 percent of the unit

Setting

Landform(s): flood plains, stream terraces
Elevation:
Precipitation: 18 to 22 inches

Slope gradient: 1 to 6 percent
Air temperature: 43 to 45 ºF
Frost-free period: 80 to 100 days

Characteristics of Fluvaquentic Haploborolls and similar soils

Average total avail. water in top 5 feet (in.):
Available water capacity class: NA
Parent material: alluvium derived from mixed sources
Restrictive feature(s): none
Depth to Water table: 30 inches
Drainage class: somewhat poorly drained
Flooding hazard: frequent
Ponding hazard: none

Soil loss tolerance (T factor): 5
Wind erodibility group (WEG):
Wind erodibility index (WEI):
Land capability class, irrigated:
Land capability class, nonirrigated: 6w
Hydric soil: yes
Hydrologic group: B
Runoff class:
Potential frost action: low
Farm Class: Not prime farmland

Saturated hydraulic conductivity class: High

Representative soil profile:

Horizon -- Depth (inches)	Texture	Available water capacity (inches)	pH	Salinity (mmhos/cm)	SAR
H1 -- 0 to 60	Variable			Null	Null

Ecological class(es): NRCS Rangeland Site - Semiwet Fresh Streambank (Narrowleaf Cottonwood)

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Brief Soil Descriptions (UT)

Morgan Area, Utah - Morgan County and Part of Weber County

[FAB--Fluvaquentic Haploborolls-Fluventic Haploxerolls complex, 1 to 6 percent slopes]

Characteristics of Fluventic Haploxerolls and similar soils

Average total avail. water in top 5 feet (in.):
Available water capacity class: NA
Parent material: alluvium derived from mixed sources
Restrictive feature(s): none
Depth to Water table: none within the soil profile
Drainage class: well drained
Flooding hazard: occasional
Ponding hazard: none

Soil loss tolerance (T factor): 5
Wind erodibility group (WEG):
Wind erodibility index (WEI):
Land capability class, irrigated:
Land capability class, nonirrigated: 6e
Hydric soil: no
Hydrologic group: B
Runoff class:
Potential frost action: none
Farm Class: Not prime farmland

Saturated hydraulic conductivity class: High

Representative soil profile:

Horizon -- Depth (inches)	Texture	Available water capacity (inches)	pH	Salinity (mmhos/cm)	SAR
H1 -- 0 to 60	Variable			Null	Null

Ecological class(es): NRCS Rangeland Site - Mountain Loam (Mountain Big Sagebrush)

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HeG--Henefer loam, 40 to 60 percent slopes

Composition

- Henefer and similar soils: 90 percent of the unit

Setting

Landform(s): mountainsides
Elevation:
Precipitation: 18 to 22 inches
Slope gradient: 40 to 60 percent
Air temperature:
Frost-free period:

Characteristics of Henefer and similar soils

Average total avail. water in top 5 feet (in.): 7.6
Available water capacity class: Moderate
Parent material: colluvium and/or slope alluvium derived from conglomerate
Restrictive feature(s): none
Depth to Water table: none within the soil profile
Drainage class: well drained
Flooding hazard: none
Ponding hazard: none
Soil loss tolerance (T factor): 4
Wind erodibility group (WEG): 6
Wind erodibility index (WEI): 48
Land capability class, irrigated:
Land capability class, nonirrigated: 7e
Hydric soil: no
Hydrologic group: C
Runoff class:
Potential frost action: moderate
Farm Class: Not prime farmland

Saturated hydraulic conductivity class: Moderately Low

Representative soil profile:

Horizon -- Depth (inches)	Texture	Available water capacity (inches)	pH	Salinity (mmhos/cm)	SAR
A11, A12 -- 0 to 16	Loam	2.3 to 2.7	6.1 to 7.3	0.0	0
B1 -- 16 to 28	Gravelly silty clay loam	1.5 to 1.9	6.1 to 7.3	0.0	0
B21t -- 28 to 46	Gravelly silty clay	1.8 to 2.4	6.1 to 7.3	0.0	0
B22t -- 46 to 60	Very cobbly silty clay	1.0 to 1.2	6.1 to 7.3	0.0	0

Ecological class(es): NRCS Rangeland Site - Mountain Loam (Oak)

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KrG--Kilfoil-Rock outcrop complex, 40 to 60 percent slopes

Composition

- Kilfoil and similar soils: 65 percent of the unit
- Rock outcrop: 20 percent of the unit

Setting

Landform(s): mountainsides
Elevation:
Precipitation: 18 to 22 inches
Slope gradient: 40 to 60 percent
Air temperature:
Frost-free period:

Characteristics of Kilfoil and similar soils

Average total avail. water in top 5 feet (in.): 4.4
Available water capacity class: Low
Parent material: colluvium over residuum derived from sandstone and shale
Restrictive feature(s): paralithic bedrock at 20 to 40 inches
Depth to Water table: none within the soil profile
Drainage class: well drained
Flooding hazard: none
Ponding hazard: none
Soil loss tolerance (T factor): 3
Wind erodibility group (WEG): 6
Wind erodibility index (WEI): 48
Land capability class, irrigated:
Land capability class, nonirrigated: 7e
Hydric soil: no
Hydrologic group: C
Runoff class:
Potential frost action: moderate
Farm Class: Not prime farmland

Saturated hydraulic conductivity class: Moderately High

Representative soil profile:

Horizon -- Depth (inches)	Texture	Available water capacity (inches)	pH	Salinity (mmhos/cm)	SAR
A11, A12 -- 0 to 3	Loam	0.4 to 0.5	7.4 to 7.8	0.0 to 2.0	0
B21t, B22t -- 3 to 21	Clay loam	2.8 to 3.4	7.9 to 8.4	0.0 to 2.0	0
Ck -- 21 to 30	Very gravelly loam	0.6 to 0.8	7.9 to 9.0	0.0 to 2.0	0
Cr -- 30 to 34	Weathered bedrock			Null	Null

Ecological class(es): NRCS Rangeland Site - Mountain Gravelly Loam (Mountain Big Sagebrush)

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[KrG--Kilfoil-Rock outcrop complex, 40 to 60 percent slopes]

Characteristics of Rock outcrop

Average total avail. water in top 5 feet (in.):
Available water capacity class: NA
Parent material:
Restrictive feature(s):
Depth to Water table:
Drainage class:
Flooding hazard:
Ponding hazard:

Soil loss tolerance (T factor):
Wind erodibility group (WEG):
Wind erodibility index (WEI):
Land capability class, irrigated:
Land capability class, nonirrigated:
Hydric soil: no
Hydrologic group:
Runoff class:
Potential frost action:
Farm Class: Not prime farmland

Saturated hydraulic conductivity class: NA

Ecological class(es):

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LHG--Lithic Haploxerolls-Rock outcrop complex, 40 to 80 percent slopes

Composition

- Lithic Haploxerolls and similar soils: 50 percent of the unit
- Rock outcrop: 25 percent of the unit

Setting

Landform(s): mountain slopes, ridges
Elevation: 5200 to 7999 feet
Precipitation: 18 to 22 inches
Slope gradient: 40 to 80 percent
Air temperature: 39 to 45 ºF
Frost-free period: 70 to 100 days

Characteristics of Lithic Haploxerolls and similar soils

Average total avail. water in top 5 feet (in.):
Available water capacity class: NA
Parent material: colluvium over residuum derived from mixed sources
Restrictive feature(s): lithic bedrock at 8 to 20 inches
Depth to Water table: none within the soil profile
Drainage class: well drained
Flooding hazard: none
Ponding hazard: none
Soil loss tolerance (T factor): 1
Wind erodibility group (WEG):
Wind erodibility index (WEI):
Land capability class, irrigated:
Land capability class, nonirrigated: 7s
Hydric soil: no
Hydrologic group: D
Runoff class: high
Potential frost action: low
Farm Class: Not prime farmland

Saturated hydraulic conductivity class: Moderately High

Representative soil profile:

Horizon -- Depth (inches)	Texture	Available water capacity (inches)	pH	Salinity (mmhos/cm)	SAR
H1 -- 0 to 14	Variable			Null	Null

Ecological class(es): NRCS Rangeland Site - Mountain Shallow Loam (Mountain Big Sagebrush)

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[LHG--Lithic Haploxerolls-Rock outcrop complex, 40 to 80 percent slopes]

Characteristics of Rock outcrop

Average total avail. water in top 5 feet (in.):
Available water capacity class: NA
Parent material:
Restrictive feature(s):
Depth to Water table:
Drainage class:
Flooding hazard:
Ponding hazard:

Soil loss tolerance (T factor):
Wind erodibility group (WEG):
Wind erodibility index (WEI):
Land capability class, irrigated:
Land capability class, nonirrigated:
Hydric soil: no
Hydrologic group:
Runoff class:
Potential frost action:
Farm Class: Not prime farmland

Saturated hydraulic conductivity class: NA

Ecological class(es):

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PrA--Pringle loam

Composition

- Pringle and similar soils: 85 percent of the unit
- Canburn and similar soils: 3 percent of the unit
- Cumulic Haploborolls, WET and similar soils: 2 percent of the unit

Setting

Landform(s): flood plains, stream terraces, valley floors
Elevation:
Precipitation: 18 to 22 inches
Slope gradient: 0 to 1 percent
Air temperature:
Frost-free period:

Characteristics of Pringle and similar soils

Average total avail. water in top 5 feet (in.): 4.3
Available water capacity class: Low
Parent material: alluvium derived from limestone, sandstone and quartzite
Restrictive feature(s): none
Depth to Water table: 18 inches
Drainage class: somewhat poorly drained
Flooding hazard: occasional
Ponding hazard: none
Soil loss tolerance (T factor): 3
Wind erodibility group (WEG): 5
Wind erodibility index (WEI): 56
Land capability class, irrigated: 3w
Land capability class, nonirrigated: 7w
Hydric soil: no
Hydrologic group: B/D
Runoff class:
Potential frost action: moderate
Farm Class: Not prime farmland

Saturated hydraulic conductivity class: Moderately High

Representative soil profile:

Horizon -- Depth (inches)	Texture	Available water capacity (inches)	pH	Salinity (mmhos/cm)	SAR
A11, A12 -- 0 to 11	Loam	1.5 to 1.9	7.4 to 8.4	0.0 to 2.0	0
A13 -- 11 to 19	Stratified very fine sandy loam to silt loam	1.1 to 1.4	7.4 to 8.4	0.0 to 2.0	0
IIC1 -- 19 to 45	Very gravelly sand	0.5 to 1.0	7.4 to 8.4	0.0 to 2.0	0
IIC2 -- 45 to 60	Extremely gravelly sand	0.3 to 0.6	7.4 to 8.4	0.0 to 2.0	0

Ecological class(es): NRCS Rangeland Site - Semiwet Fresh Streambank (Narrowleaf Cottonwood)

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StG--St. Marys-Hoskin cobbly loams, 30 to 50 percent slopes

Composition

- Hoskin and similar soils: 40 percent of the unit
- St. Marys and similar soils: 40 percent of the unit

Setting

Landform(s): mountainsides, ridges
Elevation:
Precipitation: 18 to 22 inches
Slope gradient: 30 to 50 percent
Air temperature:
Frost-free period:

Characteristics of Hoskin and similar soils

Average total avail. water in top 5 feet (in.): 2.1
Available water capacity class: Very low
Parent material: colluvium over residuum derived from conglomerate
Restrictive feature(s): lithic bedrock at 20 to 40 inches
Depth to Water table: none within the soil profile
Drainage class: well drained
Flooding hazard: none
Ponding hazard: none
Soil loss tolerance (T factor): 2
Wind erodibility group (WEG): 8
Wind erodibility index (WEI): 0
Land capability class, irrigated:
Land capability class, nonirrigated: 7s
Hydric soil: no
Hydrologic group: C
Runoff class:
Potential frost action: moderate
Farm Class: Not prime farmland

Saturated hydraulic conductivity class: Moderately High

Representative soil profile:

Horizon -- Depth (inches)	Texture	Available water capacity (inches)	pH	Salinity (mmhos/cm)	SAR
A11, A12 -- 0 to 14	Very cobbly loam	1.1 to 1.6	6.1 to 7.3	0.0	0
B21t, B22t -- 14 to 28	Extremely cobbly sandy clay loam	0.6 to 0.8	6.1 to 7.3	0.0	0
R -- 28 to 32	Unweathered bedrock			Null	Null

Ecological class(es): NRCS Rangeland Site - Mountain Stony Loam (Mountain Big Sagebrush)

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[StG--St. Marys-Hoskin cobbly loams, 30 to 50 percent slopes]

Characteristics of St. Marys and similar soils

Average total avail. water in top 5 feet (in.): 4.4
Available water capacity class: Low
Parent material: colluvium and/or slope alluvium derived from conglomerate
Restrictive feature(s): none
Depth to Water table: none within the soil profile
Drainage class: well drained
Flooding hazard: none
Ponding hazard: none

Soil loss tolerance (T factor): 5
Wind erodibility group (WEG): 8
Wind erodibility index (WEI): 0
Land capability class, irrigated:
Land capability class, nonirrigated: 7e
Hydric soil: no
Hydrologic group: B
Runoff class:
Potential frost action: moderate
Farm Class: Not prime farmland

Saturated hydraulic conductivity class: Moderately High

Representative soil profile:

Horizon -- Depth (inches)	Texture	Available water capacity (inches)	pH	Salinity (mmhos/cm)	SAR
A11 -- 0 to 7	Very cobbly loam	0.6 to 0.8	6.6 to 7.3	0.0	0
A12 -- 7 to 10	Very cobbly loam	0.2 to 0.3	6.6 to 7.3	0.0	0
B2 -- 10 to 40	Very cobbly loam	2.1 to 2.7	6.1 to 7.3	0.0	0
C1, C2, C3 -- 40 to 60	Extremely cobbly sandy loam	0.8 to 1.2	6.1 to 7.3	0.0	0

Ecological class(es): NRCS Rangeland Site - Mountain Gravelly Loam (Mountain Big Sagebrush)

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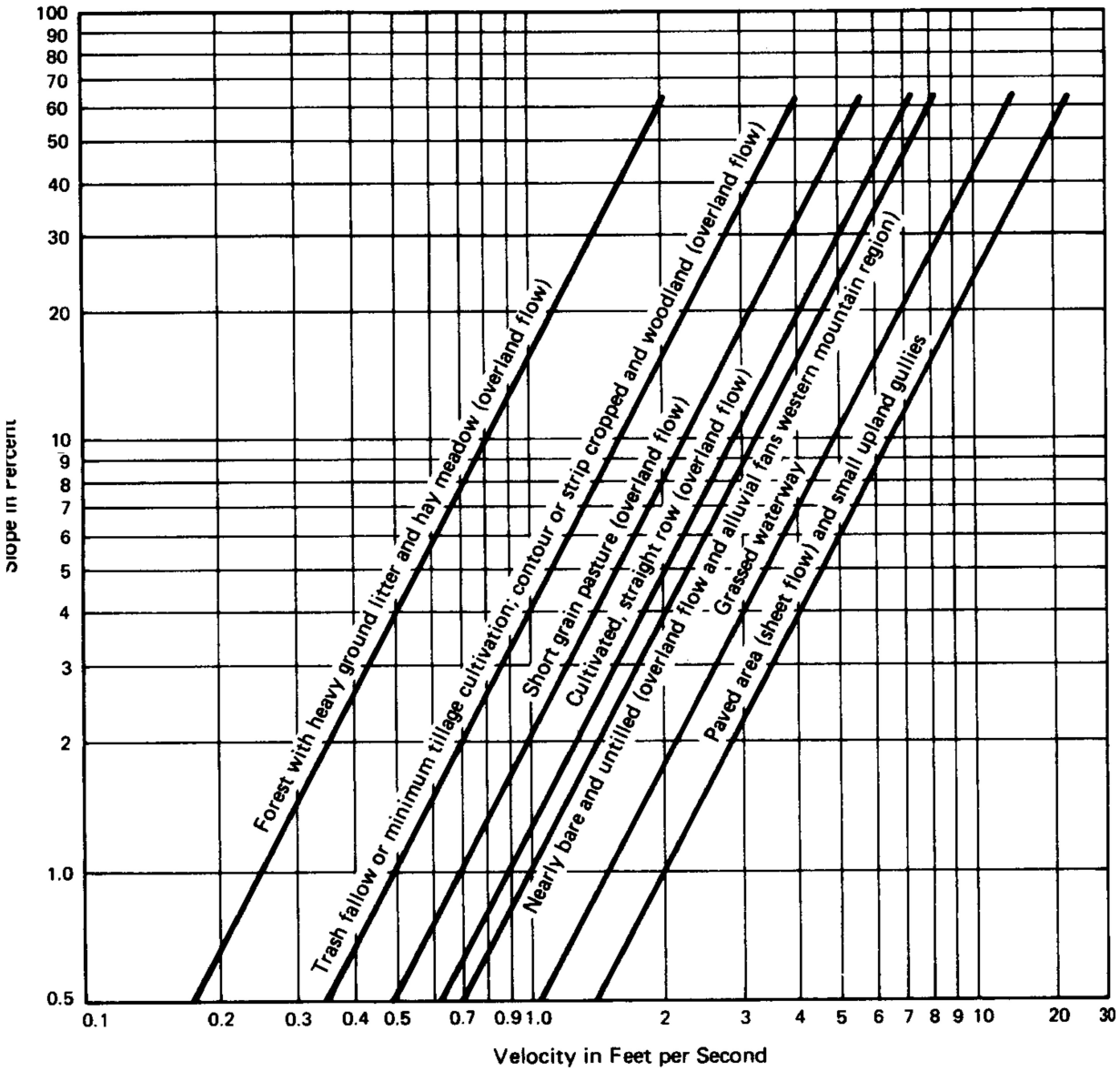

Velocities for upland method of estimating t_c.

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Appendix A - Input HEC-HMS Model Parameters used for the Devils Slide Hydrological Analysis

Sub-basin ID	Area (mi^2)	Loss Method	Initial Loss (in)	Moisture Deficit	Wetting Suction Front (in)	Hydraulic Conductivity (in/hr)	Percent Impervious (%)	Synthetic Unit Hydrograph Method	Lag Time (min)	Channel Routing ID	Channel Routing Description	Time Lag (min)
SB-8	0.3673	Green and Ampt	0.1	0.1	17.7	0.4	2	SCS	13.28			
SB-11	0.1194	Green and Ampt	0.2	0.1	17.7	0.6	2	SCS	11.02			
SB-10	0.0774	Green and Ampt	0.2	0.1	12.4	0.6	2	SCS	8.49			
SB-7B	0.3428	Green and Ampt	0.1	0.1	17.7	0.4	2	SCS	17.23			
SB-7A	0.0893	Green and Ampt	0.1	0.1	17.7	0.4	2	SCS	12.32			
										RCH-SB-7	Routing Reach bwtn SB-7A and SB-7B	13.24

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Appendix A – EPA SWMM Model Output Report

```
 EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.018)
--------------------------------------------------------------

***********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
***********************************************************

****************
Analysis Options
****************
Flow Units ............... CFS
Process Models:
  Rainfall/Runoff ........ NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Flow Routing Method ...... KINWAVE
Starting Date ............ JAN-01-2010 00:00:00
Ending Date .............. JAN-02-2010 02:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Routing Time Step ........ 30.00 sec

WARNING 02: maximum depth increased for Node NODE-8B

**************************        Volume         Volume
Flow Routing Continuity        acre-feet       10^6 gal
**************************     ---------      ---------
Dry Weather Inflow .......         0.000          0.000
Wet Weather Inflow .......         0.000          0.000
Groundwater Inflow .......         0.000          0.000
RDII Inflow ..............         0.000          0.000
External Inflow ..........        22.875          7.454
External Outflow .........         6.777          2.208
Internal Outflow .........         0.000          0.000
Storage Losses ...........         0.000          0.000
Initial Stored Volume ....         0.000          0.000
Final Stored Volume ......        16.134          5.257
Continuity Error (%) .....        -0.153


*********************************
Highest Flow Instability Indexes
*********************************
Link CNL-7A (2)
```

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****
Routing Time Step Summary
****

Minimum Time Step	:	30.00 sec
Average Time Step	:	28.86 sec
Maximum Time Step	:	30.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	0.99

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min
NODE-8B	JUNCTION	0.07	2.02	5311.02	0 04:32
JNCT-7and8	JUNCTION	0.12	2.39	5305.39	0 04:22
JNCT-7B	JUNCTION	0.10	1.84	5240.84	0 04:50
WR-OUTFALL	OUTFALL	0.10	1.84	5238.84	0 04:50
PND-8	STORAGE	4.89	6.70	5316.70	0 04:32
PND-7B2.1	STORAGE	3.84	6.51	5243.51	0 04:33
PND-7B2.2	STORAGE	2.96	5.09	5242.09	0 04:50

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal
NODE-8B	JUNCTION	0.00	75.72	0 04:32	0.000	0.996
JNCT-7and8	JUNCTION	332.00	332.00	0 04:22	4.031	5.038
JNCT-7B	JUNCTION	0.00	119.01	0 04:50	0.000	2.208
WR-OUTFALL	OUTFALL	0.00	118.99	0 04:50	0.000	2.208
PND-8	STORAGE	366.60	366.60	0 04:14	3.423	3.423
PND-7B2.1	STORAGE	0.00	331.79	0 04:22	0.000	5.038
PND-7B2.2	STORAGE	0.00	253.40	0 04:33	0.000	3.474

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	E&I Pcnt Loss	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CFS
PND-8	273.808	68	0	382.911	95	0 04:32	75.72
PND-7B2.1	178.511	51	0	318.907	92	0 04:33	253.40
PND-7B2.2	143.462	46	0	256.705	82	0 04:50	119.01

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****
Outfall Loading Summary
****

Outfall Node	Flow Freq. Pcnt.	Avg. Flow CFS	Max. Flow CFS	Total Volume 10^6 gal
WR-OUTFALL	82.28	3.83	118.99	2.208
System	82.28	3.83	118.99	2.208

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum Velocity ft/sec	Max/ Full Flow	Max/ Full Depth
CNL-8B	CONDUIT	74.43	0 04:35	4.21	0.44	0.67
CNL-7A	CONDUIT	331.79	0 04:22	20.46	0.59	0.80
CNL-7B	CONDUIT	118.99	0 04:50	8.44	0.84	0.92
WEIR-7B2.1	WEIR	253.40	0 04:33			0.00
Weir-8	WEIR	75.72	0 04:32			0.00
Weir-7B2.2	WEIR	119.01	0 04:50			0.00

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Thu Jan 21 09:34:47 2010
Analysis ended on: Thu Jan 21 09:34:51 2010
Total elapsed time: 00:00:04

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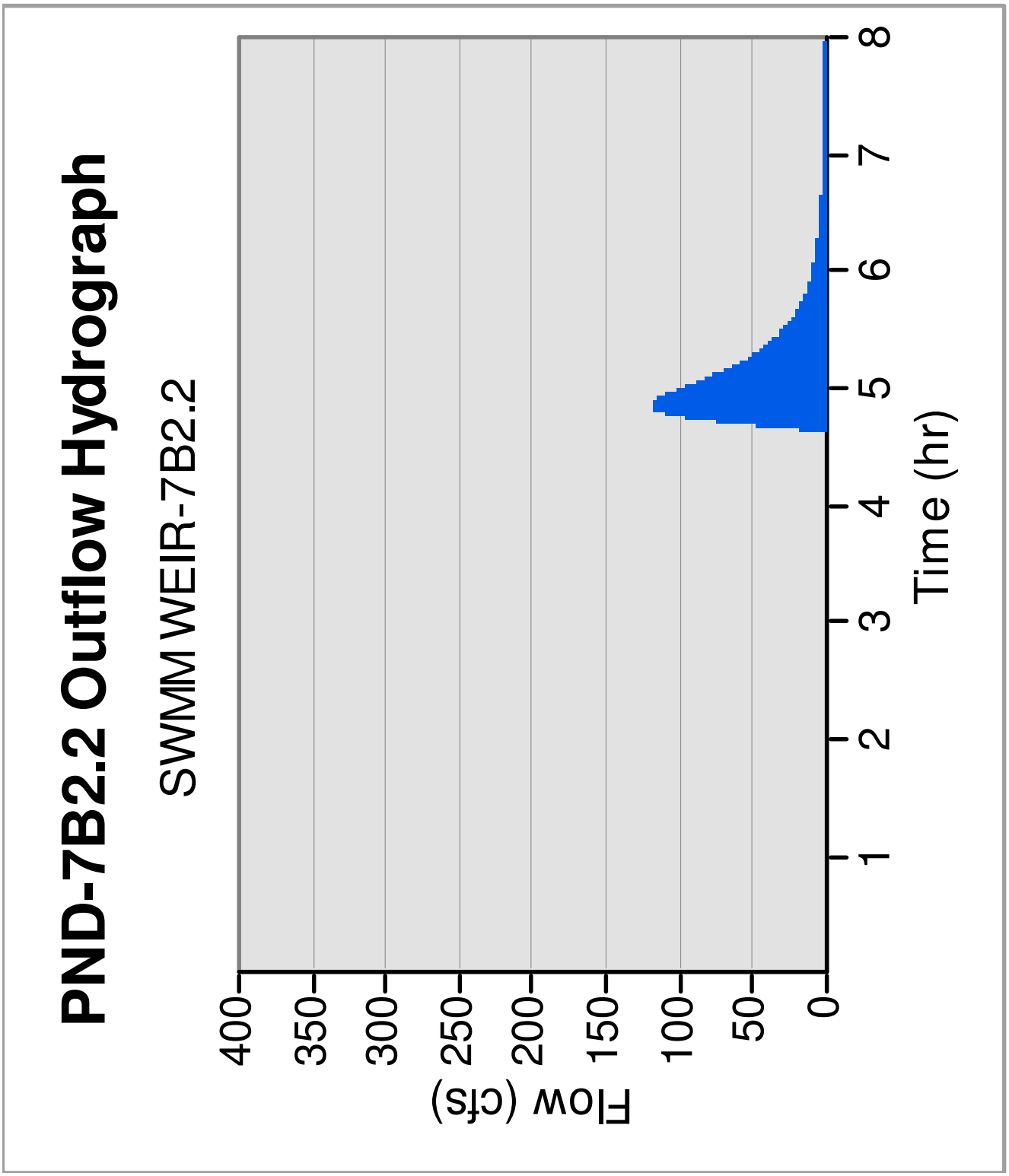

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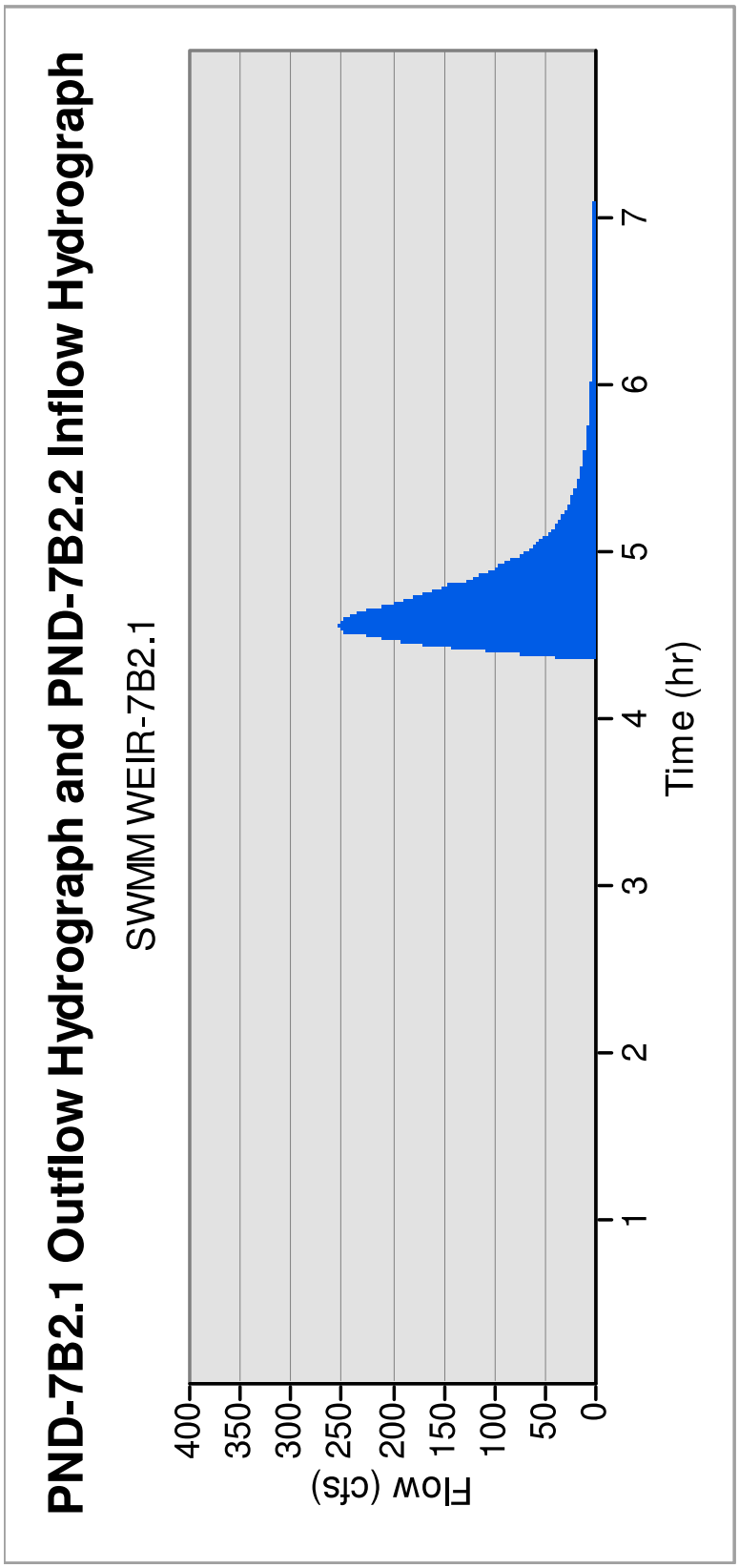

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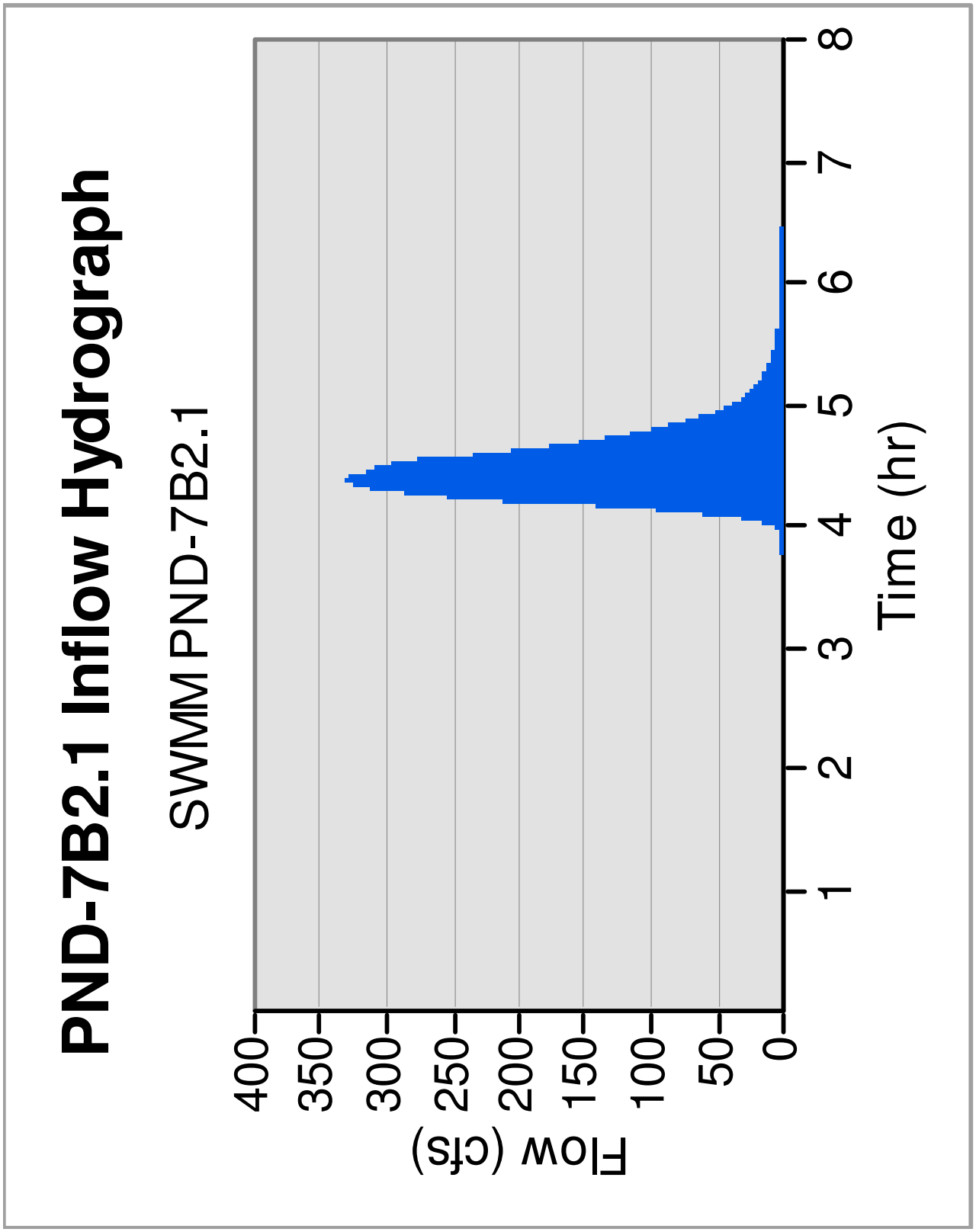

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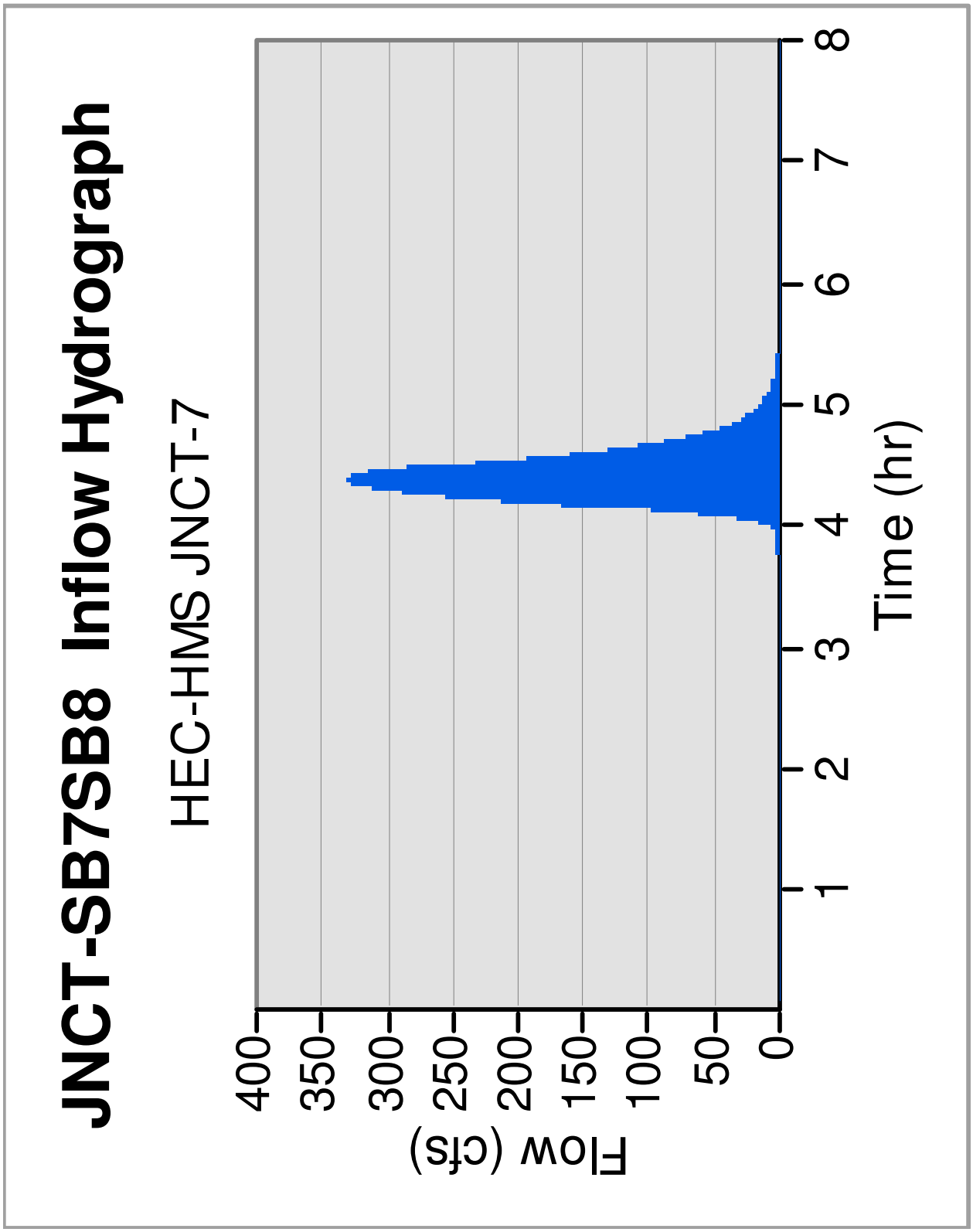

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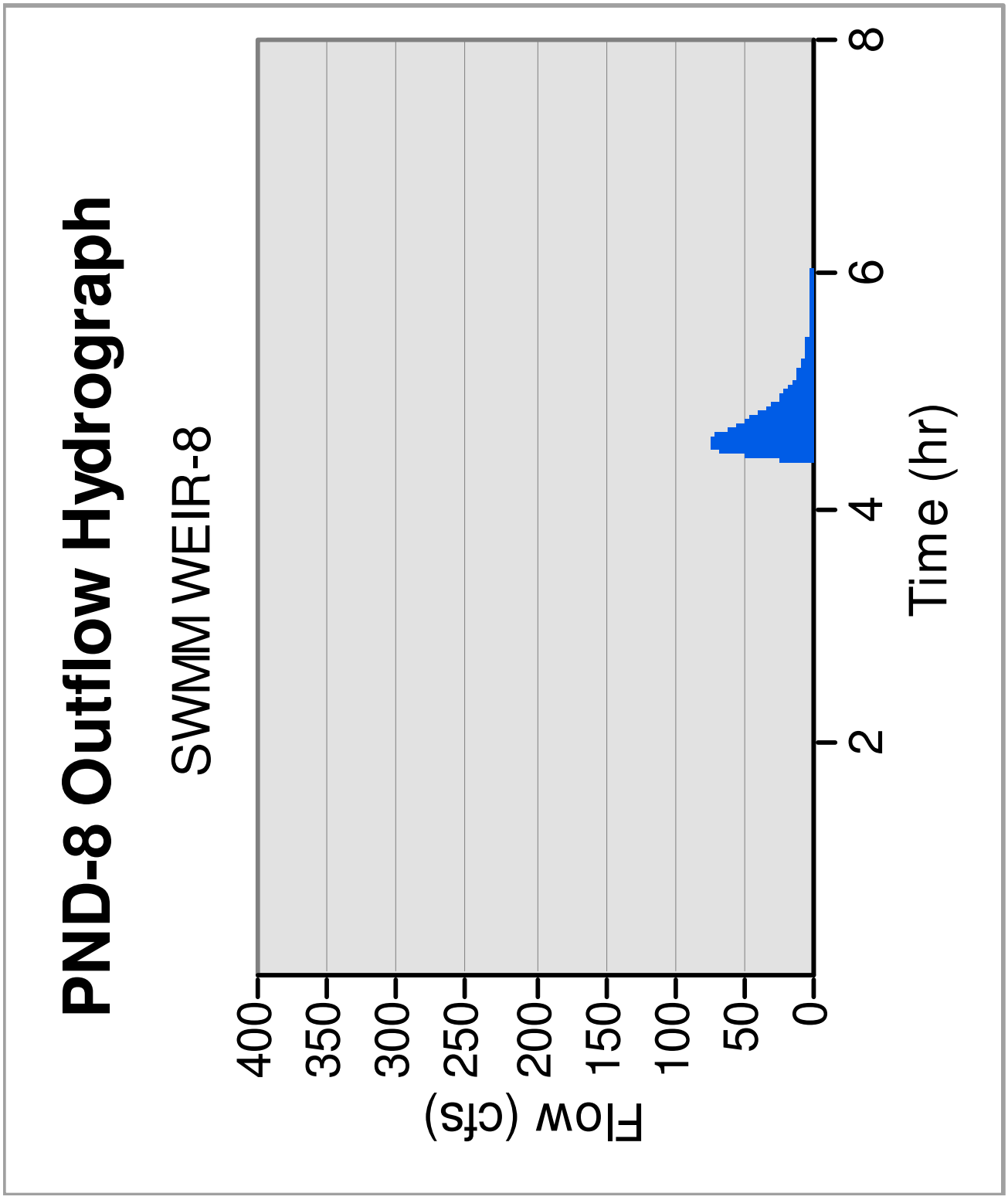

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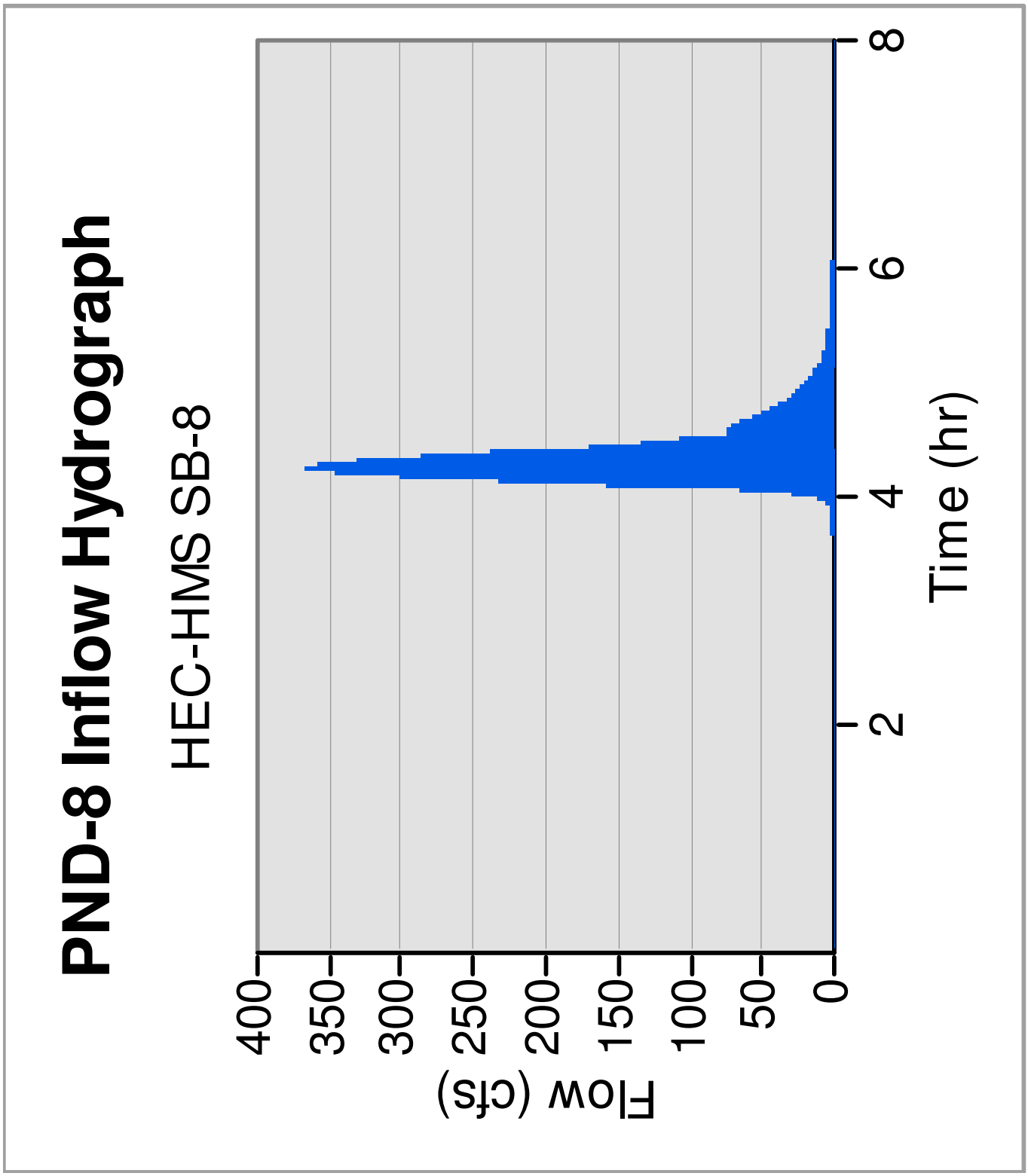

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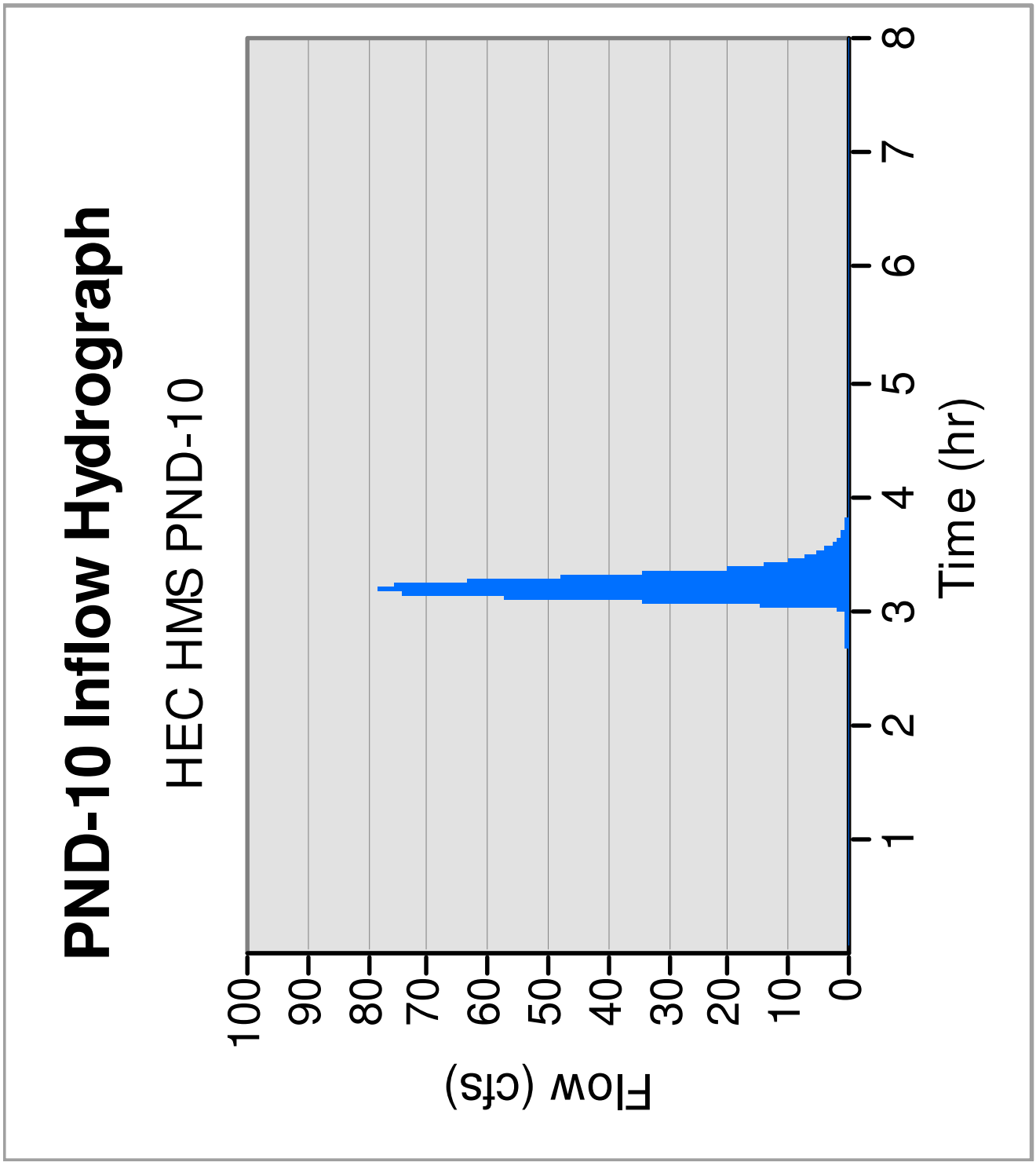

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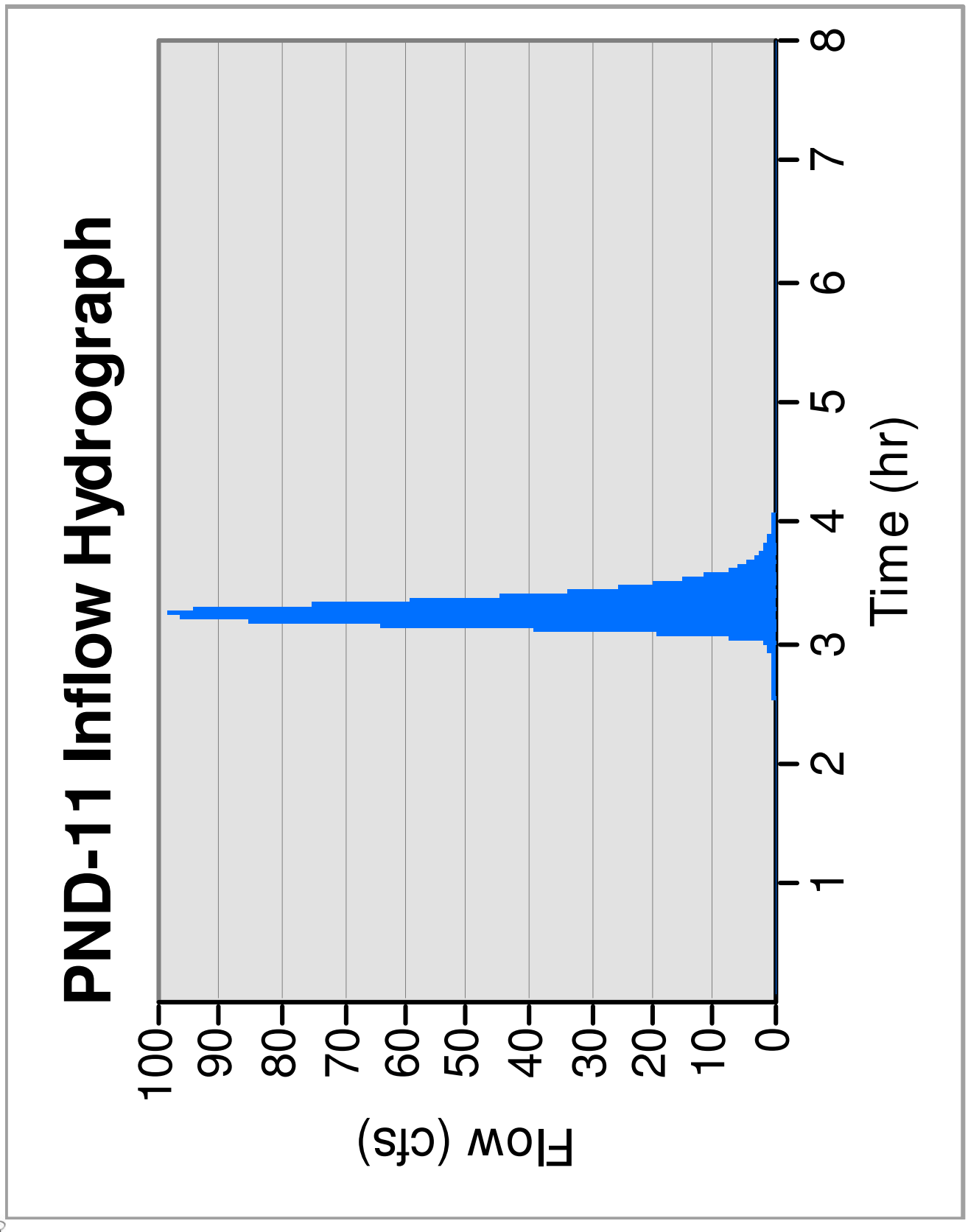

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Appendix B – Hydraulics

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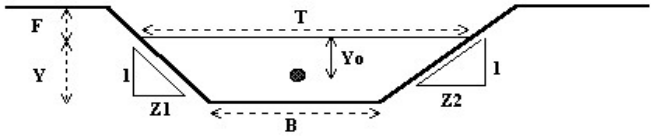
Normal Flow Analysis - Trapezoidal Channel

Project: Holicm Devil's Slide Interim Drainage Plan
Channel ID: Channel CNL-7B Design

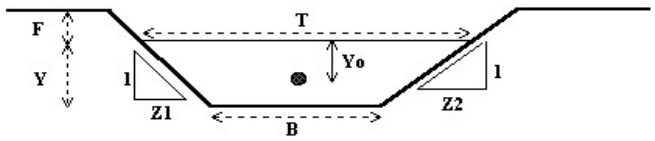


Design Information (Input)			
Channel Invert Slope	So =	0.0150	ft/ft
Manning's n	n =	0.035	
Bottom Width	B =	10.00	ft
Left Side Slope	Z1 =	2.00	ft/ft
Right Side Side Slope	Z2 =	2.00	ft/ft
Freeboard Height	F =	1.00	ft
Design Water Depth	Y =	**1.60**	ft

Normal Flow Condtion (Calculated)			
Discharge	**Q =**	**126.49**	cfs
Froude Number	**Fr =**	**0.93**	
Flow Velocity	**V =**	**5.99**	fps
Flow Area	A =	21.12	sq ft
Top Width	T =	16.40	ft
Wetted Perimeter	P =	17.16	ft
Hydraulic Radius	R =	1.23	ft
Hydraulic Depth	D =	1.29	ft
Specific Energy	Es =	2.16	ft
Centroid of Flow Area	Yo =	0.73	ft
Specific Force	Fs =	2.44	kip

Critical Flow Analysis - Trapezoidal Channel

Project: Holicm Devil's Slide Interim Drainage Plan
Channel ID: Channel CNL-7B Check for Super Critical Flow



Design Information (Input)			
Bottom Width	B =	6.00	ft
Left Side Slope	Z1 =	2.00	ft/ft
Right Side Side Slope	Z2 =	2.00	ft/ft
Design Discharge	Q =	**118.90**	cfs

Critical Flow Condition (Calculated)			
Critical Flow Depth	**Y =**	**1.85**	ft
Critical Flow Area	A =	18.01	sq ft
Critical Top Width	T =	13.42	ft
Critical Hydraulic Depth	D =	1.34	ft
Critical Flow Velocity	V =	6.60	fps
Froude Number	**Fr =**	**1.00**	
Critical Wetted Perimeter	P =	14.30	ft
Critical Hydraulic Radius	R =	1.26	ft
Critical (min) Specific Energy	Esc =	2.53	ft
Centroid on the Critical Flow Area	Yoc =	0.69	ft
Critical (min) Specific Force	Fsc =	2.30	kip

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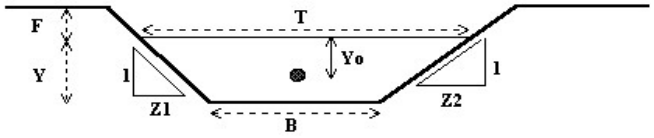
Normal Flow Analysis - Trapezoidal Channel

Project: Holicm Devil's Slide Interim Drainage Plan
Channel ID: Channel CNL-8B Design

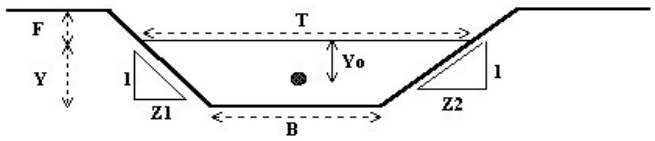


Design Information (Input)			
Channel Invert Slope	So =	0.0100	ft/ft
Manning's n	n =	0.035	
Bottom Width	B =	4.00	ft
Left Side Slope	Z1 =	2.00	ft/ft
Right Side Slope	Z2 =	2.00	ft/ft
Freeboard Height	F =	0.50	ft
Design Water Depth	Y =	**2.00**	ft

Normal Flow Condtion (Calculated)			
Discharge	**Q =**	**78.45**	cfs
Froude Number	**Fr =**	**0.75**	
Flow Velocity	**V =**	**4.90**	fps
Flow Area	A =	16.00	sq ft
Top Width	T =	12.00	ft
Wetted Perimeter	P =	12.94	ft
Hydraulic Radius	R =	1.24	ft
Hydraulic Depth	D =	1.33	ft
Specific Energy	Es =	2.37	ft
Centroid of Flow Area	Yo =	0.83	ft
Specific Force	Fs =	1.57	kip

Critical Flow Analysis - Trapezoidal Channel

Project: Holicm Devil's Slide Interim Drainage Plan
Channel ID: Channel CNL-8B Check for Super Critical Flow



Design Information (Input)			
Bottom Width	B =	6.00	ft
Left Side Slope	Z1 =	2.00	ft/ft
Right Side Slope	Z2 =	2.00	ft/ft
Design Discharge	Q =	**75.70**	cfs

Critical Flow Condition (Calculated)			
Critical Flow Depth	**Y =**	**1.44**	ft
Critical Flow Area	A =	12.79	sq ft
Critical Top Width	T =	11.76	ft
Critical Hydraulic Depth	D =	1.09	ft
Critical Flow Velocity	V =	5.92	fps
Froude Number	**Fr =**	**1.00**	
Critical Wetted Perimeter	P =	12.44	ft
Critical Hydraulic Radius	R =	1.03	ft
Critical (min) Specific Energy	Esc =	1.98	ft
Centroid on the Critical Flow Area	Yoc =	0.56	ft
Critical (min) Specific Force	Fsc =	1.32	kip

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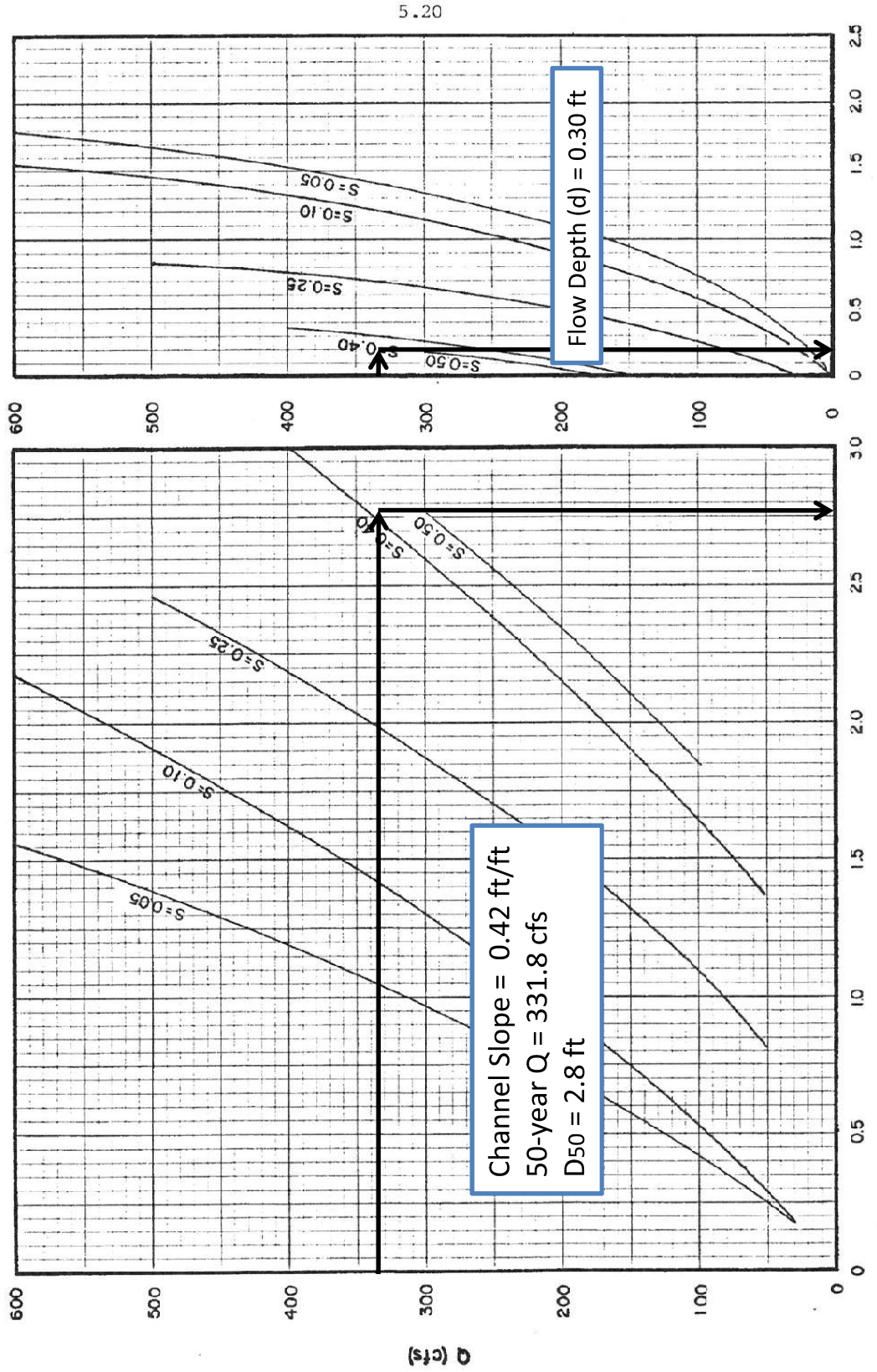
Channel CNL-7A Flow Depth and Riprap D_{50} Specification



Design Curves from Surface Mining Water Diversion Design Manual, United States Department of the Interior, Office of Surface Mining; Technical Services & Research, September 1982.

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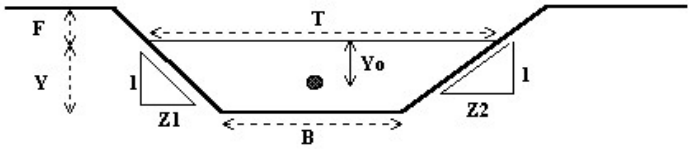
Design of Riprap Channel Cross Section

Project: Holcim (US) Devils Slide Interim Drainage Study
Channel ID: CNL 7B Riprap Design



Design Information (Input)			
Channel Invert Slope	So =	0.0150	ft/ft
Bottom Width	B =	10.0	ft
Left Side Slope	Z1 =	2.5	ft/ft
Right Side Slope	Z2 =	2.5	ft/ft
Specific Gravity of Rock	Ss =	2.65	
Radius of Channel Centerline	Ccr =	38.0	ft
Design Disharge	**Q =**	**110.5**	**cfs**
Flow Condition (Calculated)			
Riprap Type (Straight Channel)	**Type =**	**H**	
Intermediate Rock Diameter (Straight Channel)	**D50 =**	**18**	**inches**
Calculated Manning's n (Straight Channel)	**n =**	**0.0423**	
Riprap Type (Outside Bend of Curved Channel)	**Type =**	**H**	
Intermediate Rock Dia. (O.B. of Curved Channel)	**D50 =**	**18**	**inches**
Calculated Manning's N (Curved Channel)	**n =**	**0.0423**	
Water Depth	Y =	1.62	ft
Top Width of Flow	T =	18.1	ft
Flow Area	A =	22.8	sq ft
Wetted Perimeter	P =	18.7	ft
Hydraulic Radius (A/P)	R =	1.2	ft
Average Flow Velocity (Q/A)	V =	4.9	fps
Hydraulic Depth (A/T)	D =	1.3	ft
Froude Number (max. = 0.8)	Fr =	0.77	
Channel Radius / Top Width	Ccr/T =	2.10	
Riprap Design Velocity Factor For Curved Channel	Kv =	1.87	
Riprap Sizing Velocity For Curved Channel	V_{Kv} =	9.2	fps
Riprap Sizing Paramenter for Straight Channel	**K =**	**1.73**	
Riprap Sizing Paramenter for Outside Bend of Curve	**K_{curve} =**	**3.23**	
*** Superelevation (dh)	dh =	0.18	ft
Discharge (Check)	**Q =**	**111.9**	**cfs**

*** **Superelevation to be carried from the beginning of the channel bend to a distance of two times the top width (T) downstream of the channel bend.**

Check on Rock Size for Riprap

Range of K, K_{curve}	Riprap	D50
< 3.3	VL	6 inch
≥ 3.3 to < 4.0	L	9 inch
≥ 4.0 to < 4.6	M	12 inch
≥ 4.6 to < 5.6	H	18 inch
≥ 5.6 to 6.4	VH	24 inch

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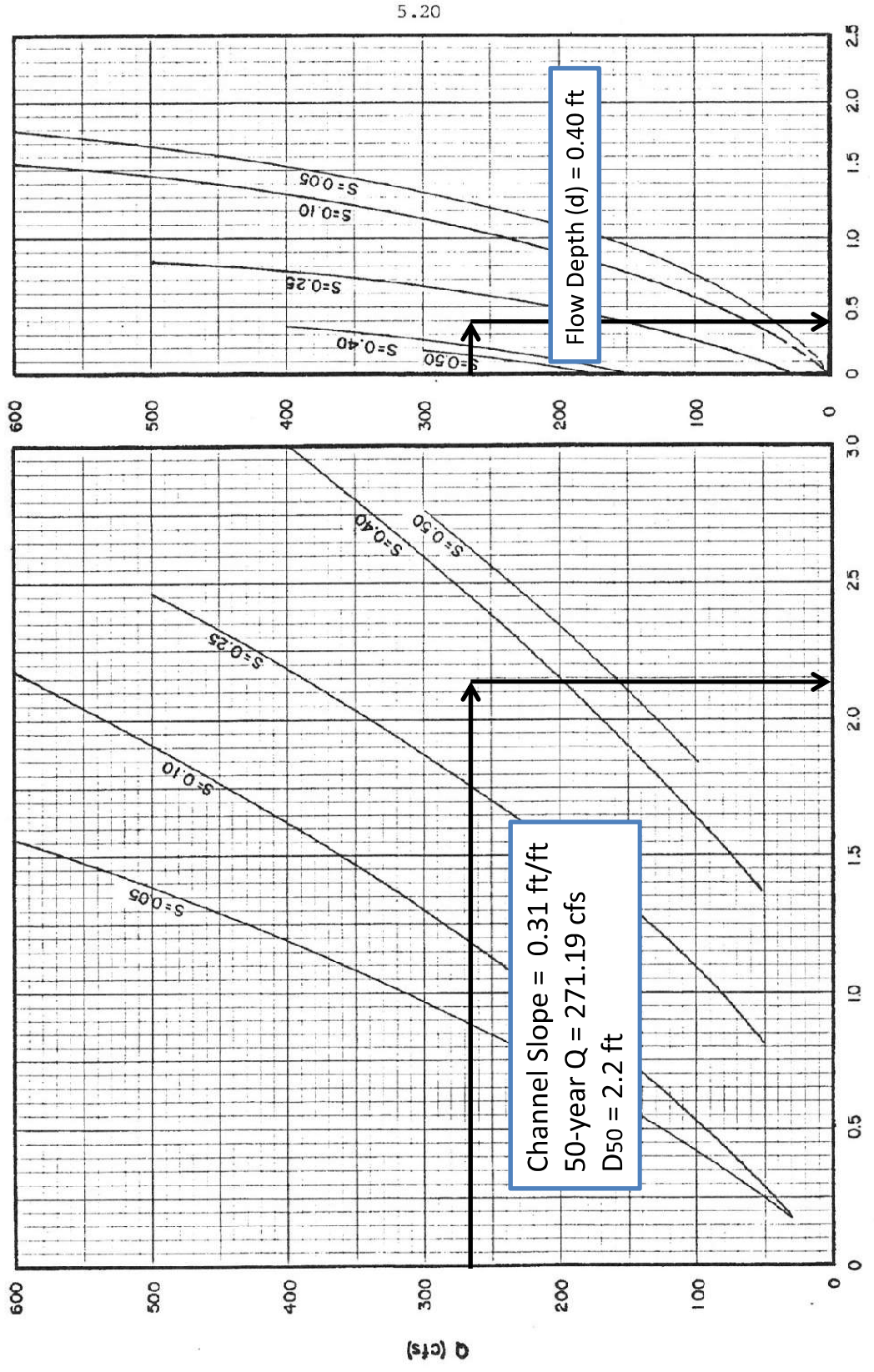
Channel CNL-8A Flow Depth and Riprap D_{50} Specification



Design Curves from Surface Mining Water Diversion Design Manual, United States Department of the Interior, Office of Surface Mining; Technical Services & Research, September 1982.

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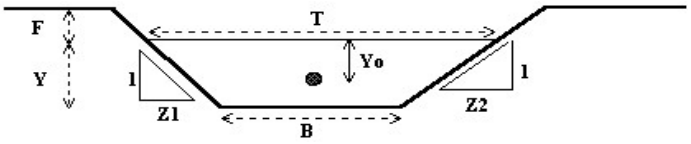
Design of Riprap Channel Cross Section

Project: Holcim (US) Devils Slide Interim Drainage Study
Channel ID: Channel CNL-8B



Design Information (Input)			
Channel Invert Slope	So =	0.0100	ft/ft
Bottom Width	B =	4.0	ft
Left Side Slope	Z1 =	2.5	ft/ft
Right Side Slope	Z2 =	2.5	ft/ft
Specific Gravity of Rock	Ss =	2.65	
Radius of Channel Centerline	Ccr =	200.0	ft
Design Disharge	**Q =**	**75.7**	**cfs**

Flow Condition (Calculated)			
Riprap Type (Straight Channel)	**Type =**	**VL**	
Intermediate Rock Diameter (Straight Channel)	**D50 =**	**6**	**inches**
Calculated Manning's n (Straight Channel)	**n =**	**0.0352**	
Riprap Type (Outside Bend of Curved Channel)	**Type =**	**VL**	
Intermediate Rock Dia. (O.B. of Curved Channel)	**D50 =**	**6**	**inches**
Calculated Manning's N (Curved Channel)	**n =**	**0.0352**	
Water Depth	Y =	1.88	ft
Top Width of Flow	T =	13.4	ft
Flow Area	A =	16.4	sq ft
Wetted Perimeter	P =	14.1	ft
Hydraulic Radius (A/P)	R =	1.2	ft
Average Flow Velocity (Q/A)	V =	4.7	fps
Hydraulic Depth (A/T)	D =	1.2	ft
Froude Number (max. = 0.8)	Fr =	0.74	
Channel Radius / Top Width	Ccr/T =	14.93	
Riprap Design Velocity Factor For Curved Channel	Kv =	1.00	
Riprap Sizing Velocity For Curved Channel	V_{Kv} =	4.7	fps
Riprap Sizing Paramenter for Straight Channel	**K =**	**1.53**	
Riprap Sizing Paramenter for Outside Bend of Curve	**K_{curve} =**	**1.53**	
Superelevation (dh)	dh =	0.00	ft
Discharge (Check)	**Q =**	**76.4**	**cfs**

Check on Rock Size for Riprap

Range of K, K_{curve}	Riprap	D50
< 3.3	VL	6 inch
≥ 3.3 to < 4.0	L	9 inch
≥ 4.0 to < 4.6	M	12 inch
≥ 4.6 to < 5.6	H	18 inch
≥ 5.6 to 6.4	VH	24 inch

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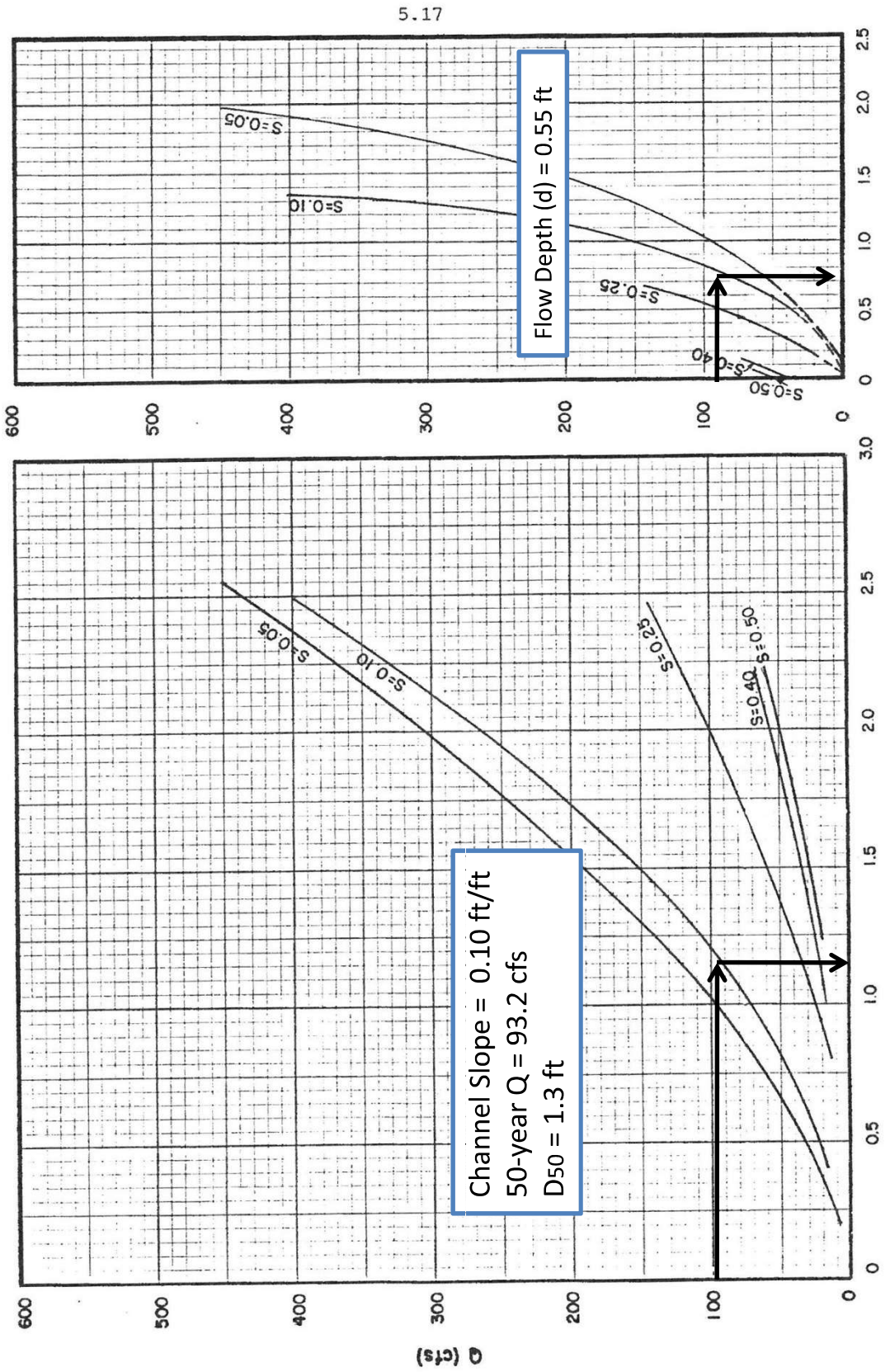
Channel CNL-10 D_{50} Riprap Specification



Design Curves from Surface Mining Water Diversion Design Manual, United States Department of the Interior, Office of Surface Mining; Technical Services & Research, September 1982.

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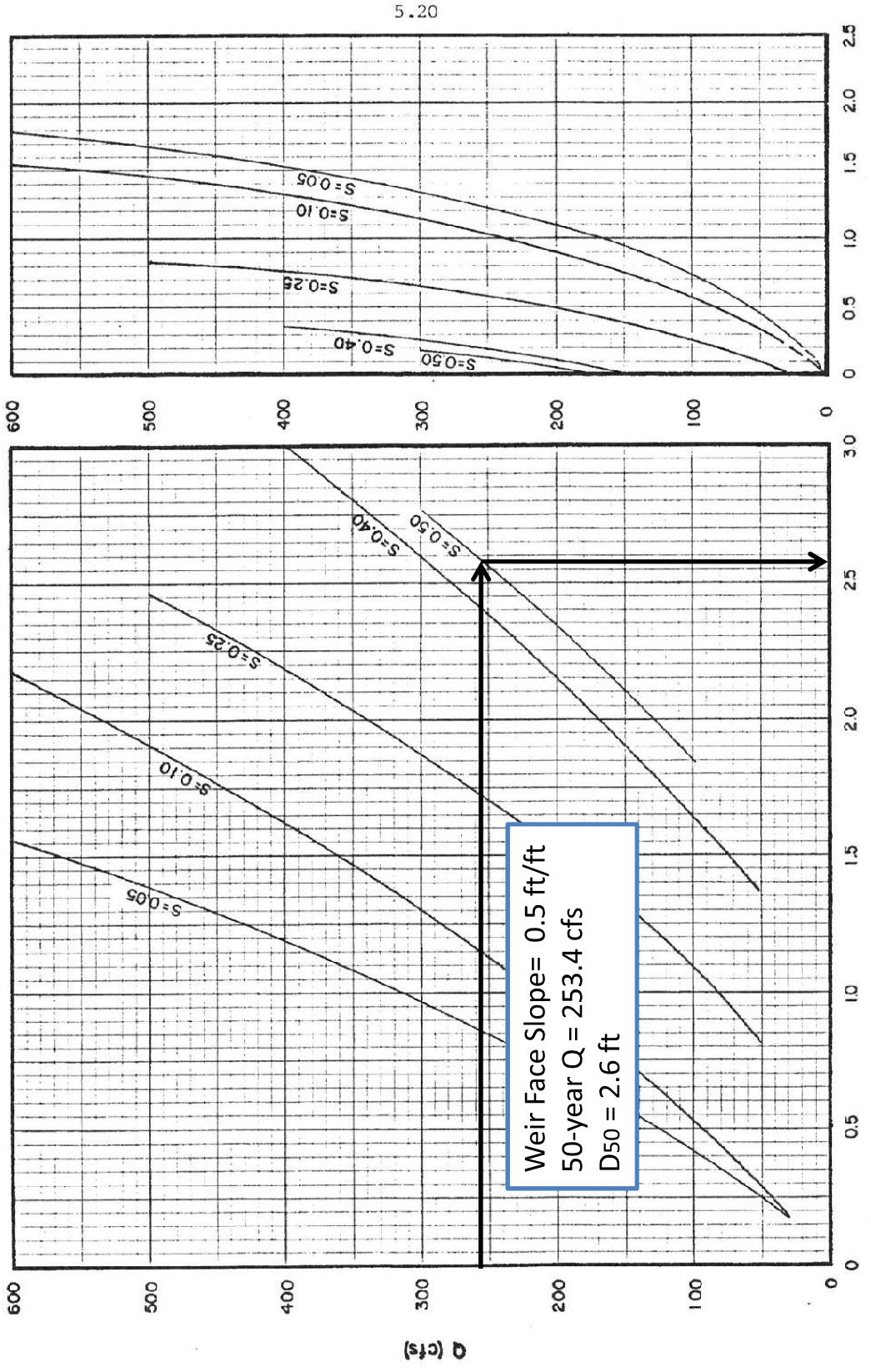
Channel WEIR-7B2.1 Face of Weir Riprap D_{50} Specification



* 20 ft design curve used for 30 foot weir face riprap specification as a conservative assumption

Design Curves from Surface Mining Water Diversion Design Manual, United States Department of the Interior, Office of Surface Mining; Technical Services & Research, September 1982.

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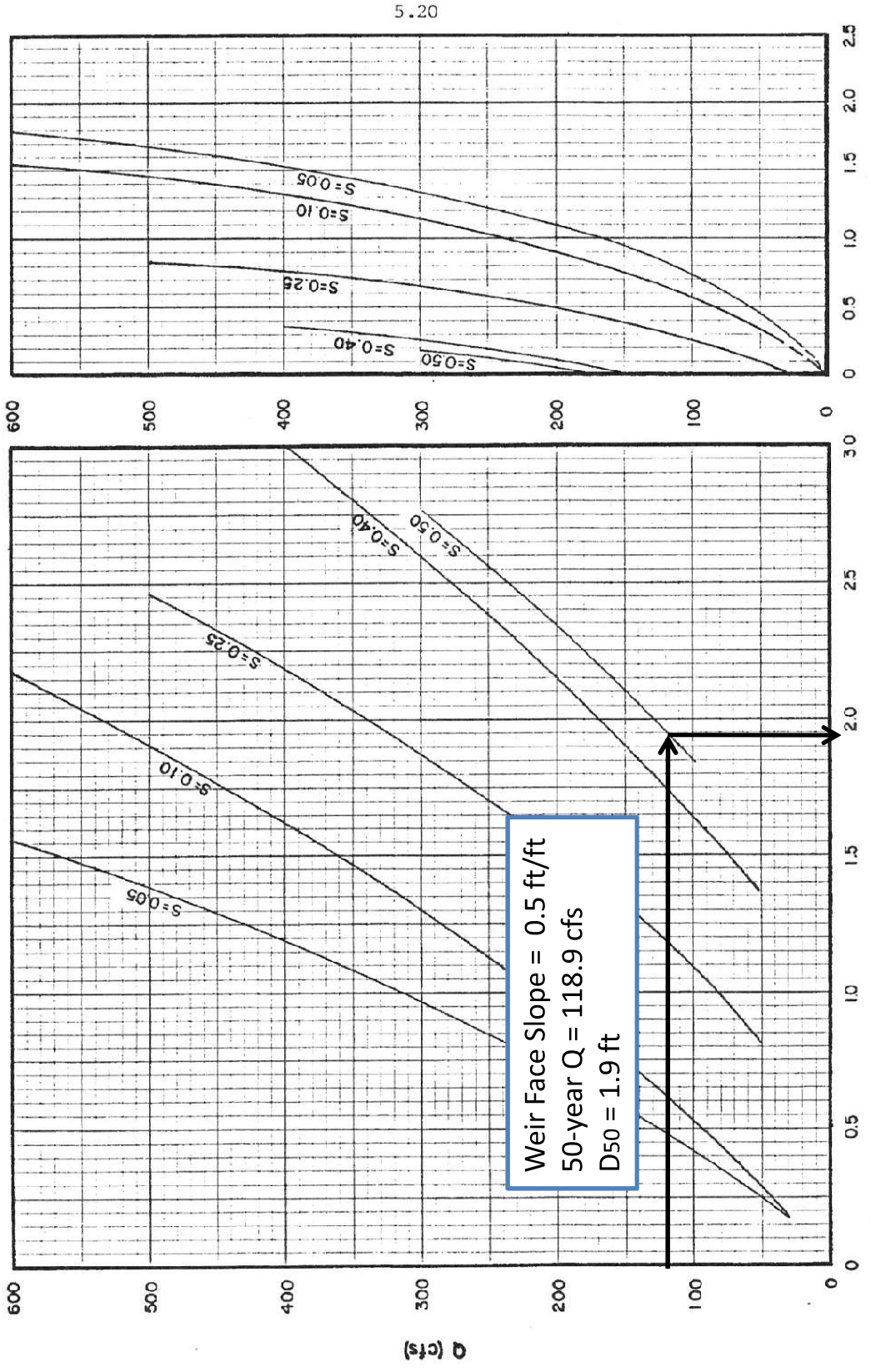
Channel WEIR-7B2.2 Face of Weir Riprap D_{50} Specification



Design Curves from Surface Mining Water Diversion Design Manual, United States Department of the Interior, Office of Surface Mining; Technical Services & Research, September 1982.

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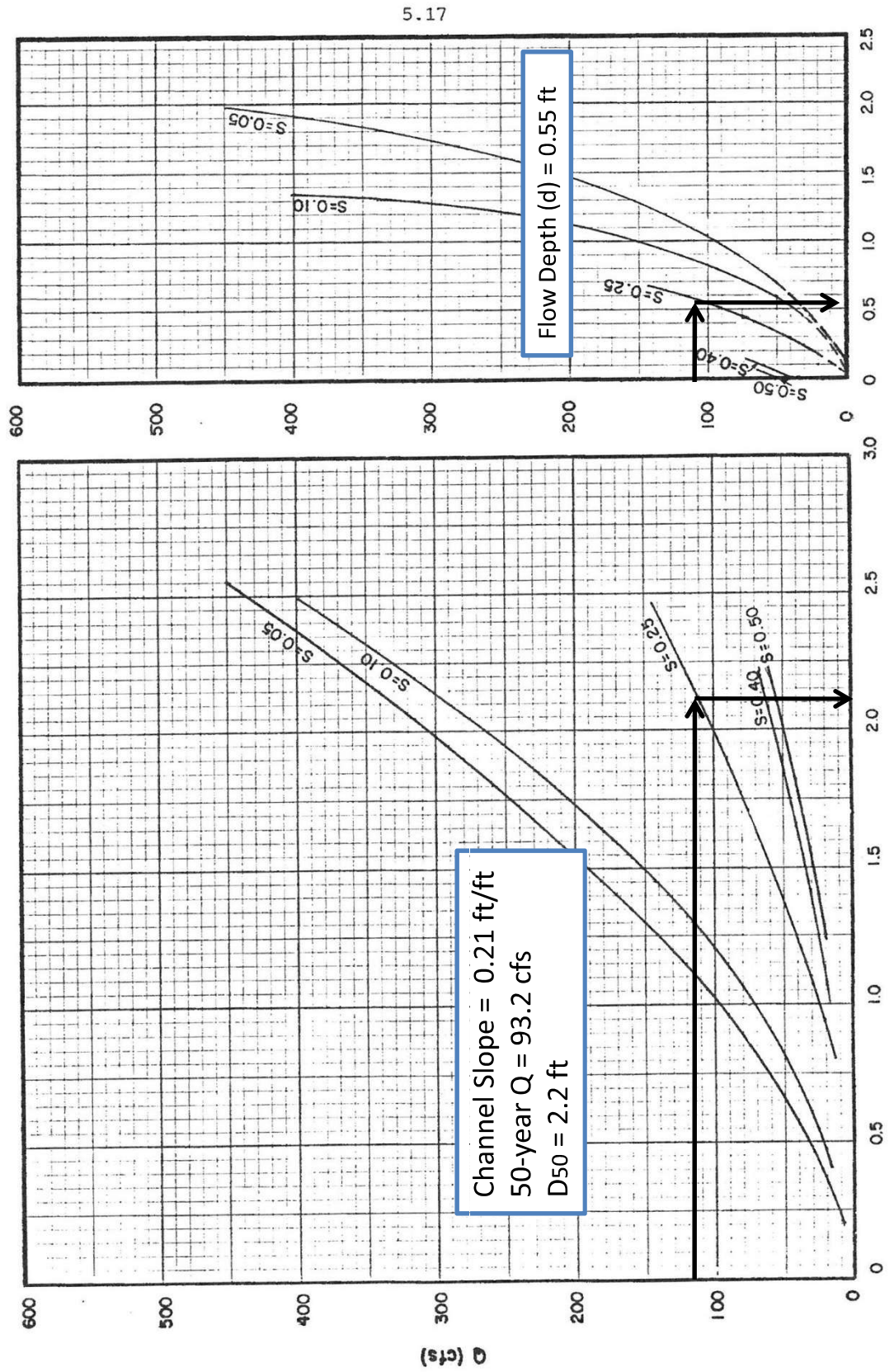
Weber River Outfall D_{50} Riprap Specification



Design Curves from Surface Mining Water Diversion Design Manual, United States Department of the Interior, Office of Surface Mining; Technical Services & Research, September 1982.

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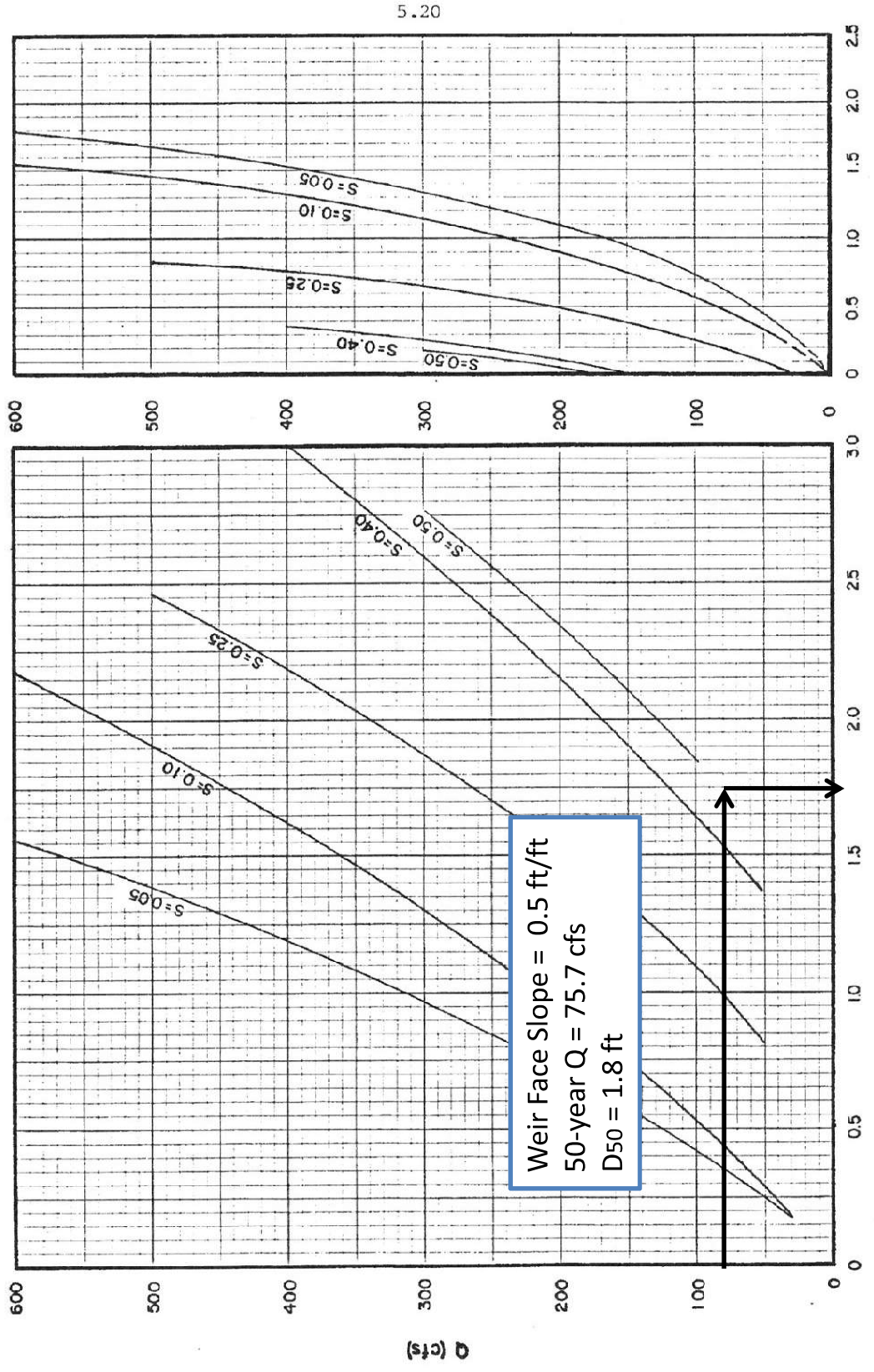
Channel WEIR-8 Face of Weir Riprap D_{50} Specification



Design Curves from Surface Mining Water Diversion Design Manual, United States Department of the Interior, Office of Surface Mining; Technical Services & Research, September 1982.

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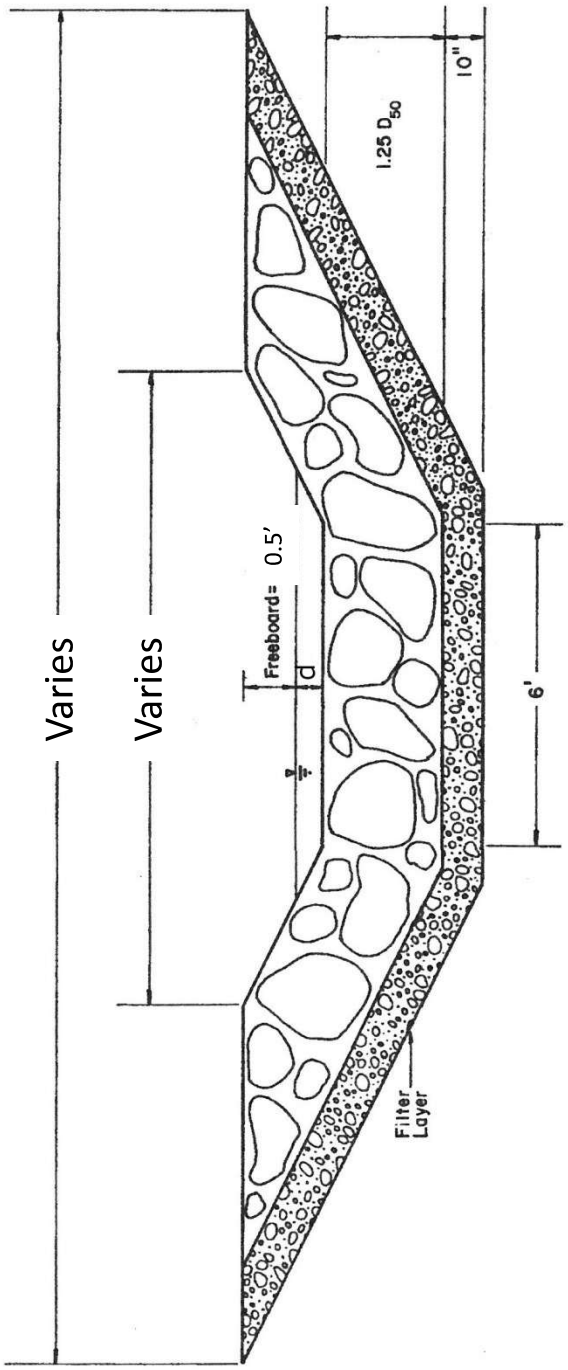

Typical Conveyance Channel Detail

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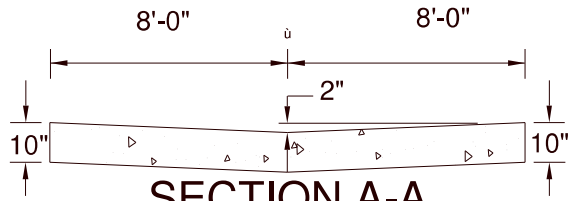
Cross-pan Detail



SECTION A-A

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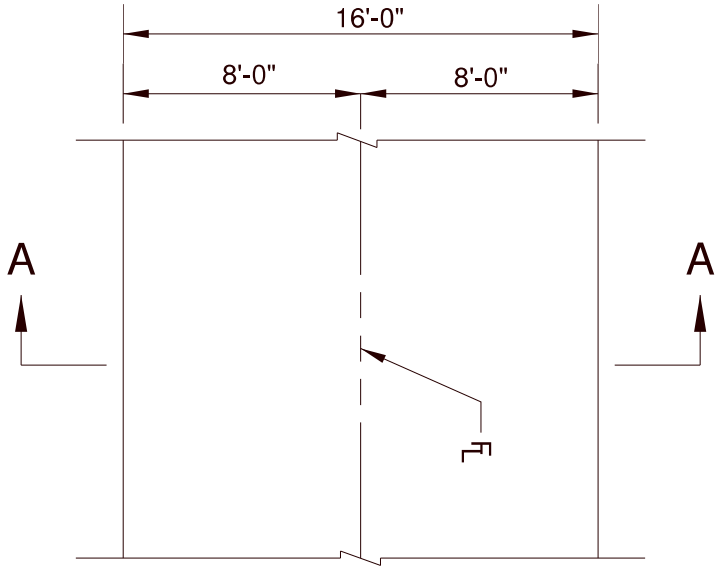

PLAN VIEW

16' CROSSPAN

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Appendix D – Best Management Practices

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Holcim (US) Devils Slide

Best Management Practices

For Quarry Operations

January 24th, 2010

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1 Introduction:

Best Management Practices (BMPs) have been identified for the Holcim (US) Devils Slide site as a set of criteria and technical guidelines to prevent erosion and control sediment within the plant and quarry areas. Herein describes various BMPs for waterway protection. For this document, waterway is used in reference to a drainage way, gulch, creek, stream, river, lake, reservoir or wetland. The overall objectives for BMP implementation are for erosion control including the following:

- Conduct all land disturbing activities in a manner that effectively reduces accelerated soil erosion and reduces sediment movement and deposition off site.
- Plan mining activities to minimize the total amount of soil exposed at any given time to reduce the period of accelerated soil erosion.
- Establish a temporary or permanent cover on areas that have been disturbed as soon as possible when final grades are complete.
- Construct temporary or permanent facilities for the conveyance of water around, through, or from the disturbed area to limit the flow of water to non-erosive velocities.
- Implement a sediment control plan for detailed maintenance of sediment control structures to prevent facility degradation caused by accelerated soil lose and deposition.
- Stabilize the areas of land disturbance with permanent vegetative cover or stormwater quality control measures.

2 Mining Activities Management – Planning and Implementation

Before removal of overburden soil or mining an area for resource material, Holcim or contractor shall plan activities, staging, storage and handling of materials so as to prevent pollutants being release from the site to receiving waterways. Materials include but are not limited to fuel, oil, lubricants, paint, solvents, liquid chemicals as well as solid fertilizers, herbicides and pesticides. In addition, staging and storage area for

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equipment will require proper planning to contain potential release of liquids as to prevent release to receiving waterways. Planning will also including protection of stockpile materials that can erode or wash off during and after precipitation events.

2.1 Chemical and Petroleum Products Storage

Areas of the site that are used for storage of toxic materials and petroleum products should be designed with an enclosure, container, or dike located around the perimeter of the storage area to prevent discharge of these materials in runoff from the site. These barriers will also function to contain spilled materials from contact with surface runoff.

Measures to prevent spills or leaks of fuel, gear oil, lubricants, antifreeze, and other fluids from construction vehicles and heavy equipment should be considered to protect groundwater and runoff quality. All equipment maintenance should be performed in a designated area and measures, such as drip pans, used to contain petroleum products. Spills of construction-related materials, such as paints, solvents, or other fluids and chemicals, should be cleaned up immediately and disposed of properly.

2.2 Waste Area and Storage

Designate areas for material waste deposit and storage. This should include designated areas for temporary disposal of materials and washing off activities. Also designate areas for collection and temporary storage of solid and liquid waste to prevent discharge or movement of these materials off the site. Locate these sites away from all storm drainage facilities and waterways. Consider covering waste storage areas and fencing them, if necessary, to contain windblown materials. Also consider constructing a perimeter dike to exclude or to contain runoff. These measures may not be necessary if all waste is placed immediately in covered waste containers at the site and is otherwise controlled in an effective manner. All waste should be disposed only at approved landfill sites.

2.3 Dewatering

Dewatering that discharges water in a manner that may enter any waterways of the State requires a permit from the Utah Division of Water Quality. This permit will need to be obtained by Holcim or contractor and all conditions stipulated in that permit strictly adhered to.

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2.4 Dust Control

Dust control BMPs reduce surface activities and air movement that causes dust to be generated from disturbed soil surfaces. Mining can generate large areas of soils disturbance and open space for wind to pick up dust particles. A well implemented dust control plan can limit soil erosion and limit respiratory health risks to the work environment. Dust control measures are especially important in arid or semiarid region such as the Devil Slide site. Implement dust control measures on mining and plant areas where excessive vehicle traffic is located and airborne dust can be generated. A variety of dust control measures have proven effective in mining applications and are as follows:

- Mulch - Mulch can reduce wind erosion by up to 80 percent.
- Wind breaks/Barriers – For each foot of vertical height, an 8- to 10 foot depositional zone develops on the leeward side of the barrier. The permeability of the barrier will change its effectiveness at capturing windborne sediments.
- Tillage – Roughening the soil can reduce soil losses by approximately 70 percent in some situations.
- Spay-on Chemical Treatment (palliatives) – Effectiveness of polymer stabilization methods range from 70 percent to 90 percent, according to research.

3 Erosion Control Measures – Planning and Implementation

The planning for the installation of permanent or temporary soil erosion controls needs to begin in advance of all major soil disturbance activities on the site. Minimizing the area being disturbed at any given time is one of the most effective erosion control measures. This principle needs to be kept in mind whenever developing storm water management plans.

Soil surface stabilization protects soil from the erosive forces of raindrop impact, flowing water, and wind. Erosion control practices include surface roughening, mulching, establishment of vegetative cover and soil treatments. Stabilization measures to be used should be appropriate for the time of year, site conditions and estimated duration of use.

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4 Haul Roads

Haul road cuts, haul road fills, and equipment staging areas should be covered with the appropriate aggregate base course or stable material as to provide a stable road base during rainfall events.

4.1 Haul Road Drainage Network

Haul road roadside ditches should have cutouts or crossings appropriately spaced as to minimize erosion and scouring. Rerouting or transferring up-gradient runoff via roadside ditches to adjacent basins, even small sub-basins, which would result in a cross-basin diversion that could alter natural flow and sediment regimes, should be avoided.

Road side ditches should incorporate check dams as to limit the conveyance of sediment transported with storm water within areas of concentrated flow. Check dam spacing is dependant of haul road grade. The following check dam spacing criteria should be followed:

- For haul roads greater than 5% slope, check dams should be spaced at 500 foot intervals.
- For haul roads less than 5% slope, check dams should be spaced at 1000 foot intervals.

As with all sediment control structures, check dams should be inspected and maintained regularly. The following maintenance of check dams should be followed:

- Check dams should be inspected monthly, during and after any storm event and repairs made or cleaned out as necessary.
- Sediment accumulation upstream of check dams shall be removed when the sediment depth is 60% of the height of the crest.
- Check dams are to remain in place until the upstream disturbed area is reseeded and mature vegetation has established.
- When check dams are removed, excavations shall be filled with suitable compacted backfill. Any disturbed area shall be seeded and mulched and covered with erosion control blanket or otherwise stabilized.

The following detail including dimensions for construction of check dams along roadside ditches.

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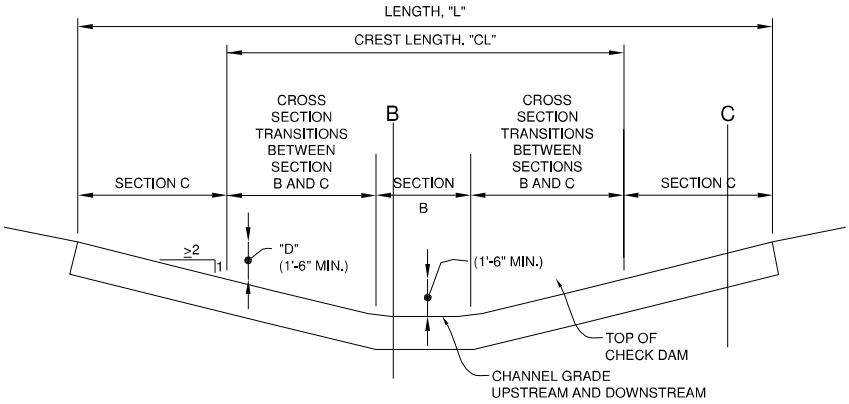

ELEVATION
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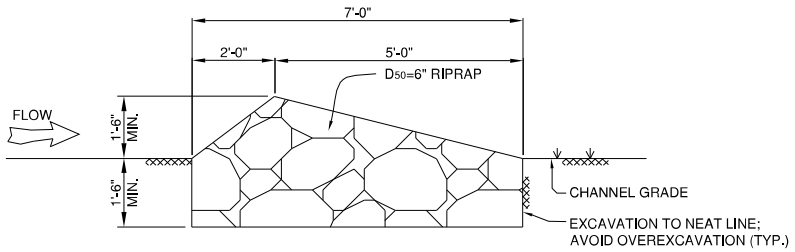

SECTION B
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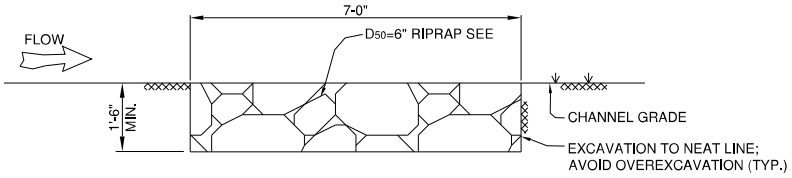

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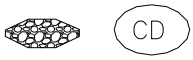
CHECK DAM INSTALLATION NOTES

1. CHECK DAM INSTALLATION SPECIFICATIONS
   - FOR HAUL ROAD GREATER THAN 5% SLOPE, INSTALL CHECK DAMS AT 500-FT INTERVALS.
   - FOR HAUL ROAD LESS THAN 5% SLOPE, INSTALL CHECK DAMS AT 1000-FT INTERVALS.
3. RIPRAP UTILIZED FOR CHECK DAMS SHALL HAVE A D_{50} MEDIAN STONE SIZE OF 6".
4. RIPRAP PAD SHALL BE TRENCHED INTO THE GROUND A MINIMUM OF 1'-6".
5. THE ENDS OF THE CHECK DAM SHALL BE A MINIMUM OF 6" HIGHER THAN THE CENTER OF THE CHECK DAM.

CHECK DAM MAINTENANCE NOTES

1. CHECK DAMS SHALL BE INSPECTED MONTHLY, DURING AND AFTER ANY STORM EVENT AND MAKE REPAIRS OR CLEAN OUT AS NECESSARY.
2. SEDIMENT ACCUMULATED UPSTREAM OF CHECK DAMS SHALL BE REMOVED WHEN THE SEDIMENT DEPTH UPSTREAM OF CHECK DAM IS WITHIN 60%THE HEIGHT OF THE CREST.
3. CHECK DAMS ARE TO REMAIN IN PLACE UNTIL THE UPSTREAM DISTURBED AREA IS RESEEDED AND AND MATURE VEGETATION HAS ESTABLISHED.
4. WHEN CHECK DAMS ARE REMOVED, EXCAVATIONS SHALL BE FILLED WITH SUITABLE COMPACTED BACK FILL. ANY DISTURBED AREA SHALL BE SEEDED AND MULCHED AND COVERED WITH EROSION CONTROL BLANKET OR OTHERWISE STABILIZED.



CHECK DAM

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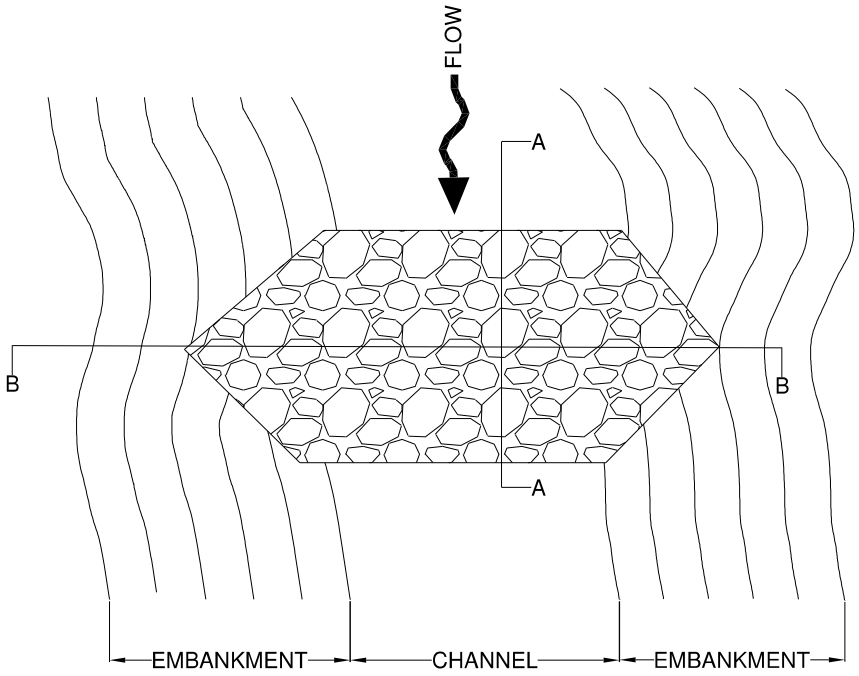

PLAN VIEW

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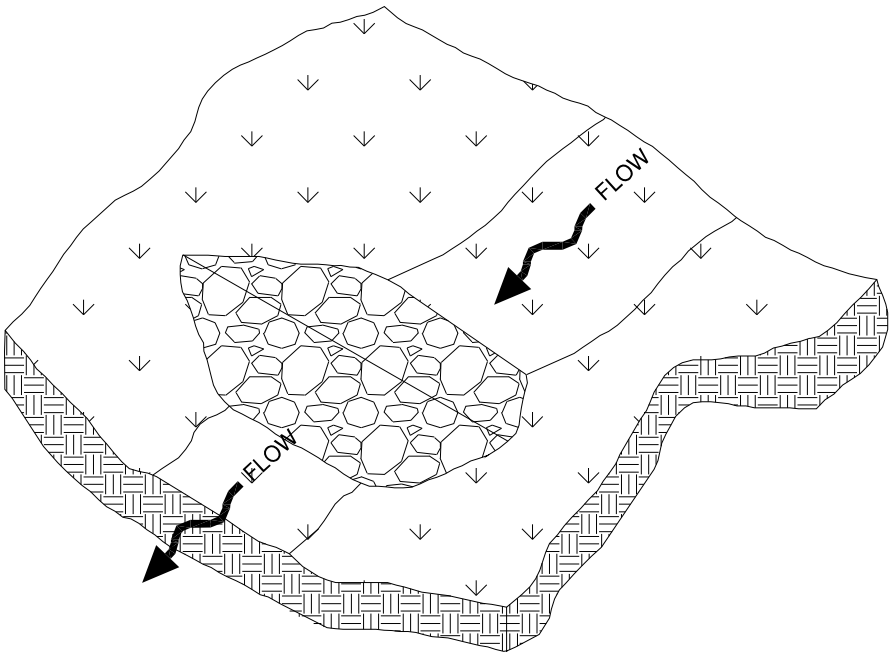

ISOMETRIC

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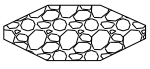

CD

CHECK DAM

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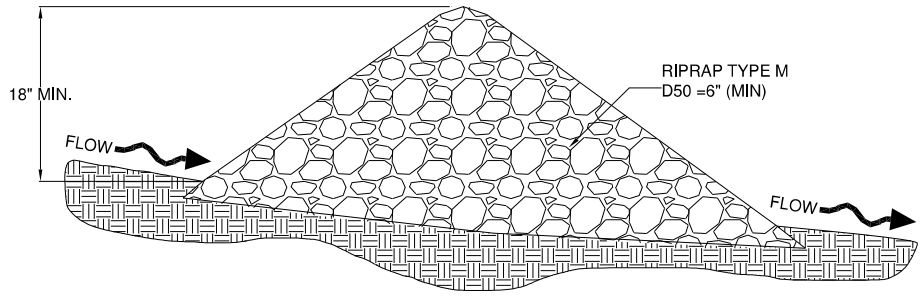

SECTION A-A

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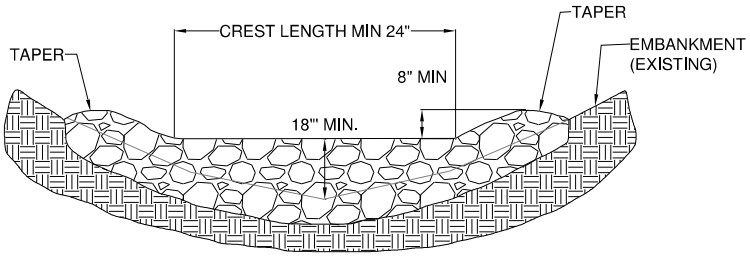

SECTION B-B

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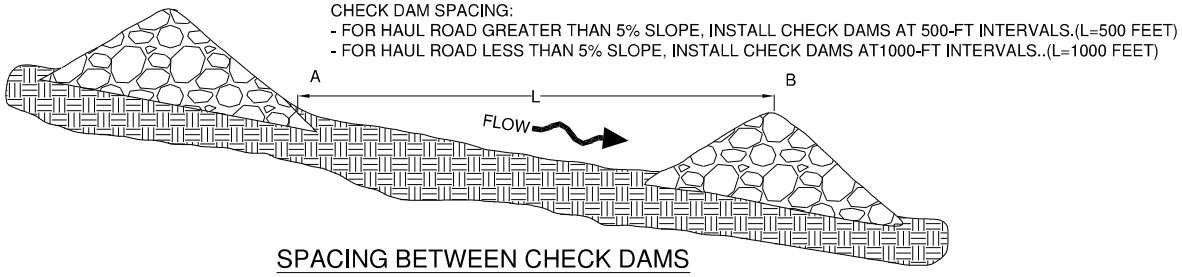

SPACING BETWEEN CHECK DAMS

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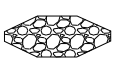

CHECK DAM

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Where possible, cross drains and ditch turn outs should be located on gently sloping, stable terrain such as where rock or stable vegetation is found. Discharge areas should be located to release water on convex slopes where possible, so that water can be dispersed rather than channeled; concave slopes should be avoided wherever possible.

5 Sediment Control Measures – Planning and Implementation

As with erosion control, planning for the control of sediment that is picked up by stormwater has to begin before new excavations are initiated. The following sections outline techniques and BMPs that will limit soil erosion and resulting sedimentation.

5.1 Surface Roughening

Surface roughening (scarification) provides temporary stabilization of disturbed areas from wind and water erosion. It is particularly useful where temporary revegetation cannot be immediately established due to seasonal planting limitations. The soil surface is considered roughened if depressions are created two (2) to four (4) inches deep and are spaced approximately four (4) to six (6) inches apart. If slopes are sufficiently rough after final grading, no further treatment is required. The surface of exposed soil can be roughened by a number of techniques and equipment. A chisel or ripping implement can be used in most soil conditions. Roughening is not acceptable in very sandy soils and cannot be effectively performed in rocky soil.

Surface roughening should be performed after final grading. Fill slopes can be constructed with a roughened surface. Cut slopes that have been smooth graded can be roughened as a subsequent operation. Roughening ridges and depressions should follow along the contours of the slope. On slopes steeper than 2:1, the tracks left by a dozer working perpendicular to the contour can leave acceptable horizontal depressions.

Care should be taken not to drive vehicles or equipment over areas that have been scarified. Tire tracks will smooth the roughened surface and encourage runoff to collect into rills and gullies. As surface roughening is only a temporary control, additional treatments may be necessary to maintain the soil surface in a roughened condition.

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5.2 Slope-Length and Runoff Considerations

Cut-and-fill slopes must be designed and constructed to minimize erosion. This requires consideration of the length and steepness of the slope, the soil type, upslope drainage area, groundwater conditions and other applicable factors. Slopes which are found to be eroding excessively will require additional slope stabilization until the problem is corrected. The following guidelines should assist site planners and plan reviewers in developing an adequate design:

1. Temporary diversion dikes need to be constructed at the top of long or steep slopes. Diversion dikes or terraces should be considered to reduce slope length within the disturbed area.

   Temporary diversion dikes **shall** be provided whenever:

   S^2L > 2.5 for **undisturbed** tributary areas:
   S^2L > 1.0 for **disturbed** tributary areas:

   where: S = slope of the upstream tributary area (in feet/foot); and, L = length of the upstream slope (in feet).

2. Concentrated stormwater (pipe outflow, channel, swale) should not be allowed to flow down cut or fill slopes unless contained within an adequately-sized temporary channel diversion, a permanent channel, or temporary slope drain.

3. Wherever a slope face crosses a water seepage plane which endangers the stability of the slope, adequate drainage should be provided.

4. Provide sediment basins or barriers (silt fences) at or near the toe of slopes to reduce offsite sediment transport or to reduce slope lengths.

5.2.1 Slope Diversions and Diversion Dikes

A temporary diversion or a diversion dike consist of a horizontal ridge of soil placed perpendicular to the slope and angled slightly to provide drainage along the contour along with a swale or a small channel upslope of it to convey the diverted water. Temporary diversion dikes can be constructed by excavation of a V-shaped trench or

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ditch and placement of the fill on the downslope side of the cut. A design of a temporary diversion with a diversion dike is shown on Figure C5.3.

There are two types of temporary slope diversion dikes:

1. A dike located at the top of a slope to divert upland runoff away from the disturbed area. The runoff from undisturbed or previously-developed upland areas dikes may be directed by such dykes to a permanent channel or temporary diversion channel.

2. Diversion dike located at the base or mid-slope of a disturbed area to divert sediment-laden water to a retention basin. The discharge intercepted by these diversion dikes may be directed to a temporary slope drain and/or retention basin.

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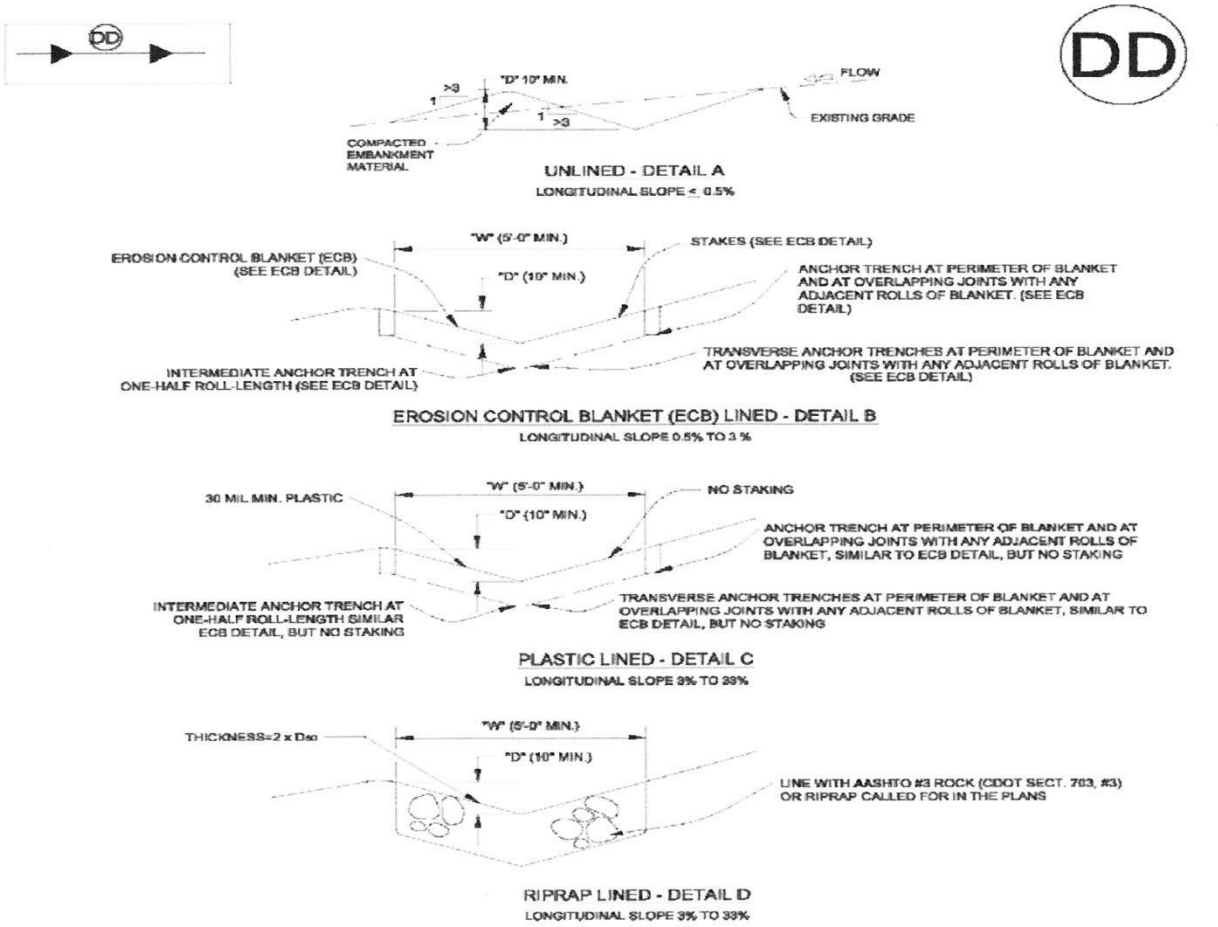

DIVERSION DITCH INSTALLATION NOTES

1. SEE PLAN VIEW FOR:
   - LOCATION OF DIVERSION DITCH.
   - TYPE OF DITCH (UNLINED, ECB LINED, PLASTIC LINED OR RIPRAP LINED).
   - LENGTH OF EACH TYPE OF DITCH.
   - DEPTH, "D", AND WIDTH, "W" DIMENSIONS.
   - FOR ECB LINED DITCH, EROSION CONTROL BLANKET TYPE (SEE ECB DETAIL).
   - FOR RIPRAP LINED DITCH, SIZE OF RIPRAP, "D 50".
2. SEE DRAINAGE PLANS FOR DETAILS OF ANY PERMANENT CONVEYANCE FACILITIES OR DIVERSION DITCHES EXCEEDING A 2-YEAR FLOW RATE OF 10 CFS.
3. DIVERSION DITCHES INDICATED ON INITIAL SWMP PLAN SHALL BE INSTALLED PRIOR TO ANY LAND-DISTURBING ACTIVITIES.
4. FOR ECB LINED DITCHES, INSTALLATION OF EROSION CONTROL BLANKET SHALL CONFORM TO THE REQUIREMENTS OF THE ECB DETAIL.
5. IN LOCATIONS WHERE CONSTRUCTION TRAFFIC MUST CROSS A DIVERSION DITCH, THE PERMITTEES SHALL INSTALL A TEMPORARY CULVERT WITH A MINIMUM DIAMETER OF 12 INCHES.

DIVERSION DITCH MAINTENANCE NOTES

1. THE SWMP MANAGER SHALL INSPECT DIVERSION DITCHES WEEKLY AND DURING AND AFTER ANY STORM. MAKE REPAIRS AS NECESSARY.
2. DIVERSION DITCHES ARE TO REMAIN IN PLACE UNTIL THE END OF CONSTRUCTION, OR IF APPROVED BY LOCAL JURISDICTION MAY BE LEFT IN PLACE.
3. IF DIVERSION DITCHES ARE REMOVED, THE DISTURBED AREA SHALL BE COVERED WITH TOPSOIL, DRILL SEEDED, HAY CRIMPED, MULCHED OR OTHERWISE STABILIZED IN A MANNER APPROVED BY LOCAL JURISDICTION.

DETAIL BASED ON DETAILS PROVIDED BY DOUGLAS COUNTY, COLORADO

Figure C5-3—Temporary Diversion Dike & Ditch

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5.2.2 Terracing

Sediment can be controlled on slopes that are particularly steep by the use of terracing. During grading, relatively flat sections or terraces, are created and separated at intervals by steep slope segments. The steep slope segments are prone to erosion and must be stabilized by mulching or other techniques. Retaining walls, gabions, cribbing, deadman anchors, rock-filled slope mattresses and other types of soil retention systems are available for use. Installation of these types of revetment systems should be supported by an appropriate design or by manufacturer's guidelines.

5.2.3 Slope Drains

There are instances when runoff must be directed using diversion dikes and ditches to a facility that conveys it down a steep slope within the disturbed area. A temporary slope drain should be used for this purpose, which protects the hill slope areas from erosion. The discharge from all slope drains must be directed to a stabilized outlet, temporary or permanent channel and/or sedimentation basin. Figure C5-7 illustrates the application of a slope drain.

5.3 Sediment Entrapment Facilities

Sediment entrapment facilities are necessary to reduce sediment discharges to downstream properties and receiving waterways. Sediment entrapment facilities include straw bale barriers, silt fences, rock berms and sediment basins. The type of sediment entrapment facility to be used depends on the tributary area, basin slope and slope length of the upstream area. Table C-5 summarizes the recommended maximum tributary areas, slope lengths and slopes for three (3) types of sediment entrapment facilities.

All runoff leaving a disturbed area shall pass through a sediment entrapment facility and facility inspected and maintained routinely.

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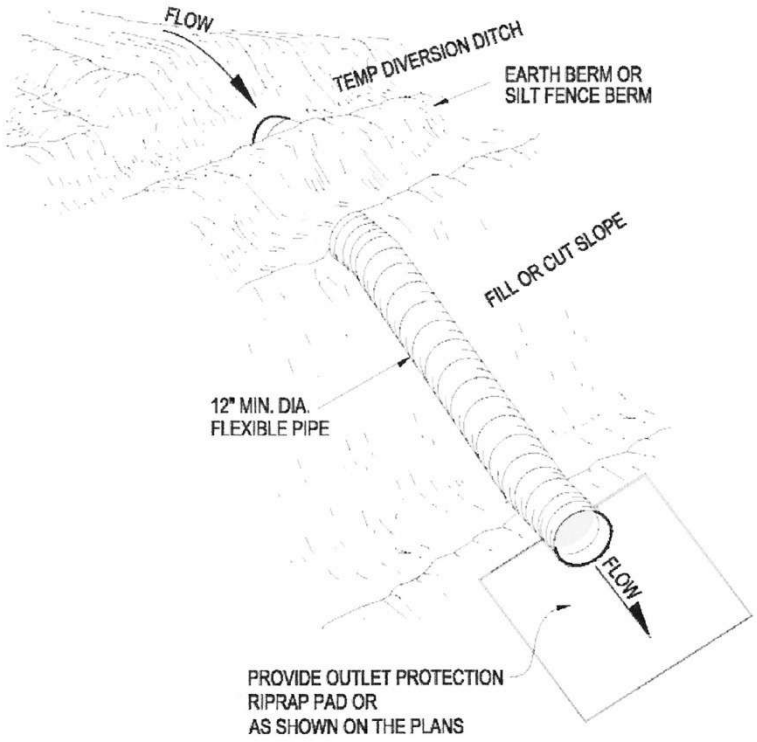

FROM COLORADO DEPARTMENT OF HIGHWAYS, 1978

Figure C5-7—Illustration of a Temporary Slope Drain Installation

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Allowable Maximum Limit			
Sediment Control Facility	**Tributary Drainage Area per 100 lineal feet (ac)**	**Disturbed Tributary Slope Length (ft)**	**Tributary Slope Gradient**
Straw Wattles, Curb Socks or Silt Fence	0.5-1.0 per 100 lineal ft	150	3:1 (33%)
Sediment Basin	n/a	n/a	n/a

Table C-5—Sediment Entrapment Facility Limitations
(Exceeding any one limit will trigger a need for a sediment basin)

Straw bale barriers or silt fences may be used for small sites. When the tributary area is greater than that allowed for straw bale barriers or silt fences, runoff shall be collected in diversion dikes and routed through temporary sediment basins.

5.4 Sediment Control Log

Sediment control logs consisting of manufactured logs (wattles) made of straw, excelsior, or coconut fiber can be placed parallel to the contour at the base of a hill slope as a sediment barrier. They are temporary in nature and may only perform for a period of weeks or months before they degrade. Proper installation and maintenance is essential to ensure their performance. There are many examples of poor installations that included failure to imbed them into the ground, anchor them and pack them closely to each other and fully fill in the joints, and to extend them up the slopes to prevent flow bypassing around their ends. Installation shall be done as shown in Figures C5-8 and C5-9.

5.5 Silt Fence

A silt fence is made of a woven synthetic material. Its function is to trap sediment through sedimentation and filtering of runoff. Silt fence can be placed as a temporary barrier along the contour at the base of a slope of a disturbed area. They are of little if any use if placed at the top of the disturbed slope and are not intended for use as diversion barriers or as perimeter fencing. In addition, they are not to be used as checks within a swale or channel. The material is durable and can last for more than one season if properly installed and maintained. Proper installation and maintenance is essential to ensure their performance. If concentrated flow conditions are expected, do not use silt

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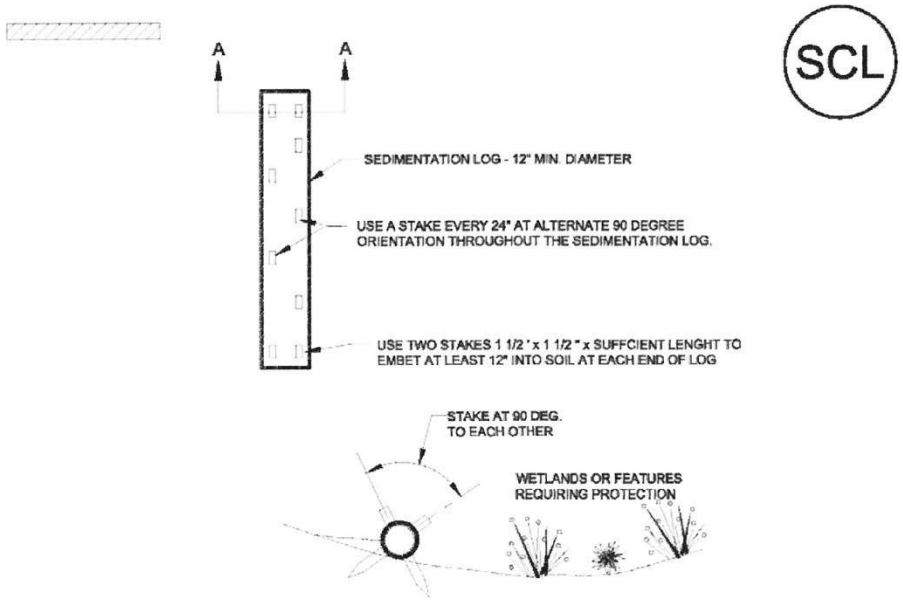
fencing; the use of rock check dams is recommended. Silt fence design guidance and installation details are shown on Figures C5-10.



SECTION A - A

SEDIMENT CONTROL LOG INSTALLATION NOTES

1. SEE PLAN VIEW FOR:
   -LOCATION AND LENGTH OF SEDIMENT CONTROL LOG.
2. SEDIMENT CONTROL LOGS INDICATED ON INITIAL SWMP PLAN SHALL BE INSTALLED PRIOR TO ANY LAND-DISTRURBING ACTIVITIES.
3. SEDIMENT CONTROL LOGS SHALL CONSIST OF STRAW, COMPOST, EXCELSIOR OR COCONUT FIBER.
4. NOT FOR USE IN CONCENTRATED FLOW AREAS.
5. THE SEDIMENT CONTROL LOG SHALL BE TRENCHED INTO THE GROUND A MINIMUR OF 2" AND ADJACENT LOGS SHALL BE FIRMLY PACKED AGAINST EACH OTHER TO ELIMINATE ALL GAPS.

SEDIMENT CONTROL LOG MAINTENANCE NOTES

1. THE SWMP MANAGER SHALL INSPECT SEDIMENT CONTROL LOGS DAILY, DURING AND AFTER ANY STORM EVENT AND MAKE REPAIRS OF CLEANOUT UPSTREAM SEDIMENT AS NECESSARY.
2. SEDIMENT ACCUMULATED UPSTREAM OF SEDIMENT CONTROL LOGS SHALL BE REMOVED WHEN THE UPSTREAM SEDIMENT DEPTH REACHES ½ THE HEIGHT OF THE CREST OF THE LOG.
3. SEDIMENT CONTROL LOGS SHALL BE REMOVED AT THE END OF CONSTRUCTION. IF ANY DISTURBED AREA EXISTS AFTER REMOVAL, IT SHALL BE COVERED WITH TOPSOIL, DRILL SEEDED AND CRIMP MULCHED OR OTHERWISE STABILIZED IN A MANNER APPROVED BY THE LOCAL JURISDICTION.

DETAIL BASED ON DETAILS PROVIDED BY DOUGLAS COUNTY AND CDOT

Figure C5-8—Sediment Control Log

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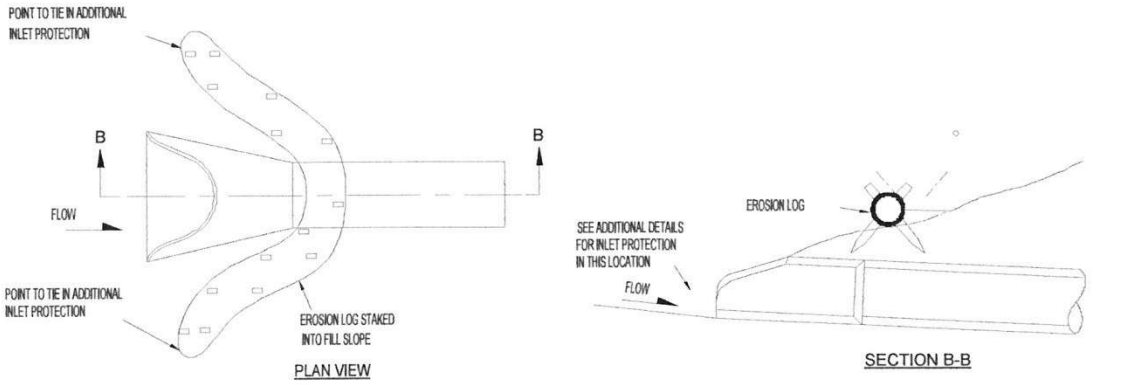
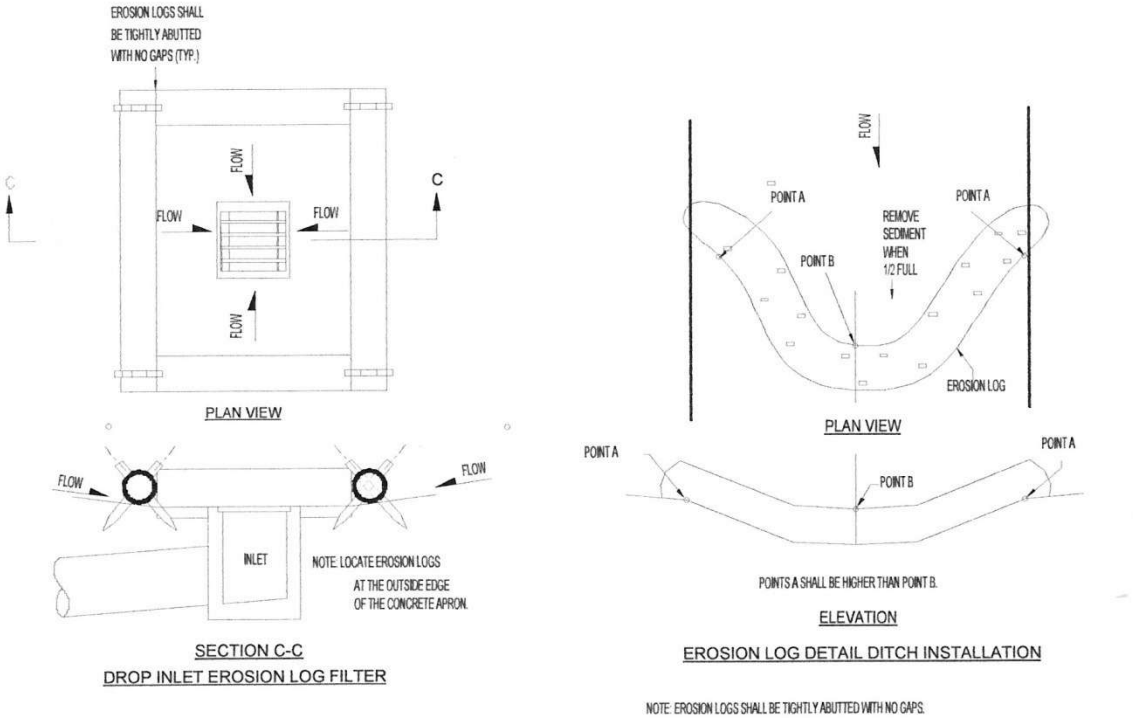


CULVERT EROSION LOG INLET PROTECTION



Adapted From Colorado Department of Transportation (2007)

Figure C5-9—Sediment Control Log Application Examples

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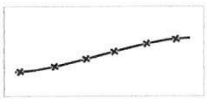
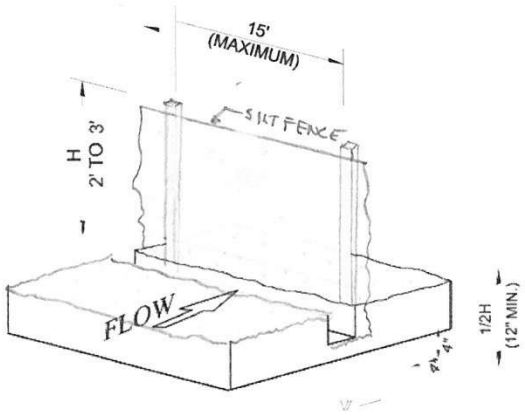
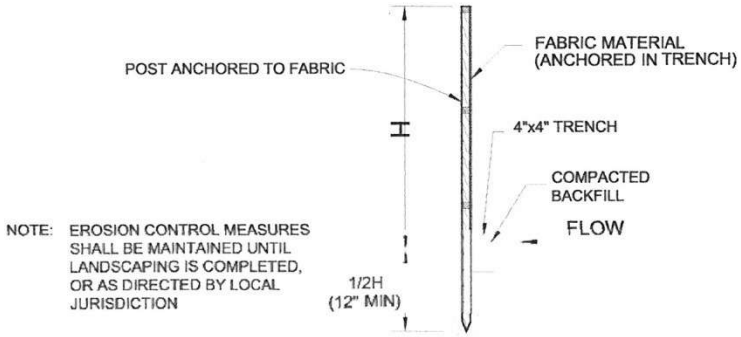


SF



SILT FENCE INSTALLATION
-NTS-



SECTION
-NTS-

DETAILS PROVIDED TO DISTRICT BY THE CITY OF BROOMFIELD, COLORADO

Figure C5-10—Silt Fence Erosion Barrier

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5.6 Waterway Protection

At times construction activities must occur within or immediately adjacent to a drainageway, gulch, stream, creek or river (jointly or separately referred to in this *BMP Plan* as a "waterway"). Whenever this occurs, bottom sediments and the soils adjacent to or/and within the waterway will be disturbed and sediment movement will occur. The goal of these criteria is to minimize the movement of sediments resulting from construction activities that take place immediately adjacent to and within any waterway. When the work is immediately adjacent to a waterway, use of the erosion and sediment control practices described earlier in this BMP Plan should accomplish this goal. As a result, activities such as minimizing disturbed areas adjacent to the waterways, properly mulching disturbed areas as quickly as possible, silt fencing, temporary slope diversions to direct runoff to sediment basins before runoff enters the waterway, and the use of sediment traps or retention basins are needed to accomplish the stated goal. One item that may differ from ordinary construction or mining activities is that the inspection and maintenance of the erosion and sedimentation controls for work adjacent to waterways should occur routinely and after any significant rainfall event.

6 Retention Pond Inspection and Maintenance

Retention ponds incorporated into the Holcim drainage plans are design to function as both stormwater retention facilities and sedimentation ponds. In order for retention ponds to function properly, routine inspection should be done at least on a monthly basis and after any significant rainfall event. Surveys of pond bottom elevation shall be do annually to assess the accumulation of sediment and schedule maintenance. Table 6.1 outlines pond bottom elevations to be maintain throughout the active live of the Holcim Devils Slide Quarry.

Table 6.1 – Retention Pond Bottom Elevations

Pond ID	Pond Bottom Elevation
PND-7B2.1	5237.0
PND-7B2.2	5237.0
PND-8	5310.0
PND-10	6016.0
PND-11	5998.0

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Stormwater held by retention ponds will be allowed to infiltrate into the ground water. Due to the average annual precipitation, the site soils and the semi-arid climate of the area, these retention ponds will not hold water for a significant amount of time. These facilities will remain in place until the disturbed portions of the drainage areas are fully stabilized.

The effectiveness of these retention pond facilities depends upon regular inspections. Routine maintenance will reduce the need to future repairs and remediate any potential for failure and possible release into adjacent waterways. Retention ponds will accumulate sediment over time that will need to be removed periodically. Rates of sedimentation vary considerably based on terrain slope, soil type and regional climate characteristics. Through routine inspections, sediment levels in the ponds should be noted and an appropriate maintenance schedule for removal of sediments formulated. Keep in mind a significant rainfall event could yield a significant supply of sediment to the retention ponds. Spot inspections should be done after all large storm events. In the event of significant sediment deposition after an intense rainfall event, unscheduled maintenance may be required to re-establish the required retention volume for the next storm.

7 Reclamation Revegetation

Holcim will need to arrange for inspection by the Utah Department of Oil, Gas and Mining (UDOGM) when re-vegetation has reached acceptable levels of coverage and maturity in order to start reclaiming stormwater conveyance facilities and retention ponds for ultimate reclamation. Holcim or contractor needs to inspect the site on a regular basin to determine if there are deficiencies or damage to revegetated areas that need to be addressed. Holcim or contractor will be responsible for the performance of all erosion and sedimentation control installations until such time the site's re-vegetation is deemed acceptable.

A viable vegetation cover should be established within one (1) year on all reclaimed areas. Vegetation should be considered established when a ground cover is achieved which is equivalent to at least 70 percent of previously existing vegetation and is sufficiently mature to control soil erosion and can survive severe weather conditions.

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7.1 Seedbed Preparation

Areas to be revegetated should have soils capable of supporting vegetation. Regrading efforts will oftentimes bring to the surface sub-soils that have low nutrient value, little organic matter content, few soil microorganisms, rooting restrictions, and conditions less conducive to infiltration of precipitation. As a result, adding topsoil, compost and/or other soil amendments can be essential to achieve successful revegetation.

Topsoil should be salvaged during stipping operations and stockpiled for use and spreading on areas to be revegetated later. Topsoil should be viewed as an important resource to be utilized for vegetation establishment, primarily due to its water-holding capacity. Native topsoil located on a site has good soil structure, organic matter content, biological activity, and nutrient supply that supports vegetation.

The rooting depth of most semi-arid grasslands evident in the Devils Slide area is four (4) to ten (10) inches. At a minimum, the upper four (4) inches of topsoil can be stripped and stockpiled, and respread for reclamation of disturbed areas. If the surface is compacted, ripping sub-soils prior to placing topsoil is recommended. Scarification will assist in placement of a stable topsoil layer on steeper slopes, and allow percolation and root penetration to greater depth.

Where topsoil is not available or utilized, sub-soils can be treated to provide a plant-growth medium. Organic matter, such as well digested compost, can be added to improve nutrient levels necessary for plant growth. Other treatments, such as liming, can be used to adjust soil pH conditions when needed.

A suitable seedbed will enhance the success of revegetation efforts. The surface should be rough and the seedbed should be firm, but neither too loose nor compacted. The upper layer of soil should be in a condition suitable for seeding at the proper depth and conducive to plant growth.

References:

Urban Drainage Flood Control District, Drainage Criteria Manual, Volume 3 – Best Management Practices, April 2008

United State Environmental Protection, BMP Inspection and Maintenance. http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=factsheet_results&view=specific&bmp=91

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Appendix E – Plate H Drainage Improvements Overview Map

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Legend

N

Graphic Scale
200 0 200
(in feet)
1 inch = 200 feet

Notes

LEGEND

- Structural Cross-pan
- Pond Outlet Weir
- Proposed Rip Rap Channel
- Proposed Stormwater Pond
- Contour Line: 25 ft Interval

Devils Slide Property Lines

- Leased
- Owed
- Drainage Basin Boundary

25-foot Contour Interval

Revision	By	Apprd.	Date
File Name: 106300000	xxx Dwn.	xxx Chkd.	xxx Dsgn.	xx/xx/xx Date

Seals

Client/Project
Holcim US
Devils Slide Plant and Quarry
Interim Drainage Study

Title
Plate H

Project No. 0905001
Scale 1" = 200 ft
Drawing No. 1H
Revision 1

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Appendix I

INTERIM GEOLOGIC MAP OF THE DEVILS SLIDE QUADRANGLE, MORGAN AND SUMMIT COUNTIES, UTAH

By: James C. Coogan, Jon K. King, and Greg N. McDonald

2018

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Plate 1
Utah Geological Survey Open-File Report 691
Interim Geologic Map of the Devils Slide Quadrangle

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SCALE 1:24,000
1 0.5 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0.5 0 1 KILOMETER
CONTOUR INTERVAL 40 FEET
SUPPLEMENTARY CONTOUR INTERVAL 20 FEET

APPROXIMATE MEAN DECLINATION, 2018

QUADRANGLE LOCATION

Base from USGS Devils Slide 7.5' Quadrangle (1991)
Projection: UTM Zone 12
Datum: NAD 1927

Utah Geological Survey
1594 West North Temple, Suite 3110
P.O. Box 146100, Salt Lake City, UT 84114-6100
(801) 537-3300
geology.utah.gov

INTERIM GEOLOGIC MAP OF THE DEVILS SLIDE QUADRANGLE, MORGAN AND SUMMIT COUNTIES, UTAH

by
James C. Coogan, Jon K. King, and Greg N. McDonald

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INTERIM GEOLOGIC MAP OF THE DEVILS SLIDE QUADRANGLE, MORGAN AND SUMMIT COUNTIES, UTAH

by

James C. Coogan [1], Jon K. King [2], and Greg N. McDonald [2]

[1] now with Geology Program, Western State Colorado University, Gunnison, Colorado
[2] Utah Geological Survey

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OPEN-FILE REPORT 691
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INTRODUCTION

The Devils Slide quadrangle is located northeast of Salt Lake City and southeast of Ogden, Utah (figure 1) along a national east-west transportation corridor (U.S. Interstate Highway 84 and the Union Pacific Railroad). The major geographic features in and near the quadrangle are Henefer and Round Valleys and the valleys of Lost Creek and Main Canyon Creek; East Canyon, which extends northward forming the valley of Main Canyon Creek; Durst Mountain to the west and north; the Weber River in Henefer and Round Valleys; and Upper Weber Canyon cut by the Weber River between Henefer and Round Valleys. The valleys of Lost Creek and Main Canyon Creek will be referred to as Lost Creek valley and Main Canyon Creek valley, respectively, hereafter in this report. Devils Slide is named after the two resistant, near vertical limestone beds south of Interstate Highway 84 in Upper Weber Canyon.

This is the third version of a large-scale geologic map of the Devils Slide quadrangle. Schick (1955) presented the first detailed map of the area in his thesis on Upper Weber Canyon, and Mullens and Laraway (1973) published a more complete bedrock map. For this study, Coogan mapped the bedrock, improving the stratigraphy and structure, and also mapped some Quaternary surficial deposits. McDonald mapped surficial deposits on the west margin of the quadrangle. King did additional mapping and standardized surficial units, and therefore is responsible for the Quaternary/surficial deposits; surficial deposits are generally not mapped where they are likely less than 6 feet (2 m) thick. King also added the upper tongue of the Dinwoody Formation and middle shale member of the Thaynes Formation; subdivided the Weber Sandstone like he did in the adjacent Morgan quadrangle (Coogan and others, 2015), although with uncertain accuracy; and locally subdivided the Park City and Phosphoria Formations north of the Weber River. Select field-measured attitudes from Mullens and Laraway (1973) are also included in red on the present map in areas where Coogan had limited access. Several of Mullens and Laraway's (1973) prospect locations and bedrock outcrops that were obliterated by highway construction are also shown in red on the present map. Coogan's work was prior to 2000, while most of McDonald's work was in 2003 and 2004. King's additions and changes were done irregularly from 2000 to 2012. The contacts for the extent of the quarrying for cement plant feed and other human disturbances (Qh) are as of September 1986, when the aerial photographs used to geologically map the Devils Slide quadrangle were taken. Only larger disturbances are mapped. The extent of more recent disturbances, taken from 2009 orthophotographs, are shown by purple lines. The cement plant quarry extent is about double the 1986 size and new disturbances are present near the golf course in Round Valley.

GENERAL GEOLOGY

In the Devils Slide quadrangle, Pennsylvanian through Permian marine sedimentary strata and Mesozoic (Triassic and Jurassic) rocks are exposed between Round and Henefer Valleys. These Paleozoic and Mesozoic strata are probably on the Cretaceous Crawford thrust sheet and are exposed in an east-dipping homocline that is locally complicated by Cretaceous folding, west-directed thrusts, and other faults. The homocline is cut by two west-directed(?) thrust faults north of Round Valley, two smaller west-directed thrusts near Devils Slide, and the west-directed East Canyon thrust west of Henefer Valley. The other (normal[?]) faults in these rocks, no matter the trend, are likely related to deformation during the Cretaceous and early Tertiary because these faults do not cut the Eocene-Paleocene Wasatch Formation. Cretaceous deformation created the Crawford thrust sheet, while Cretaceous and early Tertiary deformation created the Absaroka and Medicine Butte thrust systems farther to the east and reactivated thrust faults that formed earlier in the quadrangle (see figure 2). Mesozoic rocks and the Wasatch Formation are cut by Cenozoic extensional faults near Main Canyon Creek valley. Rotation of the homocline likely occurred during late Cretaceous to Eocene uplift of the Wasatch anticlinorium (culmination of Yonkee and others, 1997), rather than during middle to late Cenozoic normal faulting, because significant down-to-the-west normal faulting, in the form of a large valley, is not present to the east of the exposed homocline. This rotation also produced the overturned monoclines mapped to the west in the Morgan quadrangle (Coogan and others, 2015) and is the reason the direction of transport on the thrust faults is not easily deciphered. Mississippian and older units are likely present in the homocline in the subsurface beneath the Devils Slide quadrangle (see cross section) and are briefly described in the description of map and cross-section units.

Cretaceous conglomeratic rocks of the Weber Canyon Conglomerate and Evanston Formation are exposed on the east flank of the homocline, and unconformably overlie the older Paleozoic and Mesozoic rocks. These synorogenic conglomeratic rocks and the Cretaceous thrust sheets are unconformably overlain by the Cenozoic (Eocene and upper Paleocene) Wasatch Formation. The Weber Canyon Conglomerate is associated with Late Cretaceous movement on the Crawford thrust sheet and initial movement on the Absaroka thrust sheet to the east in Wyoming (figure 2). The younger Evanston and Wasatch strata were deposited during Late Cretaceous and early Tertiary reactivation (and uplift?) of the Willard thrust fault (north of map area) and Crawford thrust fault, and uplift of the Wasatch anticlinorium (figure 2). In the southwest part of the Devils Slide quadrangle,

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west-dipping Wasatch Formation strata are present on the east limb of the Morgan Valley syncline. The Wasatch Formation predates the formation of Morgan Valley, and Lost Creek and Main Canyon Creek valleys. The Oligocene(?) and Eocene Norwood Formation appears to "pinch out" near Lone Tree Canyon in the East Canyon Reservoir quadrangle and is not exposed to the north in the Devils Slide quadrangle; the Norwood may be present in the subsurface on the east side of Main Canyon Creek valley. The Norwood unconformably overlies the Wasatch Formation, "fills" Morgan Valley and the East Canyon graben in adjacent quadrangles, and is folded with the Wasatch Formation in the Morgan Valley syncline.

The Devils Slide quadrangle is geologically significant for its well-exposed Jurassic and Triassic strata, and late Cretaceous to Eocene synorogenic conglomerates (see for example DeCelles, 1994). Other than the Jurassic Twin Creek Limestone (Imlay, 1967) and Triassic Thaynes Formation (Smith, 1969), the Jurassic and Triassic strata in the quadrangle are little studied and warrant further work (see limited palynological data in appendix). The Twin Creek Limestone is the feed source for the cement plant at Devils Slide and is a reservoir rock for oil and gas fields near the Utah-Wyoming border. Asphaltum of uncertain origin was found in Quaternary deposits in the U.S. Bureau of Reclamation trench used to evaluate paleoseismicity in the East Canyon graben (Piety and others, 2010). Salt, likely NaCl (see Mansfield, 1927 p. 338), is present in the shallow subsurface in the Preuss Formation in Main Canyon Creek valley and to the south in the East Canyon graben (see for example Lamerson, 1982, p. 325). Water wells less than 300 feet (90 m) deep on the south margin of Henefer Valley (section 5, T. 3N., R. 4E. Salt Lake Base Line and Meridian [SLBM]) encountered salt (table 1, see Utah Division of Water Rights well drilling database for details). Phosphate is present in the Meade Peak Phosphatic Member of the Phosphoria Formation (map unit Ppm); see Cheney and others (1953), Cheney (1957), and Cheney and Sheldon (1959) for more information. Two trenches have been excavated across the Meade Peak Phosphatic Member south of U.S. Interstate Highway 84 east of Taggarts; it is not known if either of these trenches is that of Cheney and others (1953). The southern (and larger) trench seems to post-date the 1961 U.S. Geological Survey Morgan 15-minute topographic map and pre-date the 1967 aerial photographs McDonald used to map surficial deposits. The larger trench might be related to highway or railroad construction in Upper Weber Canyon rather than phosphate exploration. Minor excavations for coal and copper have also been made in the quadrangle (see for example Gloyn and others, 1995).

SURFICIAL DEPOSITS

Remnants of Pliocene and/or Pleistocene alluvial deposits are present in Main Canyon Creek valley and likely cap some terraces on the Wasatch Formation north of Upper Weber Canyon. Pre-Lake Bonneville Pleistocene alluvial and landslide deposits are present in the Devils Slide quadrangle. Late Pleistocene lacustrine, deltaic, and alluvial deposits related to Lake Bonneville are present in Round Valley, and post-Bonneville shoreline Quaternary (latest Pleistocene and Holocene) alluvial deposits are present in Henefer Valley and Lost Creek valley. Lake Bonneville likely extended into Upper Weber Canyon but did not reach Henefer or Lost Creek valleys, because the highest shoreline is about 5180 feet (1579 m) in Morgan Valley. Mass-movement deposits like landslides and rockfalls are probably the most significant Quaternary units in the quadrangle because of the potential threat to the transportation (railroad, highway, and pipeline) corridor through Upper Weber Canyon. Rockfalls have occurred even where obvious talus slopes are not visible (see McDonald, 2009). Note that no attempt was made to map landslides that post-date the September 1986 aerial photographs used to create the Devils Slide map. Ages (years) in the text and tables are from various methods and are the numbers reported in the original references.

Like in Morgan and Round Valleys, multiple alluviated surfaces are present in the Devils Slide quadrangle east of Round Valley and they seem to be in roughly the same height ranges as surfaces in Morgan and Round Valleys (table 2). The ages of alluvium, including terraces and fans, in the Devils Slide quadrangle are in part based on heights above present adjacent drainages (see table 3). This height approach was taken, rather than relating them to altitudes (including Lake Bonneville shorelines) or a single drainage (like the Weber River), because erosion over time has incised drainages, increasing the heights of alluvium above drainages, alluvial surfaces have slopes, and tributaries to the Weber River increase in altitude up their drainages. So the first surface next to a drainage could be ten to hundreds of feet above the Weber River or a particular altitude. Also, Lake Bonneville did not reach most of the Devils Slide quadrangle, many surfaces predate Lake Bonneville, and drainages were likely backfilled during the rise of Lake Bonneville. If correlated correctly, the surfaces in Morgan and Round Valleys are almost the same as those in the Devils Slide quadrangle that are upstream from several potential Weber River nick points (tight bends cutting Weber Sandstone near Taggarts and extensive Weber Canyon Conglomerate) in Upper Weber Canyon. The alluvial surface heights above Dry and Quarry Cottonwood Creeks are similar to those in Morgan and Round Valleys although these Creeks are upstream from tight bends in Weber Canyon and downstream from the nick point in the Weber Canyon Conglomerate. Due to this apparent correspondence of surfaces, King expanded the area of surface correlations to include the Lost Creek drainage (Lost Creek Dam, Peck Canyon, Francis Canyon) and the Henefer quadrangle (table 3) upstream from the Weber Canyon Conglomerate. Although the older map labels (Coogan, 2004a-c, 2010b) are not consistent with the newer maps (Coogan and

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others, 2015; this report), the surfaces are at about the same heights above adjacent drainages. Note that the correlations for the Lost Creek drainage and Henefer Valley in Coogan (2010b) have been revised (see table 3). The ages of the surficial deposits are uncertain and may extend through the Quaternary, whether the lower boundary is at 1.8 Ma, roughly the top of the Olduvai subchron normal paleomagnetism, or about 2.6 Ma, roughly the top of the normal paleomagnetism marking the top of the Gauss chron (Gibbard and Cohen, 2008).

Quaternary deposits are likely cut by extensional faults in Main Canyon Creek valley (see Piety and others, 2010) and are shown as dashed faults west of and in unit QTa on our map. Another scarp (10 to 18 feet [3–5 m] high) is present across late Pleistocene deposits (Qap) in Hay Hollow to the north in the Lost Creek drainage, but is not prominent in adjacent colluvial deposits that mantle bedrock. Alternatively, these scarps may be from dissolution of the salt welt under East Canyon; see Lamerson (1982, p. 325) and Yonkee and others (1997, figure 28-B) for more on the salt welt.

STRUCTURAL GEOLOGY

The folding and faulting in the area is complex; the timing from oldest to youngest is summarized here. The southwest end of the Crawford thrust fault is located just to the east in the Henefer quadrangle and its location, as mapped there (Coogan, 2010a), is based on the inferred northern extent of the Preuss salt welt. Salt and thrust movement interacted such that the thrust enters the salt, seems to disappear, and then reappears. For an example see Coogan and Yonkee (1984, figure 7) and think of the homocline in upper Weber Canyon as being the rocks of the Sublette Range and the syncline east of the Gulf well as being a faulted version of the Stevenson syncline, which is east of the Devils Slide quadrangle. The salt welt is thickest in East Canyon south of the Devils Slide quadrangle (see Lamerson, 1982, p. 325) and extends northward through Main Canyon Creek valley, Croydon, and Lost Creek valley. The inferred northern extent of the Preuss salt welt is placed at the northern ends of normal faults in the Devils Slide and Henefer quadrangles.

East of the Devils Slide quadrangle, the Stevenson syncline formed after deposition of the Cretaceous (Santonian-Coniacian) Echo Canyon Conglomerate (deposited during emplacement of the Crawford thrust sheet, figure 2) and prior to deposition of the latest Cretaceous Evanston Formation, possibly during early (Campanian) movement on the Absaroka thrust system (see figure 2; Yonkee and others, 1997, figure 30) and likely formed at the same time as the Coalville anticline (see Lamerson, 1982, p. 320–321), also east of the Devils Slide quadrangle. In the Devils Slide quadrangle, the mostly Campanian and coeval Weber Canyon Conglomerate displays widespread growth structures and records uplift of the east limb of the Wasatch anticlinorium in its clast composition. Weber Canyon Conglomerate deposition is synchronous with late slip on the Crawford thrust, early movement on the Absaroka thrust, initial development of the Henefer anticline (now known as the salt welt), and back-thrusting along the East Canyon thrust fault zone (figure 2). The location, thickness, and numerous angular unconformities in the Weber Canyon Conglomerate may be most indicative of repeated salt welt dissolution and movement providing the “hole” for deposition and rotation of beds.

The roughly east-west-trending normal faults and the north-south-trending, broad folds in the Eocene-Paleocene Wasatch Formation are likely the result of Eocene (Darby/Hogsback) thrusting (figure 2), with a leading edge to the east in Wyoming (Yonkee and others, 1997). The west-northwest-trending faults that cut the Cretaceous Evanston Formation in the Devils Slide quadrangle may have formed during Cenozoic extension (normal faults) or Darby/Hogsback-thrusting (tear faults). The abundance of such faults west of Main Canyon Creek valley and the observation that they “die out” away from the valley are the reason these west-northwest-trending faults are shown as normal faults on the map and are interpreted as being contemporaneous with valley development rather than being tear faults.

The roughly north-south-trending normal faults are likely due to post-thrust Cenozoic extension, either from Oligocene(?) and Eocene relaxation of the Cordilleran fold-and-thrust belt (collapse of Constenius, 1996) or from Miocene and younger Basin and Range extension (see for example Sullivan and others, 1988), or from both. Cenozoic extensional faulting occurred along at least the west side of Main Canyon Creek valley; the faulting on the east side of the valley and to the northeast of Croydon may or may not be due to salt dissolution. In particular, some offset in Main Canyon Creek valley and the East Canyon graben is due to relaxation of the Cordilleran fold-and-thrust belt (Constenius, 1996). This is indicated by Oligocene(?) and Eocene Norwood Formation fill to the south in the East Canyon graben (see Bryant, 1990). Miocene and younger Basin and Range extension may have also occurred in and along the East Canyon graben (see Piety and others, 2010).

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The thickness of Tertiary fill (Wasatch Formation, with or without Norwood Formation and younger deposits) in the East Canyon graben is uncertain, but overall seems to increase to the south, possibly with increasing throw on the East Canyon fault zone. From seismic data and well bore sonic velocities, Coogan (July 18, 2007, digital communication to U.S. Bureau of Reclamation) showed about 4000 to 4500 feet (1220–1370 m) of Wasatch and about 800 feet (245 m) of Norwood south of the Devils Slide quadrangle and north of East Canyon Reservoir. From less precise gravity data (Quitzau, 1961), valley fill would be between about 4000 and 5000 feet (1200 and 1500 m) thick near Henefer and 5248 and 6500 feet (1600 and 2000 m) thick near East Canyon Reservoir, based on ~15 mgal and ~20 mgal differences multiplied by 80 and 100 meters of lower density valley fill per mgal, respectively (see data in Phelps and others, 1999 that crudely results in 90 meters per mgal). But low-density salt is present in the subsurface (Jps) so the valley fill is thinner, like Coogan (July 18, 2007, digital communication to U.S. Bureau of Reclamation) showed, or the 80 meters is correct. Quitzau (1961) did not model a profile for either area, but noted a 20 mgal decrease in the 2 miles (3.2 km) east of Devils Slide and a 12 mgal closure in gravity contours. His 20 mgal decrease east of Devils Slide is likely partly due to low-density salt (Jps) in the subsurface (see cross section).

MAP AND CROSS SECTION UNIT DESCRIPTIONS

SURFICIAL DEPOSITS

QUATERNARY

Qa **Alluvium, undivided (Holocene and Pleistocene)** – Sand, silt, clay, and gravel in stream and alluvial-fan deposits; variably sorted; variably consolidated; composition depends on source area and some source areas extend beyond map boundaries; deposits lack fan shape (Qaf) and are distinguished from terraces (Qat) based on upper surface sloping toward adjacent streams from sides of drainage, are mapped where fans and terraces are too small to show separately at map scale, or where relative age (height above adjacent drainage) of alluvium is uncertain; mapped on queried Qatp terrace above Henefer Valley where contact cannot be drawn between thin younger fans (Qafy) upslope and these older terrace deposits; 6 to 20 feet (2–6 m) thick.

Qay, Qa2?

Younger alluvium (mostly Holocene) – Like undivided alluvium, but unconsolidated; mapped on the margins of Round, Henefer, and Lost Creek valleys where not incised by active drainages, and stream and fan alluvium cannot be mapped separately; also up to ~20 feet (6 m) above south side of Round Valley indicating unit includes slightly older post-Provo shoreline regressive Lake Bonneville-age alluvium; revised from Qa1 shown in Pine Canyon in the Henefer quadrangle (see table 3; Coogan, 2010b); mapped as Qa2 (queried) where ~20 feet (6 m) above incised stream in Stephens Canyon; 6 to 20 feet (2–6 m) thick; likely post-dates late Pleistocene Lake Bonneville and is mostly Holocene.

Qapb, Qap, Qap?, Qab, Qab?

Lake Bonneville-age alluvium (upper Pleistocene) – Like younger alluvium, but unconsolidated to weakly consolidated, higher above present drainages, and appears to be related to shorelines of Lake Bonneville; suffixes indicate age with Qap and Qab together comprising Qapb where more exact age cannot be determined or alluvium of different ages cannot be shown separately at map scale; suffixes partly based on heights above adjacent drainages (see tables 2 and 3); Qap is related to the Provo and regressive shorelines of Lake Bonneville that are not present in the map area while Qab is related to the Bonneville shoreline (~5180 feet [1579 m]); Qab appears graded to the Bonneville shoreline as mapped in Round Valley, but this highest level of Lake Bonneville only reached Upper Weber Canyon so Qab elsewhere (as well as all deposits labeled Qap) are not adjacent to shorelines and direct correlation cannot be demonstrated; 6 to 20 feet (2–6 m) thick.

Qapb is mapped about 40 feet (12 m) above Quarry Cottonwood Creek and 10 to 20 feet (3–6 m) above Qap on the floor of Harris Canyon; Qapb revised from Qat2 shown in Henefer quadrangle (see table 3; Coogan, 2010b).

Qap is mapped in the bottom of drainages into Lost Creek and Henefer valleys where the deposits are elevated about 35 feet (11 m) above the adjacent floodplains in those valleys, including a broad unnamed drainage north of Henefer Valley; Qap also mapped east of the Lost Creek valley north of Wolf Den Canyon and queried under Qafy west of the

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Lost Creek valley about 25 to 40 feet (8–12 m) above adjacent floodplain; Qap? mapped in Hay Hollow and Harris Canyon is revised from Qa1 (and stray Qal label) shown in the Henefer quadrangle (see table 3; Coogan, 2010b).

Qab? and Qab are mapped about 40 feet (12 m) and 35 feet (11 m) above Qap on the drainage floors in Hay Hollow and Harris Canyon, respectively; Qab in Harris Canyon is revised from Qat3 shown in the Henefer quadrangle (see Coogan, 2010b); queried Qab above Hay Hollow is revised from Qa2-3 (and stray Qat2 label) shown in the Henefer quadrangle (see Coogan, 2010b); the Harris Canyon Qab is 60 to 65 feet (18–20 m) above the adjacent floor of Henefer Valley; Qab? is mapped on first surface above Qatp? on west side of the Henefer Valley, and is queried because the height above the Weber River may be about 100 feet (30 m), the height of Qao (see table 3); Qab is mapped 60 to 70 (18–21 m) above Quarry Cottonwood Creek; Qab (queried) mapped 65 feet (20 m) above Pine Canyon is revised from Qat3 shown in the Henefer quadrangle (see Coogan, 2010b).

The Qab that is mapped ~80 to 95 feet (24–29 m) above Round Valley and 40 to 50 feet (12–15 m) above adjacent drainages at the mouth of Geary Hollow, with about 80-foot (24 m) thickness, appears unique. Based on heights above adjacent drainages, these deposits would be Qao, but similar alluvial deposits to the east near Phil Shop Hollow have a Bonneville shoreline cut into them and are much thinner. The lack of a Bonneville shoreline, thicknesses, and heights above drainages indicate the deposits could be a Bonneville shoreline fan-delta (see Coogan and others, 2015).

Qao, Qao?

Older alluvium (mostly upper Pleistocene) – Sand, silt, clay, and gravel on surfaces above and likely older than Lake Bonneville-age alluvium; deposits lack fan shape (Qaf) and are distinguished from terraces (Qat) based on upper surface sloping toward adjacent streams from sides of drainage; composition depends on source area; mapped 100 feet (30 m) above Quarry Cottonwood Creek and above Round Valley near Phil Shop Hollow; about 20 feet (6 m) above incised Bonneville shoreline near Phil Shop Hollow; queried Qao is mapped about 120 feet (37 m) above Dry Creek because this height overlaps with Qaoe, but the deposits are below nearby Qaoe.

Older alluvium is likely older than Lake Bonneville and the same age as Qafo (likely Bull Lake age; 95,000 to 130,000 yrs old—see Chadwick and others, 1997, and Phillips and others, 1997); see table 2 and note revisions from Coogan and King (2006) and King and others (2008). From work in the Henefer quadrangle (Coogan, 2010a) and the Devils Slide quadrangle, and age estimates in Sullivan and Nelson (1992) and Sullivan and others (1988), the older alluvium (Qao, Qafo, Qato) may encompass upper (pre-Bull Lake) and lower (Bull Lake) alluvial surfaces that are not easily recognized in Morgan Valley (see tables 2 and 3).

Qaoe, Qaoe?

Older eroded alluvium (middle and lower Pleistocene) – Like older alluvium but mapped on eroded remnants of surfaces located above the Bonneville shoreline, and above (and older than) pre-Lake Bonneville older alluvium (Qao and Qafo); Qaoe typically about 10 feet (3 m) thick, but appears ~120 feet (37 m) thick in one exposure west of Henefer Valley at Roberts Hollow and in queried exposures (Qaoe?) in Weber Canyon.

Qaoe is mapped 130 feet (40 m) above Quarry Cottonwood Creek and 150 feet (46 m) above Dry Creek; Qaoe? is mapped 190 feet (58 m) above Lost Creek valley in Wolf Den Canyon, and queried because it is shown as Qa4 (surface 5) in the Henefer quadrangle but only 60 to 80 feet (18–24 m) above the drainage in canyon; Qaoe is mapped as queried more than 140 feet (43 m) above the west side of Henefer Valley at and north of Roberts Hollow because actual height above Henefer Valley is uncertain and variable; Qaoe is mapped as queried where 135 and 160 feet (41 and 49 m) above the Weber River near the cement plant due to poor exposure and Qmc caps. In the Main Canyon Creek valley east of the graben, alluvium mapped above Main Canyon Creek is at the height boundary of Qaoe and QTa, but their mapped height above the Weber River would make the alluvium QTay, so the alluvium is labeled QTay?.

The thin colluvium capped surfaces (Qc and Qc/Qa on map) 220 feet (67 m) above Frank Hollow may be Qaoe or QTay; degraded terraces (surfaces with no mappable deposits) are present ~120 to 150 feet (37–46 m) and ~180 feet (55 m) (QTay?) above Lost Creek between Coal Hollow and Chokecherry Hollow, and ~195 feet (69 m) above Dry Creek.

The Pleistocene age for older eroded alluvium is uncertain, but west of the Weber River in the Morgan quadrangle, the deposits at similar heights above drainages were reported by Sullivan and others (1988) as being older than 730

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ka [>780 ka, Bassinot and others, 1994], based on reversed paleomagnetism; however, their sample site is one of the highest alluvial remnants of Qaoe (>200 feet [60 m] up) and may be QTay.

Qal, Qal?

Stream alluvium and floodplain deposits (Holocene) – Sand, silt, clay, and gravel in channels, floodplains, and terraces less than 10 feet (3 m) above stream level; moderately sorted; unconsolidated; locally includes muddy, organic overbank and oxbow lake deposits; mapped along Weber River and Lost Creek; composition depends on source areas far beyond the Devils Slide quadrangle, but typically contains many quartzite cobbles recycled from the Wasatch Formation; mostly Holocene, but deposited after regression of Lake Bonneville from the late Pleistocene Provo shoreline; 6 to 20 feet (2–6 m) thick. Qal queried where may include alluvial-fan deposits.

Parts of the Weber River in upper Weber Canyon were moved during construction of Interstate Highway 84, so stretches of the river bed that are mapped as Qal, and are historical, could be mapped as human disturbances (Qh).

Qat, Qat2?, Qatp?, Qato?

Stream-terrace alluvium (Holocene and Pleistocene) – Sand, silt, clay, and gravel in terraces above floodplains; moderately sorted; variably consolidated; upper surfaces slope gently downstream; number and letter suffixes indicate relative ages and are from heights above adjacent drainages and follow those in Morgan Valley and Round Valley (see tables 2 and 3); the lowest/youngest terraces are Qat2 and are post Lake Bonneville and likely mostly Holocene in age; terraces labeled Qatp? are likely related to the Provo and slightly lower regressive shorelines of Lake Bonneville, although these shorelines are not present in the map area; unit Qato? is likely older than Lake Bonneville; Qat with no suffix used where age unknown or age subdivisions of terraces cannot be shown separately at map scale; Qat only mapped north of Wolf Den Canyon where height uncertain but likely no higher (older) than Qap; 6 to at least 20 feet (2–6+ m) thick.

Queried Qat2 is only mapped where it is 12 feet (4 m) above Tom Condies Creek in Pine Canyon and queried because it may be in the floodplain (Qal2) and the bench cannot be distinguished downstream in the Henefer quadrangle; queried Qatp is only mapped 30 feet (9 m) above the Lost Creek valley north of Wolf Den Canyon and 20 to 30 feet (6–9 m) above the Weber River in Henefer Valley and queried because it is the first terrace above the River and would typically be Qat2; queried Qato is mapped north of Wolf Den Canyon where it is 120 feet (36 m) above the Lost Creek valley and may be Qao or Qaoe; Qatp? in Henefer Valley is revised from Qat2 shown in the Henefer quadrangle (see Coogan, 2010b).

Qaf **Alluvial-fan deposits, undivided (Holocene and Pleistocene)** – Mostly sand, silt, and gravel that is poorly stratified and poorly sorted; variably consolidated; includes debris-flow deposits, particularly in drainages and at drainage mouths (fan heads); mapped where fan age uncertain or for composite fans where portions of fans with multiple ages cannot be shown separately at map scale; mapped along Lost Creek and Quarry Cottonwood Creek and near mouth of Phil Shop Hollow; toes of most of the fans in Upper Weber Canyon have been removed for roadbed construction, so their age cannot be readily/easily determined and therefore are labeled Qaf; generally less than 40 feet (12 m) thick.

Qafy, Qafy?

Younger alluvial-fan deposits (Holocene and uppermost Pleistocene) – Like undivided fans but unconsolidated, and younger fans impinge on present-day floodplains, divert active streams, and/or overlie low terraces; probably post-Lake Bonneville and mostly Holocene in age; mapped where they impinge on floodplains and terraces along Weber River in Round and Henefer Valleys and Upper Weber Canyon, as well as in Lost Creek valley; queried at mouth of Hay Hollow where may include other alluvial units; generally less than 40 feet (12 m) thick.

Qafpb, Qafpb?

Lake Bonneville-age alluvial-fan deposits (upper Pleistocene) – Like undivided alluvial fans but ~40 feet (12 m) above Lost Creek Valley; appear to be related to the Provo and/or Bonneville shorelines of Lake Bonneville; mapped north of Wolf Den Canyon; queried where only 25 feet (8 m) above north end of Henefer Valley because lower than adjacent Qap (35 feet [11 m] up), but appears to underlie Qap and may be related to Lake Bonneville transgression; unit less than 40 feet (12 m) thick.

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Qafm, Qafm?

Pre-Lake Bonneville-age alluvial-fan deposits (upper Pleistocene) – Like older alluvial fans (Qafo?), but mantle Qafo? in graben in Main Canyon Creek valley and estimated age in U.S. Bureau of Reclamation trench (SW1/4SW1/4 section 5, T. 3 N., R. 4 E. SLBM) is older than Lake Bonneville and younger than Bull Lake glaciation (31–38 ka) (see table 3 and Piety and others, 2010); a surface on QTaf? and QTa? east of the graben can be traced upstream to Qafm/Qafo? and this surface is about 80 feet (24 m) above adjacent active drainage into Main Canyon Creek, a height on the boundary between Qab and Qao (see table 3). Queried because intermittent upward movement and dissolution of salt welt makes fan-age classification uncertain.

As exposed in the Bureau of Reclamation trench (plate 1), Qafm is overlain by Qafy on the downthrown side of the trenched fault and QTaf? is overlain by Qc on the upthrown side of the fault; but these younger units are so thin (<3 feet [1 m] and 3 feet [1 m] thick, respectively) that they are not mapped.

Qafo? **Older alluvial-fan deposits (mostly upper Pleistocene)** – Incised fans of mostly sand, silt, and gravel that are poorly stratified and poorly sorted; includes debris-flow deposits, particularly in drainages and at drainage mouths (fan heads); likely older than Lake Bonneville; queried in Wolf Den Canyon because 115 feet (35 m) above Lost Creek valley but only 40 feet (12 m) above creek in Wolf Den Canyon and height above Lost Creek is near boundary between Qafo and Qafoe; queried Qafo also mapped 135 to 140 feet (41–43 m) above Dry Creek in northwest margin of map area because this height is more like Qafoe in Morgan Valley (see table 2 and Coogan and others, 2015); generally less than 40 feet (12 m) thick.

Qafo is queried in the East Canyon graben because the deposits are not dissected and some deposits mantle Qafoe (see also unit Qafm above); this results in a reversal of typical height above adjacent drainages and only local incision. Our Qafo is roughly shown to the south by Bryant (1990) as Qgp (pediment gravel); farther south he showed Qoa (dissected alluvium) adjacent to the East Canyon fault, which may be the QTaf or Qafoe that we mapped in the Devils Slide quadrangle. We mapped queried Qafo under queried Qafm (Qafm?/Qafo?) east of the graben near Main Canyon Creek, where the height above the creek is at division of two surfaces (Qs3-4 and Qs4, table 3); see also unit Qafm above. These atypical deposits are likely the result of irregular upward movement and dissolution of salt in the East Canyon graben. As noted under Qao, Qafo may contain two ages (levels) of alluvial surfaces that are not easily recognized in Morgan Valley.

Qafoe? **Older eroded alluvial-fan deposits (middle and lower Pleistocene)** – Contain mostly sand, silt, and gravel that is poorly bedded and poorly sorted; typically in eroded fan remnants located above and apparently older than pre-Lake Bonneville older alluvial-fan deposits (Qafo) and lower relative to alluvial units QTa?, QTay, QTay?, and QTaf?; however in Main Canyon graben, Qafoe? actually overlies unit QTaf? and underlies Qafo?; this stacking indicates filling of the graben as it subsides and exposure due to periodic incision as the east side of the graben is breached by streams; thickness uncertain, may approach 80 feet (24 m); likely same age as Qaoe (>780 ka).

Qafoe? seems to be 120 feet (36 m) above the adjacent drainage in the Main Canyon graben but infilling of the graben makes this height ambiguous; for this reason, Qafoe? is not shown in the Devils Slide quadrangle in table 3.

Qac, Qac?

Alluvium and colluvium (Holocene and Pleistocene) – Unsorted to variably sorted gravel, sand, silt, and clay in variable proportions; includes stream and fan alluvium, colluvium, and, locally, mass-movement deposits too small to show at map scale; typically mapped along smaller drainages that lack flat bottoms; 6 to 20 feet (2–6 m) thick.

Some Qac deposits are "perched" on benches ~40 to 130 feet (12–40 m) above Quarry Cottonwood and Dry Creeks, and 55 to 80 feet (17–24 m) above the west side of the Lost Creek valley indicating the alluvium is at least partly Lake Bonneville age and older (see tables 2 and 3); similar benches are present in the Heiners Creek and Henefer quadrangles (see Coogan, 2010a-b); Qac is queried where it is ~250 feet (75 m) above Big Cottonwood Creek on the north edge of the Devils Slide quadrangle and may be QTay.

Qc, Qc?

Colluvium (Holocene and Pleistocene) – Unsorted clay- to boulder-sized material; includes material moved by slopewash and soil creep; composition depends on local bedrock and surficial deposits(?); some colluvium mapped

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on alluvial(?) surfaces about 65 to 220 feet (20–70 m) above Frank Hollow, but the surfaces may be beds in Keh; Qc queried above Quarry Cottonwood Creek and Phil Shop Hollow where it may be residual deposits on bedrock (Keh), and along tributary to Dry Creek where it may be Qmc; generally less than 20 feet (6 m) thick.

Qct **Colluvium and talus, undivided (Holocene and Pleistocene)** – Unsorted, clay- to boulder-sized angular debris (scree) at the base of and on steep, typically partially vegetated slopes; mapped in Round Valley north and south of Weber River on and at the base of steep Weber Sandstone exposures; forms debris cones north of the Weber River; also mapped in Weber Canyon on and at the base of several bedrock units; 6 to 20 feet (2–6 m) thick.

Qmc, Qmc?

Landslide and colluvial deposits, undivided (Holocene and Pleistocene) – Poorly sorted to unsorted clay- to boulder-sized material; mapped where landslide deposits are difficult to distinguish from colluvium (slopewash and soil creep) and where mapping separate, small, intermingled areas of landslides and colluvial deposits is not possible at map scale; locally includes talus, debris-flow, and flood deposits; typically mapped where landslides are shallow; also mapped where the blocky or rumpled morphology that is characteristic of landslides has been diminished or smoothed by slopewash and soil creep; composition depends on local sources; 6 to 40 feet (2–12 m) thick. These deposits may be as unstable as landslide units Qms, Qms1, Qmsy, and Qmso. Queried on north margin of map area and in Main Canyon Creek valley where may not include landslides and be Qac.

Qms, Qms?, Qms1, Qmsy, Qmso

Landslide deposits (Holocene and Pleistocene) – Poorly sorted clay- to boulder-sized material; includes slides, slumps, and locally flows and floods; generally characterized by hummocky topography, main and internal scarps, and chaotic bedding in displaced blocks; composition depends on local sources; morphology becomes subdued with time and amount of water in material during emplacement; thicknesses highly variable, but estimate up to about 20 to 30 feet (6–9 m) for small slides, and 80 to 100 feet (25–30 m) for larger landslides; divided into younger (mostly Holocene) and older (Pleistocene) deposits where possible (suffixes y and o, respectively). Qms queried where identification as landslide is uncertain. Contacts shown between landslides where deposits are different/distinct. Numerous landslides are too small to show at map scale and typically landslides less than 6 feet (2 m) thick have not been mapped.

Qms without a suffix is mapped where the age is uncertain (though likely Holocene and/or late Pleistocene), where portions of slide complexes are of different ages but cannot be shown separately at map scale, or where boundaries between slides of different ages are not distinct. Qms1 is mapped where scarps have not been revegetated, and the landslide is Holocene and may be historical. Qmsy is mapped where a landslide deflects the stream in upper Phil Shop Hollow.

Qmso is typically mapped where deposits are perched above present drainages, rumpled morphology typical of mass movements has been diminished, and/or younger surficial deposits cover or cut Qmso. Qmso is mapped above Quarry Cottonwood Creek where downslope the slide ends are "perched" about 300 feet (120 m) or more, as well as 80 and 110 feet (24 and 34 m) above the present drainage. The lower deposits are at the heights of Qao above Quarry Cottonwood Creek, and the higher deposits may be related to alluvium (unit QTa) in Morgan Valley that is likely older than 780 ka (see table 3 and Coogan and others, 2015, table 1). Older landslide deposits may be unstable, and are easily reactivated with the addition of water, be it precipitation, altered drainage, irrigation, or septic tank drain fields.

Qms(Tw), Qms?(Tw), Qms?(Keh), Qms?(Pp), Qms?(PIPw)

Block landslide and possible block landslide deposits (Holocene and upper and middle? Pleistocene) – Mapped where nearly intact block is visible in landslide (mostly block slide) with stratal strikes and dips that are different from nearby in-place bedrock; unit involved in landslide shown in parentheses, for example Qms(Tw); composition depends bedrock unit; see rock unit in parentheses for descriptions of blocks; thickness highly variable, up to about 20 to 30 feet (6–9 m) for small slides, and cross sections in nearby quadrangles show larger blocks are about 150 feet (45 m) thick. Qms queried, for example Qms?(Tw), where bedrock block may be in place, that is stratal strikes and dips in queried block are about the same as nearby in-place bedrock.

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Qmdf, Qmdfh

Debris-flow deposits (Holocene and upper Pleistocene) – Mostly very poorly sorted sand, silt, clay, gravel, and cobbles in unstratified deposits characterized by rubbly surfaces and debris-flow levees with channels, lobes, and mounding; deposits in drainages typically form mounds, an indication of being more viscous Qmdf rather than being flat like Qac; many debris flows cannot be shown separately from alluvial fans because a consistent contact cannot be drawn between the debris flows and the fans that are at least partly comprised by debris-flow deposits; Qmdfh deposits are lobate debris accumulations and are mapped on active alluvial fans (Qafy) on the north side of Round Valley where debris flows in 1958 are documented; these historical debris flows are visually distinct from alluvial fans in Round Valley and contacts are based on lack of vegetation and fresh appearance of natural levees, channels, and debris; 0 to 40 feet (0–12 m) thick; mapped because of historical hazard, despite being less than 6 feet (2 m) thick.

Qmrf **Rockfall deposits (Holocene and Pleistocene)** – Unsorted, angular, block and finer debris at base of cliff in Triassic rocks south of Interstate Highway 84 (section 23, 26, T. 4N., R. 3E. SLBM) and north of the Interstate at base of cliff of Weber Sandstone (section 28, T. 4N., R. 3E. SLBM); the former may have been emplaced by a single event and the latter is at least partly historical since it is on an old highway roadbed; the cliffs have distinct scarps above the debris; estimate 0 to 40 feet (0–12 m) thick; mapped because of historical hazard, despite being less than 6 feet (2 m) thick.

Qmt **Talus (Holocene and Pleistocene)** – Unsorted, clay- to boulder-sized, angular debris (scree) at the base of and on steep, mostly unvegetated slopes; only larger debris fields can be shown at map scale; deposits include minor colluvium locally; likely less than 20 feet (6 m) thick.

Qadb? **Lake Bonneville transgressive and Bonneville-shoreline alluvial-fan and delta deposits (upper Pleistocene)** – Cobbly gravel, sand, silt, and clay deposited above (subaerial) and in Lake Bonneville (subaqueous) as lake transgressed to and was at the Bonneville shoreline; mapped at the mouth of Phil Shop Hollow where Bonneville shoreline is obscure so that line cannot be drawn between delta and fan; outside the map area, this unit is better sorted delta and lake deposits overlying poorly sorted alluvial-fan deposits; 6 to at least 40 feet (2–12+ m) thick.

Qh, Qh?

Human disturbances (Historical) – Mapped disturbances obscure original rocks or deposits by cover or removal; only larger disturbances are shown; includes rock removal and engineered fill, particularly along Interstate Highway 84 and Union Pacific Railroad, and disturbances from cement plant operations, as well as gravel pits and sewage-treatment facilities. Edges of disturbances that post-date the 1986 aerial photographs used to map the geology in this quadrangle are shown in purple and were added from and are visible on 2006 and 2009 orthophotographs of the quadrangle.

QUATERNARY AND TERTIARY

The change in the Quaternary-Tertiary boundary favored by Europeans from about 1.8 Ma, roughly the top of the Olduvai normal paleomagnetism subchron, to about 2.6 Ma, roughly the top of the normal paleomagnetism marking the top of the Gauss chron (Gibbard and Cohen, 2008), does not affect mapping and labeling of the following unconsolidated units because we do not have any paleomagnetic data. However, carving nearly a million years out of the episodically shrinking Pliocene means rocks we have listed as Pliocene in the Morgan quadrangle (Coogan and others, 2015), like the fanglomerate of Huntsville (Thv) and younger conglomeratic unit Tcy, may be Quaternary even though they are consolidated (rock). We have chosen to keep rocks (consolidated and/or lithified) as Tertiary and unconsolidated deposits as Quaternary and Quaternary/Tertiary to emphasize their erosional, geotechnical, and hydrological differences.

QTa?, QTay, QTay?

High-level alluvium (lower Pleistocene and/or Pliocene) – Gravel, sand, silt, and clay above Weber River terraces near Henefer, and in graben between East Canyon fault and Main Canyon Creek appear to be alluvial fans and gravel armored surfaces, but may include terrace deposits related to the Weber River; at least locally poorly sorted (see Eardley, 1944, p. 874); QTa? mapped with upper surface about 265 and 360 feet (80 and 110 m) above and next to Henefer Valley, because this height range is at the division of QTay and QTao in Morgan Valley; QTay? mapped about 200 and 220 feet (60 and 67 m) above Henefer Valley; QTay mapped above Qaoe at 200 and 240 feet (60–75 m) above Quarry Cottonwood Creek, with the former queried because height may indicate alluvium is unit Qaoe; the thin colluvium-capped surfaces (Qc and Qc/Qa on map) 220 feet (67 m) above Frank Hollow may

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be Qaoe or QTay; estimate QTa? at least 240 feet (75 m) thick in high bluffs next to Henefer Valley, and QTay? ~200 feet (60 m) thick to south where relief is lower and bluffs could be Qaoe (see also well 5, table 1).

QTaf? **High-level alluvial-fan deposits (lower Pleistocene and/or Pliocene)** – Red gravel, sand, silt, and clay, in graben east of East Canyon fault; fan material eroded from red conglomeratic Wasatch Formation (Tw) and Weber Canyon Conglomerate (Kwc), as well as sandy Preuss Redbeds (Jp, Jsp?); these red bedrock units, at least locally, shallowly underlie the red fans, making fan contacts difficult to map and fan identification uncertain, hence the query on the map unit; overlain downslope by units Qafoe and Qafo and upslope map unit locally includes thin, small younger (likely Holocene) alluvial fans (Qafy) that cannot be shown separately at map scale, have indistinct edges, and/or are less than 6 feet (3 m) thick; at least locally gravel-armored and poorly sorted (see Eardley, 1944, p. 874); estimate about 240 feet (75 m) thick in bluff along antithetic fault just to south in East Canyon Reservoir quadrangle. The surface on QTaf? and QTa? in Main Canyon Creek valley is not the Weber Valley surface of Eardley (1944, see, in particular, his plate 7) despite these units being part of his surface in Morgan Valley (see Coogan and others, 2015).

Our unit QTaf? was mapped as Wasatch Formation, with a down-to-the east normal fault, to the south by Bryant (1990); farther south Bryant (1990) showed Qoa (dissected alluvium) adjacent to fault, which may be our QTaf or Qafoe unit.

STACKED UNITS

Numerous stacked units are on this map. This is partly a result of the compromise between showing surficial deposits and bedrock on the same map. By stacked, we mean a thin covering of one unit over another, which is shown by the upper map unit (listed first) then a slash and then the underlying unit (for example Qc/Tw). The upper unit is typically a surficial deposit with the lower unit being rock (Q_/rx), but exceptions are present. We map the stacked units where it is important to show both units as they have potential geologic hazards and/or economic value (for example landslides or landslide-prone impermeable clayey bedrock units, and phosphate or sand and gravel). The upper unit is typically about 6 feet (2 m) thick and conceals but does not obscure the lower unit. This thickness was chosen because a building foundation would penetrate a thinner upper unit, particularly colluvium (Qc), making it a small factor in construction. We have not mapped most of the colluvium as it is thinner than 6 feet (2 m) and we can tell what is underneath. The exceptions to this approach are where the thin deposits obscure the geologic details of faulting, lithologies, and age relationships. The underlying unit in the stack has been identified based on exposures at the edges of the stacked unit and small exposure windows (gaps) or excavations in the cover that cannot be shown at map scale, and materials in the cover that came from the underlying unit.

Qh/Qmt

Surficial deposits over mass-movement deposits – These units were mapped because they inform the map user about potential geologic hazards; and in this case about talus and potential rockfalls that may impact the human disturbance.

Qmc/Qa, Qmc/Qao?

Mass-movement deposits over surficial deposits – These units were mapped because they inform the map user about overlying potential geologic hazards.

Qc/Tw, Qc/Keh, Qac/Keh, Qc/Kk, Qc/Jsp?, QTaf?/Jsp?

Surficial deposits over bedrock – The units were mapped because they inform the map user about potential geologic hazards due to the underlying landslide-prone and impermeable clayey bedrock.

Qac/Qa, Qac/Qab, Qac/Qao?, Qc/Qa, Qc/Qab?, Qc/Qafo?, Qc/QTay?, Qc/Kwc, Qc/Kwc?, Qc/Jtl?, Qc/Jtw?

Alluvial and colluvial deposits over other surficial deposits and bedrock – These units were mapped because they show where we are uncertain about which underlying unit is present (underlying unit queried), and/or where the overlying Qac and Qc may obscure the underlying materials or bedrock.

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Tw?/Jsp, Tw?/Jsp?, Keh?/Pp

Bedrock over bedrock – Thin, typically easily weathered bedrock over other bedrock, which means the overlying "bedrock" may actually be surficial deposits; over the salt welts near Moab, Utah, units similar to stacked Jsp units are referred to as "caprock"; also units Tw, Keh, and Jsp are locally landslide prone.

Qafy/Qap?, Qafm/Qafo?, Qafm?/Qafo?, Qafo?/Qafoe?

Surficial deposits over surficial deposits – These units were mapped because they inform the map user about stratigraphic age-relation details seen in the field that went into the Quaternary correlation chart.

BEDROCK UNITS

TERTIARY

Tw, Tw?

Wasatch Formation (Eocene and upper Paleocene) – Typically red to reddish-brown sandstone, siltstone, mudstone, and conglomerate; conglomerate clasts typically rounded and derived from Precambrian (Neoproterozoic) and Paleozoic meta-sedimentary and sedimentary rocks, typically quartzite; lighter shades of red, yellow/tan, and light gray more common in uppermost Wasatch; basal conglomerate contains locally derived angular clasts where contact with underlying Mesozoic rocks is exposed and is less likely to be red; queried Wasatch (Tw?) has visible bedding, and is reddish strata northwest of Henefer and pale grayish strata on the divide between Lost Creek and Henefer Valleys that may be some other unit than the Wasatch, likely red Preuss Redbeds (Jp, Jsp), and light gray to tan Weber Canyon (Kwc), Hams Fork Member of Evanston Formation (Keh, Kehc), and/or Stump Formation (Jsp). Tw contains scattered oncolitic/algal limestone beds (see Mullens, 1971, p. 18; Mann, 1974) south of Weber Canyon and west of East Canyon fault zone. Tw locally includes landslides that are too small to show at map scale. The Wasatch Formation is at least locally prone to slope failures, because it is at least locally clay rich and poorly consolidated. Permeability in the Wasatch Formation is complicated due to clay content, limestone beds, and variable cementation that is so strong in some areas that quartzite clasts are broken through rather than around during fracturing. The variability is indicated by perched springs in the unit.

The age of the Wasatch Formation is based on the Eocene-Paleocene boundary used in Jacobson and Nichols (1982), which is likely the C24 paleomagnetic reversal (see Hicks and others, 2003). Other Eocene-Paleocene boundaries would put P6 (Paleocene) palynomorphs in the Eocene, and the P stands for Paleocene. Wasatch strata to the southeast in Salt Lake City 30 x 60-minute quadrangle contain P5-6 palynomorphs, but also the palynomorph *Platycarya platycaryoides* (Nichols and Bryant, 1990, sample D6052), which is Eocene (see Nichols, 2003). See also Jacobson and Nichols (1982) for Paleocene (P) biozones based on palynology, and upper Paleocene (P5 and P5-6) Wasatch samples (P3055-2A, 3B; P3387-2) taken to the south (their figure 7 updated with mapping by Bryant, 1990) and P5-P6 sample (P2833-1,2) from the Wasatch Formation in the Ogden 30 x 60-minute quadrangle (their figure 11 updated with mapping by Coogan and King, 2016). Wasatch strata to the northeast in the Meachum Ridge quadrangle contain upper Paleocene (P4-5) palynomorphs in sample 97-7 and Eocene palynomorphs in sample 97-13 that is above sample 97-7 (Coogan and King 2016, appendix table 1) with both containing recycled Maastrichtian and P1-2 palynomorphs; recycled since the P1-2 interval is in the unconformity that separates Paleocene (Tev) from Cretaceous (Keh) Evanston Formation (See Jacobson and Nichols, 1982).

The Wasatch Formation total thickness from the unfaulted Tn-Tw contact in the southeast part of the Morgan quadrangle to the Tw-Keh contact in the southwest part of the Devils Slide quadrangle is about 5000 to 6000 feet (1500–1800 m), as estimated by King using bedding dip (~20–25°), outcrop pattern, and topography. The Wasatch Formation may be thinner north of the Weber River because it is likely as much as about 2800 feet (800 m) thick near Herd Mountain, Bybee Knoll quadrangle. Thicknesses vary locally due to considerable relief on the basal erosional surface.

South of the map area, the total Wasatch thickness reportedly is as much as about 5000 feet (1525 m) with 4500 feet (1370 m) measured in an incomplete section in the southern Morgan Valley, Porterville quadrangle (Mann, 1974), south of the Weber River. However, the exact location of this measured section is uncertain; it appears to have started near the top of the Wasatch Formation near Whites Crossing (King reconnaissance mapping), but it may not have

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ended at the bottom of the Wasatch Formation. Also, Mann (1974) reported about 950 feet (290 m) of covered strata with schist boulder float at the base of his Wasatch section northwest of East Canyon Reservoir. However, boulder conglomerate with crystalline rock clasts is characteristic of the basal conglomerate of the Cretaceous Hams Fork Member of the Evanston Formation to the north near Devils Slide (see DeCelles, 1994).

Twc **Basal conglomerate of Wasatch Formation (upper Paleocene)** – Red-orange- and tan-weathering, cobble conglomerate, mainly containing Neoproterozoic and Cambrian quartzite clasts (DeCelles, 1994; see also Mann, 1974, site A, p. 75); forms prominent cliffs along the western tributaries of Lost Creek in Devils Slide quadrangle; likely more extensive than mapped because thinner exposures are poorly cemented and are likely masked by colluvium from adjacent mudstones; 0 to 400 feet (0–120 m) thick. Age based on P5-6 palynomorphs in Wasatch strata as shown by Nichols and Bryant (1990) and as noted above in unit Tw.

CRETACEOUS

Keh, Keh?

Hams Fork Member of Evanston Formation (Upper Cretaceous, Maastrichtian and Campanian) – Light-gray, brownish-gray, and tan sandstone, conglomeratic sandstone, and quartzite- and chert-pebble conglomerate, variegated gray, greenish-gray, and reddish-gray mudstone; coal locality is shown in Phil Shop Hollow by Mullens and Laraway (1964) (locations in section 3, T. 3 N., R. 3 E. SLBM are ours not theirs); palynology sample (P3903-2), stratigraphically above the coal and near the Wasatch Formation contact (not on our map because location is uncertain), is Maastrichtian-upper Campanian (Jacobson and Nichols, 1982, p. 740), although reported as latest Maastrichtian in Lamerson (1982, p. 324); a sample from the Causey Dam quadrangle (Mullens and Laraway, 1964) was reported as Late Cretaceous age (Lance Formation age [Maastrichtian]) (Leopold in Mullens, 1971, p. 13); up to about 600 feet (180 m) thick in Devils Slide quadrangle, not including basal conglomerate (Kehc, Kehc?). Regionally the same ages are derived from palynology (see Jacobson and Nichols, 1982; Coogan and King 2016, appendix tables 1 and 2). Queried on Thaynes Formation ridge where unit may be Wasatch Formation or surficial deposits, and queried along Quarry Cottonwood Creek and on Park City–Phosphoria Formation (Keh?/Pp) where unit may be surficial deposits. The Hams Fork is at least locally prone to slope failures due to high clay content and poor consolidation. Like unit Tw, permeability is variable.

Regionally, unconformably truncated and locally absent beneath the Wasatch Formation. In the hanging wall of the East Canyon thrust also unconformably truncated and locally absent, although King speculates that this may be an effect of movement of the salt welt rather than anything to do with the East Canyon thrust. Regionally the member thickens to the north, from 300 feet (90 m) at Echo Canyon Junction (to southeast of Devils Slide quadrangle) to 1200 feet (365 m) to the north near Lost Creek Dam (Coogan 2004b), and then thins to absence to the north below the angular unconformity at the base of the Wasatch Formation (Coogan, 2006a-b). The Member coarsens downward to the basal conglomerate (Kehc, Kehc?) that is mapped separately where possible.

This unit was named the Hams Fork Conglomerate Member by Oriel and Tracey (1970), but conglomerate in the name is dropped in the Ogden 30 x 60-minute quadrangle because strata are mostly sandstone and mudstone with only local basal conglomerate. Further, as demonstrated by the contained clasts (quartzite with lesser chert and limestone from Paleozoic rock), these geographically separate conglomerates have different source areas (compare Oriel and Tracey, 1970, p. 9 to DeCelles, 1994 and DeCelles and Cavazza, 1999, figure 10). Our Hams Fork unit has lithologies, in particular coaly beds and chert and quartzite granule and pebble beds like the lower member of Oriel and Tracey (1970), which underlies their Hams Fork Conglomerate Member. But, they reported that the lower member pinches out to the south (Oriel and Tracey, 1970, p. 6), north of our map area. Our basal conglomerate and their Hams Fork conglomerate likely have slightly different ages.

Kehc, Kehc?

Basal conglomerate of Hams Fork Member (Upper Cretaceous) – Tan, brownish-gray, and gray, cobble to boulder conglomerate with minor interbedded gray, carbonaceous mudstone; conglomerate contains greater than 80% Neoproterozoic and Cambrian quartzite clasts, but locally contains roughly 5% clasts of Triassic and Jurassic sandstone and rare Precambrian crystalline basement (schist and gneiss) clasts (DeCelles, 1994); regionally 0 to 400 feet (0–120 m) thick (see Coogan, 2004a-b; 2010a-b); west of East Canyon fault, Kehc is about 200 to 240 feet (60–70 m) thick on south margin of quadrangle and to north apparently is up to 400 feet (120 m) thick, with base not exposed and upper contact uncertain; appears to pinch-out in lower Echo Canyon to south in Coalville 7.5-minute quadrangle (Coogan, unpublished mapping) and to west above Powder Hollow in Devils Slide quadrangle.

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Queried where earlier mapping by Coogan (unpublished) identified the unit as the basal conglomerate; but the Kehc-Keh contact was later removed by Coogan, and the conglomerates where placed in unit Keh. Based on aerial photograph and field observations (Kehc? looks like Kehc), King put the contact back on this map (Keh-Kehc?). The basal conglomerate (Kehc) is not mapped separately from Keh north of Weber River and may pinch out to the north because the distinctive cliff-forming strata of Kehc and Kehc? are not present at the base of Keh north of the river. The basal Hams Fork conglomerate is absent to the north in the Peck Canyon quadrangle along the regional basal angular unconformity (Coogan, 2004c). To the south Mann (1974) measured about 950 feet (290 m) of covered strata with Precambrian schist boulder float northwest of East Canyon Reservoir, but called it Wasatch Formation.

Kwc, Kwc?

Weber Canyon Conglomerate (Upper Cretaceous, Campanian and late Santonian) – Red, gray, and tan, boulder to cobble conglomerate with minor sandstone and mudstone interbeds; forms prominent cliffs; clasts from Tintic Quartzite, Weber Sandstone, Nugget Sandstone, Lodgepole Limestone, Park City Formation and Twin Creek Limestone (DeCelles, 1994) (list order not by age or abundance); contains progressive intraformational unconformities; overlies older rocks with angular unconformity; exposures continue south of Devils Slide quadrangle, west of East Canyon fault, and were shown by Bryant (1990) as Echo Canyon Conglomerate (his Ke); near cement plant about 1000 foot (300 m) thickness exposed in axis of syncline, with bottom not exposed, but does not appear much thicker between basal exposure on west limb of syncline and syncline axis; reportedly at least 1900 feet (580 m) thick near Devils Slide (DeCelles, 1994), but his figure 2 sketch map includes about 700 feet (215 m) of Hams Fork (Keh and Kehc) in his Weber Canyon Conglomerate.

Queried where Coogan did not label the outcrop and where colluvial cover (Qc/Kwc?) makes identification uncertain. East of the map area in the northwest limb of the Stevenson syncline the underlying older rocks include the Upper Cretaceous Echo Canyon Conglomerate, Henefer Formation, and Frontier Formation (see Coogan, 2010a-b); these Upper Cretaceous units are not present in the Devils Slide quadrangle.

Kk **Kelvin Formation (Lower Cretaceous, Albian and Aptian)** – More completely exposed to east in adjacent Henefer quadrangle (see Coogan, 2010b). Upper part mainly light-gray, tan, and light-reddish-gray, coarse-grained, cross-bedded sandstone and pebbly sandstone with abundant chert; interbedded with gray, tan, and minor reddish-gray and gray-green mudstone and siltstone; upper part up to 2300 feet (700 m) thick to south near Wanship (Eardley, 1944) and overlain by the Aspen Shale (Hale, 1960; Trexler, 1966), which is not present or not exposed near Henefer (see Coogan, 2010a-b). Lower one-third dominantly red-weathering, with reddish-gray and tan mudstone and siltstone; contains thin, discontinuous beds of nodular, blue-gray and lavender, micritic limestone (Morrison of some workers); gray and reddish-gray, coarse-grained, pebbly sandstone with reddish-gray, chert-pebble conglomerate toward base; exposed lower one-third reportedly up to 700 feet (210 m) thick (Eardley, 1944), but not clear where this thickness is exposed in his map area. Total Kelvin thickness east of Croyden at least 5700 feet (1740 m), with base not exposed (after Coogan, 2010a-b; since base and top not exposed near Henefer) due to fault truncation; based on topography, outcrop pattern, and bedding dip, King estimates thickness near Croydon as about 5600 to 6000 feet (1700–1800 m); about 6000 feet (1800 m) was penetrated in Gulf Richins well in East Canyon graben (section 32, T. 3N., R. 4E. SLBM), but Twin Creek Limestone thickness in same well (API 43-043-30256, Utah DOGM well and log files) is about twice its surface thickness of 2850 feet (870 m), possibly indicating Kelvin thickness in well is not stratigraphic thickness.

South of the map area along East Canyon Creek, Granger (1953) noted Weber and older quartzite clasts and a few Carboniferous limestone pebbles in the Kelvin; his uppermost conglomerate may not be part of the Kelvin. Farther south and to the east between Peoa and Wanship, Kelvin conglomerate clasts in four conspicuous beds were described as black, red, and yellow-colored chert in a lower bed, with a few quartzite pebbles that may be from Weber Sandstone in a second bed, and in an upper conglomerate bed where most of the large boulders were quartzite (Weber?) and the small pebbles were mostly chert. Some pebbles of Nugget Sandstone and Paleozoic limestone are present (see Eardley, 1944, p. 838).

JURASSIC

Jsp, Jsp?

Stump Formation and Preuss Redbeds, undivided (Upper and Middle Jurassic) – Mapped in small exposure south of Croydon and queried in large exposures in Main Canyon Creek valley; combined unit is about 1000 feet (300

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m) thick to northeast at Toone Canyon, Lost Creek Dam quadrangle (Coogan, 2004b). The queried unit is reddish with some visible bedding that may or may not contain Stump Formation (note photogrammetric dips on map). The Jsp? unit grades into reddish clay, silt, and sand with only a hint of bedding that may be conglomerate-poor Wasatch Formation overlying residual Stump-Preuss deposits ("caprock") above the dissolving salt welt in Main Canyon Creek valley and the divide between Henefer Valley and Lost Creek valley (shown on map as Tw?/Jsp?). Palynomorphs from sample 99-11 are Jurassic but are not stage diagnostic (Coogan, 2010 a-b). However, the sample also contained Cretaceous morphotaxa (see Coogan and King, 2016, appendix table 1) that may have been recycled from or be from thin remnants of the Cretaceous Weber Canyon and Evanston Formations.

Stump Formation (Upper and Middle Jurassic) – Pale-red, yellow, gray, and green-gray shale and calcareous sandstone; at least locally green and glauconitic; about 100-foot- (30 m) thick covered interval of gray-green sandy soil represents the Stump at Toone Canyon (Coogan, 2004b) to the northeast; exposed Stump is 220 and 250 feet (67 and 76 m) thick about 25 miles (40 km) south of Devils Slide near Peoa and about 25 miles (40 km) north of Devils Slide near Walton Creek, respectively; underlying contact with Preuss is at least locally unconformable (Pipiringos and Imlay, 1979).

Jp, Jp?, Jps

Preuss Redbeds (Middle Jurassic) – Red and purplish-red sandstone, siltstone, and shale; poorly exposed; basal halite and anhydrite in subsurface (Jps); about 900 feet (270 m) thick to north at Toone Canyon (Coogan, 2004b), and 1196 feet (365 m) thick near Peoa (Thomas and Krueger, 1946) about 25 miles (40 km) away on north flank of Uinta Mountains; queried where may be Wasatch Formation or surficial deposits in Main Canyon Creek valley.

Subsurface thickness south of map area in the East Canyon graben is about 900 to 1250 feet (275–380 m), likely including Stump strata, which is about the same as surface thicknesses. An additional 0 to 700 feet (210 m) of saline strata was cut in the Gulf Richins well (API 43-043-30256, Utah DOGM; section 32, T. 3N., R. 4E. SLBM) and possibly as much as 6000 to 7500 feet (1800–2300 m) of salt was penetrated in the Amoco Franklin Canyon well (section 20, T. 3N., R. 4E. SLBM), but bed dips seem to indicate this well is in steeply dipping Preuss strata (see Lamerson, 1982, p. 325; API 43-043-30070, Utah DOGM well files). See Yonkee and others (1997, figure 28) for a complex interpretation of Franklin Canyon well.

Jtc **Twin Creek Limestone (Middle Jurassic)** – Mostly white- to gray-weathering, shaley limestone with some shale; mapped along back-thrust east of Powder Hollow; member descriptions from Coogan (2004b) to northeast in Lost Creek drainage where member thicknesses total ~2850 feet (870 m); similar, although incomplete, 2722-foot (825 m) thickness at Devils Slide, with member thicknesses (shown below) from Imlay (1967, p. 11, 13). Jtgl on cross section combines Jtgc and Jtl, while Jtrs combines Jtr and Jts. Potential groundwater source with variable permeability enhanced by cleavage noted in member descriptions; permeabilities and porosities in gas and oil fields near Evanston, Wyoming, are summarized in Chidsey (2016, table 4.1).

Jtgc **Giraffe Creek Member (Middle Jurassic)** – Gray, greenish-gray, and tannish-gray, calcareous sandstone and lime grainstone; forms ridges; total thickness about 225 feet (70 m) to northeast in Lost Creek drainage (Coogan, 2004b); 108-foot (35 m) exposed partial thickness at Devils Slide (Imlay, 1967), thrust truncated. Contact with underlying Leeds Creek Member is the most difficult to pick of member contacts in the Twin Creek Limestone; this has likely led to the disparate thicknesses reported for these members, particularly in subsurface.

Jtl, Jtl? **Leeds Creek Member (Middle Jurassic)** – Light-gray, thin- to very thick bedded, soft, clay-rich micritic limestone with tan silt partings; locally exhibits bedding-normal pencil cleavage; forms barren scree-covered slopes; 1000 to 1200 feet (300–365 m) thick to northeast in Lost Creek drainage (Coogan, 2004b); 1289 feet (393 m) thick at Devils Slide (Imlay, 1967). Queried where poorly exposed and member identification uncertain.

Jtw, Jtw?

Watton Canyon Member (Middle Jurassic) – Dark-gray, lime micrite (mudstone) and wackstone and minor oolite packstone; forms prominent ridges; locally exhibits bedding-normal stylolitic, spaced cleavage; about 400 feet (120 m) thick to northeast in Lost Creek drainage (Coogan, 2004b); 380 feet (115 m) thick at Devils Slide (Imlay, 1967). Queried where poorly exposed and member identification uncertain.

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Jtb, Jtb?

Boundary Ridge Member (Middle Jurassic) – Gray, very thick bedded, ridge-forming, oolitic, lime grainstone to wackestone beds in middle and upper part that separate reddish and purplish siltstone and gray, silty limestone beds in middle and lower part; 100 to 250 feet (30–75 m) thick in Lost Creek drainage (Coogan, 2004b); about 100 feet (30 m) thick at Devils Slide (Imlay, 1967). Devils Slide (geographic feature) is in this unit and not in the Sliderock Member, which was named for Sliderock in Wyoming (see Imlay, 1967). Queried where poorly exposed and member identification uncertain.

Jtr, Jtr? **Rich Member (Middle Jurassic)** – Light-gray, thin- to very thick bedded, clay-rich, micritic limestone in upper part, and gray, lime wackestone in lower part; locally exhibits bedding-normal pencil cleavage; forms barren scree-covered slopes; about 500 feet (150 m) thick in Lost Creek drainage (Coogan, 2004b); 540 feet (165 m) thick at Devils Slide (Imlay, 1967). Queried where poorly exposed and member identification uncertain.

Jts **Sliderock Member (Middle Jurassic)** – Dark-gray, very thick bedded, lime wackestone in upper part and dark-gray, pelecypod and crinoid grainstone in lower part; forms small ridges; 100 to 227 feet (30–70 m) thick in Lost Creek drainage (Coogan, 2004b); 100 feet (30 m) thick at Devils Slide (Imlay, 1967); middle covered part at Devils Slide may be variegated siltstone and shaley sandstone exposed at Birch Creek (see Imlay, 1967).

Jtgs **Gypsum Spring Member (Middle Jurassic?)** – Red siltstone and sandstone, and gray, vuggy dolomite, with anhydrite in subsurface; up to 208 feet (65 m) thick at Devils Slide (Imlay, 1967). Despite its sharp upper and lower contacts (Imlay, 1967, p. 18), the Gypsum Spring is separated from overlying and underlying units by unconformities (see Imaly, 1980, figures 26–28). Where the Twin Creek is not present in Wyoming, the Gypsum Spring is a separate Formation (see Love and others, 1993), but Oriel (1969, p. 10) noted that the member in the Twin Creek does not include the entire Gypsum Spring Formation. See appendix for palynology data supplied by D.A. Sprinkel.

Isotopic dating of the Gypsum Spring in the Devils Slide quadrangle (see table 4 and Kowallis and others, 2011) implies a 10-million-year unconformity between the Pliensbachian Gypsum Spring and overlying Bajocian Twin Creek Limestone. For isotopic ages of Jurassic stage boundaries see for example Palfy and others (2000). The span of the overlying unconformity may be shorter if the tuff bed is not airfall (reworking of older material will make the unconformity seem larger) or the Jurassic stage boundaries are askew (see for examples Palfy and others, 2000, figure 3).

Jn **Nugget Sandstone (Lower Jurassic)** – Pale-grayish-orange, pinkish-tan, and locally off-white, well-cemented, cross-bedded, quartz sandstone; thickness here estimated by King (from outcrop pattern, dip, and topography) as about 1250 to 1360 feet (380–415 m); about 1100 feet (335 m) thick to northeast at Toone Canyon, Lost Creek Dam quadrangle (Coogan, 2004b); thickness of about 1500 feet (460 m) reported near Devils Slide by Eardley (1944) is about 10% too large. Potential groundwater source; permeabilities and porosities in gas and oil fields near Evanston, Wyoming, are summarized in Chidsey (2016, table 3.1).

South of the Uinta Mountains near Vernal, High and others (1969) and Sprinkel and others (2011) place less resistant, planar-bedded, reddish Triassic sandstone beds in the Nugget Sandstone that would be mapped, if present, as part of the Triassic Ankareh Formation in the Overthrust (fold-and-thrust) belt north of the Uinta Mountains in Utah, Wyoming, and Idaho. To the east in Wyoming, north of Colorado and east of Utah, as the Nugget thins and disappears, planar-bedded Nugget-like sandstones are interbedded (intertongued?) with shaly units that look like the Triassic Chugwater Group/Formation (Bell Springs unit of Pipiringos, 1968) and specifically the Jelm Formation. In Wyoming, this interbedded relationship is visible in the Rawlins Uplift and the age of the Bell Springs strata is conjecture (see Pipiringos, 1968).

TRIASSIC

Thickness estimates by King from outcrop pattern, bedding dip, and topography in the Devils Slide quadrangle.

Ŧa **Ankareh Formation, undivided (Triassic)** – Shown on cross section and combines members Ŧas, Ŧag, and Ŧam; see Kummel (1954) for a regional look at members of the Ankareh Formation.

Ŧas **Stanaker Member or upper member (Wood Shale Tongue?) of Ankareh Formation (Upper Triassic)** – Bright orange-red shale, siltstone, and sandstone; locally micaceous; an estimated 600 feet (185 m) thick near Devils Slide

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and 680 feet (210 m) thick several miles south of Weber River; Schick (1955) reported 515-foot (155 m) exposed thickness near Devils Slide, but contradicted this thickness in his cross section; Mullens and Laraway (1964) showed about 750 feet (230 m) thickness in their cross section (including our Ŧag unit). In Lost Creek drainage called Wood Shale Tongue because Higham Grit, Timothy Sandstone, and Portneuf Limestone (all Idaho names) are present (see Coogan, 2004a).

Ŧag **Gartra Grit(?) Member of Ankareh Formation (Triassic)** – Red, buff and gray, gritty micaceous sandstone reported; no greenish sandstone, conglomerate (granule or pebble), or limestone reported, lithologies indicative of the Higham Grit, Timothy Sandstone, and Portneuf Limestone; 43 to 76 feet (15–23 m) thick (Shinarump of Scott, 1954; Schick, 1955); Smith (1969) reported a 30-foot (9 m) thick, locally conglomeratic unit in the middle of the Ankareh and called it Gartra Grit. Unit may not be the Gartra; it may be the Higham Grit or Timothy Sandstone, part of the middle unit mapped to the northeast in the Lost Creek drainage (see Coogan, 2004a).

Middle unit to the northeast is about 200 feet (60 m) thick and, in contrast to Devils Slide, includes gray and greenish-gray, micaceous, quartz-granule sandstone at top (Higham Grit); middle greenish-gray, lithic-pebble conglomerate in middle, containing green siltstone clasts and rare fossil wood fragments (Timothy Sandstone Member of Thaynes Formation); and thin (2 feet [0.6 m]), gray and lavender, mottled limestone at base (Portneuf Limestone Member of the Thaynes Formation) (Coogan, 2004a).

If granule conglomeratic or gritty rocks are the only rock types present at Devils Slide, this unit should be called the Gartra Grit Member of the Ankareh and the units above and below are the upper (or Stanaker) and Mahogany Members of the Ankareh, respectively. Despite assertions that the Higham, Gartra, and Shinarump Conglomerate are equivalent units, each of these coarser units have their own geographic distribution (depositional area) and source area, as indicated by differing clasts (see Kummel, 1954; Stewart and others, 1972; and references above), and likely have their own timing following the Middle Triassic unconformity. Further, Thomas and Krueger (1946, p. 1273) indicated the conglomerate beds called Gartra have at least two different source areas.

Ŧam **Mahogany Member (Lanes Tongue?) of Ankareh Formation (Lower Triassic)** – Purple and brownish-red shale, siltstone, and sandstone (Coogan, 2004a, Lanes Tongue); an estimated 600 feet (185 m) thick near Devils Slide and 725 feet (220 m) thick several miles south of the Weber River. In Lost Creek drainage called Lanes Tongue because other units named in Idaho are present (see Coogan, 2004a).

Previously reported and shown thicknesses near Devils Slide vary widely, with 465-foot (140 m) exposed thickness reported by Schick (1955), with buff to gray siltstone and sandstone, but Schick (1955) contradicted this thickness in his cross section; to a 785-foot (240 m) thickness reported by Scott (1954); to about 850 feet (260 m) thick on the cross section of Mullens and Laraway (1964); and about 920-foot (280 m) thickness reported by Smith (1969).

Thaynes Formation (Lower Triassic) – Gray, silty limestone and calcareous shale and siltstone; estimated thickness of 1850 feet (565 m) (upper tongue of Dinwoody not included) from several miles south of Weber River in this quadrangle, similar to 1835-foot (560 m) thickness to northeast in Lost Creek drainage (note revision to Coogan, 2004a) that may or may not include the upper tongue of Dinwoody; 2200-foot (670 m) exposed thickness reported near Devils Slide (Eardley, 1944) likely includes upper tongue of Dinwoody. Scott's (1954) thicknesses at Devils Slide for the Thaynes, as well as the Ankareh, Dinwoody and Woodside, are mostly about 1.5 times thicker than what most workers have measured; at least some of Smith's (1969) member thicknesses are also too large.

Note that Kummel's (1954) members from about 70 miles (110 km) to the north near Bear Lake in Idaho are recognizable in this section and that most of these members are recognizable another 25 miles (40 km) to the southwest near Salt Lake City, Utah (see Mathews, 1931; Solien and others, 1979). Member descriptions after and thicknesses from Francis Canyon quadrangle, Lost Creek drainage (Coogan, 2004a) with estimated thicknesses from several miles south of the Weber River in the Devils Slide quadrangle. Members Ŧtu and Ŧtms are combined as unit Ŧtus on cross section, while the Thaynes members below Ŧtms are combined with the upper tongue of the Dinwoody Formation as unit Ŧto on cross section.

Ŧtu **Upper calcareous siltstone member (Lower Triassic)** – Brownish-gray, thin-bedded, calcareous siltstone and thin-bedded, gray, fossiliferous limestone; an estimated 1035 feet (315 m) thick in Devils Slide quadrangle and about 1050 feet (320 m) thick in Francis Canyon quadrangle (note revision to Coogan, 2004a); Scott (1954, units 2–13) measured 1240 feet (380 m) while Smith (1969, units 161–225) measured about 1053.5 feet (321 m) of upper calcareous siltstone member.

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Ṫtms, Ṫtms?

Middle shale member (Lower Triassic) – Gray, thin-bedded, calcareous, silty shale; queried where member identification uncertain; an estimated 115 feet (35 m) thick in Devils Slide quadrangle and about 100 feet (30 m) thick in Francis Canyon quadrangle; Scott (1954, unit 14 and possibly units 15–24) measured about 160 or possibly 285 feet (50–87 m), while Smith (1969, units 151–160) measured about 280 feet (85 m) of middle shale member. Coogan (2006a-b) lumped this member in his unit Ṫtu in the Horse Ridge and Dairy Ridge quadrangles.

Ṫtml **Middle limestone member (Lower Triassic)** – Gray, very thick to medium-bedded, fossiliferous limestone; forms prominent ridge; an estimated 230 feet (70 m) thick in Devils Slide quadrangle and about 110 feet (33 m) thick in Francis Canyon quadrangle. Scott (1954, unit 25) measured about 640 feet (195 m), while Smith (1969, units 139–150) measured about 120 feet (35 m) of middle limestone member; neither measurement seems correct.

Ṫtls **Lower shale member (Lower Triassic)** – Gray to brownish-gray, thin-bedded, calcareous siltstone to silty shale; lower half is likely reddish sandy siltstone of Decker Tongue of Ankareh Formation; unit Ṫtls an estimated 185 feet (55 m) thick in the Devils Slide quadrangle and about 375 feet (115 m) thick in Francis Canyon quadrangle, but poor exposures there may mean this reported thickness is too large; Scott (1954, unit 26) measured about 230 feet (70 m), while Smith (1969, unit 138 and lower part of unit 139, and Decker Tongue) measured about 140 feet (45 m) of lower shale member.

Ṫtll **Lower limestone member (Lower Triassic)** – Gray to grayish-brown, thick- to thin-bedded, fossiliferous limestone with *Meekoceras* ammonite zone at base; near Salt Lake City mapped with upper tongue of Dinwoody Formation (Ṫdu) as single unit with ammonite zone in the middle (see for example Solien and others, 1979); lower member an estimated 285 feet (85 m) thick in Devils Slide quadrangle; about 200-foot (60 m) thickness reported in Francis Canyon quadrangle (after Coogan, 2004a) and to north in Dairy Ridge quadrangle lower limestone member is 200 feet (60 m) thick (Coogan, 2006a); Scott (1954, units 27 and 28) measured about 315 feet (95 m) of lower limestone member of Thaynes, while Smith (1969, top of unit 120 through unit 135) measured about 270 feet (80 m).

Ṫdu **Upper tongue of Dinwoody Formation (Lower Triassic)** – Silty limestone and calcareous siltstone that is less resistant than overlying unit (Ṫtll) and is present below the *Meekoceras* ammonite zone; map unit an estimated 285 feet (85 m) thick in Devils Slide quadrangle; to north in Dairy Ridge quadrangle upper tongue of Dinwoody is 250 feet (75 m) thick and is greenish-gray and tan (Coogan, 2006a). Scott (1954, units 29 and 30) measured about 530 feet (160 m) of strata (Dinwoody tongue) below the ammonite zone, while Smith (1969, units 74 to most of 120) likely measured about 560 feet (170 m); both measurements are about twice as thick as our map thickness.

Ṫwd **Woodside and Dinwoody Formations, undivided (Lower Triassic)** – Only shown on cross section.

Ṫw **Woodside Shale (Lower Triassic)** – Dark-red, sandy shale and siltstone, with some sandstone; an estimated 500 feet (150 m) thick in Devils Slide quadrangle.

Other thicknesses reported near Devils Slide vary widely from 600-foot (180 m) thickness reported by Eardley (1944); to 755-foot (248 m) thickness reported by Scott (1954), although his figure 15 shows only about 600 feet (185 m) of Woodside with the rest being Dinwoody; to 800-foot (245 m) thickness shown by Mullens and Laraway (1964, cross section); and Smith (1969) reported about 990-foot (300 m) thickness but with about 135 feet (40 m) covered. The 384-foot (120 m) thickness reported at Salt Lake City is not red (Granger, 1953), so could all be upper tongue of Dinwoody (Ṫdu).

Ṫd **Dinwoody Formation (Lower Triassic)** – Greenish-gray and tan, calcareous siltstone and silty limestone; an estimated 300 feet (90 m) thick in Devils Slide quadrangle 500-foot (150 m) thickness shown by Mullens and Laraway (1964, cross section); Smith (1969) reported about 290 feet (88 m) of Dinwoody, but we are unsure that Smith's Dinwoody contacts are the same as those used on our map. Cheney and Sheldon (1959) described greenish-gray calcareous shale with a few beds of fossiliferous carbonate above the Franson Member of the Park City Formation at Devils Slide, but they called these 190 feet (58 m) of strata Woodside. Eardley (1944) apparently placed the Dinwoody strata in his overly thick upper division of the Park City Formation.

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PERMIAN

Pp, Pp?

Park City and Phosphoria Formations, undivided (Permian) – Mapped north of Weber River where individual units cannot be consistently separated due to structural complexity; also used on cross section; queried where may be upper Weber Sandstone (PPwu). Total thickness near Taggarts 857 feet (260 m) but lower two units likely faulted (Cheney and others, 1953; Cheney, 1957). U.S. Geological Survey trench may be lower cut that is visible south of Weber River. Formations were also examined by Williams (1943), but his units do not fit well with Meade Peak and Grandeur Members used here.

Where possible divided into:

Ppf **Franson Member of Park City Formation (Permian)** – Interbedded gray to pinkish-gray to dark-gray, vuggy, cherty limestone, with lesser gray shale and calcareous sandstone; 242 feet (75 m) thick (Cheney and others, 1953; Cheney, 1957). Dark-gray and black, bedded chert of Rex Chert Member of Phosphoria Formation probably present. Williams (1943) noted 170 feet (52 m) of sandstone with chert (Rex) and 140 feet (43 m) of sandstone that probably make up this unit.

Ppm, Ppm?

Meade Peak Phosphatic Shale Member of Phosphoria (Permian) – Gray limestone, dark-gray to black, phosphatic siltstone and shale, and gray, calcareous sandstone; typically less resistant than overlying and underlying members; queried where member identification uncertain; 303 feet (90 m) thick (Cheney and others, 1953; Cheney, 1957). Williams (1943) noted 40 feet (12 m) of phosphate, 575 feet (175 m) of limestone and sandstone, and 8 feet (2.5 m) of basal phosphate; his thicknesses for the Park City and Phosphoria units, like those of Eardley (1944), are too large compared to our mapping.

Ppg, Ppg?

Grandeur Member of Park City (Permian) – Light-gray, thick-bedded, calcareous to dolomitic sandstone with gray chert nodules; queried where member identification uncertain; 312 feet (95 m) thick (Cheney and others, 1953; Cheney, 1957). Williams (1943) noted 65 feet (20 m) of limestone and 65 feet (20 m) of sandstone, with underlying 230 feet (70 m) of sandstone that is partly conglomeratic and contains intraformational breccia (flat-pebble conglomerate); both conglomerates are atypical of the Grandeur, as is the reddish coloration noted by Williams (1943, p. 597).

PERMIAN AND PENNSYLVANIAN

PPw, Pwl, Pwl?, PPwu

Weber Sandstone (Lower Permian and Pennsylvanian) – Gray, indurated, quartzose sandstone with dolomite and siltstone in lower part; where possible King divided Weber into Pwl (lower) with distinct regular bedding and PPwu (upper) with less distinct bedding; lower unit queried (Pwl?) west of back-thrust and north of Round Valley where complex structure makes it difficult to determine if any of the upper unit is present, and Pwl-PPwu contact queried where separation of units is even more difficult. Reportedly 2260 to 3300 feet (690 to 975 m) thick near Morgan (after Williams, 1943; Eardley, 1944; Bissell and Childs, 1958; Mullens and Laraway, 1973); but, these thicknesses are likely from near the Weber River, so are likely from complexly folded strata and are across a back-thrust. King's estimated thickness of ~2600 feet (790 m) (from outcrop pattern, dip, and topography) is from about 2 miles (3.2 km) north of Weber River where two monoclines are present but Weber strata are not thrust faulted. See Williams (1943, p. 598) for fossils. Likely at least partly non-marine eolian (see Fryberger, 1979).

The lower Weber (Pwl) may be units 1–3 of Eardley (1944) and *Fusulina*-bearing and older strata of Bissell and Childs (1958); both about 1000 feet (300 m) thick. The lower Weber does not appear to be the Desmoinesian and older strata of Welsh and Bissell (1979, p. Y18 and Y23) because Bissell (1964) identified Desmoinesian *Wedekindellina* sp. fusulinids to within 378 feet (115 m) of the top of the Weber (rounded to 400 feet). Since Bissell (1964) noted Permian *Schwagerina* sp. fusulinids in the uppermost Weber, the disconformity of Welsh and Bissell (1979, p. Y22) is not at the Pwl-PPwu contact or the back-thrust in upper Weber (PPwu) in the Devils Slide quadrangle.

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PENNSYLVANIAN

IPm **Morgan Formation (Pennsylvanian)** – Reddish brown-weathering sandstone, siltstone and limestone that grade northward into light-gray lower part of Weber Sandstone, as seen to west in adjacent Morgan quadrangle, and "pinching" out to north in southern Durst Mountain quadrangle (Coogan and King, 2006); thrust faulted into Weber rather than intertongued, also seen to west in adjacent Morgan quadrangle (Coogan and others, 2015); only exposed along thrust fault on west margin of Devils Slide quadrangle; likely unconformably overlies Round Valley Limestone (see Eardley, 1944 p. 832–833); 0 to ~1000 feet (0–300 m) thick in Morgan area (Eardley, 1944; Bissell and Childs, 1958; Mullens and Laraway, 1973) (see also Williams, 1943, although he missed the Round Valley Limestone). The type Morgan is Desmoinesian (see Sadlick, 1955); also see Williams (1943) for fossils.

Blackwelder (1910) described the contact between the Morgan Formation and underlying Round Valley Limestone (his Morgan-Mississippian limestone) as an unconformity with red strata that bear clasts of the underlying limestone and chert over a cavernous weathered surface of limestone. This description is significant enough that Eardley (1944, p. 832–833) quoted Blackwelder (1910) and we include it here because it implies karst development. This contact relationship explains the rapid thinning of the Morgan to the north (it was not deposited everywhere above the unconformity). We note that this contact is similar to the Amsden-Madison contact in Wyoming (though the Amsden and Madison are older) (see for example Mallory, 1967; Sando, 1974).

SUBSURFACE UNIT DESCRIPTIONS

Descriptions of concealed units on cross section are from exposures to west in the Durst Mountain and Morgan quadrangles (Coogan and King, 2006; Coogan and others, 2015).

PENNSYLVANIAN?

IPmr **Morgan and Round Valley Formations, undivided (Pennsylvanian)** – See description above for Morgan Formation.

Round Valley Limestone (Pennsylvanian and possibly Mississippian) – Mostly light-gray, fine-grained limestone with regular bedding; about 375 to 400 feet (115–120 m) thick near Morgan (Sadlick, 1955; Crittenden, 1959, p. 70; Mullens and Laraway, 1973).

MISSISSIPPIAN

Mdo **Doughnut Formation, undivided (Upper Mississippian)** – Includes upper member of limestone and siltstone that is about 300 feet (90 m) thick on Durst Mountain (Crittenden, 1959, p. 70, his units 3–6; Mullens and Laraway, 1973; Coogan and King, 2006), and lower (shale) member of siltstone, black shale, and limestone that is an estimated 200 feet (60 m) thick on Durst Mountain (see also Crittenden, 1959, p. 70, his unit 2).

Mh **Humbug Formation (Upper Mississippian)** – Tan- to reddish weathering, interbedded calcareous to dolomitic, quartzose sandstone, and sandy limestone and dolomite; lower part contains more sandstone and is less resistant than upper part; estimated total thickness 700 feet (215 m) on Durst Mountain (Coogan and King, 2006); see also Crittenden (1959, p. 70, his unit 1).

Mde **Deseret Limestone (Mississippian)** – Limestone, dolomite, and sandstone, with dark, less-resistant, shaly, phosphatic strata at base (Delle Phosphatic Shale Member); about 500 feet (150 m) thick in Morgan quadrangle (Mullens and Laraway, 1973) and estimated on Durst Mountain (Coogan and King, 2006).

Ml **Lodgepole Limestone (Lower Mississippian)** – Gray, fossiliferous limestone and lesser dolomitic limestone, locally cherty; estimate thickness as 650 feet (200 m) on Durst Mountain (Coogan and King, 2006; Coogan and others, 2015); reported thicknesses about 650, 755, and 800 feet (200, 230, and 245 m) (Eardley, 1944, Madison near Morgan; Williams, 1943, Madison at Weber Canyon; Mullens and Laraway, 1973, near Morgan, respectively).

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DEVONIAN

Db **Beirdneau Sandstone (Devonian)** – Reddish-tan to tan to yellowish-gray, calcareous sandstone and siltstone, some silty to sandy dolomite and limestone, and lesser intraformational (flat-pebble) conglomerate; less resistant than adjacent units; estimate thickness as 200 feet (60 m); field thickness in Durst Mountain quadrangle of about 300 feet (90 m) (Coogan and King, 2006); reported thicknesses near Morgan about 185 and 230 feet (55 and 70 m) (Eliason, 1969; Three Forks of Mullens and Laraway, 1973, respectively); like the Hyrum, Eliason (1969) measured the Beirdneau where both formations appear to be at their thinnest on Durst Mountain. A bed of brownish-gray dolomite, resembling Hyrum Dolomite, is present in middle part of Beirdneau to northeast on the Crawford thrust sheet in Horse Ridge quadrangle (Coogan, 2006b), and a thin (~10–20 feet [3–6 m]) bed seems to be present on Durst Mountain as well, although the color is slightly different (see Coogan and King, 2006; Coogan and others, 2015).

Dhw **Hyrum and Water Canyon Formations, undivided (Devonian)**

Hyrum Dolomite (Devonian) – Brownish-gray and gray dolomite and minor limestone; more resistant at top and bottom with center of less resistant beds that grade laterally into reddish, dirty carbonate like the Beirdneau Sandstone; this gradation created problems in mapping Db-Dh contacts and faults cutting these units, and estimating thicknesses; estimate thickness as 250 to 450 feet (75–140 m) on Durst Mountain (Coogan and King, 2006); reported thickness of about 136 feet (40 m) (Eliason, 1969) is too thin relative to adjacent units and Eliason (1969) measured the Hyrum where it appears to be at its thinnest on Durst Mountain; unconformably overlies Water Canyon Formation.

Water Canyon Formation (Devonian) – Light-yellow-gray to medium-gray, interbedded calcareous sandstone and silty to sandy dolomite and limestone, with sandstone below carbonate and a distinctive very light gray, yellow-weathering dolomite at top; less resistant than underlying and overlying unit; estimate 200 feet (60 m) thick on Durst Mountain (Coogan and King, 2006); see also Eardley (1944), his Cambrian units 9–12 are 155 feet (47 m) thick in total; only about 100 to 150 feet (30–45 m) thick to northeast on leading edge of Willard thrust sheet (Coogan, 2006a-b).

SILURIAN AND ORDOVICIAN

Missing on Durst Mountain, along with all or most(?) of St. Charles Formation equivalent strata (uppermost Cambrian), due to thinning over Tooele arch and/or Stansbury uplift (see Hintze, 1959 and Rigby, 1959, respectively). Note that about 15 miles (25 km) to the northwest in Ogden Canyon, 1000 feet (300 m) of Ordovician and upper Cambrian strata are present (Fish Haven, Garden City, and St. Charles Formations), as is part of the Bloomington Formation between the Nounan and Maxfield. The Nounan and Maxfield are also thicker in Ogden Canyon, although the Ophir and Tintic are about the same thickness (see Yonkee and Lowe, 2004).

CAMBRIAN

Cn **Nounan Formation (Upper and Middle Cambrian)** – Medium-gray, typically thick-bedded dolomite and some limestone; estimate 350 to 400 feet (105–120 m) thick on Durst Mountain (see Coogan and King, 2006); see also Eardley (1944), his Cambrian units 6, 7, and 8 are 315 feet (95 m) thick in total. Underlying Bloomington Formation not present on Durst Mountain.

Cm **Maxfield Limestone (Middle Cambrian)** – Limestone and calcareous siltstone; estimate thickness as 300 feet (90 m) on Durst Mountain (Coogan and King, 2006); at least 280-foot (80 m) thickness inferred from Eardley (1944, Cambrian units 3–5), that is, at least to top of his limestone edgewise (flat-pebble) conglomerate; not consistently divisible into members; much thicker to west in Wasatch Range (see Yonkee and Lowe, 2004). Cambrian limestone (Cl) of Mullens and Laraway (1973) includes Maxfield and upper shale member of Ophir Formation.

Co **Ophir Formation, undivided (Middle Cambrian)** – Consists of upper and lower gray to olive-gray, variably calcareous and micaceous to silty argillite to slate with intercalated gray, silty limestone beds, and middle gray, micritic limestone. Highly deformed in most outcrops causing highly variable apparent thicknesses, but estimate at least 440 to 725 feet (135–220 m) thick on Durst Mountain (Coogan and King, 2006; Coogan and others, 2015). Ophir of Eardley (1944) and Mullens and Laraway (1973) is only the lower argillite member and their lower marker bed is likely the middle limestone member.

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Ct **Tintic Quartzite (Middle and Lower? Cambrian)** – Tan, very well-cemented quartzite; conglomeratic in lower half with Precambrian quartzite pebbles and cobbles; basal 50 to 100 feet (15–30 m) is arkosic conglomerate derived from unconformably underlying Farmington Canyon Complex material; Eardley (1944) reported about 1000-foot (300 m) thickness at Durst Mountain.

PROTEROZOIC

Xfc **Farmington Canyon Complex (lower Proterozoic)** – Micaceous schistose and gneissic crystalline rocks with small bodies of amphibolite and pegmatite, variously called dikes and pods; Barnett and others (1993) reported the various isotopic ages of the complex in the Wasatch Range and concluded it is latest Early Proterozoic (about 1700 Ma) in age; more detailed information on the complex in the Wasatch Range is available in Bryant (1988) and Yonkee and Lowe (2004).

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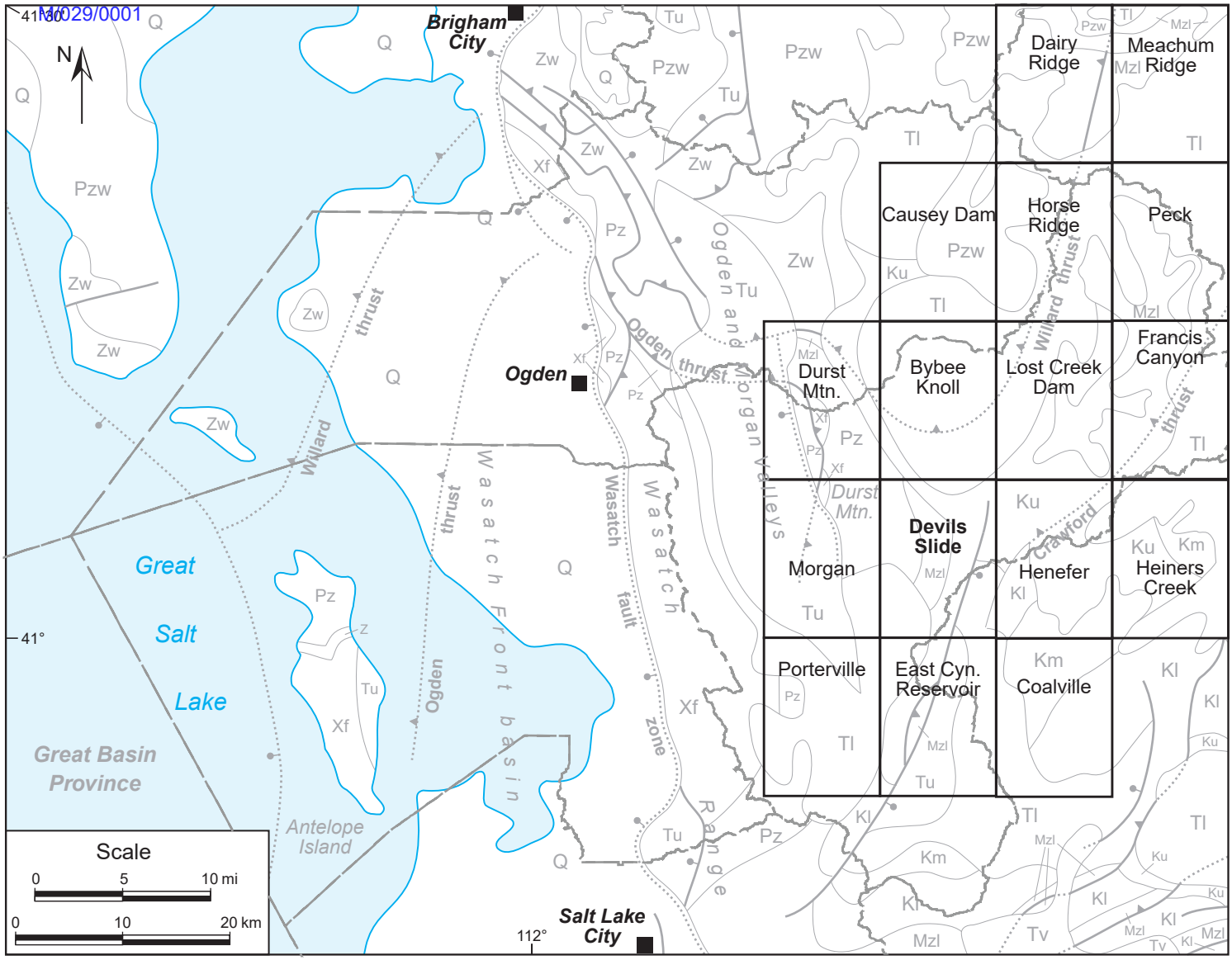

Q	Quaternary deposits	Kl	Cretaceous, lower
Tu	Tertiary, upper	Mzl	Mesozoic, lower
Tl	Tertiary, lower	Pz	Paleozoic
Tv	Tertiary volcanics	Pzw	Paleozoic, Willard thrust sheet
Ku	Cretaceous, upper	Zw	Late Proterozoic, Willard thrust sheet
Km	Cretaceous, middle	Xf	Farmington Canyon Complex

Figure 1. Generalized geologic map (modified from Yonkee and others, 1997) showing adjacent quadrangles and those noted in text. Geologic maps of the Dairy Ridge (Coogan, 2006a), Horse Ridge (Coogan, 2006b), Lost Creek (Coogan, 2004b), Francis Canyon (Coogan, 2004a), Henefer (Coogan, 2010b), Durst Mountain (Coogan and King, 2006), and Morgan (Coogan and others, 2015) quadrangles have been published.

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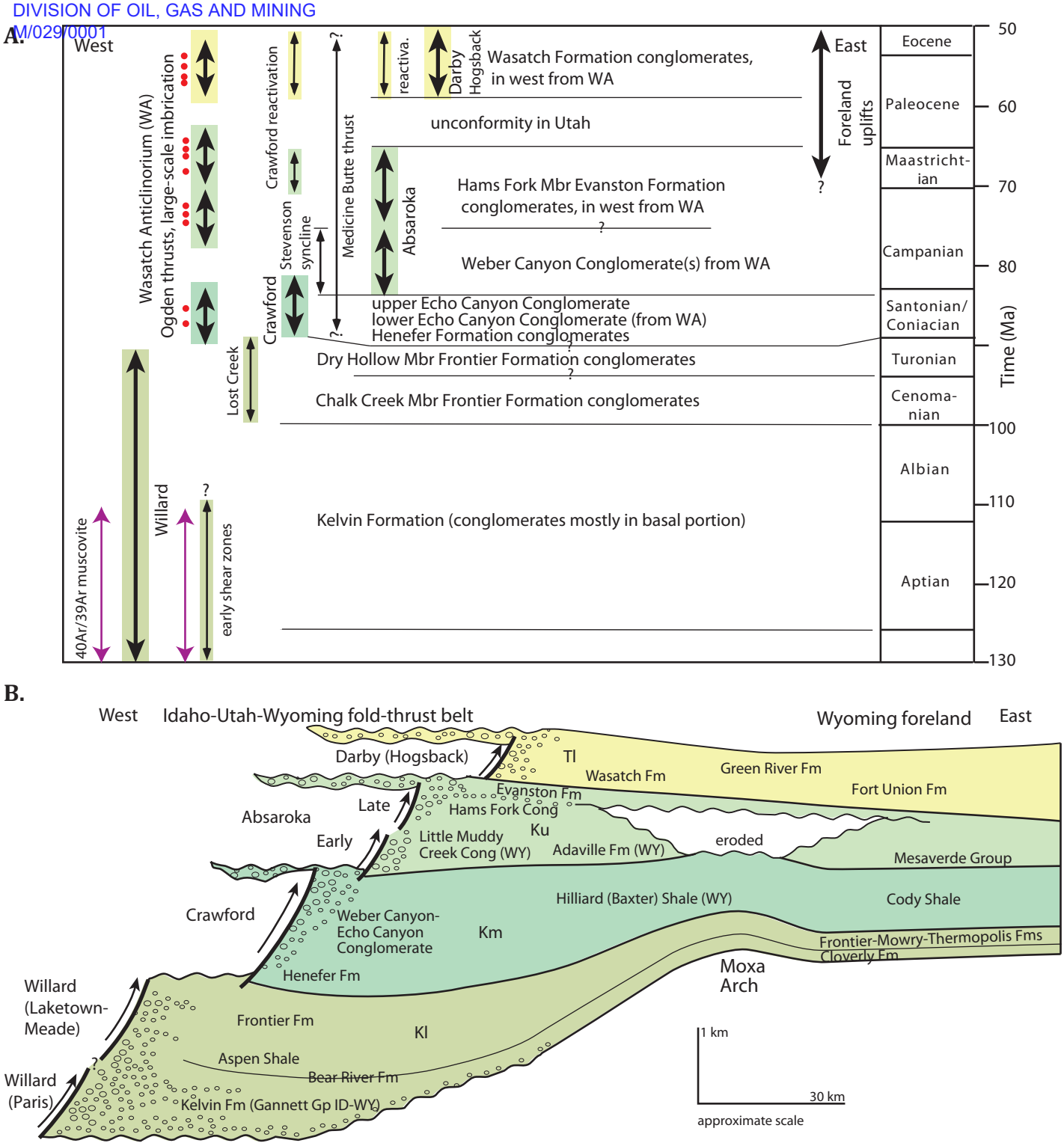

Figure 2. History of thrusting in the Idaho-Utah-Wyoming fold and thrust belt (modified from Yonkee and Weil, 2011; who modified Wiltschko and Dorr, 1983 for A, and Royse and others, 1975 for B). A) Ages of thrusting and synorogenic strata from this compilation and Coogan (2010a-b, appendix). Apatite fission-track ages (red dots) from Naeser and others (1983) and Burtner and Nigrini (1994). Argon-Argon ages from Yonkee and others (1989). B) General thicknesses and names of synorogenic strata in relation to major thrusts from Utah and Wyoming going into the southern Green River Basin. Note that conglomeratic intervals (ellipses) are east and west of associated thrusts, and Cretaceous divisions are informal. Lower Cretaceous strata (Kl) are thickest in the foredeep associated with movement on the Willard-Paris-Laketown (Meade) thrusts. Middle Cretaceous strata (Km) record movement on the Crawford thrust and regional subsidence, indicated by thick shales. Upper Cretaceous strata (Ku) record two episodes of movement on the Absaroka thrusts, along with the uplift of and erosion over the Moxa Arch. Paleocene and Eocene strata (Tl) record movement on the Darby-Hogsback thrust. Thrusts get younger to the east, with limited reactivation and uplift along older thrusts and the Wasatch Anticlinorium (WA).

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Table 1. Geologically significant water wells in the Devils Slide quadrangle, from data in Utah Division of Water Rights well drilling database.

Map no.	Cadastral location - feet (ft) from, section, township (T) and range (R)	Total depth in feet (ft)	Interpretation of drillers logs ft=feet
1	N 602ft, W 968ft of E1/4 corner, section 20, T. 4N., R. 4E.	126	Unit Keh at 79 ft or less
2	N 850ft, W 1442ft of SE corner, section 20, T. 4N., R. 4E.	150	Penetrated fault and unit Kwc that are mapped to west
3	N1250ft, W 950ft of SE corner, section 29, T. 4N., R. 4E.	420	Quaternary and unit Tw above 310 ft, unknown unit(s) below
4	70 rods (1155ft?) E, 15ft N of SW corner, section 32, T. 4N., R. 4E.	319	Salt at 250 ft
5	N 403ft, E 102ft of W1/4 corner, section 5, T. 3N., R. 4E.	785	No salt reported, but salt may have been obscured by rotary drilling below 286 ft. Completed above 286 ft, likely in unit QTa?, with perforations above 80 ft likely in unit QTay?
6	S 1865ft, W 65ft of N1/4 corner, section 5, T. 3N., R. 4E.	143	Red shale (unit Jp?) at 106 ft, salt at 141 ft
7	S 3037ft, W 2546ft of NE corner, section 5, T. 3N., R. 4E.	135	Salt at 135 ft

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Table 2. Heights of alluvial deposits above adjacent active drainages in Morgan and Round Valleys, and apparently Henefer and Lost Creek Valleys. Heights are from the Morgan, Durst Mountain, Snow Basin, and Peterson quadrangles (see Coogan and others, 2015), as well as the Devils Slide quadrangle. Younger ages (<20 ka) from Lake Bonneville history in C-14 years (see Oviatt and others, 1992). See Chadwick and others (1997) and Phillips and others (1997) for "Bull Lake" and Qaoe ages (cosmogenic ages). Other age estimates from Sullivan and others (1988) and Sullivan and Nelson (1992).

Unit(s)	Feet (m) above drainage	Age (ka=1000) years	Comments
Qal, Qay, Qafy	at to slightly above	<~13 ka	Post Lake Bonneville
Qa2	~15 feet (5 m)	<~13 ka	Younger age limit uncertain, post Lake Bonneville
Qat2	~10 to 20 feet (3-6 m)		
Qaf2	~20 to 40 feet (6-12 m)		
Qap	15 to 40 feet (5-12 m)		
Qatp	20 to 30 feet (6-9 m)	~13-15 ka	Provo shoreline occupation, Lake Bonneville
Qafp	~30 to 45 feet (9-14 m)		
Qab	40 to 90 feet (12-27m)		sites >50 feet (15 m) may be part of unit Qfdb
Qafb	~45 to 55 feet (14-17 m)	~15-20 ka	Bonneville shoreline occupation, Lake Bonneville
Qfdb	~50 to 100 feet (15-30 m)		fans that go into lake and become deltas
Qao	~70 to 120 feet (20-37 m)	~95-130 ka	"Bull Lake" glaciation-related deposits
Qato	~100 feet (30 m)		
Qafo	~70 to 120 feet (20-37 m)	~98-155 ka	amino acid ages, also >70-100 ka soil carbonate age ≥ 400 ka amino acid age is possible if two alluvial surfaces
Qaoe	120 to 230 feet (35-70 m)	>247ka	>780 ka paleomag age, but paleomag may be on QTay;
Qafoe	~120 to 200 feet (35-60 m)		suspect marine oxygen isotope stage 16
QTay	~215 to 450 feet (66-137 m)	>780 ka	note height overlap with Qaoe
QTao	~320 to 800 feet (100-240 m)	>780 ka	
QTaf	~230 to 300 feet (70-90 m)	>780 ka	may be upstream equivalent of QTay
	~320 to 1000 feet (100-300 m)	>780 ka	may be entirely Pliocene

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Table 3. Alluvial surfaces and deposits in Devils Slide quadrangle compared to those in Henefer quadrangle (Henefer and Lost Creek valleys) (Coogan, 2010b), Lost Creek drainage (Lost Creek Dam, Francis Canyon, and Peck Canyon quadrangles) (Coogan, 2004a-c) and Morgan Valley (Durst Mountain, Snow Basin, Peterson, and Morgan quadrangles) (Coogan and King, 2006; King and others, 2008; Coogan and others, 2015); for Round Valley - see Morgan Valley units. Heights are feet above adjacent active drainages.

Surface	Height above, feet	Devils Slide quad units	Henefer quad units	Lost Creek drainage units	Morgan Valley units
2	10-20	Qat2?, Qa2?	Qa2, Qat2	Qat2, Qaf2	Qa2, Qat2
2-3	20-30, 40?	Qap, Qatp?, Qafpb?	Qa2-3, Qat2 [Qatp?]	Qaty, Qaf2?	Qap, Qatp, Qaf2
3	40-60	Qab, Qafpb, Qapb	Qa3, Qat3	Qat3, Qaty?	Qab, Qafb
3-4	60-80	Qab, Qafm	Qa3, Qat3 [Qab], Qaf3?	Qat3, Qaf3	Qab, Qfdb
4	80-100	Qafm, Qao, Qmso	Qa4 (lower), Qaf3 [Qaf4]	Qa3, Qaf3?	Qao, Qafo
4-5	100-120	Qao, Qato?, Qafo?, Qmso	Qa4 (upper)	Qao	Qao, Qato, Qafo
5	120-150	Qaoe, Qao?, Qato?, Qafo?	Qa4?		Qaoe, Qafoe
6	160, 170?	Qaoe?	Qa5	Qa5?, Qat4, Qaf4	Qaoe, Qafoe
6-7	170-220	QTay, QTay?	Qa5?	Qa5	Qaoe, Qafoe
7	220 & 240	QTay, QTa?, QTaf?			QTay, QTaf?
8	300?	Qmso			QTa, QTaf
9?	>320	QTa?			QTao, QTaf

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Table 4. Preliminary geochronologic results for Gypsum Spring Formation/Member (Jtgs) samples in Devils Slide quadrangle reported in abstract of Kowallis and others (2011). Toarcian and Aalenian stages missing, indicating an unconformity between these samples and overlying Bajocian-stage Twin Creek Limestone samples. Data provided by Doug Sprinkel of the Utah Geological Survey, but lithology changed to tuff (lithified) from ash (unconsolidated, unlithified). Locations are in WGS84 decimal degrees. Sample DS-040709-4 not plotted on map because no analysis performed.

Sample No.	Map Mbr	Latitude	Longitude	Lithology	Analysis	Age Ma	Error ±Ma	Stage
2000-DS-1	Jtgs	41.066529	-111.549277	Tuff	Ar/Ar sanidine	184.6	0.2	Pliensbachian
DS-040709-1A	Jtgs	41.066535	-111.549278	Tuff	U-Pb zircon	184.3	2.3	Pliensbachian
DS-040709-4		41.066531	-111.549263	Tuff	no crystals recovered			

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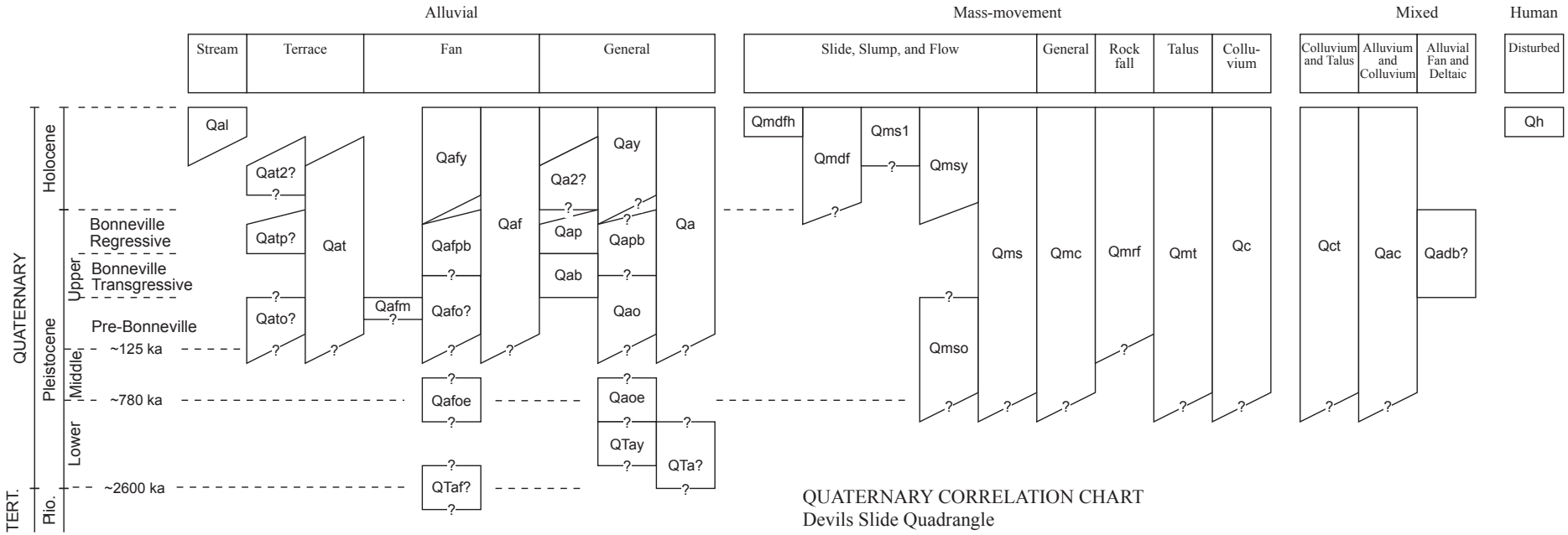

QUATERNARY CORRELATION CHART
Devils Slide Quadrangle

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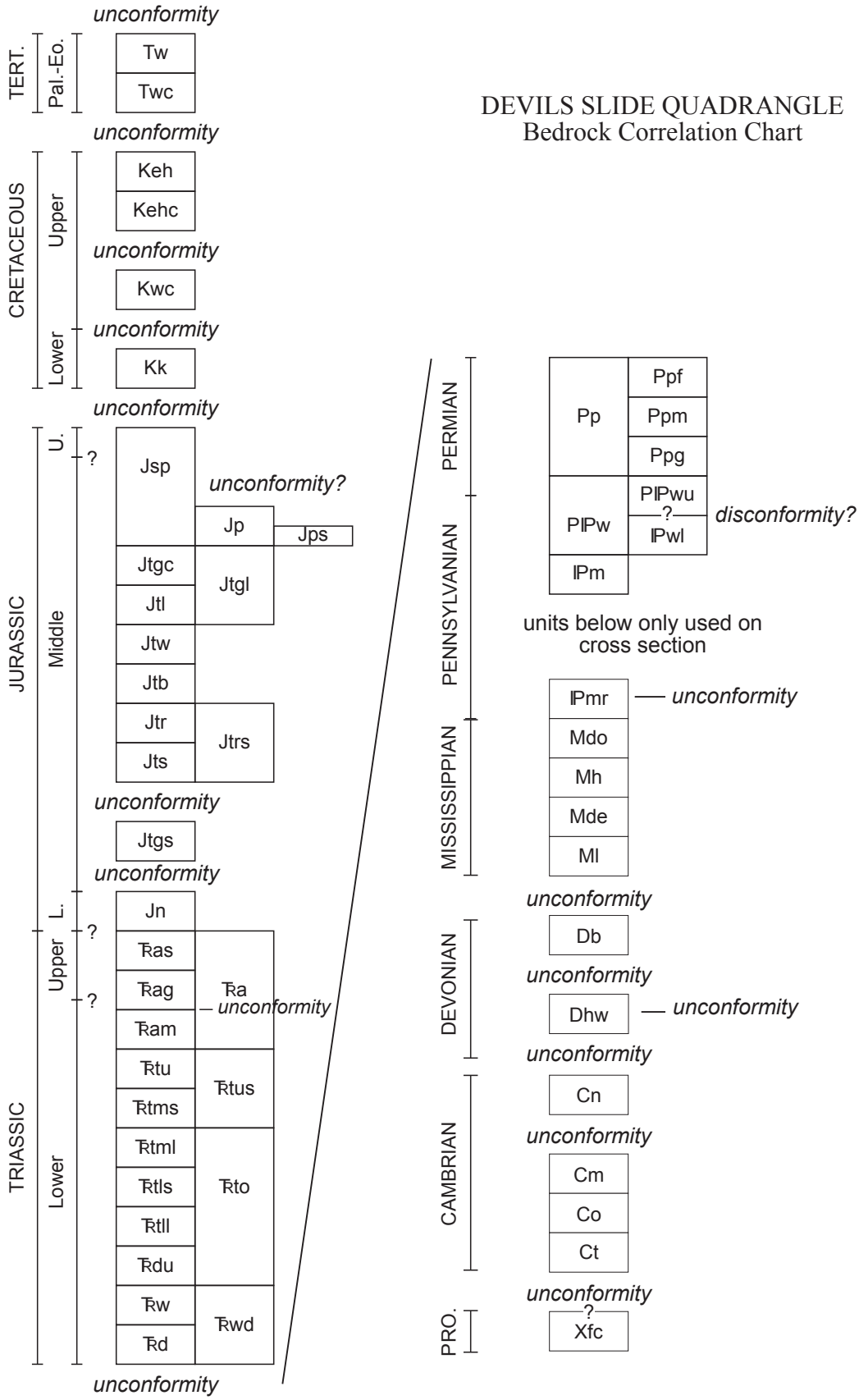
DEVILS SLIDE QUADRANGLE
Bedrock Correlation Chart



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LITHOLOGIC COLUMN - Devils Slide quadrangle

AGE	UNIT SYMBOL	GEOLOGIC UNIT	THICKNESS FEET	THICKNESS METERS	SCHEMATIC COLUMN	OTHER INFORMATION
Q	Q-various	Alluvium and mass movements	0-100?	0-30?		
TERTIARY P	QT	Alluvium, gravel	0-400?	0-120?		
TERTIARY Pal.-Eo.	Tw	Wasatch Formation	~0-5000	~0-1500		
	Twc	basal conglomerate	0-400	0-120		
CRETACEOUS	Keh	Hams Fork Member of Evanston Formation	0-600	0-180		
	Kehc	basal conglomerate	0-400	0-120		
	Kwc	Weber Canyon Conglomerate	0-1900	0-580		ANGULAR UNCONFORMITY
	Kk	Kelvin Formation	3000+	915+		ANGULAR UNCONFORMITY
JURASSIC	Jsp	Stump Sandstone	220-250	67-76		Not in contact; but UNCONFORMITY
	Jp	Preuss Redbeds	~900	~270		UNCONFORMITY Additonal 0 to at least 700 feet (0-215 m) of salt in subsurface
	Jtgc	Twin Creek Limestone: Giraffe Creek Member	225	70		
	Jtl	Twin Creek Limestone: Leeds Creek Member	1000-1300	300-395		
	Jtw	Twin Creek Limestone: Watton Canyon Member	400	120		
	Jtb	Twin Creek Limestone: Boundary Ridge Member	100	30		
	Jtr	Twin Creek Limestone: Rich Member	500-540	145-165		
	Jts	Twin Creek Limestone: Sliderock Member	100	30		UNCONFORMITIES
	Jtgs	Twin Creek Limestone: Gypsum Spring Member	210	65		
?	Jn	Nugget Sandstone	1250-1360	380-415		
TRIASSIC	Tras	Stanaker Mbr (Wood Shale T.?) of Ankareh Fm	600-680	185-210		Wood Shale Tongue to north
	Trag	Gartra Grit Member of Ankareh Formation	30-75	9-23		Timothy Ss, & Portneuf Ls Mbrs, and Higham Grit not present
	Tram	Mahogany Mbr (Lanes T.?) of Ankareh Fm	600-725	185-220		UNCONFORMITY
	Trtu	Thaynes Fm: upper calcareous siltstone member	~1035	~315		Lanes Tongue to north
	Trtms	Thaynes Fm: middle shale member	~115	~35		
	Trtml	Thaynes Fm: middle limestone member	~230	~70		Includes Decker Tongue of Ankareh Formation
	Trtls	Thaynes Fm: lower shale member	~185	~55		
	Trtll	Thaynes Fm: lower limestone member	~285	~85		*Meekoceras* sp. ammonite
	Trdu	Dinwoody Formation, upper tongue	~285	~85		
	Trw	Woodside Shale	~500	~150		
	Trd	Dinwoody Formation	~300	~90		UNCONFORMITY?
PERM.	Ppf	Franson Member of Park City Formation	240	75		
PERM.	Ppm	Meade Peak Shale Member of Phosphoria Fm	300	90		Phosphatic
PERM.	Ppg	Grandeur Member of Park City Formation	310	95		
PENN.	PIPwu	Weber Quartzite	~2600	~790		
PENN.	PIPw ?—	Weber Quartzite	~2600	~790		Back thrust and folding instead of disconformity?
PENN.	IPwl	Weber Quartzite	~2600	~790		
PENN.	IPm	Morgan Formation	0-1000	0-300		See Morgan quadrangle (UGS OFR 643) for subsurface strata

Diagram is schematic - no fixed thickness scale

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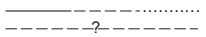
GEOLOGIC SYMBOLS

Devils Slide quadrangle



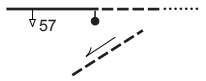
Contact, dashed where approximately located, dotted where concealed; queried where existence uncertain

Contact (purple), human disturbance that post dates 1986 aerial photographs used in geologic mapping

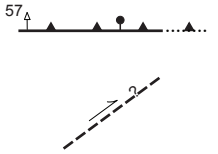
Contact (red), concealed due to human disturbance; location from Mullens and Laraway (1964)

Salt welt extent, concealed

Fault, dashed where approximately located, dotted where concealed, sense of movement unknown



Normal fault, bar and ball on downthrown side, dashed where approximately located, dotted where concealed; arrow and number indicate photogrammetric dip on fault; arrow on cross section shows sense of offset



Thrust fault, teeth on upper plate, dotted where concealed; arrow and number indicate photogrammetric dip on fault; arrow on cross section show sense of offset; bar and ball indicates later normal fault offset, shown with double-headed arrow on cross section; dashed on cross section where approximately located; query on cross section indicates existence uncertain,

Lineament, fold axis or fault, but offset uncertain

Major folds, for clarity projected under thin surficial deposits

Anticline hinge-zone trace, dashed where approximately located, dotted where concealed, arrow shows plunge

Syncline hinge-zone trace, dashed where approximately located (very approximate for broad syncline in Tertiary units and unit Keh), dotted where concealed, arrow shows plunge

Overturned synform hinge-zone trace, dashed because approximately located

Overturned antiform hinge-zone trace, dashed because approximately located

Monocline (flexure) hinge zone trace, dashed where approximately located, arrow shows plunge

Monocline, anticlinal bend on left, synclinal bend on right

Lake Bonneville shoreline

Bonneville (about 5180 feet [1579 m])

Mass-movement scarp

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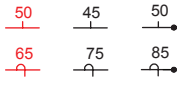
Strike and dip of bedding (attitudes in red from Mullens and Laraway, 1964)

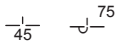


Upright (top known from bedding indicators on right)

Overturned (top known from bedding indicators on right)

Vertical

Horizontal



Photogrammetric, upright on left; overturned on right

Strike and dip of cleavage

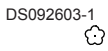
Borehole, selected; see table 1

Adit

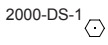
Prospect, with prospective material (in red from Mullens and Laraway, 1964)
coal
Cu = copper

Trench, PO4 = Phosphate, PS = Paleoseismic Study

Sample location



Palynology; see Appendix



Isotopic dating; see table 4

Thin Quaternary unit over another unit (for example Qc/Jtc in Weber Canyon near Devils Slide)

Landslide with nearly intact rotated blocks of unit in parentheses; for example Qms(Tw); queried where blocks may be in place.

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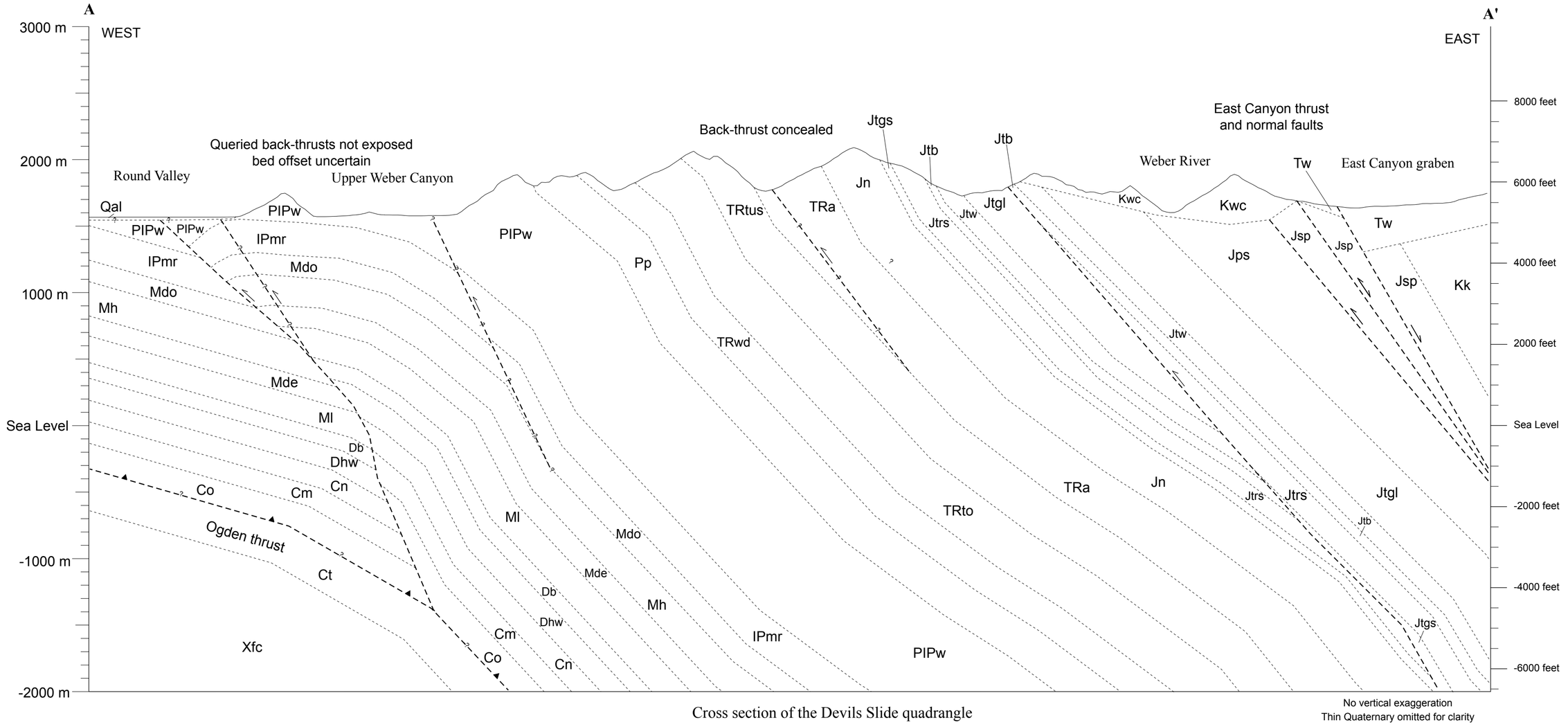

Cross section of the Devils Slide quadrangle

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APPENDIX

This appendix contains the preliminary palynological results of Twin Creek Limestone samples from the Devils Slide quadrangle analyzed by Dr. Gerald Waanders and are provided with locations and units by Doug Sprinkel of the Utah Geological Survey (written communications, March 30, 2010 and December 12, 2012). Locations are in WGS84 decimal degrees. Barren samples are not plotted on map.

Map no.	Sample No.	Map Mbr	Age/Stage	Lithology	Latitude	Longitude	lower Sprinkel unit	upper Sprinkel unit
	DS-063003-1		barren	Limestone	41.066529	-111.549301	8 (Jgs)	
	DS-063003-3		barren	Mudstone	41.066527	-111.549211	10 (Jgs)	
	DS-063003-4		barren	Limestone	41.066531	-111.548979	15 (Jgs)	
1	DS-063003-5	Jts	Bajocian to Bathonian	Limestone	41.067222	-111.547778	20 (Jts)	
2	DS-063003-6	Jts	Bajocian to Bathonian	Limestone	41.067222	-111.547500	21 (Jts)	
3	DS-092603-1	Jtr	Jurassic undiff.	Limestone	41.068314	-111.545721		7 (Jtr)
4	DS-092603-2	Jtw	Jurassic undiff.	Siltstone-Mudstone	41.068333	-111.544620		18 (Jtb)
5	DS-092603-3	Jtw	Bajocian to Bathonian	Limestone	41.068258	-111.544342		22 (Jtw)
6	DS-092603-4	Jtw	Bajocian to Bathonian	Limestone	41.067464	-111.544489		28 (Jtl)
	DS-092603-5		barren	Limestone	41.066718	-111.542778		21 (Jtw)
7	DS-102403-1	Jtl	Bathonian	Limestone	41.066726	-111.542216		32a (Jtl)
8	DS-102403-2	Jtl	Bathonian	Limestone	41.066393	-111.540965		32c (Jtl)
9	DS-102403-3	Jtgc	Callovian	Mudstone	41.064431	-111.539400		32d (Jtl)

Jts=Sliderock Member
Jtr=Rich Member
Jtw=Watton Canyon Member
Jtl=Leeds Creek Member
Jtgc=Giraffe Creek Member

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Gerald Waanders
Consulting Palynologist

1475 Rancho Encinitas Drive
Encinitas, California 92024-7031
Phone: (858) 759-0180
FAX: (858) 759-9028
Email: waanpaly@adelphia.net

March 17, 2004

TO: Mr. Douglas A. Sprinkel
Utah Geological Survey
1594 West N. Temple, Suite 3110
P. O. Box 146100
Salt Lake City, Utah 84114-6100

RE: Palynology analysis of outcrop samples received from Doug Sprinkel:
DS063003-1, -2, -3, -4, -5, -6, DS092603-1, -2, -3, -4, -5, DS102403-1, -2, -3.

PO#308415; SS#04176

PALYNOLOGY REPORT

Twenty-five samples were processed and analyzed for palynomorphs. A list of the taxa found and their relative abundances is provided for each sample examined (R=rare, F=frequent, C=common and A=abundant). An estimate of the kerogen content (total organic recovery), paleoenvironment and age is also indicated.

9. DS063003-1, Unit 8, Gypsum Springs.

Barren of Palynomorphs

Kerogen Content: 100% Woody/Inertinite

T.A.I: Indeterminate

AGE: Indeterminate

ENVIRONMENT: Indeterminate

10. DS063003-2, Unit 88, Volcanic ash, Gypsum Springs

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Paly. analysis of 25 Miscellaneous outcrop samples received from Doug Sprinkel.

Barren of Palynomorphs

Kerogen Content: 100% Woody/Inertinite

T.A.I: Indeterminate

AGE: Indeterminate

ENVIRONMENT: Indeterminate

11. DS063003-3, Unit 10, Gypsum Springs

Barren of Palynomorphs

Kerogen Content: 100% Woody/Inertinite

T.A.I: Indeterminate

AGE: Indeterminate

ENVIRONMENT: Indeterminate

12. DS063003-4, Unit 15, Limestone.

Barren of Palynomorphs

Kerogen Content: 100% Woody/Inertinite

T.A.I: Indeterminate

AGE: Indeterminate

ENVIRONMENT: Indeterminate

13. DS063003-5, unit 20, Rich?

Spores and Pollen:

Araucariacites australis	(R)
Cerebropollenites mesozoicus	(R)
Callialasporites dampieri	(R)
Classopollis classoides	(R)

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Paly. analysis of 25 Miscellaneous outcrop samples received from Doug Sprinkel.

Exesipollenites tumulus	(R)
Perinopollenites elatoides	(R)
Undifferentiated Bisaccates	

Microplankton:

Barbatacysta verrucosum	(R)
Leptodinium subtile	(R)
Tasmanites sp.	(A)

Kerogen Content: 70% Amorphous, 20% Cuticular and 10% Woody

T.A.I: 2.5

AGE: Bajocian to Bathonian

ENVIRONMENT: Nearshore Marine, Lagoonal/Estuarine

14. DS063003-6, unit 20, Rich?

Spores and Pollen:

Araucariacites australis	(F)
Cerebropollenites mesozoicus	(F)
Callialasporites dampieri	(R)
C. triangulus	(R)
Classopollis classoides	(R)
Corrugatisporites amplectiformis	(R)
Deltoidospora spp.	(C)
Exesipollenites tumulus	(R)
Klukisporites pseudoreticulatus	(R)
Undifferentiated Bisaccates	(A)

Microplankton:

Barbatacysta verrucosum	(F)
Microforaminifera linings	(R)
Tasmanites sp.	(C)
Tythodiscus sp.	(R)

Kerogen Content: 40% Amorphous, 10% Cuticular and 50% Woody

T.A.I: 2.5

AGE: Bajocian to Bathonian

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Paly. analysis of 25 Miscellaneous outcrop samples received from Doug Sprinkel.

ENVIRONMENT: Nearshore Marine, Lagoonal/Estuarine

15. DS092603-1, unit 7, Rich (upper resistant bed).

Spores and Pollen:

Araucariacites australis	(C)
Callialasporites dampieri	(R)
Cerebropollenites mesozoicus	(R)
Classopollis spp.	(R)
Deltoidospora spp.	(F)
Exesipollenites tumulus	(R)
Leptolepidites psarosus	(R)
Undifferentiated Bisaccates	(R)

Kerogen Content: 85% Amorphous, 5% Cuticular and 10% Woody

T.A.I: 2.5

AGE: Jurassic (Undifferentiated)

ENVIRONMENT: Restricted Marine/Lacustrine

16. DS092603-2, unit 18, Boundary Ridge.

Spores and Pollen:

Araucariacites australis	(R)
Cerebropollenites mesozoicus	(R)
Classopollis spp.	(R)
Exesipollenites tumulus	(F)
Undifferentiated Bisaccates	(R)

Kerogen Content: 20% Amorphous, 50% Cuticular and 10% Woody

T.A.I: 2.5
AGE: Jurassic (Undifferentiated)

ENVIRONMENT: Estuarine/Deltaic

17. DS092603-3, unit 21, Boundary Ridge/Watton Canyon?

Spores and Pollen:

Paly. analysis of 25 Miscellaneous outcrop samples received from Doug Sprinkel.

Araucariacites australis	(C)
Callialasporites dampieri	(R)
Cerebropollenites mesozoicus	(R)
Classopollis spp.	(R)
Deltoidospora spp.	(R)
Exesipollenites tumulus	(R)

Microplankton:

Barbatacysta verrucosum	(C)
Durotrigia filipicatum	(R)
Lithodinia jurassica	(R)

Kerogen Content: 20% Cuticular and 80% Woody

T.A.I: 2.5

AGE: Bajocian to Bathonian

ENVIRONMENT: Nearshore Marine, Lagoonal/Estuarine

18. DS092603-4, unit 22, Watton Canyon.

Spores and Pollen:

Araucariacites australis	(R)
Callialasporites dampieri	(F)
C. triangulus	(F)
Cerebropollenites mesozoicus	(R)
Classopollis spp.	(C)
Deltoidospora spp.	(F)
Exesipollenites tumulus	(A)
Undifferentiated Bisaccates	(F)

Microplankton:

Barbatacysta verrucosum	(C)
Korystocysta pachydermum	(R)
Tasmanites sp.	(R)

Kerogen Content: 50% Amorphous, 25% Cuticular and 25% Woody

T.A.I: 2.5

AGE: Bajocian to Bathonian

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Paly. analysis of 25 Miscellaneous outcrop samples received from Doug Sprinkel.

ENVIRONMENT: Nearshore Marine, Lagoonal/Estuarine

19. DS092603-5, Unit 28, Watton Canyon.

Barren of Palynomorphs

Kerogen Content: 5% Cuticular and 95% Woody

T.A.I: 2.5

AGE: Indeterminate

ENVIRONMENT: Fluvial/Deltaic

20. DS102403-1, Leeds Creek

Spores and Pollen:

Araucariacites australis	(R)
Cerebropollenites mesozoicus	(F)
Callialasporites dampieri	(R)
C. triangulus	(R)
Classopollis classoides	(A)
Deltoidospora spp.	(R)
Exesipollenites tumulus	(R)
Phyllocladidites sp.	(R)
Rugubivesiculites sp.	(R)
Undifferentiated Bisaccates	(F)

Microplankton:

Barbatacysta verrucosum	(F)
Chlamydophorella sp. (*Sentusi.*, Van Pelt)	(R)
Epiplosphaera reticulata	(R)
Leptodinium subtile	(R)
L. subtile subsp. *pectinigerum*	(R)
Tasmanites sp.	(C)
Valensiella ovula	(R)

Kerogen Content: 20% Amorphous, 30% Cuticular and 50% Woody

T.A.I: 2.5

AGE: Bathonian

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Paly. analysis of 25 Miscellaneous outcrop samples received from Doug Sprinkel.

ENVIRONMENT: Nearshore Marine Shelf

21. DS102403-2, Leeds Creek.

Spores and Pollen:

Araucariacites australis	(R)
Cerebropollenites mesozoicus	(R)
Callialasporites dampieri	(R)
Classopollis classoides	(R)
Corrugatisporites amplectiformis	(R)
Deltoidospora spp.	(R)
Exesipollenites tumulus	(R)
Undifferentiated Bisaccates	(R)

Microplankton:

Barbatacysta verrucosum	(F)
Chlamydophorella sp. (*Sentusi.*, Van Pelt)	(R)
Ctenidodinium continuum	(R)
C. ornatum	(R)
Durotrigia filipicata	(R)
Gonyaulacysta jurassica	(R)
G. sp.	(R)
Epiplosphaera reticulata	(A)
Korystocysta pachydermum	(R)
Leptodinium subtile	(R)
Microforaminifera linings	(F)
Rynchodiniopsis cladophora	(F)
Tythodiscus sp.	(C)
Valensiella ovula	(F)
V. vermiculata	(R)

Kerogen Content: 20% Amorphous, 20% Cuticular and 60% Woody

T.A.I: 2.5

AGE: Bathonian

ENVIRONMENT: Open Marine Shelf

22. DS102403-3, near top of Leeds Creek.

Spores and Pollen:

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Paly. analysis of 25 Miscellaneous outcrop samples received from Doug Sprinkel.

Acanthotriletes sp.	(R)
Araucariacites australis	(R)
Cerebropollenites mesozoicus	(R)
Callialasporites dampieri	(A)
C. triangulus	(R)
C. trilobatus	(R)
Cingulatisporites sp.	(R)
Classopollis classoides	(A)
Deltoidospora spp.	(A)
Exesipollenites tumulus	(R)
Foraminisporis wonthaggiensis	(R)
Foveotriletes canalis	(R)
Klukisporites pseudoreticulatus	(R)
Podocarpidites sp.	(R)
Punctatosporites sp.	(R)
Trilobosporites jurassica	(R)
Undifferentiated Bisaccates	(C)

Microplankton:

Barbatacysta verrucosum	(F)
Chlamydophorella sp. (*Sentusi.*, Van Pelt)	(R)
Durotrigia filipicata	(R)
Endoscrinium galeritum	(R)
Gonyaulacysta jurassica	(R)
Leptodinium subtile	(F)
Lithodinia deflandrei	(R)
Microforaminifera linings	(R)
Pareodinia ceratophora	(R)
Tasmanites sp.	(R)

Kerogen Content: 5% Amorphous, 20% Cuticular and 75% Woody

T.A.I: 2.5

AGE: Callovian

ENVIRONMENT: Nearshore Marine Shelf

Analysis By:

Gerald Waanders

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Gerald Waanders
Consulting Palynologist

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April 17, 2009

TO: Mr. Douglas A. Sprinkel
Utah Geological Survey
1594 West N. Temple, Suite 3110
P. O. Box 146100
Salt Lake City, Utah 84114-6100

RE: Palynology analysis of 3 Gypsum Spring outcrop samples from the Devils Slide Section.

PO#: 312021

PALYNOLOGY REPORT

Three samples were processed and analyzed for palynomorphs. The samples were all barren of palynomorphs. HCl reactions, total organic recoveries, kerogen contents, T.A.I.'s (Thermal Alteration Indices) and paleoenvironments are provided below.

1. DS040709-21b; Gypsum Spring collected 1.5 m above ash dated at 184 Ma, UTM: 0453759 easting, 4546398 northing.

Barren of Palynomorphs

HCl Reaction: Strong

Total Organic Recovery: Poor

Kerogen Content: 30% Amorphous, 20% Cuticular and 50% Woody

T.A.I: 0.4-0.5% Equivalent R_0

AGE: Indeterminate

ENVIRONMENT: Nearshore Restricted Marine/Lacustrine

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RE: Palynology analysis of 3 Gypsum Spring outcrop samples from the Devils Slide Section.

2. DS040709-2; Gypsum Spring, collected 23 m below ash dated at 184 Ma, UTM: 0453833 easting, 4546304 northing.

Barren of Palynomorphs.

HCl Reaction: Very Strong

Total Organic Recovery: Good

Kerogen Content: 100% Amorphous

T.A.I: 0.4-0.5% Equivalent R_0

AGE: Indeterminate

ENVIRONMENT: Restricted Marine/Lacustrine

3. DS040719-3; Gypsum Spring, collected in bed immediately below ash dated at 184 MA, UTM: 0453851 easting, 4546288 northing.

Barren of Palynomorphs:

HCl Reaction: Weak

Total Organic Recovery: Trace

Kerogen Content: 10% Amorphous, 20% Cuticular, and 70% Woody

T.A.I: 0.4-0.5% Equivalent R_0

AGE: Indeterminate

ENVIRONMENT: Floodplain/Deltaic

Analysis By:

_____

Gerald Waanders

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Appendix J

SURETY

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