

**HERMOSA DRILLING PROJECT
PLAN OF OPERATIONS**

ARIZONA MINERALS, INC.

Prepared for:

**UNITED STATES DEPARTMENT
OF AGRICULTURE FOREST SERVICE**
Coronado National Forest
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REV1 June 6, 2013

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ACRONYMS

AAC	Arizona Administrative Code
ADEQ	Arizona Department of Environmental Quality
ADWR	Arizona Department of Water Resources
AMC	Arizona Mining Claim
AMI	Arizona Minerals, Inc.
AMSL	Above Mean Sea Level
ANSI	American National Standards Institute
ATV	All-Terrain Vehicle
AZPDES	Arizona Pollutant Discharge Elimination System
BLM	Bureau of Land Management
BMP	Best Management Practice
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFS	Cubic Feet per Second
CFR	Code of Federal Regulations
CGP	Construction General Permit
CME	Central Mine Equipment
CPR	Cardio Pulmonary Resuscitation
CNF	Coronado National Forest
DMGP	De Minimis General Permit
EMT	Emergency Medical Technician
EPA	Environmental Protection Agency
FR	Forest Road
FSH	Forest Service Handbook
FSM	Forest Service Manual
GPS	Gallons Per Second
HDPE	High-Density Polyethylene
MSDS	Material Safety Data Sheet
MVUM	Motor Vehicle Use Map
NEPA	National Environmental Policy Act
NFPA	National Fire Protection Agency
NFS	National Forest Service
OVP	Overland Vehicle Path
PPE	Personal Protective Equipment
PVC	Polyvinyl Chloride
RC	Reverse Circulation
RQ	Reportable Quantity
SPCC	Spill, Prevention, Control, and Countermeasures
SR	State Route
SWPPP	Stormwater Pollution Prevention Plan
SWQS	Surface Water Quality Standards
TAR	Temporary Access Road
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USFS	United States Forest Service

1. GENERAL INFORMATION

The Hermosa Drilling Project (the Project) is operated by Arizona Minerals, Inc. (AMI), a Nevada Corporation licensed with the Arizona Corporation Commission. AMI is a subsidiary of Wildcat Silver Corporation (Wildcat Silver), a publicly traded company with headquarters in Vancouver, Canada.

AMI is submitting this Plan of Operations (the Plan) for proposed site characterization activities that would extend their current Hermosa mineral deposit exploration program from portions of their patented claims to their unpatented claims. The unpatented claims are located within the Sierra Vista Ranger District of the Coronado National Forest (CNF) where surface use is administered by the U.S. Forest Service (USFS). The Project Area is located approximately 50 miles southeast of Tucson, Arizona in Santa Cruz County, Arizona (the Project Area; **Figure 1**). Site characterization activities will include: mineral exploration drilling; hydrogeologic drilling and testing to characterize groundwater conditions; and geotechnical drilling and sampling and geophysical testing to characterize soil and rock conditions. A variety of proven, conventional drilling and/or excavation techniques would be employed by AMI and its contractors to obtain measurements and samples of subsurface water, minerals, soil, and rock.

The total area of CNF land that would be disturbed for proposed characterization activities, new access roads, and existing access road improvements is 9.19 acres. Areas of disturbance proposed under this Plan are based on conservative estimates of the maximum area that would be required for proposed activities. Therefore, estimated areas of disturbance described herein consider the maximum area required for work planned at each characterization site.

This Plan generally follows the outline of the U.S. Department of Agriculture Standard Form FS-2800-5.

1.1. NAME OF PROJECT

Hermosa Drilling Project
United States Forest Service, Coronado National Forest, Sierra Vista Ranger District
Santa Cruz County, Arizona

1.2. TYPE OF OPERATION

The type of operation proposed under this Plan is exploration and characterization of some of AMI's unpatented claims. The proposed Project involves site characterization activities that include drilling for mineral exploration, hydrogeological investigations, groundwater monitoring well installation, and geotechnical investigations of soil and rock conditions on unpatented claims in the CNF. The proposed Project would require limited construction of temporary drill and excavator pads, limited construction of temporary roads to provide access to the characterization site locations, and improvement or reconstruction of existing Forest Roads (FRs).

1.3. STATUS OF OPERATION

The proposed Project is a new operation.

1.4. PROPOSED START-UP DATE OF OPERATION

The proposed Project will begin after the bond is accepted and within 30 days of final approval of the plan.

1.5. EXPECTED TOTAL DURATION OF THIS OPERATION

The entire drilling program and final reclamation will be completed within fifteen years from the start of operations. Reclamation for the drilling program will be completed for all activities within two years with the exception of monitoring well reclamation, which will be completed within fifteen years.

1.6. EXPECTED DATE FOR COMPLETION OF ALL REQUIRED RECLAMATION

This proposed Project is not expected to be seasonal; therefore, annual reclamation will not be required. Final reclamation will be completed concurrently upon completion of each characterization site. Final reclamation will be completed for all activities, excluding the monitoring well sites, within two years from the start of operations. The monitoring well sites are expected to be reclaimed in 15 years. Although the proposed Project does not have seasonal restrictions, the success of reclamation efforts will depend on seasonal weather conditions.

2. PRINCIPALS

2.1. OPERATOR

The operator of the Project is AMI. The primary point of contact is:

Mr. Don Taylor, President of AMI
4500 Cherry Creek South Drive, Suite 1040
Denver, Colorado 80246
Phone: (303) 300-6890
Fax: (303) 300-0135

2.2. FIELD REPRESENTATIVE

The Field Representative is:

Mr. Gregory Lucero, Vice-President of AMI
825 North Grand Avenue, Suite 100D, PO Box 177
Nogales, Arizona 85628
Phone: (520) 287-0045

2.3. OWNERS OF THE CLAIMS

Detailed claim information on the characterization sites and associated access routes proposed under this Plan is provided in **Tables 1 and 2**. The claim block names, boundaries, and landownership status within the Project Area are presented in **Figure 2**. Claims associated with AMI within the entire Project Area total 6,148.75 acres (9.61 square miles).

- AMI, a subsidiary of Wildcat Silver, is the owner of eight patented claims totaling 152.24 acres¹ (0.24 square miles).
- Three hundred thirteen (313) claims, totaling 5,996.51 acres (9.37 square miles), are unpatented and coincide with lands administered by the USFS/CNF.

2.4. LESSEES, ASSIGNS, AND AGENT(S)

None.

¹ An apparent discrepancy exists in public documents regarding the acreage of AMI's land holdings. Tax documents indicate a total of 154.39 acres; however, the true area of claims patented by AMI total 152.24 acres, which is the number used throughout this Plan of Operations.

3. PROPERTY OR AREA

The Project Area is located approximately 50 miles southeast of Tucson, Arizona in Santa Cruz County, Arizona (the Project Area; **Figure 1**). The Project Area includes lands owned by AMI and lands managed by the CNF. Some roads proposed for access within the Project Area traverse other private lands in proximity to the Project Area. The National Forest Service (NFS) lands within and surrounding the Project Area are administered by the Sierra Vista Ranger District of the CNF. The general vicinity of the Project Area is shown in **Figure 1**; the claim block boundaries and land ownership status within the Project Area are shown in **Figure 2**; and the proposed characterization sites and associated access within the Project Area are shown in **Figure 3**.

Detailed information (name of claim, date located or amended, BLM Serial AMC number, and legal land description) of all unpatented claims within the Project Area is provided in **Table 1**, and the AMI patented lands within the Project Area are identified in **Table 2**.

Other private lands (owned by the Hale Revocable Family Trust and Jon B. & Linda F. Coppa), are identified in **Table 3**. These lands are identified because roads that would provide access to the Project Area (FR 4686, FR 5523, and FR 58) cross or originate on these private lands.

4. DESCRIPTION OF THE OPERATION

The proposed Project activities include drilling 24 geotechnical boreholes, 10 exploration boreholes, 12 hydrogeologic boreholes/monitoring wells, and excavating 16 test pits. These activities will be conducted on 48 proposed characterization sites, 11 of which would host multiple activities (co-located characterization sites). Access to the 48 characterization sites would be gained from existing FRs, construction of five temporary access roads (TARs), and 10 overland vehicle paths (OVPs). The following sections provide detailed descriptions of the project access, maps and drawings, project description, support equipment and vehicles, structures, and project support sites/staging area.

4.1. ACCESS

4.1.1. Primary Access to the Project Area

Primary access to the proposed Project Area will generally be gained from Harshaw Road, which connects to Arizona State Route (SR) 82 at the town of Patagonia. To access the Project Area, traffic will proceed from SR 82 in Patagonia onto 3rd Avenue and then eastward onto McKeown Avenue, which becomes Harshaw Road after 0.10 miles. Harshaw Road proceeds 2.67 miles to the CNF boundary, whereupon Harshaw Road becomes coincident with FR 58. From the CNF boundary, FR 58/Harshaw Road continues 3.26 miles to its intersection with FR 49. At this point, Harshaw Road becomes coincident with FR 49, proceeds southerly toward the historic Harshaw town site, and continues in a roughly semi-circular, counterclockwise arc around the western side of the Project Area. The Project Area is located approximately 6 miles southeast of Patagonia off Harshaw Road. During the course of the Project, equipment, materials, and personnel would be initially directed to a project staging area located on private land owned by AMI approximately one mile southwest of the historic Harshaw town site. The project staging area is accessed from FR 5521, which intersects FR 49/Harshaw Road approximately 2.81 miles southwest of the intersection of FR 49 and FR 58.

4.1.2. Access to Characterization Sites within the Project Area

Based on reconnaissance conducted within the proposed Project Area, access routes were developed to minimize disturbance to CNF lands. Consideration was given to the location of characterization sites, the nature of the surrounding terrain and topography, the state of existing access provided to the area, and the constraints of the equipment required for conducting work at the site. Where practicable, many of the characterization sites are located immediately adjacent to existing FRs. Access to the proposed characterization sites within the Project Area consists of the following types of routes: 1) AMI-owned private roads, 2) existing FRs, 3) overland vehicle paths (OVPs), and 4) temporary access roads (TARs).

Ten characterization sites supporting exploration boreholes would be accessed from AMI-owned patented lands and from FR 4687 (**Figure 3**). Initial routes of travel to the proposed drill locations would consist of existing private roads that have been developed by AMI throughout the patented claim area. Use of newly constructed TARs would then be required from FR 4687 and from the existing private roads to the exploration drill site locations.

Fourteen characterization sites are proposed in areas that are not presently served by FRs. To minimize land disturbance in these areas major equipment will be track-mounted, low ground-pressure drill rigs and excavators, utilizing OVPs. Support vehicles and portable drilling equipment are also proposed for overland access to these locations. Crew access to these characterization sites will be by foot or by using all-terrain vehicles (ATVs). No cut or fill will be required for the 10 OVPs proposed under this Plan. Disturbance would be limited to a narrow track and some tree and vegetation trimming and/or removal.

Specific details of the location and development of access routes within the Project Area are further described in **Appendix A – Road Use Plan**.

4.1.3. Access Road Maintenance, Reconstruction, and Construction

Access road maintenance and construction will be conducted with best management practices (BMPs) in place to ensure road stability and safety and to reduce environmental impacts. Details of road maintenance, reconstruction, and construction within the Project Area are included in **Appendix A – Road Use Plan**. Details of environmental protection measures are described below and in **Section 5**.

4.1.3.1. Maintenance of Existing FRs

Some existing FRs will require maintenance to allow access of drilling, excavation, and support equipment. Maintenance will be limited to road improvement activities that can be conducted within the disturbance area of the existing roadbed and is not considered new disturbance. Maintenance will be accomplished per the details provided in **Appendix A – Road Use Plan**, using a Caterpillar D6 or equivalent-sized dozer and/or John Deere 772-2B motor grader or equivalent. Selective vegetation removal will be performed if deemed necessary to establish access, such as tree trimming along the immediate sides of FRs and clearing of fallen trees. Limited removal of live trees or other vegetation will be undertaken only when no safe alternative exists or where alternatives will result in greater environmental impact.

4.1.3.2. Reconstruction of Existing FRs

One existing FR (FR 4687) within the Project Area will require some degree of reconstruction to allow safe passage of equipment. In general, reconstruction is required along a segment of FR 4687 that cannot be returned to an accessible condition through limited disturbance or maintenance within the existing roadbed. Reconstruction will include the filling of heavily eroded areas, temporary placement of culverts or cross-wash access, placement or replacement of permanent culverts (if required), cut of more than 12 inches of soil or rock from within the existing roadway, and placement of leveling fill or aggregate surfacing in the existing roadway. The intent is to perform reconstruction along the original roadbed in a manner that reduces impacts. Approximately 1,060 linear feet (0.2 miles) of FR 4687 will require reconstruction. The proposed area of disturbance from the reconstruction is approximately 0.15 acres. The road segment requiring reconstruction, reconstruction methods, equipment, and approach are detailed in **Appendix A – Road Use Plan**.

4.1.3.3. Construction of Temporary Access Roads

The characterization sites planned for exploration boreholes would require new TAR construction on CNF lands. Five TARs would be constructed within the Project Area in accordance with CNF requirements and per the methods, equipment, approach, and locations specified in **Appendix A – Road Use Plan**. All TARs will be reclaimed after the exploration drilling operations are completed. The Plan would require approximately 4,350 linear feet of new TAR construction with approximately 2.50 acres of disturbance.

Proposed TAR locations have been evaluated and selected to minimize erosion and disturbance to vegetation, seeps and springs, and any other site conditions that warrant special attention. Any vegetation removed will be limbed, lopped, and chipped, and set aside for use in erosion control features and for reclamation.

4.1.4. Traffic Patterns

Equipment will be mobilized to the project staging area located on AMI-owned lands. After mobilization, traffic will move between the project staging area and the characterization sites or road work sites on CNF lands. Traffic effects on FR 49 and FR 58, if any, should be insignificant. Traffic patterns associated with the proposed project will include:

- Mobilization of the drill rigs and support vehicles to the site. Up to two track-mounted drilling rigs, one track-mounted excavator, and their support vehicles will be mobilized on 18-wheeled tractor-trailers. Up to three road-approved truck-mounted drill rigs will be driven to the site. These mobilizations may be considered as six separate events since it is unlikely the mobilizations will occur on the same day.
- There will be daily crew trips to and from the site. Each crew will likely include two or at most three pickups, SUV's, or similar personnel vehicles. In general, each crew will make one trip to the site in the morning from the Patagonia area and one trip out in the evening. Up to three drill crews and the test pit excavation crew may be active on certain days, but on most days only one or two crews will be active.
- No more than two trips per week during active drilling to the project staging area by a tractor-trailer (10-wheeled or 18-wheeled vehicle) to provide drilling supplies.
- Daily trips by a pump support truck over the period of about two weeks while aquifer testing is underway (see **Section 4.3.2.2**).
- At least one trip per week by a contracted pump truck traveling to the site to remove sanitary waste from the portable toilets.
- Trash pickup will occur as needed and no less frequently than once per month.
- Demobilization of drill rigs and support vehicles at the end of drilling activities. This will be done the same way as the mobilization patterns described above. Demobilizations of more than one site are not likely to occur on the same day.

4.2. MAPS AND DRAWINGS

4.2.1. Location and Layout of Operation

The proposed Project Area, characterization sites, and access routes are depicted in **Figures 1 through 3**. The general vicinity of the Project Area is shown in **Figure 1**; the claim block boundaries and land ownership status within the Project Area are shown in **Figure 2**; and the proposed characterization sites and associated access within the Project Area are shown in **Figure 3**.

Additional figures containing detailed information for each proposed characterization location, including the existing and the proposed access routes within the Project Area, are provided in **Appendix A – Road Use Plan (Figures A-01 through A-27)**.

4.2.2. Project Area Streams

No perennial streams have been identified in the Project Area, though segments of five intermittent drainages are located within the claim block boundary. These segments include Corral Canyon, Goldbaum Canyon, Harshaw Creek, Hermosa Canyon, and Willow Spring Canyon. These drainages are shown in **Figure 3**.

Drainage crossings will be constructed and maintained in compliance with the project Stormwater Pollution Prevention Plan (SWPPP), Clean Water Act, Arizona Department of Environmental Quality (ADEQ), and CNF requirements.

4.2.3. Surface Disturbances

An itemized summary of the surface disturbance proposed under this Plan and the assumptions used in determining this disturbance is provided in **Appendix B – Surface Disturbance Analysis and Assumptions**. To minimize surface disturbance to CNF lands, several proposed Project locations would support multiple site characterization activities (co-located characterization sites). The characterization activities proposed for each characterization site (CS-01 through C-048) are identified in **Table 4**, and the general proposed location of each characterization site on CNF lands is depicted in **Figures 1 through 3**. In summary, surface disturbances for the development of 48 proposed characterization sites and associated access on CNF lands would include:

- 1) Drilling 9 exploration (i.e. mineral exploration) boreholes that would impact approximately 1.51 acres including cut and fill disturbance;
- 2) Drilling 7 hydrogeological boreholes that would impact approximately 0.88 acres to accommodate installation of groundwater monitoring wells;
- 3) Drilling 14 geotechnical boreholes that would impact approximately 0.59 acres;
- 4) Excavating 7 test pits that would impact approximately 0.06 acres;
- 5) Developing 11 additional co-located characterization sites that would impact approximately 1.04 acres including limited cut and fill disturbance, and would cumulatively support an

additional 10 geotechnical boreholes, 1 exploration borehole, 5 hydrogeological boreholes/monitoring wells, and 9 test pits; and

- 6) Limited construction of temporary access roads, overland vehicle paths, and reconstruction of a portion of an existing FR to provide access to the proposed characterization sites. Construction of TARs would impact approximately 2.50 acres, overland vehicle paths would impact approximately 2.46 acres, and the reconstruction of FRs would impact approximately 0.15 acres.

The total area of CNF land that would be disturbed for proposed characterization activities, new access roads, and existing access road improvements is 9.19 acres. Areas of disturbance proposed under this Plan are based on conservative estimates of the maximum area that would be required for proposed activities. Therefore, estimated areas of disturbance described herein consider the maximum area required for work planned at each characterization site, some of which support multiple activities. Impacts within CNF lands would be minimized to the greatest extent practicable.

The project staging area will occupy approximately 4 acres of previously-disturbed private land owned by AMI (*Figure 3*).

4.3. PROJECT DESCRIPTION

4.3.1. General

The purpose of the Project is to conduct site characterization activities that include: mineral exploration drilling; hydrogeologic drilling and testing to characterize groundwater conditions; and geotechnical drilling and sampling and geophysical testing to characterize soil and rock conditions. The site characterization activities are proposed on unpatented claims located on CNF lands and will be used in support of AMI's ongoing feasibility studies of the Hermosa mineral deposit. The estimated surface disturbances of the site characterization activities and associated access proposed under this Plan are previously summarized in *Sections 1 and 4.2.3* and are also described in supporting appendices to this document.

The general order of operations proposed during drilling, excavation, and site closure for this Project is as follows:

- Prepare access routes (where needed);
- Prepare drill and/or excavator pad sites, transport equipment and supplies to the characterization sites and support areas, and set-up equipment;
- Drill, sample, and log the drill holes;
- Conduct associated sampling and testing (such as aquifer pump testing, water sample collection, and/or geophysical testing) at selected holes as described herein;
- Conduct data collection and continuous sampling at test pits and then immediately replace excavated material back into the pit as described herein;

- Complete/close the drill holes as described herein; and
- Remove equipment and water lines and reclaim the access routes (where needed) and drill sites (where needed).

4.3.2. Characterization Methods and Equipment

A list of equipment to be used during the course of the Project is provided as **Table 5**, and itemized equipment lists for each characterization site are provided in **Appendix C – Detailed Description of Characterization Sites, Road Access and Activities**. The equipment to be stationed for use at characterization sites are graphically shown in typical site layouts in **Figures 4 through 7**.

4.3.2.1. Mineral Exploration Drilling

Ten exploration boreholes are proposed under this Plan. Mineral exploration drilling will be accomplished using one of two types of drilling methods: diamond core drilling or reverse circulation (RC) drilling. All boreholes will be drilled by a licensed drilling contractor with the Arizona Department of Water Resources (ADWR).

Diamond core drilling involves advancing a diamond-tipped steel bit into the earth vertically or at an angle and retrieving the intact drilled core at regular intervals by retrieving the core barrel (or tube) via wire-line (5-foot intervals for 5-foot core barrels, 10-foot interval for 10-foot core barrels). This type of drilling will be performed using a Boart-Longyear LFTM 90 (or equivalent) diamond core drilling rig mounted on a 10-wheeled truck. The hole size will range nominally from 3 to 4 inches in diameter. The diamond-tipped core bit spins at a high rate of speed and requires a continuous supply of water to cool and lubricate the core bit and to flush cuttings (ground-up rock chips and dust) from the drill hole. At regular intervals, the core barrel is removed from the hole and the rock core is removed and examined (logged) by a geologist or engineer. After the desired depth is reached, the steel drill rods are removed from the hole and the hole is either plugged or completed as a groundwater monitoring well.

RC drilling involves advancing a double-tube drill pipe equipped with a drill bit that breaks rock into small fragments that are flushed by flowing drilling fluid to the surface through the inside of the pipe. This type of drilling will be performed using a DrilTech D40K (or equivalent) water-well drilling rig mounted on a 10-wheeled truck. The required hole diameter is approximately the same as for diamond core drilling. A temporary surface casing, approximately 5 inches in diameter, will be placed in the upper portion of the hole. This casing will be removed after drilling is completed. The term reverse circulation indicates that drilling fluid flows down the annular space along the outside of the drill pipe and back up through the inside of the pipe. The rock fragments created by the bit are much larger than the fine sand and silt-sized particles produced by coring. Certain additives must be mixed with water or air to produce sufficient viscosity in the fluid moving upward inside the drill pipe to carry the rock fragments to the surface. The rock fragments (cuttings) are separated out from the returning fluid and collected in sample bags or boxes for logging by a geologist or engineer. After the cuttings are separated, the drilling fluid is either reused and recirculated down the hole or decanted and discharged into a mud pit. Once the desired

drilling depth is attained, the steel drill pipe is removed from the drill hole and the hole is plugged or completed in a similar manner as a diamond core drill hole.

When drilling above the water table, and to the extent possible below the water table, compressed air is a preferred drilling fluid. Water (with or without additives) is injected into the compressed air stream to minimize dust. Below the water table, if the formation contains sufficient quantities of water, air may become ineffective as a drilling fluid and it may become necessary to use a liquid drilling fluid (water mixed with either bentonite or synthetic additives, or both). This type of operation usually requires a mud pit to hold the drilling fluid and facilitate the recirculation process and/or to allow sediment to settle out before discharging water to the environment in accordance with in the Arizona Pollutant Discharge Elimination System (AZPDES) De Minimus General Permit (DMGP) from ADEQ for well development activities, as described in **Section 5**.

For the exploration drill holes that involve collection of core samples, cores are expected to range from 2 to 3 inches in diameter. Drill cores from the exploration drill sites will be boxed and moved to a processing area on AMI-owned lands west of the drill sites for further evaluation. A single exploration drill hole is estimated to take up to seven days to complete depending on the desired depth and the nature of the formation being drilled. At any one time, there may be up to three drill rigs, including track-mounted and wheeled rigs, operating within the exploration drilling area. The drilling supplies and equipment associated with exploration drilling will also be stored at the project staging area.

Excess cuttings and drilling mud generated during drilling activities will be collected and removed from CNF land. These materials will be disposed of in accordance with applicable Arizona law. A negligible amount will remain as sediment in the bottom of the mud pit. Drilling mud generated from mineral exploration drilling will be left in the mud pit to infiltrate and evaporate. After all free-standing water has evaporated, the pit will be backfilled with the previously excavated material, covering up the sediments remaining from drilling operations. A detailed description of reclamation at mineral exploration sites is provided in **Appendix D – Reclamation Plan**.

4.3.2.2. Hydrogeologic Drilling

Twelve hydrogeological boreholes are proposed under this Plan, five of the 12 borings have been co-located with other characterization activities such as test pit excavation and geotechnical boring drilling. The boreholes will be completed as groundwater monitoring wells, which will be permitted in conformance with Arizona Administrative Code (AAC) Title 12, Chapter 15, Article 8, Sections 809, 810, and 811 (R12-15-809 through R18-15-811). All hydrogeologic boreholes will be drilled by a licensed drilling contractor with the ADWR, and each monitoring well will be permitted and registered with the ADWR.

All hydrogeological boreholes are planned to be vertically oriented. Hydrogeologic drilling will be performed using the direct rotary method. Direct rotary drilling is similar to RC drilling, except the drilling fluid flows down the inside of a steel drilling rod and up on the outside of the borehole. The drilling fluid for direct rotary will preferably be air, but it may become necessary to switch to water, or a bentonite or foam drilling fluid, depending on subsurface conditions. One hydrogeologic drill hole

(MW-08) will require overland access and will be drilled with a track-mounted Central Mine Equipment (CME) 1250 (or equivalent) drill rig. Future access to this site for long-term monitoring will be conducted on foot. The remaining hydrogeologic drill holes will be located next to existing FRs and will be drilled using a Speedstar 50K (or equivalent) rig. Appendix C-1 provides details on the length of occupancy of each characterization site and the equipment that will be used at each site.

The purpose of the hydrogeologic boreholes is to investigate aquifer characteristics, groundwater occurrence and flow direction, and groundwater quality; therefore, the hydrogeologic boreholes will be advanced below the water table. Once the desired depth is attained, the steel drill string will be withdrawn. In some boreholes, downhole geophysics may be performed to characterize the geologic/hydrogeologic stratigraphy. This involves lowering an instrument on a cable into the borehole to concurrently scan and record relevant geologic and hydrogeologic information that aids in well design. Packer tests may also be performed in some or all hydrogeologic boreholes to characterize the vertical distribution of hydraulic properties and water quality in the aquifer. Packer tests consist of isolating specific sections (usually 10 feet) with inflatable packers (bladders) so that water-quality samples can be collected and aquifer tests can be conducted. A series of packer tests provides definition of the vertical distribution of water quality and hydraulic conductivity in an aquifer. Information from the packer tests can also be used to aid in monitoring well design.

After geophysical logging and packer testing, monitoring wells will be constructed in conformance with ADWR well construction standards. Additional aquifer tests will be performed on some or all completed monitoring wells that are located next to existing FRs. The tests will involve pumping water in progressive steps and/or at constant flow rates using a submersible pump that is temporarily installed in the well for testing purposes. Water that is produced during the aquifer test will be pumped into a temporary water storage tank positioned adjacent to the well. The water will subsequently be transferred by water truck for storage on patented land or will be applied to roads for dust control. During the pumping phase of the test, water levels in the well and pumping rates are measured. When the pump is shut off, recovering water levels are measured. Water level measurements are recorded using a pressure transducer/data logger suspended in the pumping well, and in one or more adjacent boreholes or monitoring wells. Results from aquifer testing are used to estimate the hydraulic conductivity, storativity, and transmissivity of the aquifer within the zone of influence of the pumping well.

The monitoring wells will be completed using polyvinyl chloride (PVC) or carbon steel casing, slotted screen, standard annular materials, and secure surface completions. After well construction, the wells will be developed by bailing, surging, and potentially pumping groundwater from the well. The development process removes fines created during drilling and establishes hydraulic continuity through the filter pack that is placed in the annular space between the well screen and borehole. During installation and development of the monitoring wells, well development water and purge water will be collected in water trucks at the characterization sites. Collected water will be used for dust suppression or trucked to reservoirs and cattle tanks on private lands.

For monitoring wells completed to depths exceeding approximately 50 feet bgs, the drillers will equip the wells with a dedicated sampling pump, associated pump discharge pipe, and possibly a sounding tube

depending on pump configuration. The sounding tube would enable periodic collection of water levels from each well using an electronic water level indicator. These water level measurements will be used to calculate the approximate direction of

groundwater flow and hydraulic gradients. The sampling pumps will be used to enable periodic collection of groundwater samples for water quality testing. The pumps will either be bladder or electrical submersible type pumps that will be powered by portable electric generator or an air compressor controller that is transported in a pickup truck or other vehicle to the site. The pumps will be operated periodically (typically on a quarterly basis). MW-8 (which requires overland access for drilling) will be equipped with a sounding tube to enable periodic collection of water levels using an electric level indicator. Periodic monitoring of MW-8 will be conducted by accessing the site on foot.

The following characterization testing will be conducted at hydrogeological boreholes:

Characterization Test	Number of Boreholes to be Tested/Tests per Borehole	Timing of Tests	Frequency of Tests	Test Duration (hours)
Packer Testing	12 boreholes/6 tests per borehole	As borehole is advanced or once total depth is reached	Discrete events during drilling or single event at conclusion of drilling	Duration estimated at 3-4 hours per interval
Downhole Geophysical Logging	12 boreholes/1 test per borehole	After drilling and prior to well installation	Single event	6 - 8 hours per borehole
Aquifer Testing	12 boreholes/1 test per borehole	Following well development and once water levels have stabilized	Single event	Up to 12 hours per borehole
Slug Testing (falling and rising head)	TBD, to supplement aquifer testing if necessary for select wells	Following well development and once water levels have stabilized	Single event	2 – 8 hours per well
Water Quality Sampling	11 wells	Following well development and once water levels have stabilized	Quarterly, possibly transitioning to reduced frequency (semiannual or annual)	2 – 3 hours per well
Water Level Monitoring (manual measurements and/or transducer downloads)	12 wells	Following well development and once water levels have stabilized	Monthly, possibly transitioning to reduced frequency (quarterly or semiannual)	1 hour per well

During aquifer testing all water will be collected in water trucks at the characterization sites. Collected water will be used for dust suppression or trucked to reservoirs and cattle tanks on private lands.

Depending on site conditions, drill cuttings generated during hydrogeologic drilling will be handled in one of three ways: 1) buried in a pit, 2) spread on the ground surface within the drill site footprint or access road, or 3) contained in a 3 or 5 cubic yard, skid-mounted tilt hopper at the drill pad area and removed for use as fill on AMI land. If the monitoring wells are temporary installations, the cuttings will be temporarily stockpiled within the pad disturbance and returned to the drill hole after hydrogeologic testing is complete.

4.3.2.3. Geotechnical Drilling

Twenty-four geotechnical boreholes are proposed under this Plan, and 10 are proposed to be co-located with other characterization activities and will consist of both angled and vertically oriented holes. Geotechnical drilling will be performed using hollow-stem auger or mud rotary drilling techniques in soil and diamond core drilling in rock. Drilling will be performed using either a track-mounted CME 1250 (or equivalent) drill rig or a portable Winkie drill system for sites where the terrain will prevent access by the tracked drill rig. All boreholes will be drilled by a licensed drilling contractor with the ADWR.

Hollow-stem auger drilling is a direct rotary method of drilling that normally doesn't require drilling fluid. As the name implies, the augers are hollow and are drilled into the soil with a plug in the bottom of the drill string to keep soil from coming up inside the center of the auger. The auger is stopped at regular depth intervals, the plug is removed, and a soil sample is taken by driving a steel sampler into the soil through the center of the casing. When the auger bit reaches rock or very dense or hard soil, the auger will stop advancing (referred to as "refusal"), and the augers can be used as casing through which to advance a diamond core barrel. A smaller diameter core barrel (nominally 3-inch diameter) is used in this application. Although water is typically not needed for the augered portion of the drilling, water is needed for the diamond drilling operation to cool and lubricate the bit and flush rock dust from the hole.

Four geotechnical boreholes will be drilled using a portable drill system. The Winkie drill system (manufactured by Minex) also uses diamond core drilling techniques using either a 1-inch or 1½-inch core barrel. The methods of drilling are essentially the same as core drilling using the CME 1250 or F-90, except on a smaller scale.

To the extent practicable, cuttings generated from drilling geotechnical holes will be placed back into the boreholes after the removal of the core. Any excess cuttings with the exception of the cuttings from Winkie drill system sites will be contained in a tilt hopper and transported to a larger bin located at the project staging area. The cuttings will be used as fill at the project staging area. For Winkie sites, excess cuttings will be spread onto the ground at the remote drill pad area (see **Figures 3 and 6** for Winkie drill

locations and pad layout, respectively). Only small quantities of cuttings (less than 0.2 cubic yards) are likely to be generated as excess from the geotechnical drill holes, and in most cases there will be no excess generated.

Drill core collected from geotechnical holes is expected to range from 1.5 to 2 inches in diameter. The core will be boxed and transported off site in a pickup truck for logging and geotechnical properties testing at a laboratory.

When drilling fluid (water and bentonite, or drill foam) is needed, a metal or plastic trough will be placed on the ground surface around the drill hole and drill stem to contain the recirculating drilling fluid. A bentonite seal placed between the casing and a hole cut in the bottom of the trough metal (to allow the trough to be placed around the casing) will minimize fluid spillage during drilling. Water for drilling at each site will be supplied by a 1,000-gallon water tank mounted on a tracked support vehicle.

Cuttings generated from the borehole while drilling will be manually shoveled into a 3 or 5 cubic yard, skid-mounted tilt hopper positioned near the track-mounted drill rig and support vehicle, off-set from the borehole. When the tilt hopper is full or when drilling is complete, a four-wheel drive, rough terrain forklift (Ingersoll Rand, straight mast, 8,000 pound capacity, or equivalent) will be used to transport the tilt hopper from the drill site and transfer the cuttings to a large roll-off bin at the Project Storage Area or to a fill site area located on AMI property. Additional information about the project staging area is provided in **Section 4.6**.

4.3.2.4. Test Pit Excavation

Sixteen test pit excavation sites are proposed under this Plan, and nine are proposed to be co-located with other characterization activities. Development of these sites will involve excavating a rectangular hole in the ground for the purpose of characterizing the near surface lithology and obtaining bulk samples for laboratory testing. A track-mounted excavator will be used to excavate up to a maximum of 45 cubic yards of soil. The operator will excavate the test pits to approximately 3 feet wide (bucket width) until competent bedrock is reached or to refusal. The excavation depth will depend on the subsurface conditions and the ability of the machine to excavate through the materials. The maximum depth of the test pit will be approximately 20 feet bgs and all test pits will be approximately 20 feet long. Materials excavated from the hole will be temporarily placed in a stockpile next to the hole, and samples of the materials will be collected as determined necessary by the field engineer/technician. Soil samples will be collected in 5-gallon buckets, marked, secured with a lid, and transported off site to a geotechnical laboratory for testing. The field engineer/technician will complete a test pit log for each site identifying materials encountered and associated depths.

The excavator will be transported to the site on a lowboy trailer attached to a semi-truck. The excavator will be off-loaded in the vicinity of a test pit and then will move throughout the property over established routes or on OVPs, as shown in **Figure 3**. The lowboy trailer and semi-truck will be stored as described in Section 4.4. The field engineer/technician will travel by ATV on pre-existing FRs to the vicinity of the test pit and, where overland routing is required, will travel by foot. Sample buckets and shovels will be transported by either the ATV, the excavator, or manually. Overland

routing of the excavator will follow the same path to and from the test pit location to minimize the environmental impact.

The excavator will follow existing, established FRs to the extent possible and, in localized areas, will track across the ground to the test pit location. The two tracks on the excavator are approximately 2 feet wide each and the overall width of the excavator is approximately 12 feet. The length of the excavator is approximately 40 feet long with a track length of approximately 20 feet.

Upon completion of work, the test pit will be backfilled with the stockpiled materials and the area uniformly smoothed with the bucket to re-establish the pre-excavation ground contour. Depending on the travel distance and the ground conditions, approximately 5 to 10 test pits can be excavated on a daily basis.

4.3.3. Characterization Site Layout and Phasing of Co-located Sites

The various characterization methods and equipment types planned for the proposed characterization activities require four types of site layouts as described below. The site layouts are consistent with standard industry practices. Typical site layout configurations and photographs of drilling and excavation equipment are provided as **Figures 4 through 11**.

The geotechnical drilling, test pit excavation, and monitoring well drilling/installation will be three separate operations completed at different times or sequenced to avoid overlapping of equipment on a characterization site. It is possible that the three field programs will occur simultaneously; however, the work effort will be coordinated to avoid interferences at individual sites and along access routes. For example, characterization sites proposed for co-located activities may be developed in accordance with the following phasing concept:

- Geotechnical boreholes will be completed first followed by test pit excavation.
- Excavation of test pits will be completed along one edge of the co-located sites to avoid vehicular/drill rig (hydrogeologic) access problems that could occur as a result of loose or soft ground conditions in the immediate vicinity of the test pit excavation area.
- Hydrogeological drilling and monitoring wells installation will be completed last on the co-located sites to minimize the potential for damage to the well head and associated surface casing.

4.3.3.1. Wheel-Mounted Drill Rig Site Layout

The wheeled drill pad layout will be used for the 10 proposed mineral exploration holes (either RC or diamond core drilling technique) and most of the hydrogeologic holes (air rotary technique). The typical layout of a wheeled pad is illustrated in **Figure 4**, and a photograph of a wheeled drill rig is provided as **Figure 8**.

The drillers will use natural soils from disturbed ground for temporary surfacing of the site. The sites will be relatively level or gently sloping and will have been selected to minimize cut and fill. A review by the drilling supervisor will be completed to consider whether any cut and fill is required at the time of the drill pad development. Any need for cut and fill will be documented but the area of disturbance will not exceed that proposed in this plan.

For mineral exploration boreholes, the drill site layout will be rectangular in configuration and nominally 50 feet wide by 90 feet in length and disturb a minimum of 4,500 square feet per site based on projected cut and fill requirements to site the 50-foot by 90-foot flat surface on an exploration pad.

For hydrogeological boreholes, the drill site layout will be nominally 50 feet by 110 feet, disturbing a minimum of 5,500 square feet per site. These sites are not anticipated to involve cut and fill disturbance as they require placement on relatively flat areas. The final positioning of wheel-mounted drill rigs for hydrogeological boreholes on level land may vary to allow for optimal site configuration based on equipment constraints and natural contours of the terrain. The process by which minor modifications to proposed locations will be approved is detailed in **Section 4.3.3.5**.

The wheeled drill rig sites will be identified in the field by yellow caution tape with a designated access/egress location for personnel and equipment. Erosion control measures (typically straw wattles) will be installed outside of the caution tape in areas of obvious surface flow outfall.

The drill site will include the borehole location, drill rig, storage area for drill rods, access and parking areas for support vehicles, air compressor for a mud system, sump or mud pit, auxiliary equipment location, spare parts/equipment, and rental portable toilets staged adjacent to an existing FR in the vicinity of the drill site area. A mud pit will be excavated at each site using a dozer. The mud pits will be about 8 feet wide (dozer blade width), 12 to 15 feet long and have an average depth of approximately 5 feet. Excavated material will be pushed up at one side to create a small berm, and the opposite side will be sloped to allow safe egress from the pit, in the unlikely event that wildlife or personnel should enter the pit.

4.3.3.2. Track-Mounted Drill Rig Site Layout

The track-mounted drill rig layout will generally be used for drill sites requiring overland access (via OVPs) including the majority of the geotechnical drill holes and one hydrogeology drill hole (MW-08). The typical layout of a track mounted drill rig site is illustrated in **Figure 5**, and a photograph of a track-mounted drill rig setup is provided as **Figure 9**. The drill site will be rectangular and nominally 30 feet wide by 80 feet in length, resulting in a disturbance area of approximately 2,400 square feet per drill site. Each site will contain space for a water tank, tilt hopper, air compressor, drill rig, material storage, and core storage.

No leveling or excavation will be required, with the possible exception of localized leveling by hand with a shovel and/or pick axe. Relatively level or gently sloping sites have been identified for these sites, and the drill rig includes jacks to level the rig during drilling if necessary. The final positioning of track-mounted drill rigs for geotechnical boreholes may vary to allow for optimal site configuration based on equipment constraints and natural contours of the terrain. The process by which minor modifications to

proposed locations will be approved is detailed in **Section 4.3.3.5**. The sites will be identified in the field using yellow caution tape with a designated access/egress location for personnel.

4.3.3.3. Portable Drill Rig Layout

The portable drill rig layout will be used for four of the geotechnical boreholes where tracked rig access is not practicable, and the Winkie drill system is required. The typical layout of a portable drill rig is illustrated in **Figure 6**, and a photograph of a portable drill rig is provided as **Figure 10**. The drill site will be 20 feet by 20 feet and will disturb approximately 400 square feet per drill site. Each site layout contains space for a drill pipe storage area, drill base plate, gas powered water pump, and 55-gallon poly tank. The sites will be identified in the field using yellow caution tape with a designated access/egress location for personnel.

The portable drill rig weighs approximately 185 pounds and can be manually moved on foot by crew members or laborers. A temporary staging area for the Winkie drill equipment will be required; however, sites disturbed by track-mounted drill rig access will be utilized as the staging area, requiring no additional disturbance. Water for coring will be stored in a poly tank or barrel and refilled either by carrying 5-gallon plastic cans from the staging area or by pumping from the 1,000-gallon tank on the tracked support vehicle using a portable pump and temporary piping.

4.3.3.4. Track-Mounted Excavator Site Layout

The track-mounted excavator site layout will be used for the excavation of 7 of the 16 proposed test pits, 9 test pits will be co-located with other characterization activities. The typical layout of these sites is illustrated in **Figure 7**, and a photograph of a track mounted excavator is provided as **Figure 11**. The site will be 20 feet by 20 feet and will disturb approximately 400 square feet of surface area per site. For test pit sites co-located with other characterization activities, the test pit excavation will be completed along one edge of the characterization site. The equipment to be used at each test pit site will be an excavator, shovel, plastic 5-gallon sample buckets, and one ATV. The sites will be identified in the field using yellow caution tape with a designated access/egress location for personnel.

4.3.3.5. Minor Modification to Location of Characterization Sites

The final location of characterization sites may vary slightly from those proposed to allow for optimal site configuration based on equipment constraints and natural topography. AMI will coordinate with the CNF Officer for approval of any minor adjustments to the characterization site locations. Any modifications made will not result in additional impacts to CNF lands or resources over what is specified in this plan.

4.3.4. Workforce/Personnel

The following provides an estimate of the number of on-site personnel that will be involved at any given time, based on the work type:

- Road and Drill Pads: Up to 10 workers, including heavy equipment operators (for excavators, loaders, dump truck, water truck), laborers (manual work for backfilling, raking/grading, tree

trimming, etc.), and support personnel (for pickup trucks/trailers to haul tree trimmings, periodic equipment fueling, etc.);

- Wheeled Rig Exploration Drilling: Up to 10 workers, including two crews of four personnel and two field geologists (assumes simultaneous drilling with two rigs at different drill sites);
- Track-Mounted Rig: Up to eight workers, including two crews of three personnel and two field geologists/engineers (assumes simultaneous drilling with two rigs at different drill sites);
- Portable Drill Equipment (Winkie), Geotechnical and Monitoring Well Drilling: Up to four workers, including one crew of three personnel and one field geologist;
- Track-Mounted Excavator: Up to three workers, including one heavy equipment operator, one engineer (log hole and collect samples) and one laborer (manual work needed for raking/grading, tree trimming and reclamation work).
- Periodic Support for Drilling Operations: Up to four workers to deliver portable toilets, roll-off bins, drilling supplies, well construction materials, etc.; and
- Company and/or Agency Representatives: Up to four personnel to direct, inspect, and/or observe operations.
- On-site Security Service Personnel: If necessary, up to four on-site security service personnel will be provided by the contractors to protect against vandalism to equipment, or theft of tools and equipment.

Based on the above information, the total number of on-site personnel involved in the project work at a given time is estimated to be up to 44 workers.

There will be no camp sites used by personnel on CNF lands. All personnel will be required to use accommodations located on private lands.

4.3.5. Work Schedule

The proposed schedule for phasing and abandonment of each site and associated access routes is provided in *Appendix C – Detailed Description of Characterization Sites, Road Access and Activities*. The schedule provided is based on the current understanding of the planned activities. The estimated schedule for use of drilling equipment is provided as Appendix C-3.

The Project characterization activities would occur over a period of up to two years including reclamation (with the exception of the monitoring well sites which will be reclaimed in 15 years), and would not likely involve any seasonal breaks. Drilling of exploration boreholes, hydrogeological boreholes, and geotechnical boreholes may be conducted up to seven days per week for 24 hours per day. The crew size per characterization site will be three to four workers. One field geologist or engineer will also be present per characterization site to log drill cuttings and assist with sample collection/core handling and labeling. Prior to beginning work each day, a daily tailgate safety meeting will occur to discuss planned operations, hazard identification, and accident and injury prevention. Periodic short-term deliveries of drilling additives, water, or well construction materials to the drill site may be completed depending on the drilling method and production rate. In addition, a professional

geophysical logging contractor may arrive at the drill site to log the hole after the total depth is reached and drill rig tooling has been tripped out of the hole. The geophysical contractor will depart the site once the geophysical logging is complete (typically less than a day).

4.3.6. Water Supply During Drilling

The volume of water required for each drill hole will vary significantly based on the type of drilling method employed, the depth to be drilled, the hardness of the rock, the degree of fractures, voids, and clay seams, and other factors. The range of estimated water requirements for each type of characterization activity is summarized in **Table 6**.

Water needed for use in drilling the 10 exploration drill holes (CS-28, CS-29, CS-39 through 46) will be obtained from an existing water well (production well MW-2 (also referred to as HDS-130) located on the Camden No. 2 claim (**Figure 3**). Water pumped from the MW-2 storage tank at the well site is pumped south to distribution tanks located at the Hardshell No. 1 claim (**Figure 3**). There are typically two 6,000 gallon storage/distribution tanks at this location. Water from the distribution tanks at the Hardshell No. 1 claim will supply water, by gravity, to the exploration drill sites through two-inch diameter, flexible, high-density polyethylene (HDPE) pipe. MW-2 and the associated booster system and tanks are owned by AMI and are located on AMI patented land within 0.5-mile of the proposed exploration drill hole locations (**Figure 3**).

The temporary waterlines used to supply water to the exploration drill holes (CS-28, CS-29, CS-39 through 46) will be laid on the ground surface along access roads. The waterlines will be routed across FR 4687 and branch out along TARs to the characterization sites (**Figure 3**). Placement of the waterlines will be conducted in a manner that avoids or minimizes disturbance while protecting the pipes from damage. At road crossings, HDPE water lines will either be buried in within the road section, or placed in crossing guards/under split steel pipe to protect the line from damage.

Temporary water lines will be installed to each exploration drill site only as needed. Routing of the temporary waterlines will occur at approximately the same time that access roads and drill pads are developed. For removal, lines will be cut into manageable pieces and dragged using pickup tracks within existing roads or TARs to the next site. Waterlines will be placed mainly in a manner that avoids impediment of traffic and butt-welded together. After the proposed drilling program is completed, the lines will be removed by the same method.

Based on the approximate elevation of both the water tank (5500 ft AMSL) and lowest exploration drill site (CS-29 at 5150 ft AMSL) the maximum pressure of the waterline is estimated at 152 PSI. The estimated flow through a damaged waterline along these access roads is approximately 80 GPM (0.18 CFS). As a preventative measure, the waterlines will be visually inspected on a daily basis for evidence of damage and leaking. As is current AMI practice for drilling operations on patented property, waterlines are only in use during active drilling, tank outlet valves are closed, and waterlines drained when not in use.

If a leak is identified, the tank outlet valve will be closed immediately and the waterline completely repaired before operations are reassumed. Supplies to repair and/or replace the HDPE waterline will be stored on AMI patented property. As described in Section 5.2 (Water Quality), AMI will develop and implement a project Stormwater Pollution Prevention Plan (SWPPP) to minimize and manage stormwater within the Project Area. A release of water from the waterline can be managed through implementation of the SWPPP. The SWPPP will describe the sediment/erosion control, good housekeeping, maintenance, inspections and any required monitoring. Best Management Practices (BMPs) in the SWPPP will include erosion control measures along FR 4687 and the TARs.

Water required for drilling at all other proposed drill hole locations will be supplied using a rubber-tired truck or rubber-tracked support vehicle, or will be hand carried, or a combination thereof.

- For drill holes located at or in proximity (within approximately 100 feet) of FRs or of private access roads, a rubber-tired water truck with a capacity of nominally 4,000 gallons will be parked on or adjacent to the road to supply water to the drill site.
- For holes to be accessed overland using tracked rigs, water will be transported to the drill site in a 1,000-gallon polyethylene tank that is secured to a tracked support vehicle. The 1,000-gallon tank will be refilled with a rubber-tired water truck by driving the tracked support vehicle from a drill site to an adjacent road that is accessible by truck.
- For holes advanced using the portable Winkie drill system, water will be carried by hand in 5-gallon cans or pumped from existing AMI-owned monitoring wells through temporary flexible piping.

Relatively small volumes of water may also be used at characterization sites for general cleaning of sediment from drill pipe, core samplers, and other tooling after the equipment is removed from the borehole. In addition, small volumes of water will be used to mix concrete for monitoring well surface completion pads, which typically will not exceed 4 feet square by 1 foot deep.

4.3.7. Characterization Site Completion and Closure

All exploration resource drill holes will be grouted and abandoned in accordance with ADWR and CNF requirements. Upon completion, the drill hole will be backfilled with cuttings and mud to within 20 feet of the surface and then filled with cement. All equipment will be moved off the pad and mobilized to the next characterization site (or off site upon project completion). Well abandonment reports will be filed with ADWR and provided to the CNF upon request.

Disturbances created by the track rig along the route of access has been estimated to be the sum total of 5 feet wide based on an approximate width of 2.5 feet for each track that is in contact with the ground. The disturbances for the tracks and pads will be reclaimed using hand tools and applying erosion control measures as needed.

Hydrogeology drill holes will be completed as wells and capped according to ADWR requirements to allow aquifer testing and long-term water level monitoring, and groundwater sampling. Construction of

these drill holes will begin with a 14- to 16-inch diameter hole drilled to a depth of approximately 20 feet for placement of an 10-inch diameter steel surface casing (collar) set, which will be cemented into place. The hole will be drilled through this collar to the desired depth using a nominal 6-inch diameter bit. After completion of geophysical logging, a 4-inch diameter slotted steel or PVC well screen and casing will be installed, a 3-foot by 3-foot concrete pad will be constructed around the collar, and a locking steel cap will be welded onto the collar. The wells will continue to be used as test wells and monitoring wells for environmental baseline studies over the coming years.

Soil geotechnical drill holes will be backfilled with drill cuttings and sealed at the surface with a bentonite plug in accordance with ADWR standards.

Test pits holes will be backfilled the same day with the stockpiled materials, and the area will be uniformly smoothed with the bucket to re-establish the pre-excavation ground contouring.

Reclamation and/or stabilization of the temporary pads and access roads will be conducted as described in **Appendix D– Reclamation Plan**.

4.4 SUPPORT EQUIPMENT AND VEHICLES

Based on the current project scope and approach, support equipment to be used during the Project at characterization sites will include heavy equipment (excavators, loaders, and dump trucks) for road maintenance, road improvements, and construction of new TARs. To avoid transporting noxious weeds onto CNF lands, heavy equipment will be washed off-site on private property prior to entering the Project Area. Heavy equipment will be staged and stored on private land whenever possible. If this equipment is stored on CNF to reduce the amount of travel between sites, it will be stored on the constructed characterization site pad with underlayment for catchment of any spills.

Various other vehicles and equipment will be used for support during the course of the Project, including vehicles used to transport personnel to and from the site each day. The equipment and vehicles to be used for the Project, number of trips anticipated for each vehicle, and size of the equipment or vehicles, are itemized in **Table 5**. The equipment to be stationed for use on site layouts associated with each characterization site are shown in **Figures 8 through 11**.

Support vehicles within the Project Area may complete as many as 25 trips per day between the project staging area and characterization sites with an average round trip distance of 1.5 miles for a total of 40 miles. Support vehicles will include delivery trucks, pickup trucks with or without trailers, and ATVs. The nominally 4,000-gallon water trucks will be used to provide water to the drill sites and to apply water on the access roads in the Project Area daily to abate dust. These trucks will require as many as 10 trips per day for 15 miles total. Anticipated transport of drilling material may include as many as four trips per day (included within truck travel).

4.5 STRUCTURES

Temporary portable office support trailers (approximately 8 feet by 20 feet) will be used to store equipment and may be used by the drillers for shelter at each characterization site where exploration borehole and hydrogeologic borehole/monitoring well activities are proposed. In addition, a portable toilet may be placed at active characterization sites and will be periodically serviced by a contractor. Up to seven portable toilets may be used on CNF lands during drilling activities. All temporary structures will be removed upon completion of work.

4.6. PROJECT SUPPORT SITES/PROJECT STAGING AREA

4.6.1. Project Staging Area

A project staging area on land owned by AMI within Alta Lot No. 38A will be utilized for multiple Project support functions. The primary access route to the project staging area from outside to within the project area is by driving south on FR 49, followed by driving southeast on FR 5521 to the area. **Figure A-12** in **Appendix A – Road Use Plan** shows the location and access to the project staging area, which is an existing developed area on the Alta Lot No. 38A. Information on Alta Lot No. 38A, approximately 20 acres in area, is provided in **Table 1**. The size of the project staging area is approximately 4 acres. During the Project operation period, daily activity is anticipated to occur at the project staging area except on some weekends and holidays.

The following uses for the project staging area will include storage and/or staging of:

- Drilling products (additives, seals, soda ash, etc.);
- Monitoring well construction and surface completion supplies and materials (well casing, screen, grout, filter pack, concrete mix, etc.);
- Drill pipe and drill rig-related equipment;
- Drill rig vehicle lubricants, motor and hydraulic oils, and diesel fuel;
- Welding products, should they be necessary for repair of drill rig equipment and tooling (electrodes, welding gas cylinders, grinding and cutting wheels, etc.);
- Storage sheds for boxes of drill core;
- Sanitary facilities (portable toilets, wash water);
- Lined roll-off bins (to contain general trash, waste concrete or grout, drilling mud, etc.);
- Tilt hoppers and roll-off bins for temporary containment of excess drill cuttings;
- Support vehicles for the drilling and/or excavation operations (pickup trucks, water trucks, small dump truck, ATVs, etc.); and
- Heavy equipment for use to maintain and reconstruct existing FRs, and for construction of temporary and permanent new access roads (excavators, loaders, dump trucks).

A comprehensive list of equipment and vehicles that may be present at the project staging area is provided in **Table 5**. Environmental protection measures associated with proper management of solid wastes and hazardous substances, spill prevention, and fire prevention and control are included in **Section 5**. Material Safety Data Sheets (MSDS) for all anticipated materials, supplies, and substances used with the drilling program are listed in **Appendix E – Material Safety Data Sheets**. Copies of all MSDS will be kept at the project staging area.

5. ENVIRONMENTAL PROTECTION MEASURES

5.1. AIR QUALITY

Minimal impacts to air quality are expected due to light travel along the existing and newly constructed dirt roads. The following practices will reduce impacts:

- Both core and RC drilling are wet drilling methods and do not generate dust.
- Slash will not be burned, but will instead be limbed, lopped and scattered, and/or chipped for use in site control and reclamation.
- One to four water trucks, with up to 4,000-gallon capacity, will be used in rotation watering access roads as needed on operating days to control dust being generated by vehicular traffic related to the Project.
- Drilling vehicle traffic will be limited to the required access roads relevant to active drilling locations and related activity.
- The speed limit will be 15 mph on all CNF roads and as signed on other roads, such as county roads.
- All engines utilized in the operations will be equipped with the pollution control equipment provided by the manufacturer (i.e, catalytic converters, mufflers, and/or spark arrestors).

5.2. WATER QUALITY

AMI will operate the proposed Project in accordance with the requirements of an AZPDES Construction General Permit (CGP). Per ADEQ's CGP program, AMI will develop and implement a SWPPP to minimize and manage stormwater within the Project Area. The SWPPP will describe the BMPs to be implemented by AMI including sediment/erosion control, good housekeeping, maintenance, inspections and any required monitoring. SWPPP requirements will be incorporated into all phases of the Project, and a copy of the SWPPP will be maintained at the project staging area on AMI's Alta Lot No. 38A.

Specific BMPs that will be implemented as erosion control measures within disturbed areas include the following:

- Minimize drill pad size.
- Minimize exposure of disturbed areas to rainfall by building drill pads only immediately prior to scheduled drilling activity. Reclamation and revegetation will be scheduled to commence rapidly following completion of drilling to stabilize the site and restore vegetative density as quickly as possible.
- Minimize disturbance by placing drill pads as close as possible to existing roads.
- Retain and preserve existing vegetation.

- When available, utilize chipped branches as wood mulch to stabilize disturbed soil and promote vegetation growth.
- Unpaved roads can be a source of significant erosion. Surface disturbance and tire compaction promote gully formation by increasing the concentration and velocity of runoff. Water bars or check dams can be used to shorten the flow length within a long sloping right-of-way, thereby reducing the erosion potential by diverting storm runoff to a stabilized outlet or sediment trapping device. Water bars can also be used to direct runoff to the inner hillside of roads where culverts with velocity dissipation devices and/or slope drains are present.
- Fiber rolls (SE-5) placed at the toe and on the face of slopes intercept runoff, reduce its flow velocity, release the runoff as sheet flow, and remove sediment from the runoff. By interrupting the length of a slope, fiber rolls can also reduce erosion.

Seasonal closures are not anticipated to occur during the course of the Project. If unanticipated temporary cessation of activities occurs, BMPs, monitoring, and inspections will continue during the course of the Project until Project activities and reclamation are completed.

Water will come into contact with bentonite drilling mud and ground rock at depth. After it is pumped back out of the hole, the water will be treated by allowing it to evaporate and by allowing the solids to settle out in excavated mud pits at each drill site. During installation, development, and testing of the monitoring wells, water will be collected in water trucks at the characterization sites. Collected water will be used for dust suppression or trucked to reservoirs and cattle tanks on private lands.

The strategic installation of bentonite seals and professional drilling practices will minimize potential impacts of the drilling program to the existing groundwater aquifer system. In addition, no land application of wastewater will occur during the Project.

5.3 SOLID WASTES

AMI will minimize waste generated during drilling/exploration activities. In general, solids generated from drilling (e.g., rock and drilling mud) are not considered waste and will be placed back into the hole or used as fill on private land. The cuttings that will not be placed back in the hole are the wet and dry cuttings from the hydrogeologic holes that will be monitoring wells. The wet and dry cuttings removed from these sites will be accumulated in lined bins and transported off site for use as fill on private land.

Waste grout and concrete from monitoring well installations will be transported and accumulated in the roll-off box at the project staging area for disposal by Waste Management at the Los Reales Landfill. General trash including remains of food wastes, packaging, and empty containers will also be accumulated in 30-cubic yard roll-off boxes that are staged at the project staging area. A portable toilet will be placed at each active drill site and at the project staging area and will be serviced periodically by a contractor. Up to seven portable toilets may be used on CNF lands during drilling activities.

5.4. SCENIC VALUES

Scenic values will be protected by good housekeeping practices, minimizing disturbance, and implementation of timely reclamation. Impacts to scenic values as a result of the proposed Project will be minimized by implementing the following protective measures:

- Vegetation removal will be selective and will be conducted in such a way as to minimize visual contrast.
- Slash and vegetation debris will not be burned, but will be limbed, lopped and scattered, and/or chipped for reclamation and site stabilization use.
- Dust control measures discussed above will prevent degradation of scenic values.
- BMPs implemented for stormwater control will reduce erosion and sedimentation and minimize dust generation.
- Lights used for night work and safety will be directed or shielded to minimize nightlight effects to surrounding areas.
- Reclamation activities will be implemented in a timely and concurrent manner as described in *Appendix D – Reclamation Plan*.

5.5. FISH AND WILDLIFE

AMI and contracted biologists will continue to consult with CNF biologists to identify any threatened, endangered, or Forest Sensitive Species and/or habitat in the Project Area. Biological surveys for a variety of species were initiated in June 2012 and are ongoing. The proposed Project will be conducted in a manner that minimizes disturbance to wildlife species and habitat to the extent practicable to safely allow access and drilling. Additional consultation will occur with the US Fish and Wildlife Service (USFWS) and the CNF as necessary.

The following general preventative measures will be employed by AMI as part of daily operations for the protection of wildlife that may encounter proposed activities:

- Open mud pits at unoccupied drill sites will be covered to prevent wildlife from being trapped. For drilling operations that are anticipated to be continuous, wildlife are not expected to approach active rigs.
- For exploration drilling mud pits, excavated material will be pushed up at one side to create a small berm, and the opposite side will be sloped to allow safe egress in the unlikely event that wildlife or personnel should enter the pit.
- Roll-off bins used for trash management will remain covered to prevent wildlife from entering the containers and becoming trapped.

5.6. CULTURAL RESOURCES

Class I and Class III cultural resource surveys to determine the presence and/or absence of cultural resources (pre-historic, historic, and tribal considerations) within the Project Area have been initiated. Continued coordination with the CNF archaeologist will identify any additional survey requirements, relevant reporting and issues assessment, appropriate resource protection measures, and any additional resource mitigation. Consultation with the State Historic Preservation Office and the CNF will occur if required by Section 106 of the National Historic Preservation Act of 1966, as amended, and its implementing regulations (36 Code of Federal Regulations [CFR] Part 800), or if required by other federal, state, or local regulations.

To the extent practicable, impacts to cultural resource sites will be avoided. All personnel involved in any surface disturbance operations will be instructed on site avoidance and mitigation measures. This training will be conducted for all personnel prior to initial site mobilization and will be provided to new geotechnical personnel on their first day of work.

Specifications will be provided by the CNF for protection of any new discoveries of cultural resources during surface disturbance activities connected with drilling, road work, or other project activities.

5.7. HAZARDOUS SUBSTANCES

5.7.1. General

The MSDSs for the materials planned for use in the proposed Project are included in **Appendix E – Material Safety Data Sheets**. All downhole additives, well construction materials, and hazardous substances including petroleum products (diesel fuels, oil/lubricants), cleaning chemicals, contingency welding supplies, and other materials to be used in the drilling program are identified in **Appendix F – Spill Response Procedures**. Note that very few of these materials have Reportable Quantities (RQs) as defined by the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) in Title 40 Code of Federal Regulations Parts 116–117. The reason for this is that most of the materials are either exempt as petroleum products or they do not meet the hazard criteria. The drill rigs and support vehicles use several petroleum products, including diesel fuel or gasoline, motor oil, hydraulic oil, and deck engine oil. Many of the sealants used for downhole equipment and tooling will be bentonite-based products, and the liquid oils or lubricants are considered edible or “environmentally friendly” such as fish oil. Thus, while some of the materials may contain components that, under special circumstances, may be hazardous to human health, no materials, other than petroleum products, pose a significant threat to the natural environment.

The only products with acute or chronic toxic properties are either petroleum products (diesel fuel, gasoline, and the lubricant IDP-214) or the specific drilling additives Quik-Gel Gold® and EP Mudlube®. These additives are listed as toxic only they contain up to 5 percent crystalline silica, which poses inhalation risks to humans under occupational exposure.

Diesel fuel will be supplied by tanker trucks to a temporary contractor-furnished tank located at the project staging area on AMI-owned property. To prevent any spills from leaving AMI property, AMI will implement the spill contingency plan procedures documented in **Appendix F – Spill Response Procedures**. The spill contingency plan starts with potential spill anticipation and cognizance, with a focus on prevention.

Drilling contractors will provide temporary diesel fuel storage tank(s) equipped with a spill containment barrier of sufficient capacity to contain a volume of fluid equivalent to the capacity of the tank plus the quantity of rainfall resulting from a 100-year, 24-hour rainfall event. Fuel will be delivered as needed depending on the level of drilling activity. The larger drill rigs consume approximately 35 gallons per day of diesel fuel.

As a priority, and to the extent that it is practical to do so, all heavy equipment and support vehicles will be fueled at the project staging area on AMI property. Fueling of drill rigs, support vehicles, and portable field equipment involved with dedicated work away from the project staging area will be accomplished using National Fire Protection Agency (NFPA) 1192, American National Standards Institute (ANSI) 119.2-rated pickup-born fuel tanks of limited capacity that are equipped with electric fuel pumps. These portable tanks are typically used by construction, and contracting personnel. Actual fueling will take place over a portable containment vessel of sufficient size to capture any spillage. Spill kits containing leak pans, rags, granular sorbents, and/or blotters will be maintained at the project staging area and on fueling pickup trucks to be used to clean any leaks, spillage, or drips. Any used absorbent material will be contained within a lidded barrel for proper disposal off site.

Hydraulic oil and motor oil will be delivered and stored at the project staging area described in **Section 4.6.1**. The fluids will arrive in 5-gallon containers and will be stored on wooden pallets in a secure enclosure to prevent theft, vandalism, and accidental spillage. The enclosure will be equipped with a secondary containment curb or berm such that the volume of containment is equivalent to the capacity of the largest container plus the quantity of rainfall resulting from a 100-year, 24-hour rainfall event. These measures will prevent any spilled material from leaving AMI's property. Immediate cleanup will prevent contamination of runoff that may exit the private lands to CNF lands.

All petroleum products will be stored with secondary containment and in quantities below the 1,320-gallon threshold limit applicable to Spill Prevention, Control and Countermeasures (SPCC) plans. Lubricating grease will be delivered in point-of-use containers such as grease cartridges. These materials will be stored in the secure area holding hydraulic and motor oils. Drill fluid additives will be used to thicken and condition the drilling water. Some of these products (such as bentonite gel) are in powder form and come in plastic lined paper bags weighing approximately 50 pounds. Other drill fluid additives (such as Quick-Trol® polymer and Rod Ease) are available in liquid form, delivered in 5-gallon plastic containers. Quick-Trol® is a biodegradable polymer that forms long chain molecules when mixed with water. Rod Ease is a vegetable oil-based product added to the drill fluid to loosen up the drill string when squeezing conditions are present in the hole and to enhance lubrication of the bit and drill string. These and similar products are commonly used in the drilling industry and are essential to core drilling in geological formations existing under the Project Area.

On-site storage of drill consumables including drill fluid products will be held to a minimum. Bagged items will be stored on wooden pallets and protected from weather using plastic sheeting. The liquids contained in plastic containers will be stored on wooden pallets.

All refuse and debris generated by use of these products will be disposed of as general trash as presented in **Section 5.3**.

5.7.2. Spill Prevention, Control and Reporting

Site contractors will maintain less than 1,320 gallons of petroleum and petroleum-related material on site; therefore, a SPCC Plan as part of Title 40 CFR Part 112 is not required. Even though an SPCC Plan is not required, AMI has developed Spill Response Procedures in order to address spill prevention, containment, notification, and cleanup measures. Details of these procedures are provided in **Appendix F– Spill Response Procedures**.

5.8. HEALTH AND SAFETY

5.8.1. Crew Health, Safety, and Emergency Services

At least one personnel present in the Project Area will be trained in first aid and cardio pulmonary resuscitation (CPR). Vehicles and rigs are equipped with first aid kits. A small family medical facility is located in the Town of Patagonia but is only available during normal business hours. The Patagonia Fire Department includes emergency medical technician (EMT) service and helicopter landing facilities. The nearest hospital facilities are located in Nogales. Serious cases are transported to one of Tucson's large hospitals by ambulance or helicopter. The US Border Patrol, which has major stations in Sonoita and Nogales, heavily patrols the region by land and air, and assists local law enforcement and emergency medical services.

5.8.2. Site Security

Private lands are monitored during the day by AMI staff on site. At night, the FR 5521 access road is secured by a locked gate. During night time hours when equipment is present, on-site security contractors will patrol the area where the drill and excavation equipment are located on CNF lands to minimize the potential for vandalism. Security services will be provided by AMI and its subcontractors.

5.8.3. Fire Prevention and Control

AMI will implement the following measures for the prevention and control of fires during the course of the Project:

- Firefighting personnel and equipment shall be on site, ready and available at all times.
- All combustion engine equipment including chain saws will be equipped with spark arrestors installed by the manufacturer.

- Welding, cutting, and other hot work activities that create sparks must be done off site or in clear areas, free of combustible materials. These activities require the presence of a fire suppression vehicle and fire-fighting personnel.
- All vehicles will be equipped with a working fire extinguisher and a shovel. Drill rigs will be equipped with a filled water tank during periods of operation.
- All smoking will be prohibited.
- Campfires or uncontained fires of any kind will be prohibited.
- The crew contingency plan will include a fire communications protocol for contacting fire-fighting personnel.
- The Project will comply with fire restrictions and/or red flag warning day guidelines.

5.9. RECLAMATION

Timely and concurrent reclamation will be conducted for all characterization sites and associated access routes within the Project Area in accordance with ***Appendix D – Reclamation Plan***

6. FOREST SERVICE EVALUATION OF PLAN OF OPERATIONS

6.1. REQUIRED CHANGES/MODIFICATIONS/SPECIAL MITIGATION FOR PLAN OF OPERATIONS

6.1.1. Bond

Reclamation of all disturbances connected with this plan of operations is covered by Reclamation Performance Bond No._____, dated (mm/dd/yy), signed by (Principal) and (Surety), for the penal sum of _____. This Reclamation Performance Bond is a guarantee of faithful performance with the terms and conditions listed below, and with the reclamation requirements agreed upon in the plan of operations. This Reclamation Performance Bond also extends to and includes any unauthorized activities conducted in connection with this operation.

The bond amount for this Reclamation Performance Bond was based on a bond calculation worksheet. The bond amount may be adjusted during the term of this proposed plan of operation in response to changes in the operations or changes in the economy. Both the Reclamation Performance Bond and the bond calculation worksheet are attached to and made part of this plan of operations.

Acceptable bond securities (subject to change) include:

Negotiable Treasury bills and notes which are unconditionally guaranteed as to both principle and interest in the amount equal at their par value to the penal sum of the bond; or

Certified or cashier's check, bank draft, Post Office money order, cash, assigned certificate of deposit, assigned savings account, blanket bond, or an irrevocable letter of credit equal to the penal sum of the bond.

7. TERMS AND CONDITIONS

If a bond is required, it must be furnished before approval of the plan of operations.

Information provided with this plan marked confidential will be treated in accordance with the agency's laws, rules, and regulations.

Approval of this plan does not constitute certification of ownership to any person named herein and/or recognition of the validity of any claim named herein.

Approval of this plan does not relieve me of my responsibility to comply with other applicable state or federal laws, rules, or regulations.

If previously undiscovered cultural resources (historic or prehistoric objects, artifacts, or sites) are exposed as a result of operations, those operations will not proceed until notification is received from the Authorized Officer that provisions for mitigating unforeseen impacts as required by 36 CFR 228.4(e) and 36 CFR 800 have been complied with.

This plan of operations has been approved for a period of _____ or until (mm/dd/yy). A new or revised plan must be submitted in accordance with 36 CFR part 228, subpart A, if operations are to be continued after that time period.

8. OPERATING PLAN ACCEPTANCE

I/We have reviewed and agreed to comply with all conditions in this plan or operations including the required changes, modifications, special mitigation, and reclamation requirements.

I/We understand that the bond will not be released until the Authorized Officer in charge gives written approval.

Operator (or Authorized Representative)

Date

9. OPERATING PLAN APPROVAL

Name

Title

Authorized Officer

Date

TABLES

Table 1. Unpatented Claims Location

Name of Claim¹	Date Located or Amended	BLM Serial AMC Number²	Section	Township	Range
Shell 1	1/29/1965	51409	04	23S	16E
Shell 2	1/29/1965	51410	04	23S	16E
Shell 2A	5/9/2008	392436	04	23S	16E
Shell 2B	5/12/2008	392437	04	23S	16E
Shell 3	1/29/1965	51411	04	23S	16E
Shell 4	1/29/1965	51412	04	23S	16E
Shell 5	1/29/1965	51413	04	23S	16E
Shell 6	1/28/1965	51414	04	23S	16E
Shell 7	1/28/1965	51415	04	23S	16E
Shell 8	1/28/1965	51416	04	23S	16E
Shell 9	1/29/1965	51417	04	23S	16E
Shell 10	1/29/1965	51418	04	23S	16E
Shell 11	1/28/1965	51419	04	23S	16E
Shell 12	1/28/1965	51420	04	23S	16E
Shell 13	1/29/1965	51421	03/04	23S	16E
Shell 14	1/29/1965	51422	03/04	23S	16E
Shell 15	1/28/1965	51423	03/04	23S	16E
Shell 16	1/28/1965	51424	03/04	23S	16E
Shell 17	1/28/1965	51425	03/04	23S	16E
Shell 18	1/28/1965	51426	03/04	23S	16E
Shell 19	1/28/1965	51427	03/04	23S	16E
Shell 20	1/28/1965	51428	03/04	23S	16E
Shell 21	12/21/2006	376997	04	23S	16E
Shell 22	12/21/2006	376998	04	23S	16E
Shell 23	12/21/2006	376999	03/04	23S	16E
Shell 24	9/15/2008	394954	03	23S	16E
Shell 25	12/29/2006	377000	03	23S	16E
Shell 26	12/29/2006	377001	03	23S	16E
Shell 27	12/29/2006	377002	03	23S	16E
Shell 28	1/2/2007	377003	03	23S	16E
Shell 29	1/2/2007	377004	03	23S	16E
Shell 30	1/2/2007	377005	03	23S	16E
Shell 31B	5/15/2008	392438	03	23S	16E
Shell 31B Amended	7/22/2008		03	23S	16E
Shell 32	1/2/2007	377007	03	23S	16E
Shell 33	1/4/2007	377008	03/10	23S	16E
Shell 34	1/4/2007	377009	10	23S	16E
Shell 35	12/21/2006	377010	04/05	23S	16E
Shell 36	12/21/2006	377011	04/05	23S	16E
Shell 37	12/21/2006	377012	04/05	23S	16E
Shell 38	12/22/2006	377013	04/05	23S	16E
Shell 39	12/22/2006	377014	04/05	23S	16E
Shell 40	12/22/2006	377015	04/05	23S	16E
Shell 41	12/22/2006	377016	04/05	23S	16E
Shell 42	12/22/2006	377017	04/05/06/07	23S	16E
Shell 43	12/22/2006	377018	08/09	23S	16E
Shell 44	7/25/1967	51452	04/08	23S	16E
Shell 45	7/25/1967	51453	04/08	23S	16E
Shell 46	7/25/1967	51454	08	23S	16E
Shell 47	7/25/1967	51455	08	23S	16E
Shell 48	7/25/1967	51456	04/08	23S	16E
Shell 49	7/25/1967	51457	08/10	23S	16E
Shell 51	12/29/2006	377019	03	23S	16E
Shell 52	12/29/2006	377020	03	23S	16E

Table 1. Unpatented Claims Location

Name of Claim ¹	Date Located or Amended	BLM Serial AMC Number ²	Section	Township	Range
Shell 53	12/29/2006	377021	03	23S	16E
Shell 54	1/2/2007	377022	03	23S	16E
Shell 55	1/2/2007	377023	03	23S	16E
Shell 56	1/2/2007	377024	03	23S	16E
Shell 57	1/2/2007	377025	03	23S	16E
Shell 58	1/2/2007	377026	03	23S	16E
Shell 59	1/4/2007	377027	03/10	23S	16E
Shell 60	1/4/2007	377028	10	23S	16E
Shell 61	1/4/2007	377029	10	23S	16E
Shell 62	1/4/2007	377030	10	23S	16E
Shell 63	1/4/2007	377031	10	23S	16E
Shell 64	1/4/2007	377032	10	23S	16E
Shell 65	1/2/2007	377033	08/10	23S	16E
Shell 66	1/2/2007	377034	08/10	23S	16E
Shell 67	1/2/2007	377035	08	23S	16E
Shell 68	1/2/2007	377036	08	23S	16E
Shell 69	12/22/2006	377037	08	23S	16E
Shell 70	12/22/2006	377038	08	23S	16E
Shell 71	12/22/2006	377039	08/09	23S	16E
Shell 72	12/22/2006	377040	08/09	23S	16E
Shell 73	4/24/2007	383320	04	23S	16E
Shell 74	4/24/2007	383321	04	23S	16E
Shell 75	4/24/2007	383322	04	23S	16E
Shell 76	4/24/2007	383323	04	23S	16E
Shell 76 Amended	5/6/2008		04	23S	16E
Shell 77	4/24/2007	383324	04	23S	16E
Shell 77 Amended	5/6/2008		04	23S	16E
Shell 78	4/24/2007	383325	04	23S	16E
Shell 79	4/24/2007	383326	03/04	23S	16E
Shell 80	4/24/2007	383327	03/04	23S	16E
Shell 81	4/24/2007	383328	03/04	23S	16E
Shell 82	5/21/2007	383329	08	23S	16E
Shell 82 Amended	5/7/2008		08	23S	16E
Shell 83	5/21/2007	383330	08/10	23S	16E
Shell 83 Amended	5/7/2008		08/10	23S	16E
Shell 84	5/21/2007	383331	08	23S	16E
Shell 84 Amended	5/7/2008		08	23S	16E
Shell 85	5/21/2007	383332	08/10	23S	16E
Shell 86	5/21/2007	383333	08	23S	16E
Shell 86 Amended	5/7/2008		08	23S	16E
Shell 87	5/21/2007	383334	08/10	23S	16E
Shell 88	5/21/2007	383335	08	23S	16E
Shell 88 Amended	5/7/2008		08	23S	16E
Shell 89	5/21/2007	383336	08/10	23S	16E
Shell 90	5/21/2007	383337	08	23S	16E
Shell 90 Amended	5/7/2008		08	23S	16E
Shell 91	5/21/2007	383338	08/10	23S	16E
Shell 92	5/17/2007	383339	10	23S	16E

Table 1. Unpatented Claims Location

Name of Claim ¹	Date Located or Amended	BLM Serial AMC Number ²	Section	Township	Range
Shell 92 Amended	5/6/2008		10	23S	16E
Shell 93	5/17/2007	383340	10	23S	16E
Shell 93 Amended	5/6/2008		10	23S	16E
Shell 94	5/17/2007	383341	10	23S	16E
Shell 95	5/17/2007	383342	10	23S	16E
Shell 95 Amended	5/6/2008		10	23S	16E
Shell 96	5/17/2007	383343	10	23S	16E
Shell 97	5/17/2007	383344	10	23S	16E
Shell 97 Amended	5/6/2008		10	23S	16E
Shell 98	5/15/2007	383345	10	23S	16E
Shell 99	5/15/2007	383346	10	23S	16E
Shell 99 Amended	5/6/2008		10	23S	16E
Shell 100	5/15/2007	383347	10	23S	16E
Shell 101	5/15/2007	383348	10	23S	16E
Shell 101 Amended	5/6/2008		10	23S	16E
Shell 102	4/24/2007	383349	03	23S	16E
Shell 103	4/24/2007	383350	02/03	23S	16E
Shell 103 Amended	4/30/2008		02/03	23S	16E
Shell 104	4/24/2007	383351	03	23S	16E
Shell 105	4/24/2007	383352	02/03	23S	16E
Shell 105 Amended	4/30/2008		02/03	23S	16E
Shell 106	4/24/2007	383353	03	23S	16E
Shell 106 Amended	4/30/2008		03	23S	16E
Shell 107	4/24/2007	383354	02/03	23S	16E
Shell 107 Amended	4/30/2008		02/03	23S	16E
Shell 108	4/24/2007	383355	03	23S	16E
Shell 108 Amended	4/30/2008		03	23S	16E
Shell 109	4/24/2007	383356	02/03	23S	16E
Shell 109 Amended	4/30/2008		02/03	23S	16E
Shell 110	4/24/2007	383357	03	23S	16E
Shell 111	4/24/2007	383358	02/03	23S	16E
Shell 111 Amended	4/30/2008		02/03	23S	16E
Shell 112	4/26/2007	383359	03	23S	16E
Shell 113	4/26/2007	383360	02/03	23S	16E
Shell 113 Amended	4/30/2008		02/03	23S	16E
Shell 114	4/26/2007	383361	03	23S	16E
Shell 115	4/26/2007	383362	02/03	23S	16E
Shell 115 Amended	4/30/2008		02/03	23S	16E
Shell 116	4/26/2007	383363	03	23S	16E
Shell 117	4/26/2007	383364	02/03	23S	16E

Table 1. Unpatented Claims Location

Name of Claim¹	Date Located or Amended	BLM Serial AMC Number²	Section	Township	Range
Shell 117 Amended	4/30/2008		02/03	23S	16E
Shell 118	5/17/2007	383365	03/10	23S	16E
Shell 118 Amended	4/30/2008		03/10	23S	16E
Shell 119	5/17/2007	383366	02/03/10/11	23S	16E
Shell 119 Amended	4/30/2008		02/03/10/11	23S	16E
Shell 120	5/17/2007	383367	10	23S	16E
Shell 121	5/17/2007	383368	10/11	23S	16E
Shell 121 Amended	5/5/2008		10/11	23S	16E
Shell 122	5/17/2007	383369	10	23S	16E
Shell 123	5/17/2007	383370	10/11	23S	16E
Shell 123 Amended	5/5/2008		10/11	23S	16E
Shell 124	5/17/2007	383371	10	23S	16E
Shell 125	5/17/2007	383372	10/11	23S	16E
Shell 125 Amended	5/5/2008		10/11	23S	16E
Shell 126	5/11/2007	383373	10	23S	16E
Shell 126 Amended	5/5/2008		10	23S	16E
Shell 127	5/11/2007	383374	10/11	23S	16E
Shell 127 Amended	5/5/2008		10/11	23S	16E
Shell 128	5/11/2007	383375	10	23S	16E
Shell 129	5/11/2007	383376	10/11	23S	16E
Shell 129 Amended	5/5/2008		10/11	23S	16E
Shell 130	5/11/2007	383377	10	23S	16E
Shell 131	5/11/2007	383378	10/11	23S	16E
Shell 131 Amended	5/1/2008		10/11	23S	16E
Shell 132	5/11/2007	383379	10	23S	16E
Shell 133	5/11/2007	383380	10/11	23S	16E
Shell 133 Amended	5/1/2008		10/11	23S	16E
Shell 134	5/14/2007	388381	10	23S	16E
Shell 135	5/14/2007	383382	10/11	23S	16E
Shell 135 Amended	5/1/2008		10/11	23S	16E
Shell 136	5/23/2007	383383	08	23S	16E
Shell 136 Amended	5/7/2008		08	23S	16E
Shell 137	5/23/2007	383384	08	23S	16E
Shell 138	5/23/2007	383385	08	23S	16E
Shell 139	5/23/2007	383386	08	23S	16E
Shell 140	5/18/2007	383387	08/10/15/16	23S	16E
Shell 140 Amended	5/7/2008		08/10/15/16	23S	16E
Shell 141	5/18/2007	383388	15/16	23S	16E
Shell 141 Amended	5/7/2008		15/16	23S	16E
Shell 142	5/16/2007	383389	10/15	23S	16E

Table 1. Unpatented Claims Location

Name of Claim ¹	Date Located or Amended	BLM Serial AMC Number ²	Section	Township	Range
Shell 142 Amended	5/6/2008		10/15	23S	16E
Shell 143	5/16/2007	383390	15	23S	16E
Shell 144	5/16/2007	383391	10/15	23S	16E
Shell 144 Amended	5/6/2008		10/15	23S	16E
Shell 145	5/16/2007	383392	15	23S	16E
Shell 145 Amended	5/6/2008		15	23S	16E
Shell 146	5/14/2007	383393	10/15	23S	16E
Shell 146 Amended	5/1/2008		10/15	23S	16E
Shell 147	5/14/2007	383394	15	23S	16E
Shell 148	5/14/2007	383395	10/11/14/15	23S	16E
Shell 148 Amended	5/1/2008		10/11/14/15	23S	16E
Shell 149	5/14/2007	383396	14/15	23S	16E
Shell 149 Amended	5/1/2008		14/15	23S	16E
Shell 150	5/21/2008	392439	08/09	23S	16E
Shell 150 Amended	7/22/2008		08/09	23S	16E
Shell 151	9/15/2008	394955	03	23S	16E
Shell 152	9/15/2008	394956	03	23S	16E
Shell 153	9/15/2008	394957	03	23S	16E
Shell 154	9/15/2008	394958	03	23S	16E
Shell 155	9/15/2008	394959	03	23S	16E
Shell 156	9/15/2008	394960	03	23S	16E
Shell 157	9/15/2008	394961	03	23S	16E
Shell 158	9/14/2008	394962	02/03	23S	16E
Shell 159	9/14/2008	394963	03	23S	16E
Shell 160	9/14/2008	394964	02/03	23S	16E
Shell 161	9/14/2008	394965	03	23S	16E
Shell 162	9/14/2008	394966	02/03	23S	16E
Shell 163	9/14/2008	394967	03	23S	16E
Shell 164	9/14/2008	394968	02/03	23S	16E
Shell 165	9/14/2008	394969	02	23S	16E
Shell 166	11/10/2011	412595	02	23S	16E
Shell 167	11/10/2011	412596	11	23S	16E
Shell 168	11/10/2011	412597	02	23S	16E
Shell 169	11/10/2011	412598	02	23S	16E
Shell 170	11/8/2011	412599	02	23S	16E
Shell 171	11/11/2011	412600	02	23S	16E
Shell 172	11/8/2011	412601	02	23S	16E
Shell 173	11/10/2011	412602	02	23S	16E
Shell 174	11/10/2011	412603	02	23S	16E
Shell 175	12/8/2011	412604	02	23S	16E
Shell 176	11/14/2011	412605	02	23S	16E
Shell 177	11/14/2011	412606	02	23S	16E
Shell 178	11/14/2011	412607	02	23S	16E
Shell 179	11/14/2011	412608	02	23S	16E
Shell 180	11/14/2011	412609	02	23S	16E
Shell 181	11/14/2011	412610	02	23S	16E
Shell 182	11/14/2011	412611	02	23S	16E
Shell 183	11/14/2011	412612	02	23S	16E
Shell 184	11/14/2011	412613	02	23S	16E

Table 1. Unpatented Claims Location

Name of Claim ¹	Date Located or Amended	BLM Serial AMC Number ²	Section	Township	Range
Shell 185	11/14/2011	412614	02	23S	16E
Shell 186	11/14/2011	412615	02	23S	16E
Shell 187	11/14/2011	412616	02	23S	16E
Shell 188	11/14/2011	412617	2/11	23S	16E
Shell 189	11/14/2011	412618	2/11	23S	16E
Shell 190	11/14/2011	412619	11	23S	16E
Shell 191	11/14/2011	412620	11	23S	16E
Shell 192	11/17/2011	412621	11	23S	16E
Shell 193	11/17/2011	412622	11	23S	16E
Shell 194	11/22/2011	412623	11	23S	16E
Shell 195	11/22/2011	412624	11	23S	16E
Shell 196	11/22/2011	412625	11	23S	16E
Shell 197	11/22/2011	412626	11	23S	16E
Shell 198	11/17/2011	412627	11	23S	16E
Shell 199	11/17/2011	412628	11	23S	16E
Shell 200	11/17/2011	412629	11	23S	16E
Shell 201	11/17/2011	412630	11	23S	16E
Shell 202	11/17/2011	412631	11	23S	16E
Shell 202	11/17/2011	412631	11	23S	16E
Shell 203	11/17/2011	412632	11	23S	16E
Shell 204	11/17/2011	412633	11	23S	16E
Shell 205	11/17/2011	412634	11	23S	16E
Shell 206	11/17/2011	412635	11/14	23S	16E
Shell 207	11/17/2011	412636	11/14	23S	16E
Shell 208	11/17/2011	412637	14	23S	16E
Shell 209	11/17/2011	412638	14	23S	16E
Shell 210	11/11/2011	412639	02	23S	16E
Shell 211	11/11/2011	412640	01/02	23S	16E
Shell 212	11/11/2011	412641	02	23S	16E
Shell 213	11/11/2011	412642	01/02	23S	16E
Shell 214	11/11/2011	412643	02	23S	16E
Shell 215	12/8/2011	412644	01/02	23S	16E
Shell 216	11/11/2011	412645	02	23S	16E
Shell 217	11/28/2011	412646	02	23S	16E
Shell 218	11/28/2011	412647	02	23S	16E
Shell 219	11/28/2011	412648	01/02	23S	16E
Shell 220	11/28/2011	412649	02	23S	16E
Shell 221	11/28/2011	412650	01/02	23S	16E
Shell 222	11/28/2011	412651	02	23S	16E
Shell 223	11/22/2011	412652	01/02	23S	16E
Shell 224	11/22/2011	412653	02	23S	16E
Shell 225	11/22/2011	412654	01/02	23S	16E
Shell 226	11/22/2011	412655	02	23S	16E
Shell 227	11/22/2011	412656	01/02	23S	16E
Shell 228	11/22/2011	412657	02	23S	16E
Shell 229	11/22/2011	412658	01/02/11/12	23S	16E
Shell 230	11/22/2011	412659	2/11	23S	16E
Shell 231	11/22/2011	412660	11/12	23S	16E
Shell 232	11/22/2011	412661	11	23S	16E
Shell 233	11/22/2011	412662	11/12	23S	16E
Shell 234	11/22/2011	412663	11	23S	16E
Shell 235	11/21/2011	412664	11/12	23S	16E
Shell 236	11/21/2011	412665	11	23S	16E
Shell 237	11/21/2011	412666	11/12	23S	16E
Shell 238	11/21/2011	412667	11	23S	16E
Shell 239	11/21/2011	412668	11/12	23S	16E
Shell 240	11/21/2011	412669	11/12	23S	16E

Table 1. Unpatented Claims Location

Name of Claim ¹	Date Located or Amended	BLM Serial AMC Number ²	Section	Township	Range
Shell 241	11/21/2011	412670	11	23S	16E
Shell 242	11/21/2011	412671	11	23S	16E
Shell 243	11/21/2011	412672	11/12	23S	16E
Shell 244	11/21/2011	412673	11	23S	16E
Shell 245	11/21/2011	412674	11/12	23S	16E
Shell 246	11/21/2011	412675	11	23S	16E
Shell 247	11/21/2011	412676	12/13	23S	16E
Shell 248	11/21/2011	412677	11/14	23S	16E
Shell 249	11/21/2011	412678	13	23S	16E
Shell 250	11/21/2011	412679	14	23S	16E
Shell 251	3/14/2012	414953	04/05/32/33	22S/23S	16E
Shell 252	3/14/2012	414954	04/33	22S/23S	16E
Shell 253	3/14/2012	414955	32/33	22S	16E
Shell 254	3/14/2012	414956	33	22S	16E
Shell 255	3/14/2012	414957	32/33	22S	16E
Shell 256	3/14/2012	414958	33	22S	16E
Shell 257	3/14/2012	414959	32/33	22S	16E
Shell 258	3/14/2012	414960	33	22S	16E
Shell 259	3/14/2012	414961	32/33	22S	16E
Shell 260	3/14/2012	414962	33	22S	16E
Shell 261	3/14/2012	414263	32/33	22S	16E
Shell 262	3/14/2012	414264	33	22S	16E
Shell 263	3/13/2012	414965	32/33	22S	16E
Shell 264	3/13/2012	414966	33	22S	16E
Shell 265	3/13/2012	414967	32/33	22S	16E
Shell 266	3/13/2012	414968	33	22S	16E
Shell 267	3/13/2012	414969	32/33	22S	16E
Shell 268	3/13/2012	414970	33	22S	16E
Shell 269	3/13/2012	414971	28/29/32/33	22S	16E
Shell 270	3/12/2012	414972	28/33	22S	16E
Shell 271	3/13/2012	414973	28/29	22S	16E
Shell 272	3/13/2012	414974	28	22S	16E
Shell 273	3/13/2012	414976	28/29	22S	16E
Shell 274	3/13/2012	414976	28	22S	16E
Shell 275	3/15/2012	414977	04/33	22S/23S	16E
Shell 276	3/15/2012	414978	04/33/34	22S/23S	16E
Shell 277	3/15/2012	414979	33	22S	16E
Shell 278	3/15/2012	414980	33/34	22S	16E
Shell 279	3/15/2012	414981	33	22S	16E
Shell 280	3/15/2012	414982	33/34	22S	16E
Shell 281	3/15/2012	414983	33	22S	16E
Shell 282	3/15/2012	414984	33/34	22S	16E
Shell 283	3/15/2012	414985	33	22S	16E
Shell 284	3/15/2012	414986	33/34	22S	16E
Shell 285	3/15/2012	414987	33	22S	16E
Shell 286	3/15/2012	414988	33/34	22S	16E
Shell 287	3/15/2012	414989	33	22S	16E
Shell 288	3/15/2012	414990	33/34	22S	16E
Shell 289	3/15/2012	414991	33	22S	16E
Shell 290	3/15/2012	414992	33/34	22S	16E
Shell 291	3/15/2012	414993	33	22S	16E
Shell 292	3/15/2012	414994	33/34	22S	16E
Shell 293	3/15/2012	414995	28/33	22S	16E
Shell 294	3/15/2012	414996	27/28/33/34	22S	16E
Shell 295	3/15/2012	414997	28	22S	16E
Shell 296	3/15/2012	414998	27/28	22S	16E
Shell 297	3/15/2012	414999	28	22S	16E

Table 1. Unpatented Claims Location

Name of Claim¹	Date Located or Amended	BLM Serial AMC Number²	Section	Township	Range
Shell 298	3/15/2012	415000	27/28	22S	16E
Shell 299	3/16/2012	415001	03/34	22S/23S	16E
Shell 300	3/16/2012	415002	34	22S	16E
Shell 301	3/16/2012	415003	34	22S	16E
Shell 302	3/16/2012	415004	34	22S	16E
Shell 304	3/16/2012	415005	34	22S	16E
Shell 305	3/16/2012	415006	34	22S	16E
Shell 306	3/16/2012	415007	34	22S	16E
Shell 307	3/16/2012	415008	34	22S	16E
Shell 308	3/16/2012	415009	27/34	22S	16E
Shell 309	3/16/2012	415011	27	22S	16E
Shell 310	3/16/2012	415012	27	22S	16E

¹ The shaded claims correlate with the shaded claim block boundaries represented on **Figure 2**. These are AMI's unpatented claims planned for operations or road use under the proposed Plan of Operations.

² Bureau of Land Management (BLM); Arizona Mining Claim (AMC)

Table 2. AMI Patented Lands

Name of Claim	Date Located or Amended	BLM Recorded Patent Number	Acreage	Section	Township	Range
Camden Mine	11/5/1958	121192	20.66	03/04	T23S	R16E
Camden No. 2	11/5/1958	121192	20.66	03/04	T23S	R16E
Hardshell No. 1	11/5/1958	121192	20.66	03/04	T23S	R16E
Hardshell No. 15	11/5/1958	121192	17.13	03/04	T23S	R16E
Bluff Lot No. 50	4/27/1883	10279	19.00	03/04	T23S	R16E
Hermosa Lot No. 49	4/27/1883	10278	20.64	03/04	T23S	R16E
Salvador Lot No. 48	4/26/1883	10614	13.62	03/04	T23S	R16E
Alta Lot No. 38A	1/3/1877	8635	19.87	03/04	T23S	R16E

Table 3. Ownership Information for Other Private Lands in Project Area (REV1 May 31, 2013)

Name of Claim	Parcel No.	Owner	Address	Acreage	Parcel Legal Description	Section	Township	Range
Patented Trench Millsite MS-29	105-49- 001	Hale, Norman C. and Ruth J. (The Hale Revocable Family Trust)	None Assigned	5.00	Pat. Trench Millsite MS-29 Section 3 Pt. 105-48-01	03	T23S	R16E
Tract 38	105-49- 004	Hale, Norman C. and Ruth J. (The Hale Revocable Family Trust)	668 Harshaw Rd.	25.61	USFS Lot 4, "UnPat. Mine Claim Missouri Millsite" SW4NW4, Sec 3	03/04	T23S	R16E
HES 305	105-47- 001	Hale, Norman C. and Ruth J. (The Hale Revocable Family Trust)	711 San Rafael Rd.	69.45	HES 305 (less pt desc in dkt 77/533) includes 1 acre homesite	02	T23S	R16E
HES 306	105-48- 001A	Hale, Norman C. and Ruth J. (The Hale Revocable Family Trust)	None Assigned	123.51	Bk 2, p511- Excludes pt in Dkt 712/636,1048/260 (105-48-001B)	01/02	T23S	R16E
HES 305	105-47- 002	Coppa, Jon B. and Linda F.	785 San Rafael Rd.	9.00	Pt of HES 305 desc in dkt 77/533	01	T23S	R16E

Table 4. Characterization Site Layout, Pad Area, and Activity

Characterization Site ID	Site Layout Type	Location (NAD 1983)		Pad Area ² (feet ²)	Characterization Activity ¹			
		Northing	Easting		Geotechnical Borehole	Exploration Borehole	Test Pit	Hydrogeologic Borehole/Monitoring Well
CS-01	Track Mounted Drill Pad	166120	1075500	2400	1001			
CS-02	Wheeled Drill Pad	172787	1081760	5500	1004		TP-1	MW-06
CS-03	Track Mounted Drill Pad	167239	1087280	2400	1005		TP-15	
CS-04	Track Mounted Drill Pad	167004	1084460	2400	1006			
CS-05	Track Mounted Drill Pad	163630	1082990	2400	1012			
CS-06	Track Mounted Drill Pad	161457	1079530	2400	1020			
CS-07	Track Mounted Drill Pad	173045	1085020	2400	BH-1			
CS-08	Track Mounted Drill Pad	169375	1087150	2400	BH-5			
CS-09	Track Mounted Drill Pad	167565	1085450	2400	BH-8			
CS-10	Track Mounted Drill Pad	167417	1082680	2400	BH-10			
CS-11	Track Mounted Drill Pad	165886	1082640	2400	BH-11		TP-23	MW-8 ³
CS-12	Track Mounted Drill Pad	170033	1076170	2400	BH-17			
CS-13	Portable (Winkie) Drill Pad	163108	1078660	400	BH-12			
CS-14	Portable (Winkie) Drill Pad	165319	1078200	400	1017			
CS-15	Portable (Winkie) Drill Pad	164610	1077400	400	1018			
CS-16	Track Excavator Pad	169569	1083360	400			TP-7	
CS-17	Track Excavator Pad	169745	1084120	400			TP-8	
CS-18	Track Excavator Pad	169311	1085710	400			TP-9	
CS-19	Track Excavator Pad	168373	1083580	400			TP-10	
CS-20	Track Mounted Drill Pad	166420	1084250	2400	BH-24		TP-17	
CS-21	Track Mounted Drill Pad	164704	1084770	2400	BH-23		TP-18	
CS-22	Track Excavator Pad	163117	1082060	400			TP-20	
CS-23	Track Excavator Pad	162084	1081420	400			TP-21	
CS-24	Track Mounted Drill Pad	165069	1080700	2400	BH-21		TP-22	
CS-25	Track Excavator Pad	168720	1081410	400			TP-24	
CS-26	Track Mounted Drill Pad	168129	1088130	2400	BH-6		TP-14	
CS-27	Wheeled Drill Pad	166291	1086040	5500	BH-9		TP-16	MW-9

Table 4. Characterization Site Layout, Pad Area, and Activity

Characterization Site ID	Site Layout Type	Location (NAD 1983)		Pad Area ² (feet ²)	Characterization Activity ¹			
		Northing	Easting		Geotechnical Borehole	Exploration Borehole	Test Pit	Hydrogeologic Borehole/Monitoring Well
CS-28	Wheeled Drill Pad	168000	1077400	4500	BH-18	Z-107		
CS-29	Wheeled Drill Pad	169100	1077000	4500		Z-102		
CS-30	Wheeled Drill Pad	160530	1077890	5500				MW-05
CS-31	Wheeled Drill Pad	165169	1074990	5500				MW-10
CS-32	Wheeled Drill Pad	164099	1083810	5500			TP-19	MW-11
CS-33	Wheeled Drill Pad	171840	1075190	5500				MW-12
CS-34	Wheeled Drill Pad	168100	1070570	5500				MW-13
CS-35	Wheeled Drill Pad	160021	1081110	5500				MW-15
CS-36	Wheeled Drill Pad	163661	1089130	5500				MW-18
CS-37	Wheeled Drill Pad	176645	1086670	5500				MW-19
CS-38	Wheeled Drill Pad	174230	1078600	5500	BH-19			MW-20
CS-39	Wheeled Drill Pad	168300	1076140	4500		Z-071		
CS-40	Wheeled Drill Pad	168600	1076300	4500		Z-075		
CS-41	Wheeled Drill Pad	167500	1076350	4500		Z-079		
CS-42	Wheeled Drill Pad	167700	1076600	4500		Z-087		
CS-43	Wheeled Drill Pad	168010	1076600	4500		Z-088		
CS-44	Wheeled Drill Pad	168900	1076600	4500		Z-089		
CS-45	Wheeled Drill Pad	168490	1076950	4500		Z-094		
CS-46	Wheeled Drill Pad	167630	1077300	4500		Z-106		
CS-47	Portable (Winkie) Drill Pad	166964	1081510	400	BH-20			
CS-48	Track Mounted Drill Pad	163150	1081020	2400	BH-22			
TOTALS					24	10	16	12

¹ Sites with multiple characterization activities are sized to the activity requiring the largest footprint.

² Pad area does not include cut and fill disturbance.

³ MW-8 is the only hydrological borehole that will be drilled with a track-mounted drill rig.

Table 4 (Supplemental). Characterization Summary

Site Layout Type	Count	Footprint
Track Mounted Drill Pad	16	80 ft x 30 ft
Portable (Winkie) Drill Pad	4	20 ft x 20 ft
Track Excavator Pad	7	20 ft x 20 ft
Wheeled Drill Pad: Hydrogeologic Borehole/Monitoring Well	11	110 ft x 50 ft
Wheeled Drill Pad: Exploration Borehole	10	90 ft x 50 ft

Table 5. Equipment List

Equipment Type	Size Capacity	No. of Units	Use Type	Use Rate	Trips per Day
EQUIPMENT LISTED BY TYPE					
DRILLING RIGS					
Boart Longyear LF-90 Diamond Drill or equivalent		2	Exploration Drilling	Up to 24 hours per day until drilling completion	Not Applicable
Rubber Tired 3-Axel Air/Rotary Type Rig Speedstar 50K or equivalent		1	Hydro/ Geotechnical Drilling	Up to 24 hours per day until drilling completion	Not Applicable
Track Mounted Air/Rotary Type Rig Speedstar 50K or equivalent		1	Hydro/ Geotechnical Drilling	Up to 24 hours per day until drilling completion	Not Applicable
Track Mounted or Tire Mounted Hollow Stem Auger/Core CME 850/1250 (angle or vertical hole) or equivalent		1	Hydro/ Geotechnical Drilling	12 hours per day until drilling completion	Not Applicable
Winkie drill system		1	Geotechnical Drilling	12 hours per day until drilling completion	Not Applicable
PICKUP TRUCKS/JEEPS					
4WD Pickups/Jeeps	½ ton to 1 ton	8	Ingress/ Egress from property	As Needed	Variable
SPECIALTY TRUCKS					
Dump Trucks	15 yards	1	Material Handling		
Water Trucks	1,000- 4,500 Gallon	3	Dust control	As needed	4 to 15 trips per day
Air compressor booster truck		2	Drill Support	As needed	Variable
Service and fuel trucks		2	Drill Support	As needed	Variable
Peterbuilt Transport		1	Drill Support	As needed	Variable
JD CT 332 Track Loader or equivalent		2	Drill Support	As needed	Variable
Marooka Support Rig Water/Pipe Carrier or equivalent		2	Drill Support	As needed	Variable
TRAILERS					
Utility Trailers		3	Multi- Purpose	As needed	Variable
Flatbed Trailers		3	Multi- Purpose	As Needed	Variable

Table 5. Equipment List

Equipment Type	Size Capacity	No. of Units	Use Type	Use Rate	Trips per Day
Lowboy Trailers		1	Vehicle Transport	As Needed	Variable
Dump Trailers		4	Material Handling	As Needed	Variable
Personnel Trailers		2	Personnel	As Needed	Variable
Fork Lift		2	Drill Support	As Needed	Variable
ATVS					
Honda		3	Ingress/Egress from property	As needed	Variable
EARTHWORK EQUIPMENT					
310 SE Backhoe W/2 Buckets		1	Earthwork	Daily	4 to 15 trips per day
#1: 12 in Bucket		1	Earthwork	As Needed	Variable
#2: 24 in Bucket		1	Earthwork	As Needed	Variable
410 D Backhoe		2	Earthwork	As Needed	Variable
Blades (varying size)		2	Grading/Maintenance	As Needed	Variable
JD 950 C Dozer		1	Earthwork	Daily	4 to 15 trips per day
Excavator to be used for test pits	60,000 LB	2	Earthwork	Daily	4 to 15 trips per day
Loader	4 - 5 ½ Yards	4	Earthwork	As Needed	Variable
246 Cat. Skidsteer Loader		1	Earthwork	Daily	4 to 15 trips per day
2006 JD 210 LE with Gannon Attachment		1	Earthwork	Daily	4 to 15 trips per day
Hydro Vac		1	Earthwork	Daily	4 to 15 trips per day
2005 Vermeer Pro-Vac		1	Earthwork	Daily	4 to 15 trips per day
Vermeer 1250 wood chipper		1	Clearing and Grubbing	As Needed	Variable
John Deere 672 D motor grader or equivalent		1	Grading/Maintenance	As Needed	Variable
EQUIPMENT LISTED BY ACTIVITY*					
MONITORING WELL/HYDROGEOLOGICAL EQUIPMENT					
Rubber-Tired 3-Axel Air Rotary Type Rig (Speedstar 50K or Equivalent)		1		Up to 24 hours per day until drilling is complete	Not Applicable
Track Mounted Air Rotary Type Rig (Speedstar 50K or Equivalent)		1		Up to 24 hours per day until drilling is complete	Not Applicable

Table 5. Equipment List

Equipment Type	Size Capacity	No. of Units	Use Type	Use Rate	Trips per Day
18-Wheel Semi Truck with Lowboy or Flatbed Trailer for Transport of Rig to/from Site		1		As needed	Not Applicable
Rubber-Tired 3-Axel Pipe Truck		1		Up to 24 hours per day until drilling is complete	Not Applicable
Utility Trailer for Well Installation and Drilling Supplies		1		Up to 24 hours per day until drilling is complete	Not Applicable
Fork Lift		1		As needed	Variable
Air Compressor System		1		As needed	Not Applicable
Mud Pump System		1		As needed	Not Applicable
Service and Fuel Truck		1		As needed	Variable
1000- to 4500-gallon Water Truck		1 to 2		As needed	4 to 15 trips per day
4WD Vehicles		3		As needed	Variable
GEOTECHNICAL EQUIPMENT					
Track- or Tire-mounted Hollow Stem Auger/Core Type Rig (CME 850/1250 or Equivalent)		1		Up to 12 hours per day until drilling is complete	Not Applicable
18-Wheel Semi Truck with Lowboy or Flatbed Trailer for Transport of Rig to/from Site		1		As needed	Not Applicable
Utility Trailer for Well Installation and Drilling Supplies		1		Up to 12 hours per day until drilling is complete	Up to 24 hours per day until drilling is complete
Fork Lift				As needed	Variable
Air Compressor System		1		As needed	Variable
Mud Pump System		1		As needed	Variable
1000- to 4500-gallon Water Truck		1 to 2		As needed	4 to 15 trips per day
Service and Fuel Truck		1		As needed	Variable
4WD Vehicles		1		As needed	Variable

*Note that equipment type and number of units listed by activity are accounted for in the Equipment Listed by Type sections of this table (above). This information is provided for reference and should not be used to calculate total equipment units. Only the Equipment by Type section of this table should be used to determine total equipment counts.

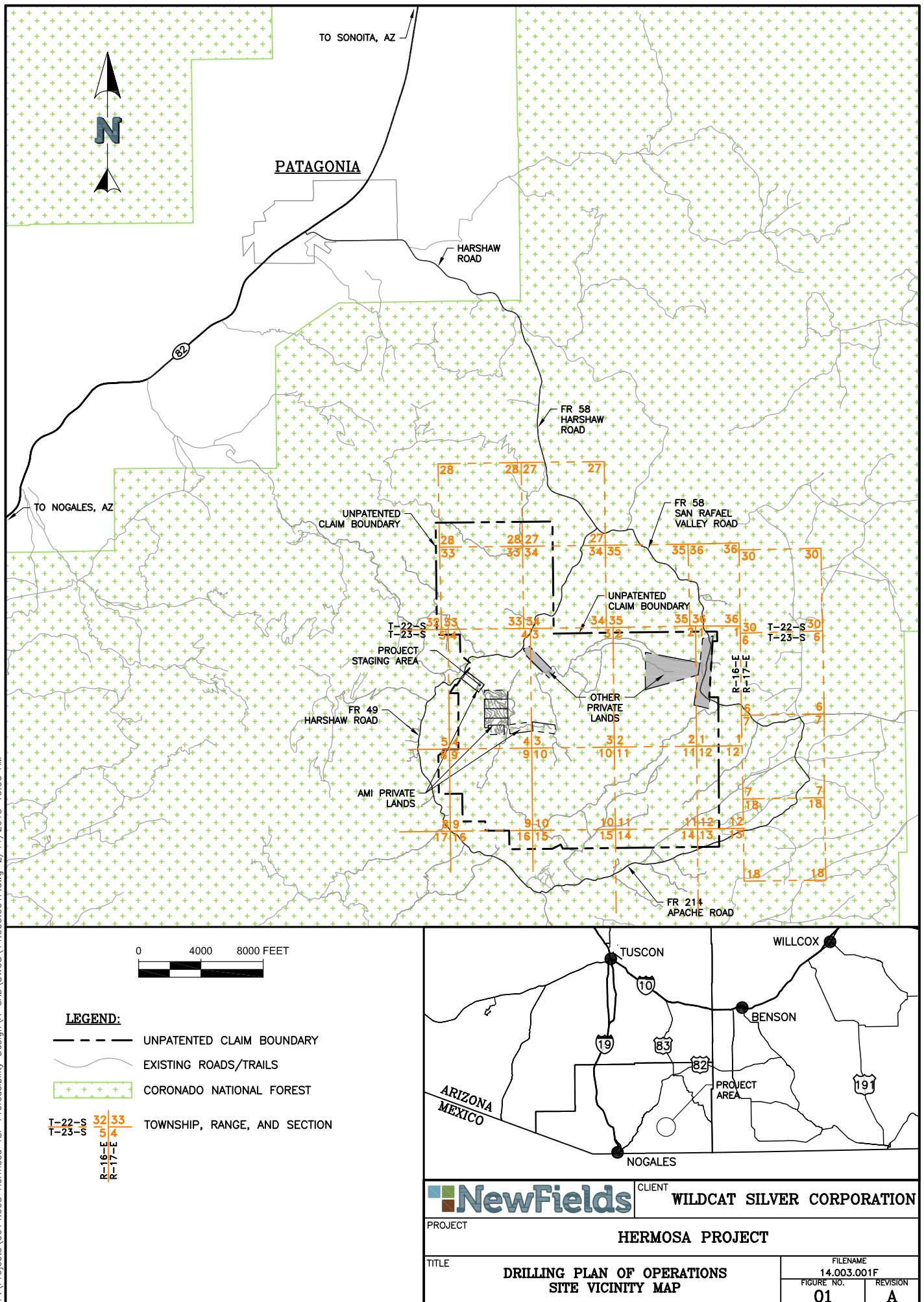
Table 6. Characterization Activity Water Usage

Characterization Activity	Number of Sites	Depth (Feet)	Estimated Water Usage (Gallons)	Total Water Usage (Gallons)
Geotechnical (Track Mounted Drill Rig)	20	50-1,000	1,000	20,000
Geotechnical (Portable Winkie Drill Rig)	4	100	200	800
Monitoring Well (Wheeled)	11	Below Water Table	3,000	33,000
Monitoring Well (Track Mounted Drill Rig)	1	Below Water Table	1,000	1,000
Test Pit	16	20	0	0
Exploration Borehole	10	600-1,200	24,000	240,000
Total Estimated Water Usage				294,800

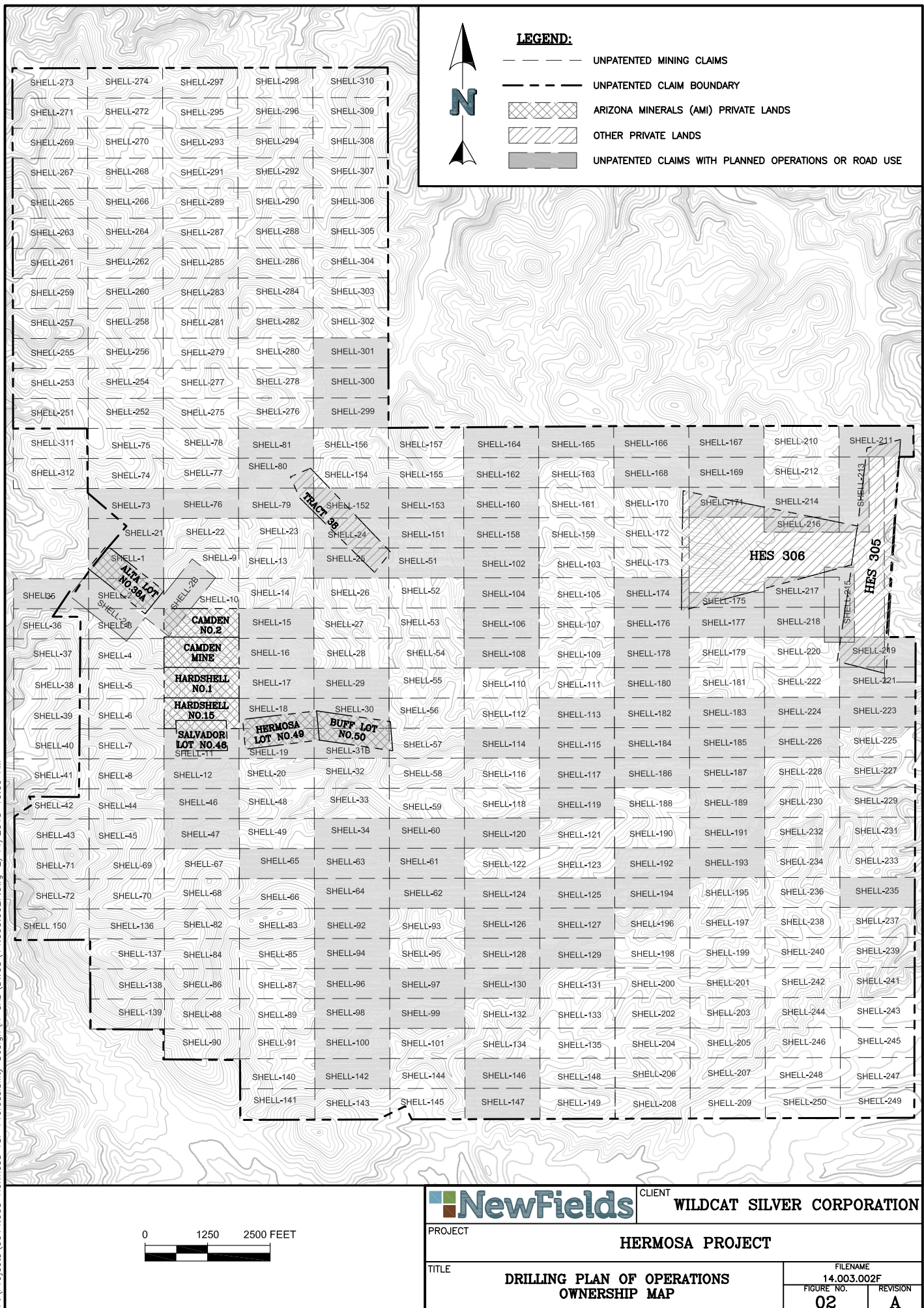


FIGURES

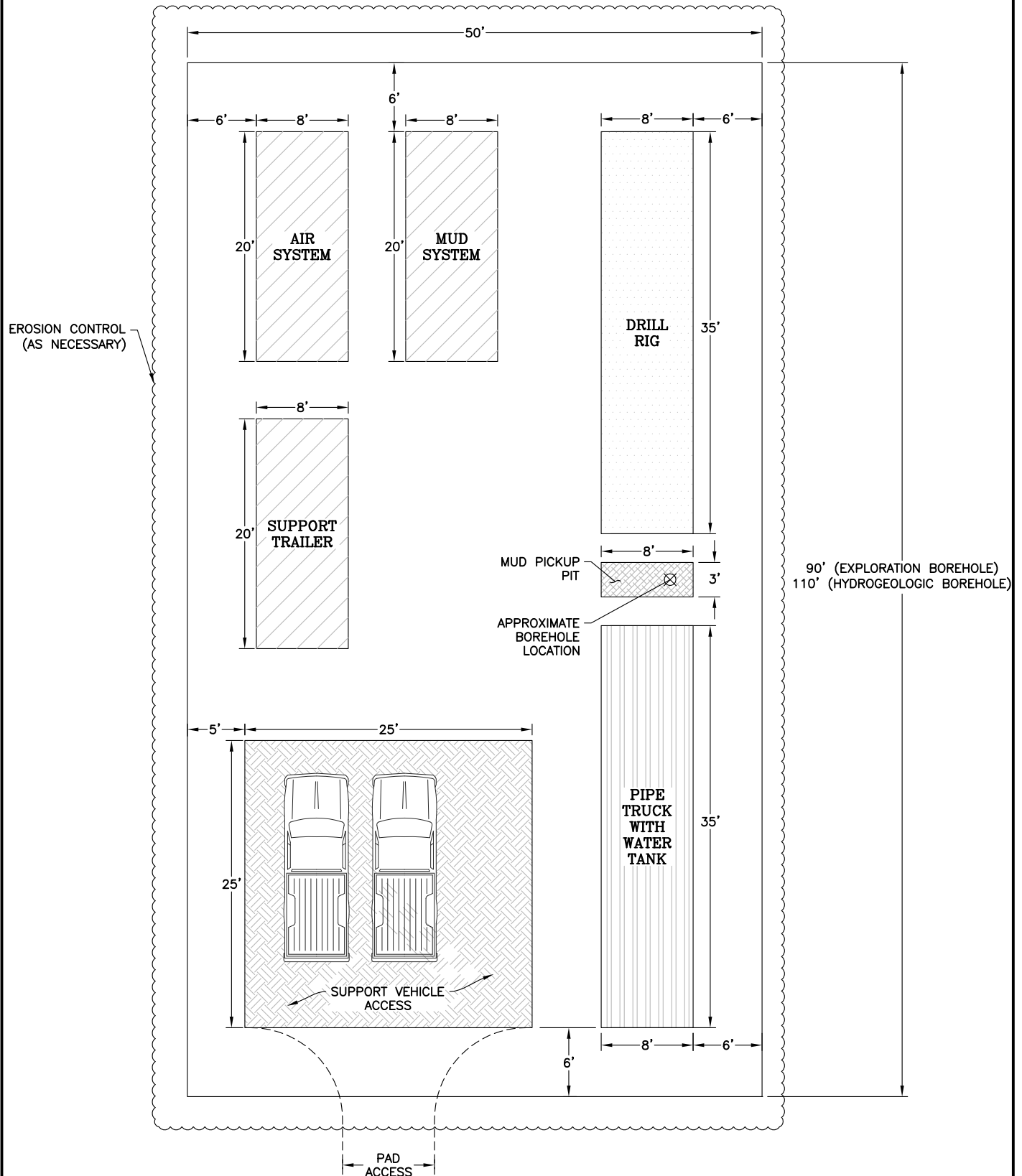
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WHEELED DRILL PAD LAYOUT

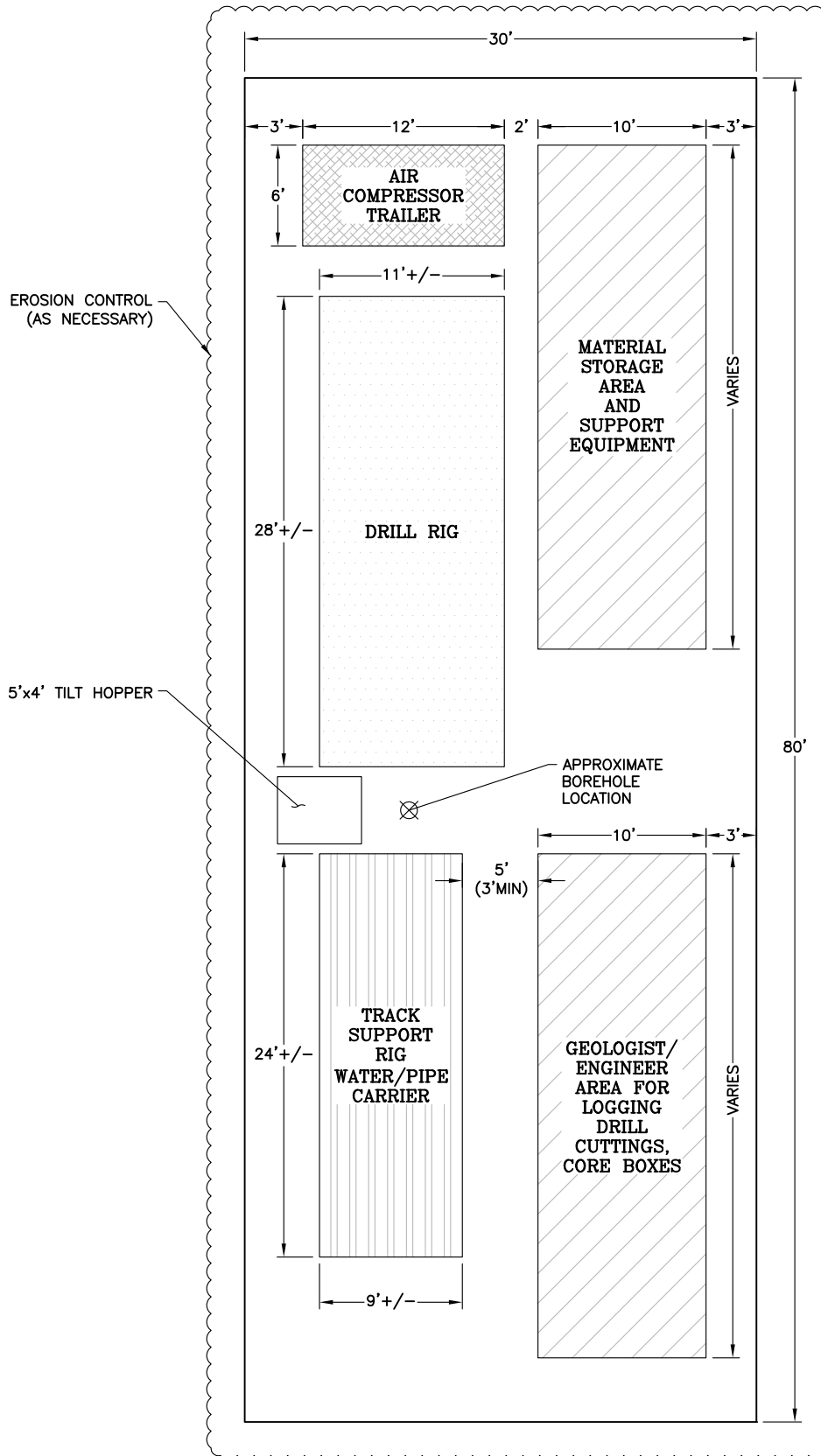


NOTES:

1. SIZES OF EQUIPMENT AND MATERIALS ARE APPROXIMATE.
2. ORIENTATION OF EQUIPMENT AND MATERIALS WILL BE ADJUSTED ONSITE WITHIN THE PAD AREA.
3. EROSION CONTROL MEASURES TO BE PLACED ON THE DOWNGRADIENT SIDE(S) OF THE PAD IN ACCORDANCE WITH THE SWPPP.

		CLIENT		WILDCAT SILVER CORPORATION	
PROJECT		HERMOSA PROJECT			
TITLE		DRILLING PLAN OF OPERATIONS WHEELED DRILL PAD LAYOUT		FILENAME 14.003.004F	
		FIGURE NO.	04	REVISION A	

TRACK MOUNTED DRILL PAD LAYOUT

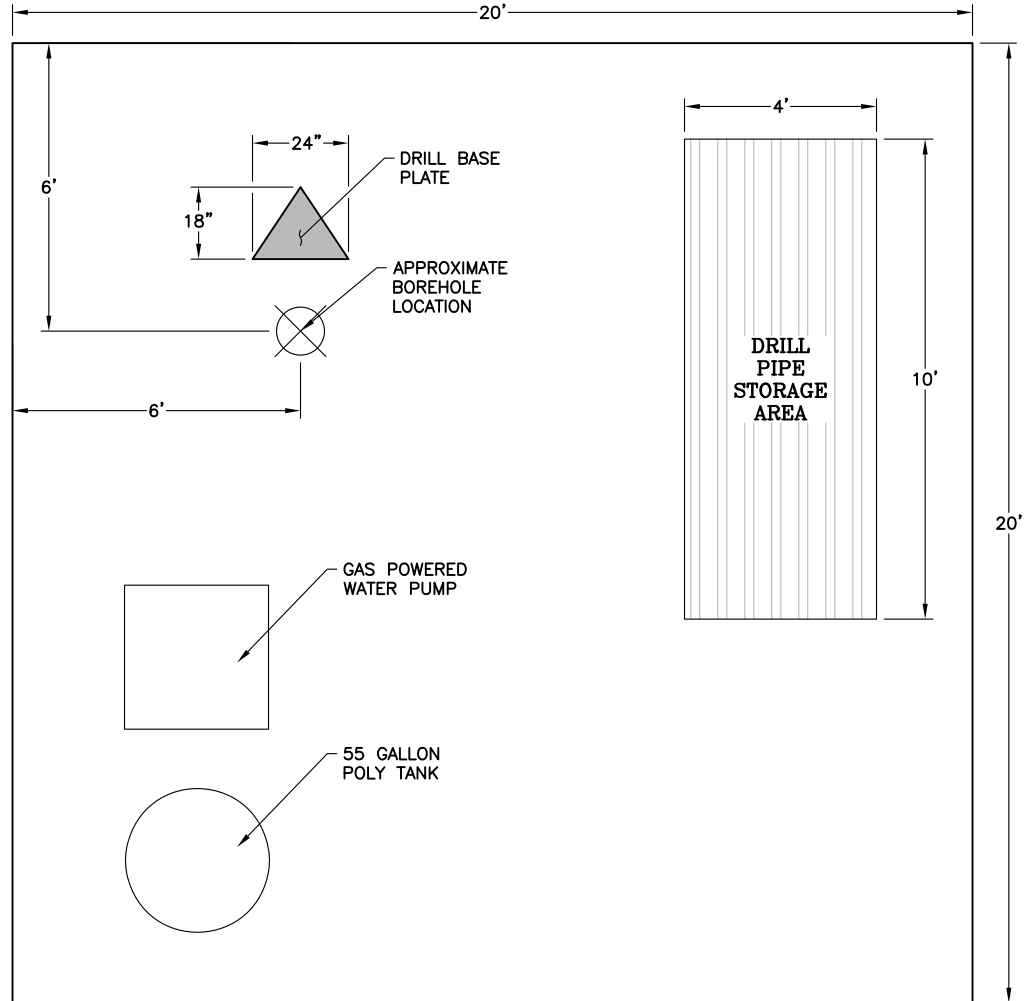


NOTES:

1. SIZES OF EQUIPMENT AND MATERIALS ARE APPROXIMATE.
2. ORIENTATION OF EQUIPMENT AND MATERIALS WILL BE ADJUSTED ONSITE WITHIN THE PAD AREA.
3. EROSION CONTROL MEASURES TO BE PLACED ON THE DOWNGRADIENT SIDE(S) OF THE PAD IN ACCORDANCE WITH THE SWPPP.

		CLIENT WILDCAT SILVER CORPORATION	
PROJECT HERMOSA PROJECT		TITLE DRILLING PLAN OF OPERATIONS TRACK MOUNTED DRILL PAD LAYOUT	
FILENAME 14.003.005F		REVISION A	
FIGURE NO. 05		REVISION A	

PORTABLE (WINKIE) DRILL PAD LAYOUT

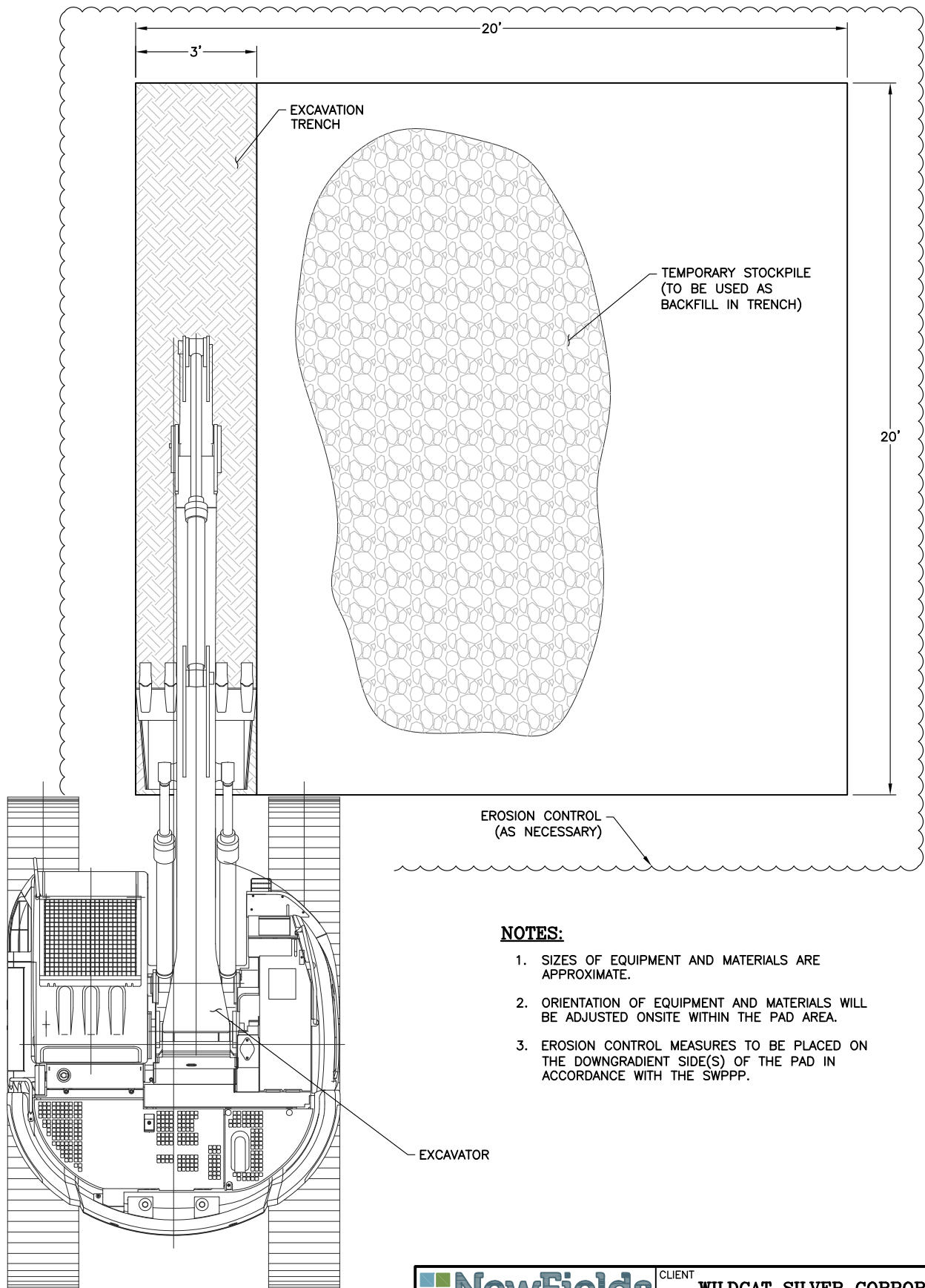


NOTES:

1. SIZES OF EQUIPMENT AND MATERIALS ARE APPROXIMATE.
2. ORIENTATION OF EQUIPMENT AND MATERIALS WILL BE ADJUSTED ONSITE WITHIN THE PAD AREA.

		CLIENT	WILDCAT SILVER CORPORATION	
PROJECT		HERMOSA PROJECT		
TITLE	DRILLING PLAN OF OPERATIONS PORTABLE (WINKIE) DRILL PAD LAYOUT		FILENAME	
			14.003.006F	
			FIGURE NO.	REVISION
			06	A

TEST PIT EXCAVATION LAYOUT



NOTES:

1. SIZES OF EQUIPMENT AND MATERIALS ARE APPROXIMATE.
2. ORIENTATION OF EQUIPMENT AND MATERIALS WILL BE ADJUSTED ONSITE WITHIN THE PAD AREA.
3. EROSION CONTROL MEASURES TO BE PLACED ON THE DOWNGRADIENT SIDE(S) OF THE PAD IN ACCORDANCE WITH THE SWPPP.

		CLIENT WILDCAT SILVER CORPORATION	
PROJECT		HERMOSA PROJECT	
TITLE	DRILLING PLAN OF OPERATIONS TEST PIT EXCAVATION LAYOUT		FILENAME 14.003.007F
			FIGURE NO. 07 REVISION A



		CLIENT WILCAT SILVER CORPORATION	
PROJECT		HERMOSA PROJECT	
TITLE		FILENAME 14.003.008F	
		FIGURE NO. 08	REVISION A
DRILLING PLAN OF OPERATIONS WHEELED DRILL RIG			



		CLIENT WILDCAT SILVER CORPORATION	
PROJECT		HERMOSA PROJECT	
TITLE		DRILLING PLAN OF OPERATIONS TRACK MOUNTED DRILL RIG	FILENAME 14.003.009F
		FIGURE NO. 09	REVISION A

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 NewFields		CLIENT WILDCAT SILVER CORPORATION	
PROJECT		HERMOSA PROJECT	
TITLE	DRILLING PLAN OF OPERATIONS PORTABLE (WINKIE) DRILL RIG	FILENAME 14.003.010F	
		FIGURE NO. 10	REVISION A



CLIENT **WILDCAT SILVER CORPORATION**

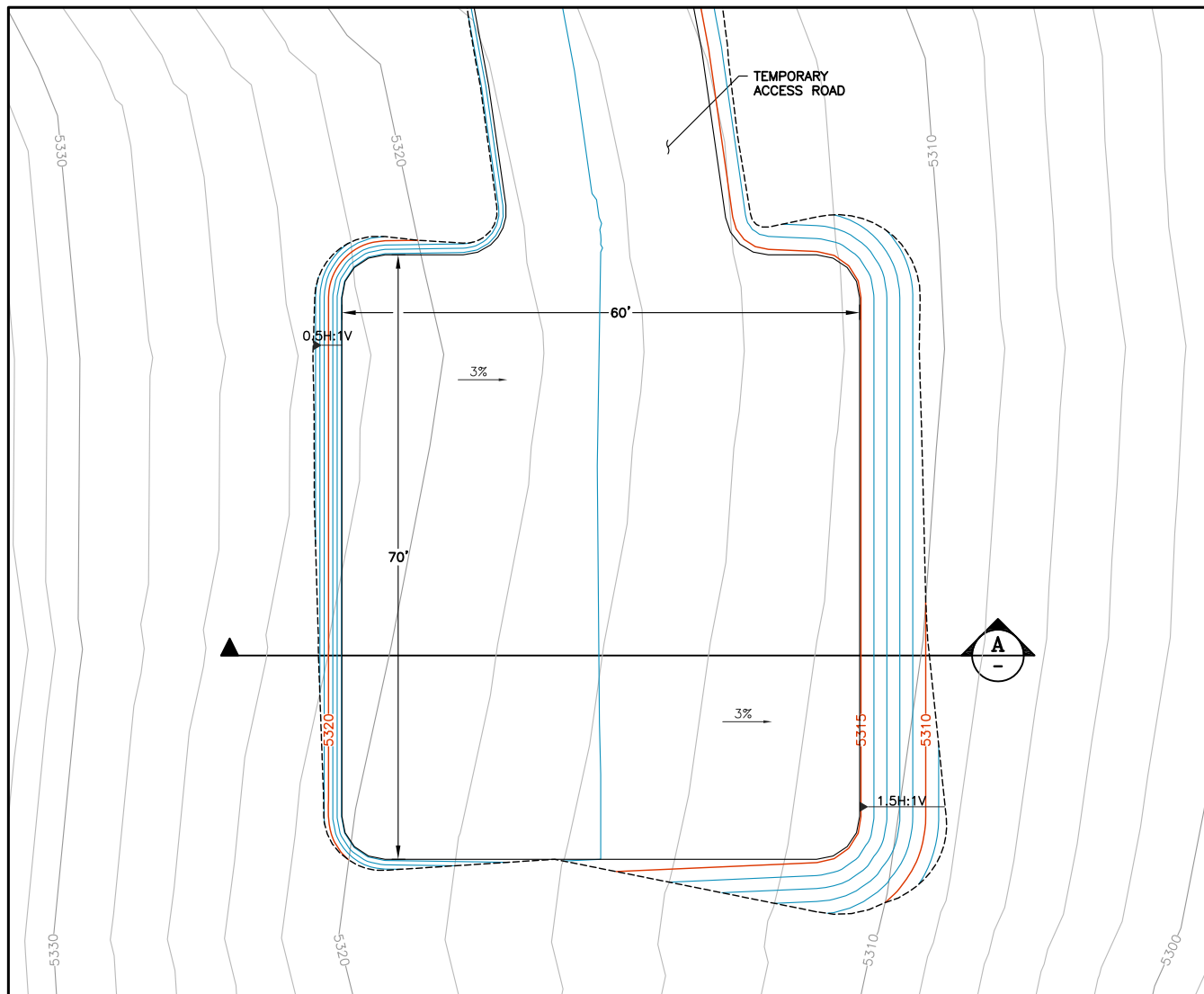
PROJECT **HERMOSA PROJECT**

TITLE **DRILLING PLAN OF OPERATIONS
TEST PIT EXCAVATOR**

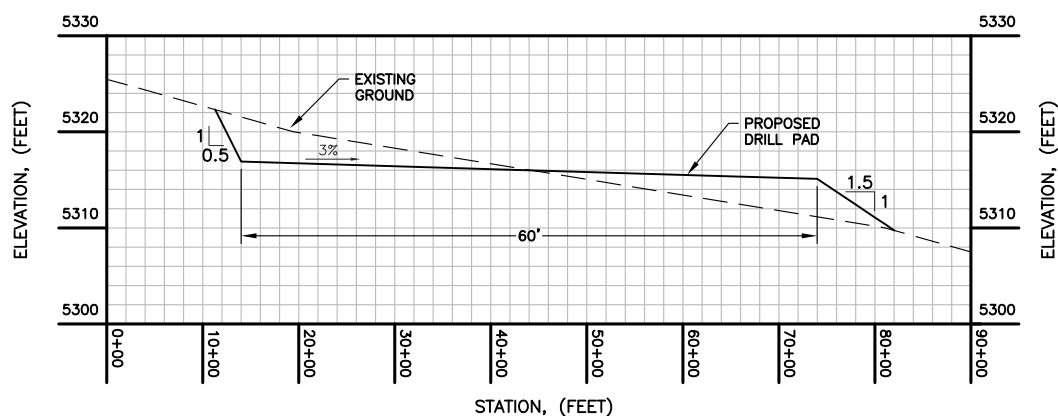
FILENAME
14.003.011F

FIGURE NO.	REVISION
11	A

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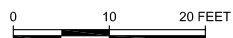
EXPLORATION DRILL PAD TYPICAL PLAN



A EXPLORATION DRILL PAD TYPICAL PROFILE

LEGEND:

-  EXISTING GROUND CONTOURS
-  PROPOSED GROUND CONTOURS



		CLIENT WILDCAT SILVER CORPORATION	
PROJECT		HERMOSA PROJECT	
TITLE	DRILLING PLAN OF OPERATIONS LAND DISTURBANCE FOR EXPLORATION DRILL HOLE	FILENAME 14.003.039F	
		FIGURE NO. 12	REVISION A

APPENDIX A

ROAD USE PLAN

HERMOSA DRILLING PROJECT PLAN OF OPERATIONS

APPENDIX A ROAD USE PLAN

Prepared for:

**UNITED STATES DEPARTMENT
OF AGRICULTURE FOREST SERVICE**
Coronado National Forest
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Tucson, Arizona 85701

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February 2013

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(follow text)

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Figure A-02.	Typical Cross Sections
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1. INTRODUCTION

Arizona Minerals, Inc. (AMI or the Applicant) is submitting a Plan of Operations (Plan) for authorization to conduct exploration and characterization activities on AMI's unpatented mining claims located on Coronado National Forest (CNF) lands in Santa Cruz County, Arizona (the Project; **Figure A-01**). The purpose of the Project is to conduct site characterization activities that include: mineral exploration drilling; hydrogeologic drilling and testing to characterize groundwater conditions; and geotechnical drilling and sampling and geophysical testing to characterize soil and rock conditions. Development of characterization sites would require limited construction of temporary roads to provide access to the characterization sites as well as maintenance and/or reconstruction of existing Forest Roads (FRs). Where practicable, characterization sites are proposed for location immediately adjacent to existing FRs.

AMI's proposed access to characterization sites was developed to minimize disturbance to CNF lands and consists of the following types of routes: 1) AMI-owned private roads, 2) existing FRs, 3) overland vehicle paths (OVPs), and 4) temporary access roads (TARs). Proposed access routes within the Project Area are identified on an overview gridded map index and associated grid sheets (**Figure A-01; Figures A-03 through A-25**). Details of the new disturbance associated with the proposed access routes are provided in **Tables A-1 through A-5**.

This Road Use Plan is intended to provide general guidance for minimizing impacts to areas, resources, and people adjoining, served by, or otherwise affected by FRs, TARs, and OVPs proposed for use by AMI and its agents to access characterization sites throughout the duration of the Project. Specifically, the Road Use Plan identifies and describes the following:

1. The Applicant's proposed access within the Project Area and anticipated use of routes;
2. The intended public use and access allowed on the existing system of open FRs in the Project Area, the proposed TARs, and the proposed OVPs;
3. The design, construction, and/or maintenance standards for roads and vehicle paths under the responsibility of AMI; and
4. The estimated disturbance area to CNF lands associated with the construction of TARs, use of OVPs, and reconstruction of existing FRs required to complete the proposed characterization activities.

2. EXISTING FOREST ROADS

All of the FRs proposed for use in the Project Area are currently open authorized (OA), open unauthorized (OU), or open authorized restricted (OAR) to motorized vehicles as identified on the Coronado Motor Vehicle Use map (MVUM; USDA 2011). Some of the roads would require routine maintenance for the Project duration. Other existing FRs would require significant maintenance/reconstruction to allow access by drilling, excavation, and supporting equipment.

2.1. APPLICANT USE

The existing FRs would be used by AMI's employees and its contractors and consultants for 1) access to and from the Project Area; 2) travel within the Project Area to the project staging area and characterization sites; and 3) deliveries and shipments of drilling products, monitoring well construction supplies and materials, and equipment.

2.2. PUBLIC USE

All of the existing FRs would remain open for motorized use during proposed characterization activities, unless the road is identified as restricted to public use (OAR). During temporary road improvements, signage will be placed at road junctions on each side of the road improvement segment indicating road maintenance.

2.3. ROUTINE MAINTENANCE TO EXISTING FOREST ROADS

2.3.1. Maintenance Level Descriptions

Forest Service Road Maintenance Levels as defined by the USDA Forest Service Handbook (USDA 1999) are:

- **Level 1 (Basic Custodial Care)** – Roads may be of any type, class or construction standard, and may be managed at any other maintenance level during the time they are open for traffic; however, while maintained at Level 1, they are closed to vehicular traffic, but may be open and suitable for non-motorized uses.
- **Level 2 (High-Clearance Vehicles)** – Roads are open for use by high-clearance vehicles and have low traffic volume and speed. These roads typically are local and connect collector roadways; have at-grade drainage treatment; are not subject to the requirements of the Highway Safety Act; do not provide surface smoothness; and are not suitable for passenger cars.
- **Level 3 (Suitable for Passenger Cars)** – Roads typically have low speed and a single lane with turn-outs and spot surfacing. These roads have low to moderate traffic volume, typically connect to arterial and collector roads, and may include some dispersed recreation roads.
- **Level 4 (Moderate Degree of User Comfort)** – Roads provide a moderate degree of user comfort and convenience at moderate travel speeds. These roads typically may connect to county roads; are usually considered collector roads; can be double-lane, aggregate-surfaced and dust-abated; and have culverts for drainage treatment.
- **Level 5 (High Degree of User Comfort)** – Roads provide a high degree of user comfort and convenience. These roads provide the highest traffic volume and speeds, are usually arterial or collector roadways, and are normally double-lane, paved facilities. Some may be aggregate-surfaced and dust-abated.

2.3.2. Maintenance Activities

The majority of existing FRs within the Project Area are currently maintained at Levels 2 or 3. Segments of FR 58 (Harshaw Road) appear to be at Maintenance Level 4, although the Coronado National Forest Huachuca Mountains Ecosystem Management Area Transportation Analysis Plan indicates an operational Maintenance Level 3. Santa Cruz County maintains parts of Harshaw Road. Roads presently at Maintenance Level 3 or 4 are maintained at their current level by Santa Cruz County; as a result, no maintenance of these roads by AMI is expected during the Project duration, other than the use of a water truck for dust suppression, if needed. Roads presently maintained at Maintenance Level 2 will be maintained at the current level, unless indicated in **Table A-1** for reconstruction.

A description of maintenance activities required for each FR to be used during the proposed Project is provided in **Table A-1**. Maintenance activity for roads requiring routine maintenance will be performed within the existing roadway width; therefore, maintenance is not considered as new disturbance.

2.4. RECONSTRUCTION OF EXISTING FOREST ROADS

To enable access to characterization sites, certain segments of the existing FRs will require significant maintenance and/or reconstruction. The methods of road reconstruction are described in **Section 2.4.2**. Proposed improvements to the existing FRs are summarized in **Table A-1**.

All existing FRs will be maintained, repaired, or reconstructed to the current level of maintenance designated by the CNF, Huachuca Mountains Ecosystem Management Area, Transportation Analysis Plan (USDA 2011a). Reconstructed roads will adhere to the design standards described below.

2.4.1. Design Standards

2.4.1.1. Traveled Way

The traveled way of the existing FRs will be widened to a maximum of 12 feet. Roads will be outsloped with an average cross slope between 3 and 5 percent. The roadway will be cleared of vegetative cover as needed for planned traffic. The road prism will be maintained to provide for passage of high-clearance vehicles. Slides and slumps will be removed or repaired as needed to control resource damage. The typical roadway cross-section is provided in **Figure A-02**. The amount of new disturbance estimated for reconstruction of existing FRs is assumed to be 6 feet of road width per linear foot of reconstruction. The new disturbance accounts for vegetation clearing and trimming on cuts and fills, outsloping the road bed and clearing loose rock and soil from the road bed and the toe of the cut slope or in the roadside ditch. The estimated disturbance is shown in **Table A-1**.

2.4.1.2. Drainage Improvements

Drainage improvements to reconstructed roads will be conducted only as needed. Roadways will be sloped for drainage to reduce erosion, water bars will be installed where necessary to prevent

concentration of runoff. The creation of berms along the side of the road will be avoided. Rolling-dip cross-drains will be constructed into the roadway on steep grades to help prevent erosion. Rolling-dip cross-drains are designed to slow traffic and disperse surface water. Rolling dips require less maintenance and are less likely to plug and fail than culvert pipes. Spacing of rolling dips is a function of road grade and soil type. Recommended maximum distances between rolling dips is provided in **Table A-2**. Specific locations of rolling dips will be determined in the field based upon actual water flow patterns, rainfall intensity, road surface erosion characteristics, and available erosion resistant outlet areas. A typical rolling dip profile is provided in **Figure A-02**.

To the extent practicable, existing drainage crossings will be simple ford-style low water crossings. Where existing drainages that cross the roadway are deeply incised, temporary crossings may be constructed and armored using cobble-sized rocks to allow water to flow through the crossings to the extent possible. The use of culverts will be avoided to the extent practicable, although some temporary culverts may be installed if required by Nationwide Permit No. 14, under the Clean Water Act (if any potential jurisdictional waters are encountered).

2.4.2. Construction Methods

Roads will be reconstructed using a Caterpillar D6 or equivalent-sized dozer and/or John Deere 772-2B motor grader or equivalent. Reconstruction will include filling and leveling of heavily eroded areas, placement of temporary low water crossings, cut of not more than 12 inches of soil or rock, and placement of leveling fill or aggregate surfacing in the roadway.

2.4.3. Environmental Protection Measures

Erosion control Best Management Practices (BMPs) to be implemented during reconstruction of FRs are documented in **Section 5** of AMI's submitted Plan and within the Project Stormwater Pollution Prevention Plan (SWPPP). Typical roadway cross sections are provided in **Figure A-02**.

To avoid transporting noxious weeds onto CNF lands, heavy equipment will be washed off-site on private property prior to entering the Project Area.

3. TEMPORARY ACCESS ROADS ON CNF LANDS

3.1. APPLICANT USE

AMI will construct new Temporary Access Roads (TARs) strictly for the proposed exploratory drilling operations. Where possible, access to the proposed drill locations will consist of existing private roads that have been developed by AMI throughout the patented claim area. TARs would then be constructed from FR 4687 and the existing private roads to provide access to the exploration drill site locations. TARs will only be used by drill rigs and support vehicles. After drilling is complete the TARs will be reclaimed per **Appendix D – Reclamation Plan**.

3.2. PUBLIC USE

Newly constructed TARs will not be open for motorized public use.

3.3. DESIGN STANDARDS

TARs will be designed to minimize land disturbance to the greatest extent practicable. Based on the current understanding of conditions along the proposed TARs, cuts and fills will be balanced on site in a manner that minimizes disturbance. To minimize land disturbance, TARs would be located on historic road beds that were developed in the 1970s for past exploration drilling whenever feasible. These road beds are largely revegetated but have stable road prisms, road cuts and road fills. Specifically, TAR-01, TAR-02, and TAR-03 are proposed for construction using historic road beds.

3.3.1. Traveled Way

The traveled way of the TARs will be constructed to a maximum of 12 feet. Roads will be outsloped with an average cross slope between 3 and 5 percent. The roadway will be cleared of vegetative cover as needed for planned traffic. The road prism will be maintained to provide for passage of high-clearance vehicles. Cut and fill slopes will be constructed at the maximum practicable slope ratio to both minimize potential erosion during temporary use and to minimize the area of disturbance. Typical roadway cross-sections are provided in *Figure A-02*. The amount of disturbance per linear foot, depending on the topography and slope, is estimated to be an average width of 25 feet. This width includes 12 feet of standard roadway and an average of 13 feet of disturbance from cut and fill slopes. TAR 01, TAR 02, and TAR 03 would be constructed along historic road beds that traverse generally level ridge tops with slopes <10 percent. TAR 04 and TAR 05 are constructed across steeper topography and routed to approximately follow the topographic contour. The estimated disturbances associated with TAR construction are shown in *Table A-3*.

3.3.2. Drainage Improvements

Drainage improvements to TARs will be kept at a minimum because they are temporary and will be concurrently reclaimed after drilling operations are complete, thus minimizing erosion. Any drainage crossings will be simple fords. Roadways will be outsloped with waddles installed down slope on edge of roadway to disperse drainage and limit erosion, except at switchbacks where the grade will be reversed to slope inward and carry water past the switchback.

3.4. CONSTRUCTION METHODS

New TARs will be constructed using a Caterpillar D6 or equivalent-sized dozer and/or John Deere 772-2B motor grader or equivalent. A tracked excavator may be used to reduce the size of large boulders as necessary. No drilling or blasting will be used for TAR construction.

3.5. ENVIRONMENTAL PROTECTION MEASURES

Erosion control BMPs will be designed as recommended in the Low-Volume Roads Engineering Best Management Practices Field Guide (Keller and Sherar 2003), and within the Project SWPPP.

4. OVERLAND VEHICLE PATHS ON CNF LANDS

4.1. APPLICANT USE

AMI will use Overland Vehicle Paths (OVPs) for accessing the characterization sites supporting test pits and geotechnical boreholes. There are ten OVPs proposed for access within the Project Area on CNF lands. These routes will only be used by track-mounted drill, track-mounted excavator, and support rigs that create a minimal amount of disturbance due to the low applied ground pressure (approximately 5 psi)

4.2. PUBLIC USE

OVPs will not be open for public motorized use as it would constitute off-road vehicle travel.

4.3. DESIGN STANDARDS

OVPs are designed to have minimal disturbance to existing soil and vegetation. OVPs do not fall under the standards listed in the Low-Volume Roads Engineering Best Management Practices Field Guide because there will be no grading or clearing of vegetation required. The amount of disturbance estimated for OVPs is based on the track width of the equipment which is two tracks at 2.5 feet wide resulting in a total OVP disturbance width of 5 feet. The anticipated disturbance from equipment traveling along the OVPs consists of some bare ground from travel and turning; and damage to vegetation. Any disturbance created along these access paths will be reclaimed using hand tools after use is completed. OVPs 3 and 5 would utilize existing user created, unauthorized roads to further minimize disturbance. Estimated disturbances associated with the proposed OVPs are summarized in *Table A-4*.

5. REFERENCES

- USDA Forest Service. 2011. Motor Vehicle Use map (MVUM). Nogales and Sierra Vista Ranger District (back side). May 2011.
- USDA Forest Service. 2011a. Coronado National Forest Huachuca Mountains Ecosystem Management Area Transportation Analysis Plan. March 2011.
- USDA Forest Service Committee for Guidelines for Road Maintenance Levels. 2005. Guidelines for Road Maintenance Levels. 2005.
- USDA Forest Service. 1999. Forest Service Handbook (FSH). Series 7000 - Engineering. <<http://www.fs.fed.us/im/directives/dughtml/fsh7000.html>>. March 17, 1999. Accessed 2013 Feb 11.
- Keller, G and Sherar, J. 2003. Low-Volume Roads Engineering Best Management Practices Field Guide. July 2003.

APPENDIX A TABLES

Table A-1. Proposed Improvements to Existing Forest Roads

Roadway ID	Forest Service Road Maintenance Level	Planned Road Condition During Plan of Operations Improvements	Road Length ¹	Area of New Disturbance	
			Linear Feet	Linear Feet	Acres
FR 58	Level 4 – Moderate Degree of User Comfort	Maintained by Santa Cruz County. Maintenance by AMI to be limited to water spraying for dust suppression, if required.	13,900	0	0
FR 49	Level 3 – Suitable for Passenger Cars	Maintained by Santa Cruz County. Maintenance by AMI to be limited to water spraying for dust suppression, if required.	12,360	0	0
FR 5521	Level 2 – High Clearance Vehicles	Repair and maintain road segments at the Level 2 maintenance standard. Improve road segments where current conditions do not meet this standard. Generally achieve a Level 2 maintenance standard suitable to provide access for the equipment required to accomplish planned activities. ³	600	0	0
FR 4687	Level 2 – High Clearance Vehicles	Repair and maintain road segments at the Level 2 maintenance standard. Improve road segments where current conditions do not meet this standard. Generally achieve a Level 2 maintenance standard suitable to provide access for the equipment required to accomplish planned activities. Reconstruct 1,060 feet of road. 6 ft disturbance width. ³	4,830	1,060	0.15
FR 4686	Level 3 – Suitable for Passenger Cars	Repair and maintain road segments at the Level 3 maintenance standard. Improve road segments where current conditions do not meet this standard. Generally achieve a Level 3 maintenance standard suitable to provide access for the equipment required to accomplish planned activities. ³	11,200	0	0
FR4686 Spur	Level 2 – High Clearance Vehicles	Repair and maintain road segments at the Level 2 maintenance standard. Improve road segments where current conditions do not meet this standard. Generally achieve a Level 2 maintenance standard suitable to provide access for the equipment required to accomplish planned activities. ³	1,700	0	0

Table A-1. Proposed Improvements to Existing Forest Roads

Roadway ID	Forest Service Road Maintenance Level	Planned Road Condition During Plan of Operations Improvements	Road Length ¹	Area of New Disturbance	
			Linear Feet	Linear Feet	Acres
FR 4690 ²	Level 2 – High Clearance Vehicles	Repair and maintain road segments at the Level 2 maintenance standard. Improve road segments where current conditions do not meet this standard. Generally achieve a Level 2 maintenance standard suitable to provide access for the equipment required to accomplish planned activities. ³	17,530	0	0
FR 5525 ²	Level 2 – High Clearance Vehicles	Repair and maintain road segments at the Level 2 maintenance standard. Improve road segments where current conditions do not meet this standard. Generally achieve a Level 2 maintenance standard suitable to provide access for the equipment required to accomplish planned activities. ³	5,070	0	0
FR 5522 ²	Level 2 – High Clearance Vehicles	Repair and maintain road segments at the Level 2 maintenance standard. Improve road segments where current conditions do not meet this standard. Generally achieve a Level 2 maintenance standard suitable to provide access for the equipment required to accomplish planned activities. ³	2,300	0	0
FR - WILLOW SPRING ²	Level 2 – High Clearance Vehicles	Repair and maintain road segments at the Level 2 maintenance standard. Improve road segments where current conditions do not meet this standard. Generally achieve a Level 2 maintenance standard suitable to provide access for the equipment required to accomplish planned activities. ³	4,850	0	0
FR UNKNOWN ²	Level 2 – High Clearance Vehicles	Repair and maintain road segments at the Level 2 maintenance standard. Improve road segments where current conditions do not meet this standard. Generally achieve a Level 2 maintenance standard suitable to provide access for the equipment required to accomplish planned activities. ³	60	0	0

¹Total road length for both Forest Service land and Private land

²All Forest Roads proposed for use in this Road Use Plan can be seen in detail in Figures A-01 and A-03 through A-25

³Detailed descriptions of purpose of, use of, and improvements to FRs can be found in Table A-5

Table A-2. Recommended Maximum Distance between Rolling Dips

Road Grade %	Low to Non-Erosive Soils	Erosive Soils
0-3	120 ft	75 ft
4-6	90 ft	50 ft
7-9	75 ft	40 ft
10-12	60 ft	35 ft
12+	50 ft	30 ft

Table A-3. New Temporary Access Roads

Roadway ID	Road Management Classification	Planned Road Condition During Plan of Operations Implementation	Area of Disturbance	
			Linear Feet	Acres
TAR-01 ¹	No Classification	Improve old existing roadbed to generally achieve the High-Clearance Vehicles management standard suitable for the equipment required to accomplish planned activities. ² 25 ft disturbance width.	1,200	0.69
TAR-02 ¹	No Classification	Improve old existing roadbed to generally achieve the High-Clearance Vehicles management standard suitable for the equipment required to accomplish planned activities. ² 25 ft disturbance width.	700	0.40
TAR-03 ¹	No Classification	Improve old existing roadbed to generally achieve the High-Clearance Vehicles management standard suitable for the equipment required to accomplish planned activities. ² 25 ft disturbance width.	350	0.20
TAR-04 ¹	No Classification	Improve new roadway segments to generally achieve the High-Clearance Vehicles management standard suitable for the equipment required to accomplish planned activities. ² 25 ft disturbance width.	1,900	1.09
TAR-05 ¹	No Classification	Improve new roadway segments to generally achieve the High-Clearance Vehicles management standard suitable for the equipment required to accomplish planned activities. ² 25 ft disturbance width.	200	0.11

¹ New Temporary Access Roads are shown in detail in Figures A-01 through A-25.

² Detailed descriptions of purpose of, use of, and improvements to TARs can be found in Table A-5

Table A-4 - Overland Vehicle Path²

Roadway ID	Road Management Classification	Planned Road Condition During Drilling Plan of Operations Implementation	Area of Disturbance	
			Linear Feet ¹	Acres
OVP-01 ²	No Classification	Remove vegetation and trim trees as necessary. No new grading disturbance. 5 ft disturbance width. ³	2,100	0.24
OVP-02 ²	No Classification	Remove vegetation and trim trees as necessary. No new grading disturbance. 5 ft disturbance width. ³	4,450	0.51
OVP-03 ²	Partially existing unmapped, un-permitted road. Existing road lies on private land.	Existing, user created road. Existing road lies on private land. Remove vegetation and trim trees as necessary. No new grading disturbance. 5 ft disturbance width. ³	1,360	0.16
OVP-04 ²	No Classification	Remove vegetation and trim trees as necessary. No new grading disturbance. 5 ft disturbance width. ³	950	0.11
OVP-05 ²	No Classification	Remove vegetation and trim trees as necessary. No new grading disturbance. 5 ft disturbance width. ³	1,350	0.15
OVP-06 ²	No Classification	Remove vegetation and trim trees as necessary. No new grading disturbance. 5 ft disturbance width. ³	1,610	0.18
OVP-07 ²	No Classification	Remove vegetation and trim trees as necessary. No new grading disturbance. 5 ft disturbance width. ³	5,100	0.59
OVP-08 ²	No Classification	Remove vegetation and trim trees as necessary. No new grading disturbance. 5 ft disturbance width. ³	1,600	0.18
OVP-09 ²	No Classification	Remove vegetation and trim trees as necessary. No new grading disturbance. 5 ft disturbance width. ³	1,750	0.20
OVP-10 ²	Existing unmapped, un-permitted road	Existing, user created road. Remove vegetation and trim trees as necessary. No new grading disturbance. 5 ft disturbance width. ³	1,200	0.14

¹ Linear disturbance only includes roads on Forest Service land.

² Overland Vehicle Paths are shown in detail in Figures A-01 and A-03 through A-25.

³ Detailed descriptions of purpose, use, and improvements to OVPs can be found in Table A-5

Table A-5 - Access Route Descriptions

Road ID	Purpose and Use	Improvement Description	Length within the Project Area (Ft)		New Disturbance Area (Acres)		Project Grid Map Cell
			Forest Service Land	Private Land	Forest Service Land	Private Land	
FR 58	Main access road from Patagonia to Drilling Operations. Provides access to CS-37.	No Improvement Necessary - County Maintained Road	13,900	4,440	0	0	D-1, E-1, E-2, E-3, E-4
FR 49	Main access road from FR 58 to Drilling Operations. Provides access to CS-34, CS-33, and CS-38	No Improvement Necessary - County Maintained Road	8,165	4,200	0	0	C-1, C-2, B-1, B-2, B-3, B-6, B-7 A-3, A-4, A-5, A-6
FR 5521	Provides access from FR 49 to Project Staging Area	Maintain approximately 0.84 miles of roadway. Repair erosion where necessary. No new disturbance planned.	600	3,560	0	0	B-3
FR 4687	Provides access from Project Staging Area to exploration drill holes, geotechnical drill holes, and monitoring wells.	Maintain approximately 1.11 miles of roadway. Repair erosion where necessary. Reconstruct approximately 1,060 feet of roadway. 6 ft disturbance width.	4,830	300	0.15	0	B-3, B-4, B-5,
FR 4686	Provides access to CS-02, OVP-01, FR-49, FR-5522.	Maintain approximately 3.01 miles of roadway. Repair erosion where necessary. No new disturbance planned.	11,180	4,740	0	0	B-2, C-2, C-3, D-2, E-2, E-3,
FR 4690	Provides access to CS-03, CS-05, CS-06, CS-21, CS-22 CS-23, CS-26, CS-27, CS-30, and CS-32	Maintain approximately 2.06 miles of roadway. Repair erosion where necessary. No new disturbance planned.	17,100	0	0	0	C-5, C-6, D-4, D-5, E-3, E-4
FR 5525	Provides access to CS-35.	Maintain approximately 0.85 miles of roadway. Repair erosion where necessary. No new disturbance planned.	4,550	0	0	0	C-6, C-7, D-5, D-6

Table A-5 - Access Route Descriptions

Road ID	Purpose and Use	Improvement Description	Length within the Project Area (Ft)		New Disturbance Area (Acres)		Project Grid Map Cell
			Forest Service Land	Private Land	Forest Service Land	Private Land	
FR 5522	Connect Forest Service roads FR-5523 and FR-4703	Maintain approximately 0.85 miles of roadway. Repair erosion where necessary. No new disturbance planned.	4,500	0	0	0	C-2, C-3
FR - WILLOW SPRING	Provides access to CS-36.	Maintain approximately 0.92 miles of roadway. Repair erosion where necessary. No new disturbance planned.	4,850	0	0	0	D-5, C-4
TAR-1	Provides access to CS-43, CS-28, and TAR 04	New Road Construction. 25 ft disturbance width.	1,200	0	0.41	0	B-1
TAR-2	Access to CS-42.	New Road Construction. 25 ft disturbance width.	700	0	0.24	0	B-4
TAR-3	Provides access to CS-41.	New Road Construction. 25 ft disturbance width.	350	0	0.12	0	B-4
TAR-4	Spur off of TAR-01. Access to CS-45, CS-44, and CS-29.	New Road Construction. 25 ft disturbance width.	1,900	0	1.09	0	B-3
TAR-5	Spur off of private land. Provides access to CS-46.	New Road Construction. 25 ft disturbance width.	200	460	0.11	0.26	B-4, C-4
OVP-01	New overland access route. Lightly vegetated hill slope. Provides access to CS-07.	Remove vegetation and trim trees as necessary. No new grading disturbance. 5 ft disturbance width.	2,100	200	0.24	0.02	D-2
OVP-02	New overland access route. Heavily vegetated and crosses a wash. Provides access from FR 5522 to CS-24 and CS-49.	Remove vegetation and trim trees as necessary. No new grading disturbance. 5 ft disturbance width.	4,450	0	0.51	0	C-4, C-5

Table A-5 - Access Route Descriptions

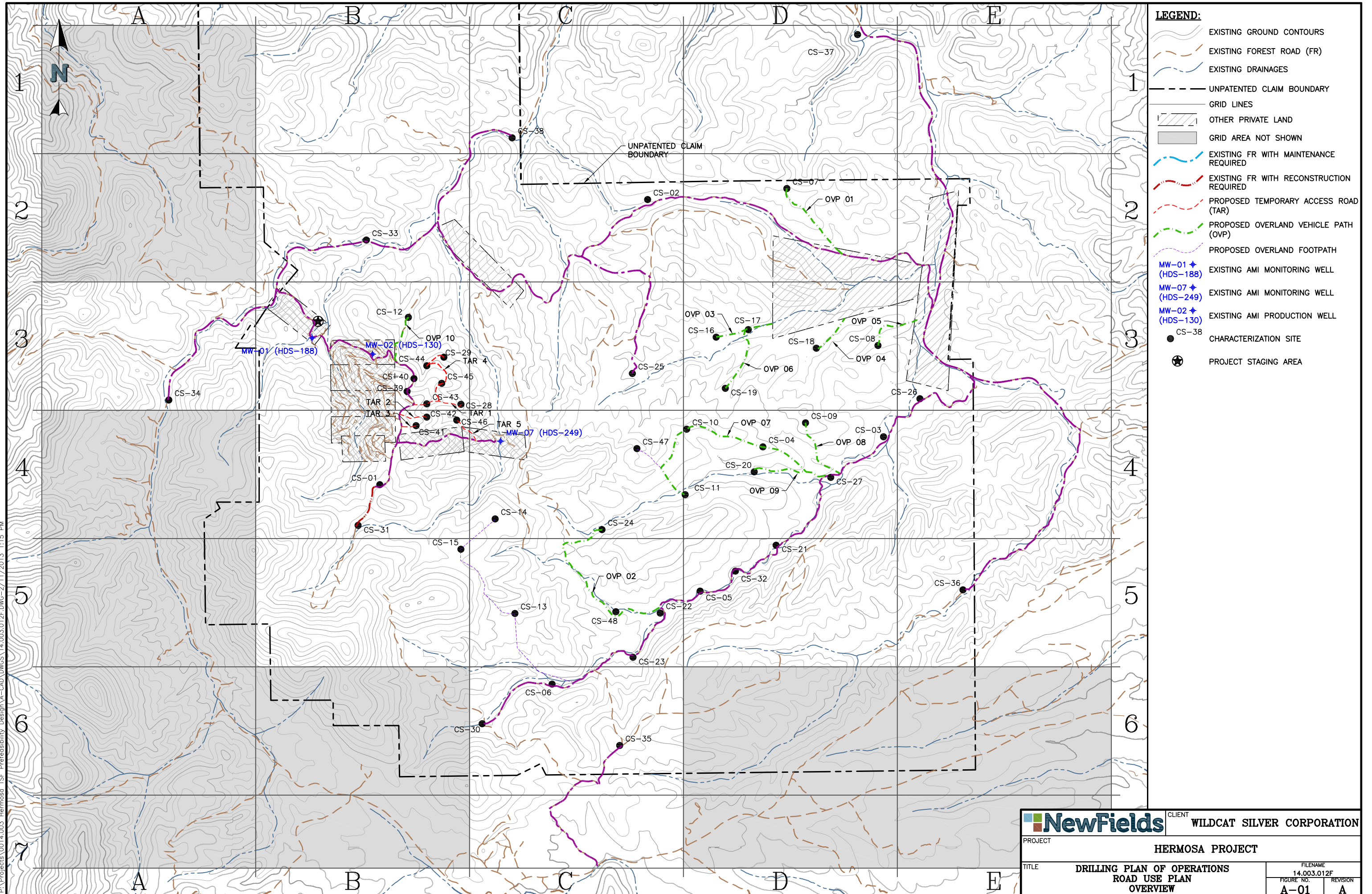
Road ID	Purpose and Use	Improvement Description	Length within the Project Area (Ft)		New Disturbance Area (Acres)		Project Grid Map Cell
			Forest Service Land	Private Land	Forest Service Land	Private Land	
OVP-03	New overland access route on forest service land. Existing user created roads lies on private land. This road provides access from PRIV-1 to CS-16 and CS-17.	Remove vegetation and trim trees as necessary. Part of the road lies on private land, which will not require reconstruction. Reconstruct approximately 0.54 miles of roadway on forest service land. No new grading disturbance. 5 ft disturbance width.	1,360	0	0.16	0	D-3
OVP-04	New overland access route. Heavily vegetated site. Provides access to CS-18.	Remove vegetation and trim trees as necessary. No new grading disturbance. 5 ft disturbance width.	950	10	0.11	0	D-3
OVP-05	New overland access route. Provides access from FR 4690 to CS-08.	Remove vegetation and trim trees as necessary. No new grading disturbance. 5 ft disturbance width.	1,350	75	0.15	0.01	D-3, E-3
OVP-06	New overland access route. Open grass land. Provides access from OVP-3 to CS-19.	Remove vegetation and trim trees as necessary. No new grading disturbance. 5 ft disturbance width.	1,610	0	0.18	0	D-3
OVP-07	New overland access route. Open grass land. Provides access from FR 4690 to CS-04, CS-10, CS-11, and FP-02.	Remove vegetation and trim trees as necessary. No new grading disturbance. 5 ft disturbance width.	5,100	0	0.59	0	C-4, D-4
OVP-08	New overland access route. Lightly vegetated open grass land. Provides access from FR 4690 to CS-09.	Remove vegetation and trim trees as necessary. No new grading disturbance. 5 ft disturbance width.	1,600	0	0.18	0	D-4

Table A-5 - Access Route Descriptions

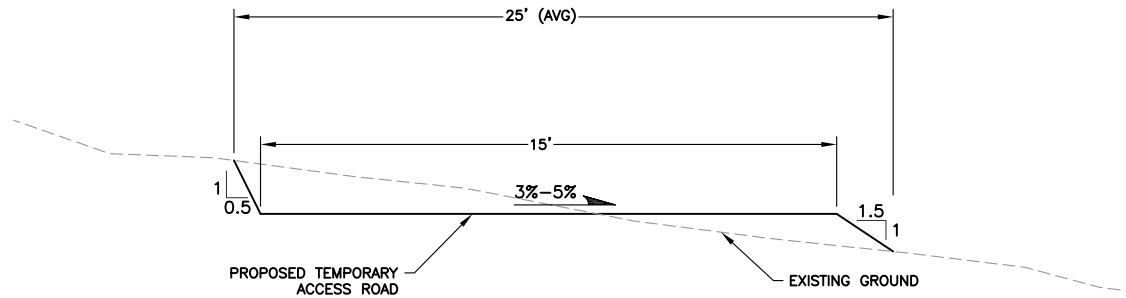
Road ID	Purpose and Use	Improvement Description	Length within the Project Area (Ft)		New Disturbance Area (Acres)		Project Grid Map Cell
			Forest Service Land	Private Land	Forest Service Land	Private Land	
OVP-09	New overland access route. Heavily vegetated with trees and scrubs. Provides access from FR 4690 to CS-20.	Remove vegetation and trim trees as necessary. No new grading disturbance. 5 ft disturbance width.	1,750	0	0.20	0	D-4
OVP-10	Exiting User Created Road. Provides access to CS-12.	Remove vegetation and trim trees as necessary. No new grading disturbance. 5 ft disturbance width.	1,200	0	0.14	0	B-3
		Total	95,495	17,985	4.58	0.29	

APPENDIX A FIGURES

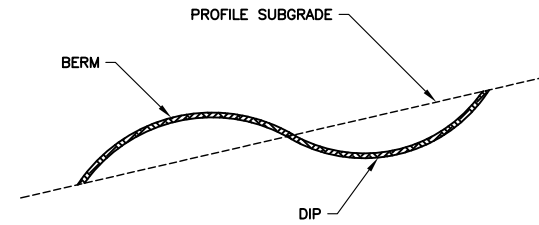
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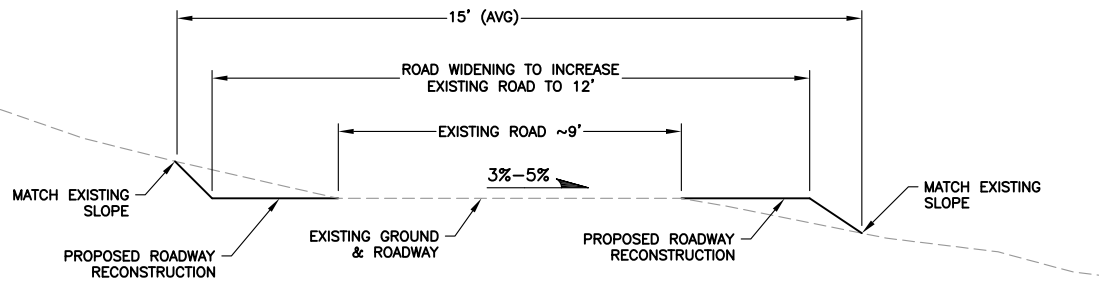
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NEW TEMPORARY ACCESS ROAD



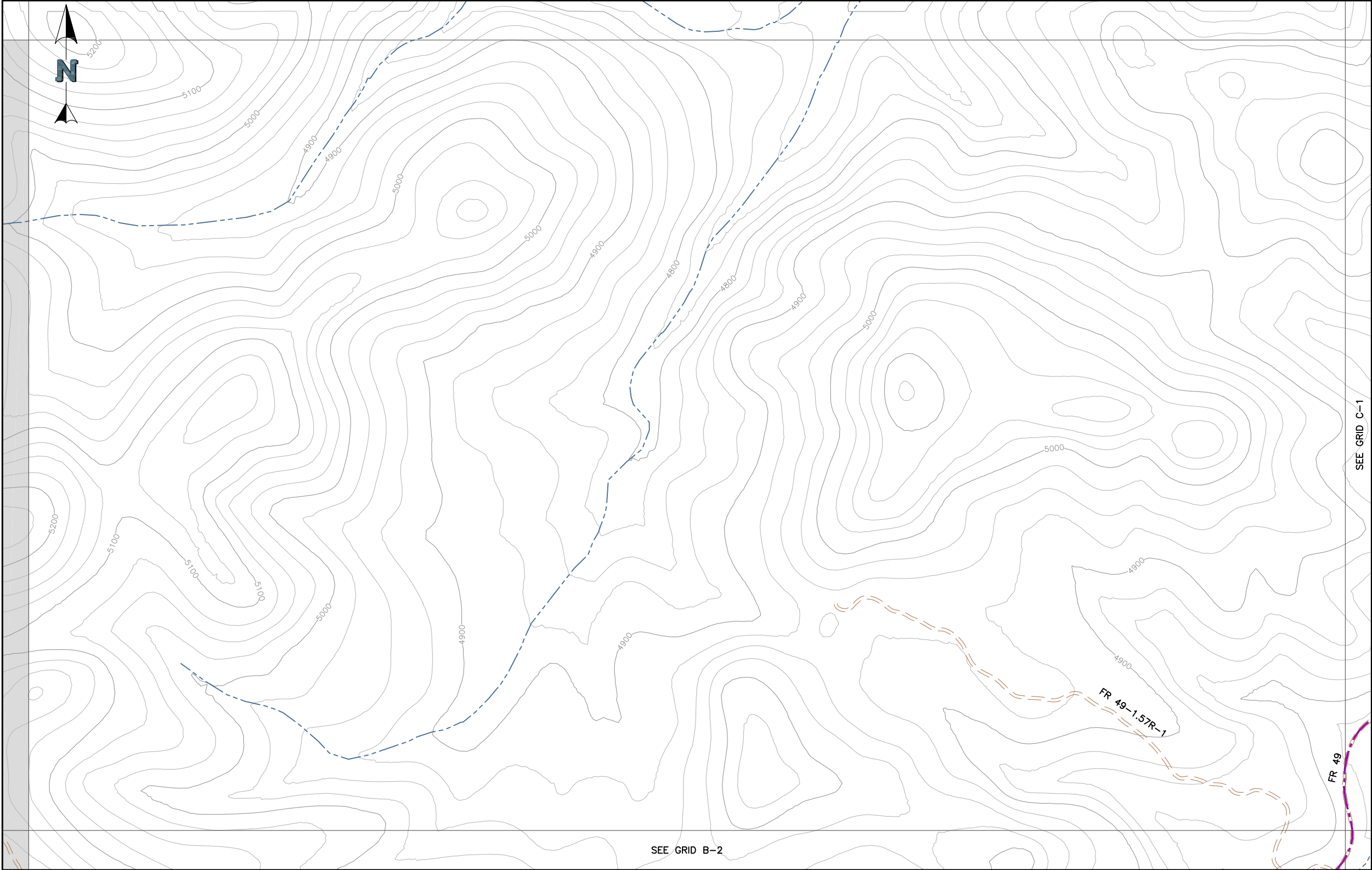
TYPICAL ROLLING DIP PROFILE



ROADWAY RECONSTRUCTION

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PROJECT		HERMOSA PROJECT	
TITLE	DRILLING PLAN OF OPERATIONS ROAD USE PLAN TYPICAL CROSS SECTIONS	FILENAME 14.003.014F	
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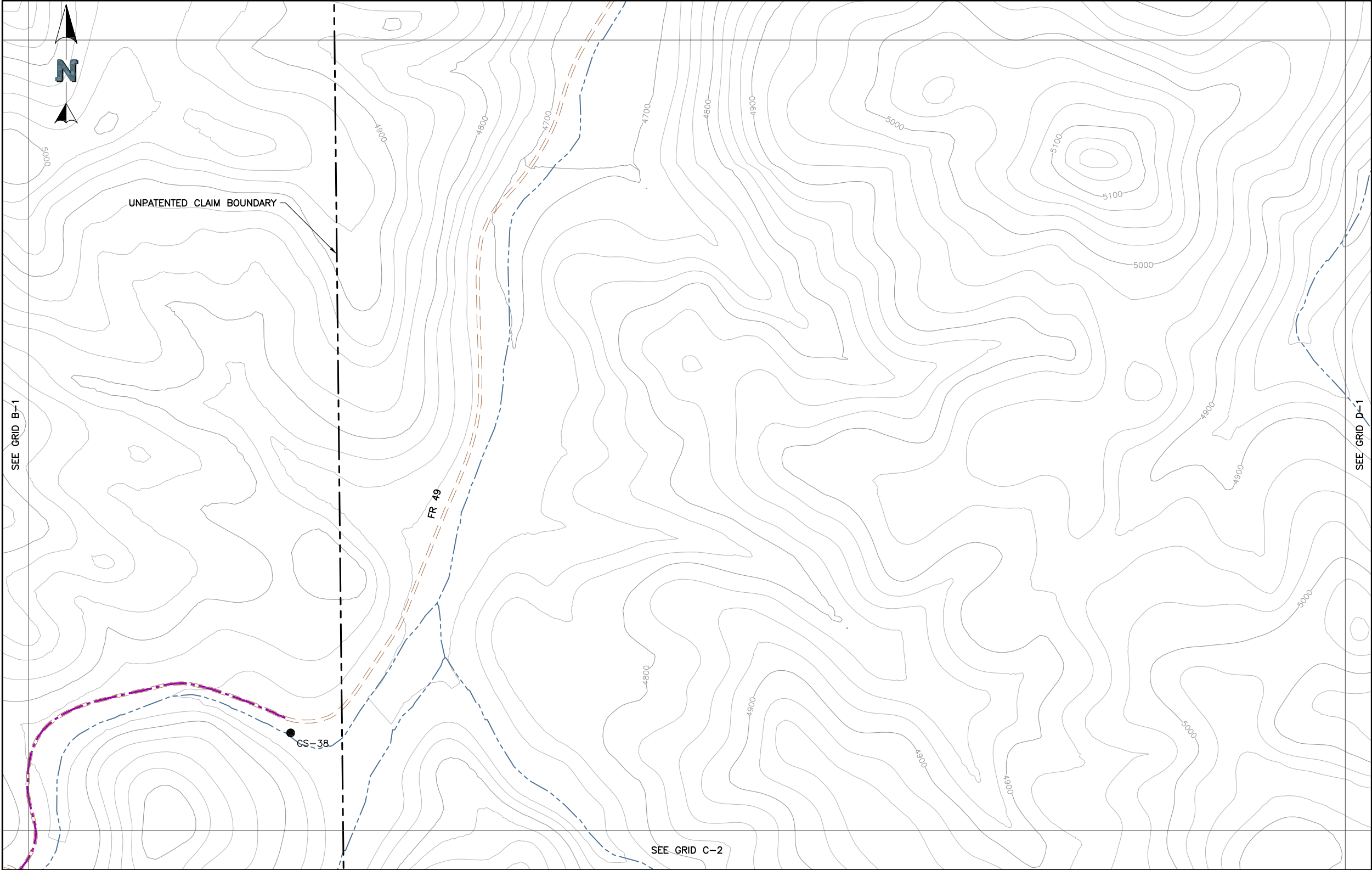


- LEGEND:**
- EXISTING GROUND CONTOURS
 - EXISTING FOREST ROAD (FR)
 - EXISTING DRAINAGES
 - GRID LINES
 - GRID AREA NOT SHOWN
 - EXISTING FR WITH MAINTENANCE REQUIRED



		CLIENT WILDCAT SILVER CORPORATION	
PROJECT HERMOSA PROJECT		FILENAME 14.003.01SF	
TITLE DRILLING PLAN OF OPERATIONS ROAD USE PLAN GRID B-1		FIGURE NO. A-03	REVISION A

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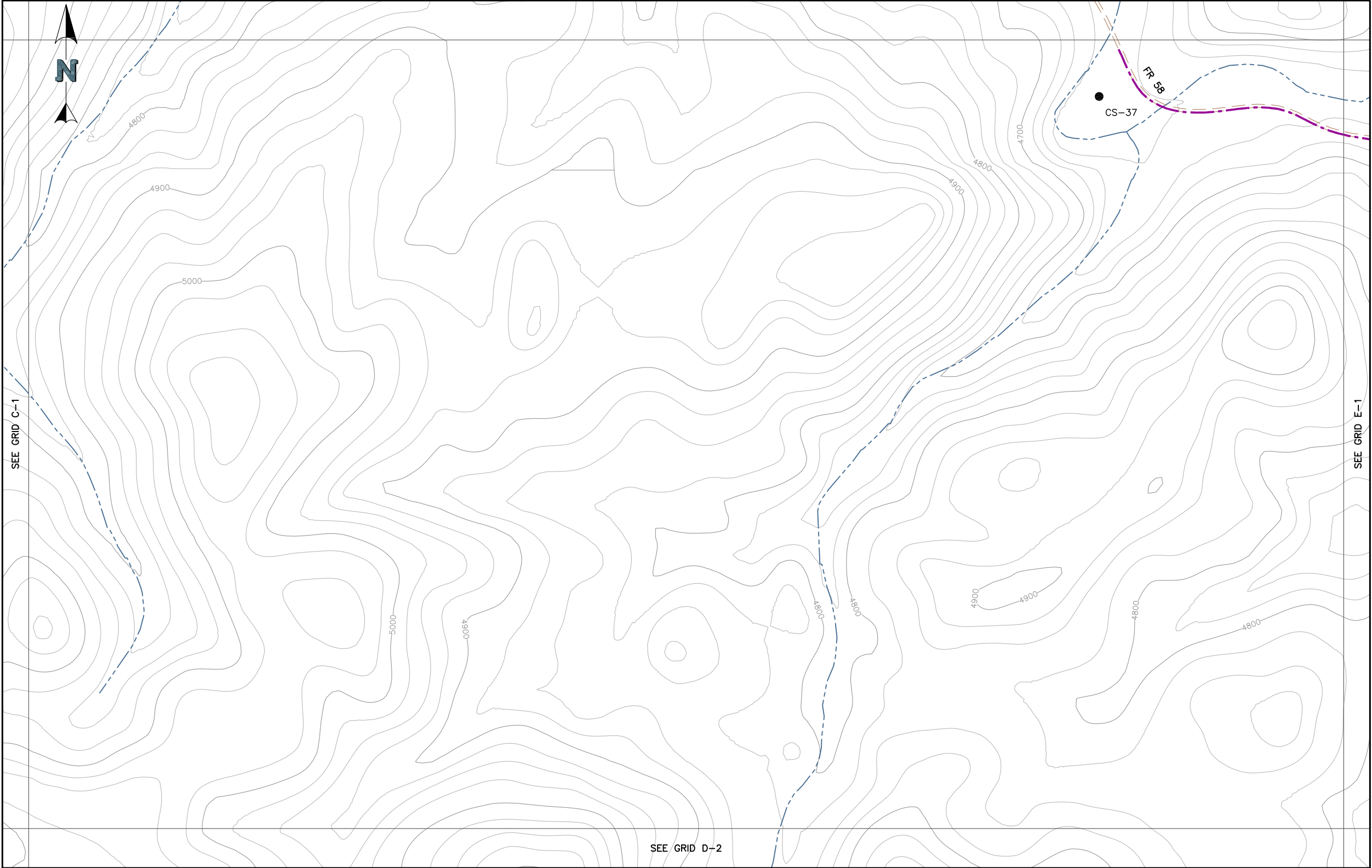


- LEGEND:**
- EXISTING GROUND CONTOURS
 - EXISTING FOREST ROAD (FR)
 - EXISTING DRAINAGES
 - UNPATENTED CLAIM BOUNDARY
 - GRID LINES
 - EXISTING FR WITH MAINTENANCE REQUIRED
 - CS-38 CHARACTERIZATION SITE



NewFields		CLIENT WILDCAT SILVER CORPORATION	
PROJECT		HERMOSA PROJECT	
TITLE DRILLING PLAN OF OPERATIONS ROAD USE PLAN GRID C-1		FILENAME 14.003.018F	
		FIGURE NO. A-04	REVISION A

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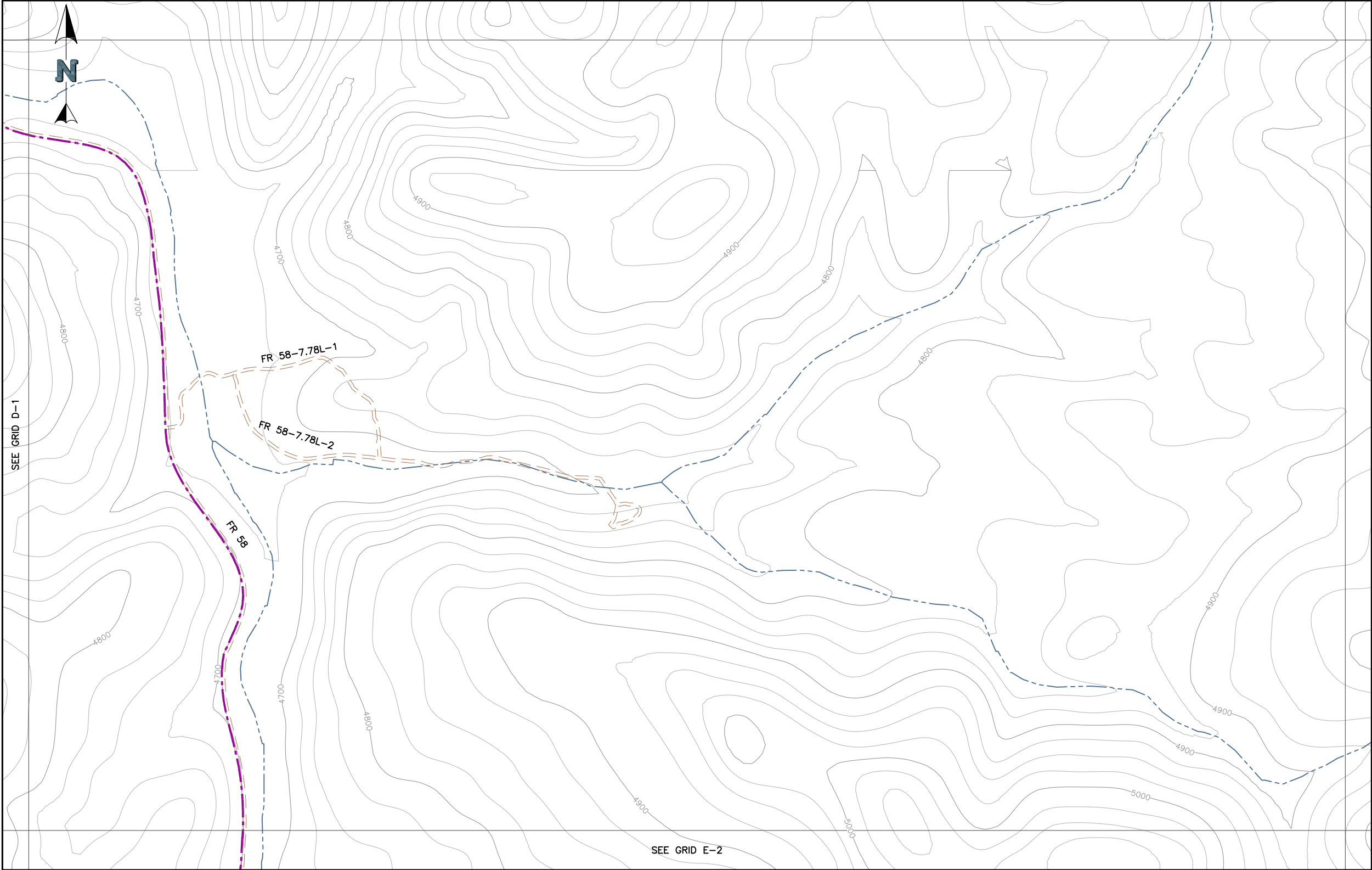


- LEGEND:**
- EXISTING GROUND CONTOURS
 - EXISTING FOREST ROAD (FR)
 - EXISTING DRAINAGES
 - GRID LINES
 - EXISTING FR WITH MAINTENANCE REQUIRED
 - CHARACTERIZATION SITE



		CLIENT WILDCAT SILVER CORPORATION	
PROJECT		HERMOSA PROJECT	
TITLE	DRILLING PLAN OF OPERATIONS ROAD USE PLAN GRID D-1	FILENAME 14.003.021F	
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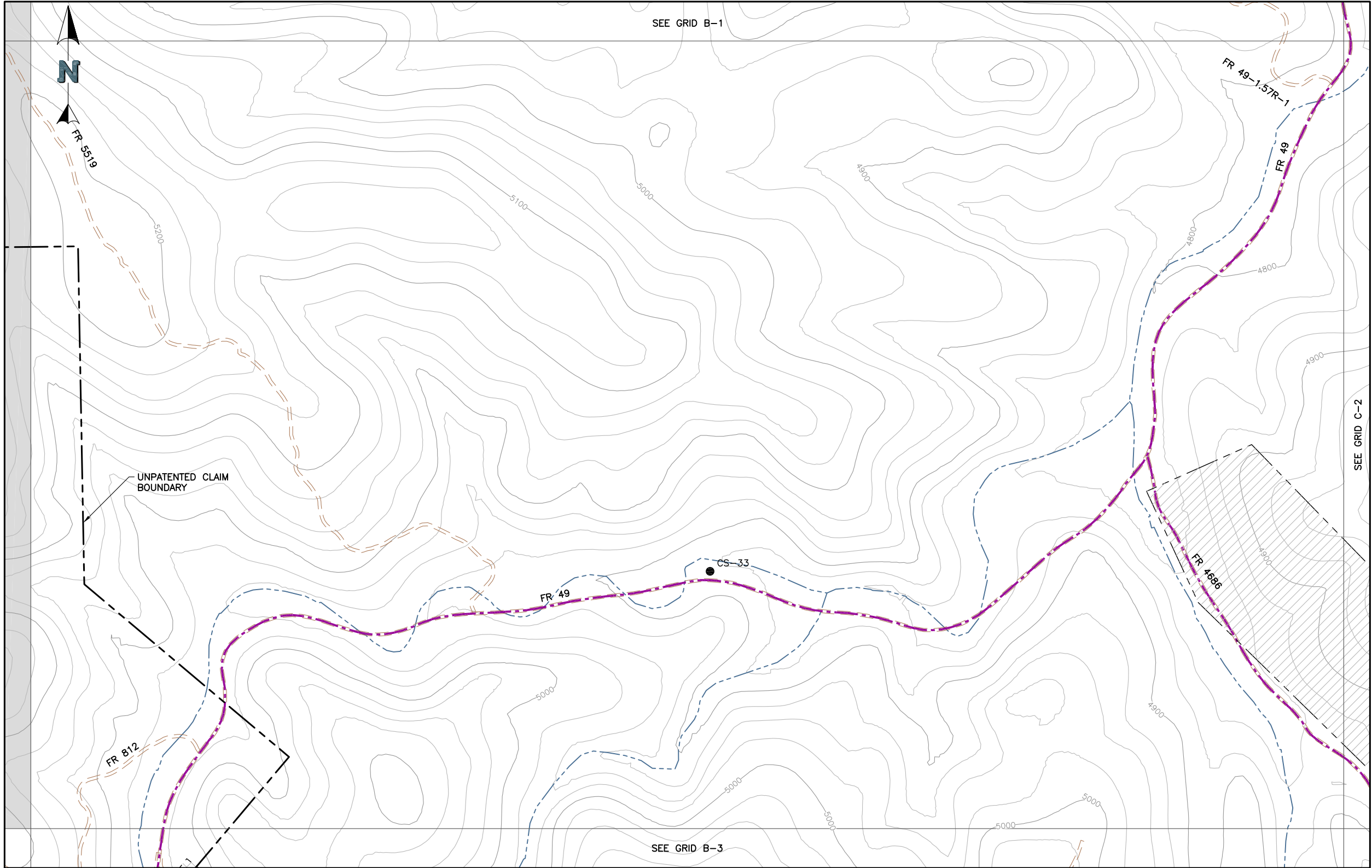


- LEGEND:**
- EXISTING GROUND CONTOURS
 - EXISTING FOREST ROAD (FR)
 - EXISTING DRAINAGES
 - GRID LINES
 - EXISTING FR WITH MAINTENANCE REQUIRED



		CLIENT WILDCAT SILVER CORPORATION	
PROJECT HERMOSA PROJECT		FILENAME 14.003.023F	
TITLE DRILLING PLAN OF OPERATIONS ROAD USE PLAN GRID E-1		FIGURE NO. A-06	REVISION A

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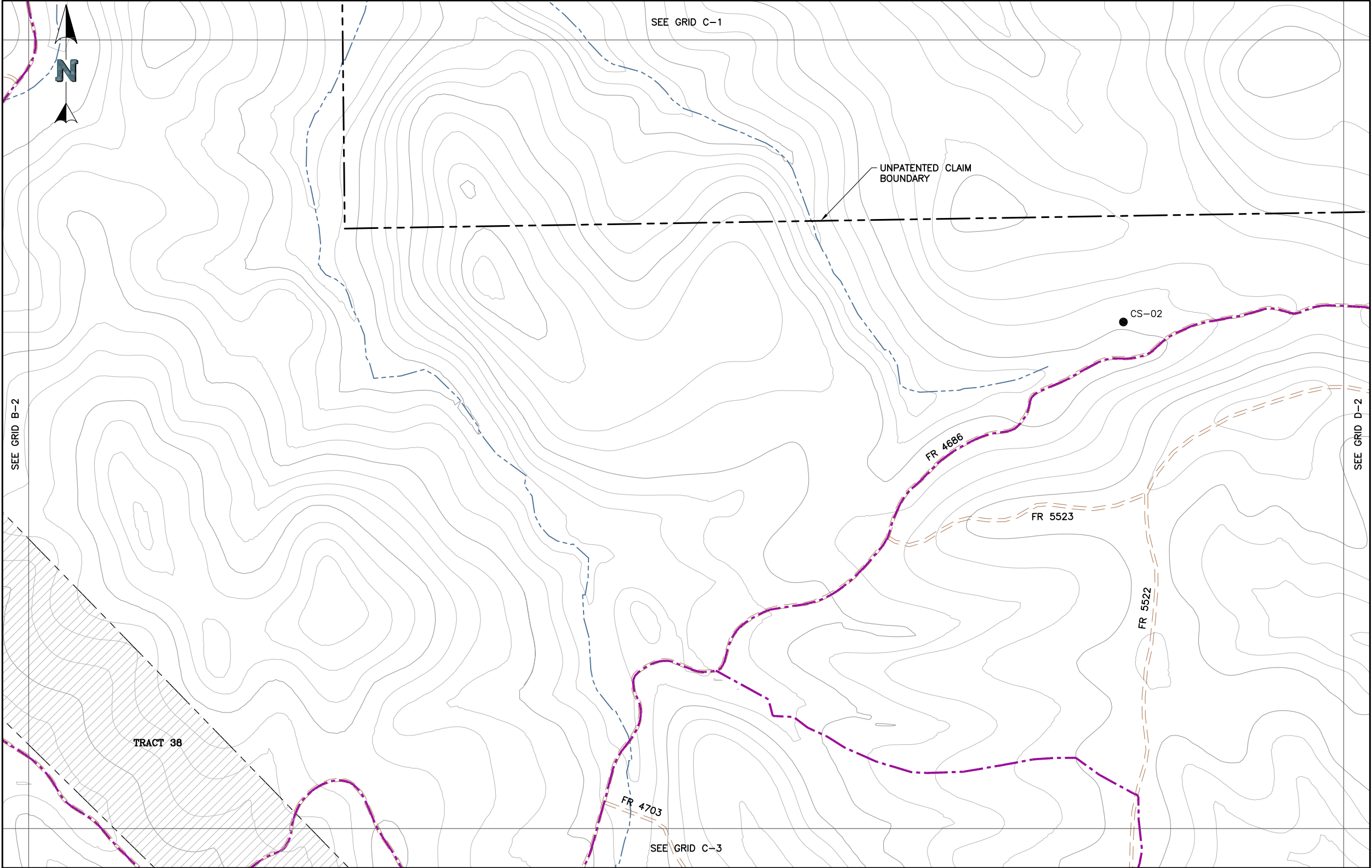


- LEGEND:**
- EXISTING GROUND CONTOURS
 - EXISTING FOREST ROAD (FR)
 - EXISTING DRAINAGES
 - UNPATENTED CLAIM BOUNDARY
 - GRID LINES
 - OTHER PRIVATE LAND
 - GRID AREA NOT SHOWN
 - EXISTING FR WITH MAINTENANCE REQUIRED



		CLIENT WILDCAT SILVER CORPORATION	
PROJECT		HERMOSA PROJECT	
TITLE	DRILLING PLAN OF OPERATIONS ROAD USE PLAN GRID B-2	FILENAME 14.003.019F	
		FIGURE NO. A-07	REVISION A

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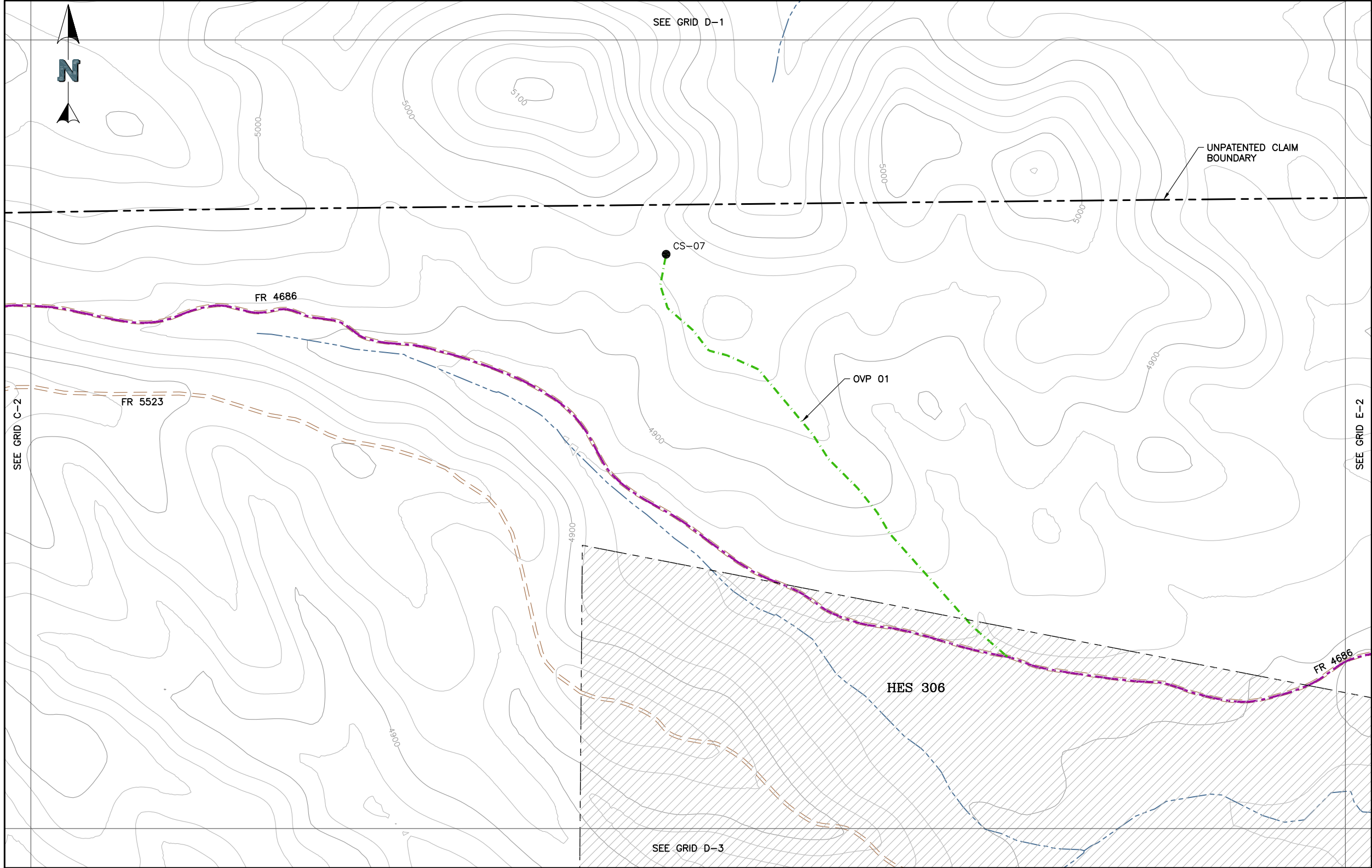


- LEGEND:**
- EXISTING GROUND CONTOURS
 - EXISTING FOREST ROAD (FR)
 - EXISTING DRAINAGES
 - UNPATENTED CLAIM BOUNDARY
 - GRID LINES
 - OTHER PRIVATE LAND
 - EXISTING FR WITH MAINTENANCE REQUIRED



PROJECT		CLIENT	
HERMOSA PROJECT		WILDCAT SILVER CORPORATION	
TITLE		FILENAME	
DRILLING PLAN OF OPERATIONS		14.003.022F	
ROAD USE PLAN		FIGURE NO.	REVISION
GRID C-2		A-08	A

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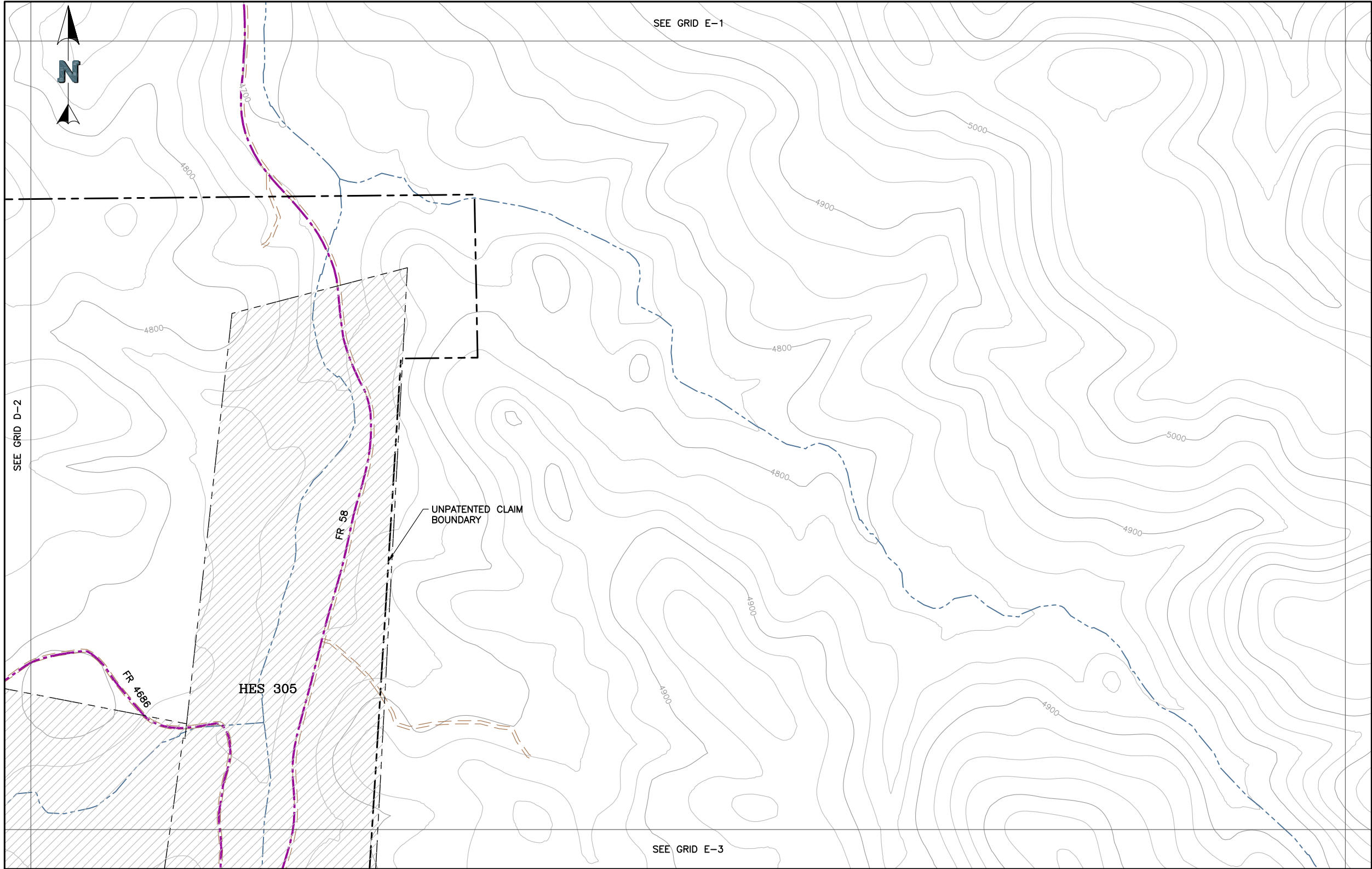


- LEGEND:**
- EXISTING GROUND CONTOURS
 - EXISTING FOREST ROAD (FR)
 - EXISTING DRAINAGES
 - GRID LINES
 - OTHER PRIVATE LAND
 - EXISTING FR WITH MAINTENANCE REQUIRED
 - PROPOSED OVERLAND VEHICLE PATH (OVP)
 - PROJECT BOUNDARY



		CLIENT WILDCAT SILVER CORPORATION	
PROJECT		HERMOSA PROJECT	
TITLE DRILLING PLAN OF OPERATIONS ROAD USE PLAN GRID D-2		FILENAME 14.003.026F	
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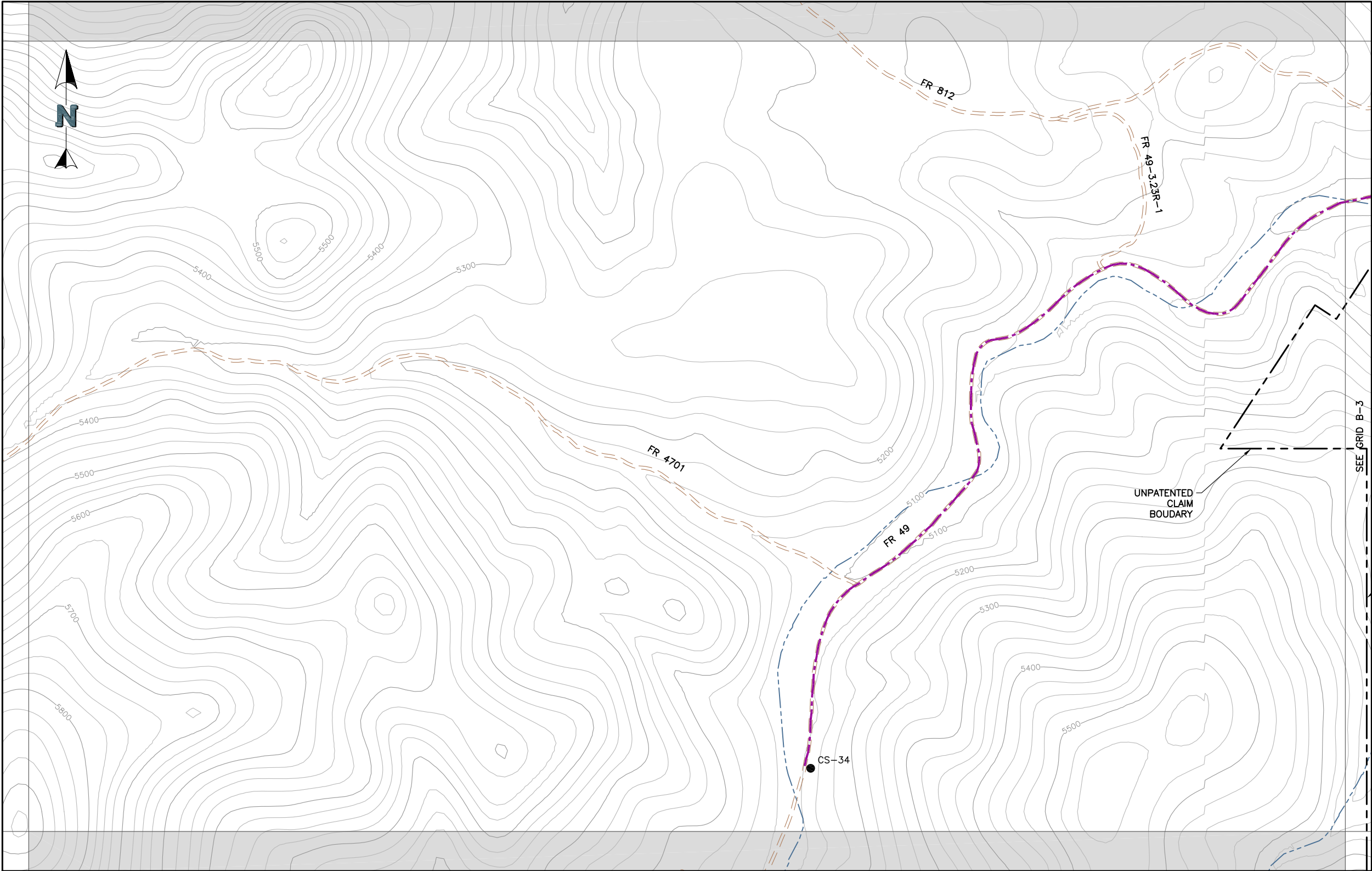


- LEGEND:**
- EXISTING GROUND CONTOURS
 - EXISTING FOREST ROAD (FR)
 - EXISTING DRAINAGES
 - UNPATENTED CLAIM BOUNDARY
 - GRID LINES
 - OTHER PRIVATE LAND
 - EXISTING FR WITH MAINTENANCE REQUIRED



NewFields		CLIENT WILDCAT SILVER CORPORATION	
PROJECT		HERMOSA PROJECT	
TITLE	DRILLING PLAN OF OPERATIONS ROAD USE PLAN GRID E-2	FILENAME 14.003.029F	
		FIGURE NO. A-10	REVISION A

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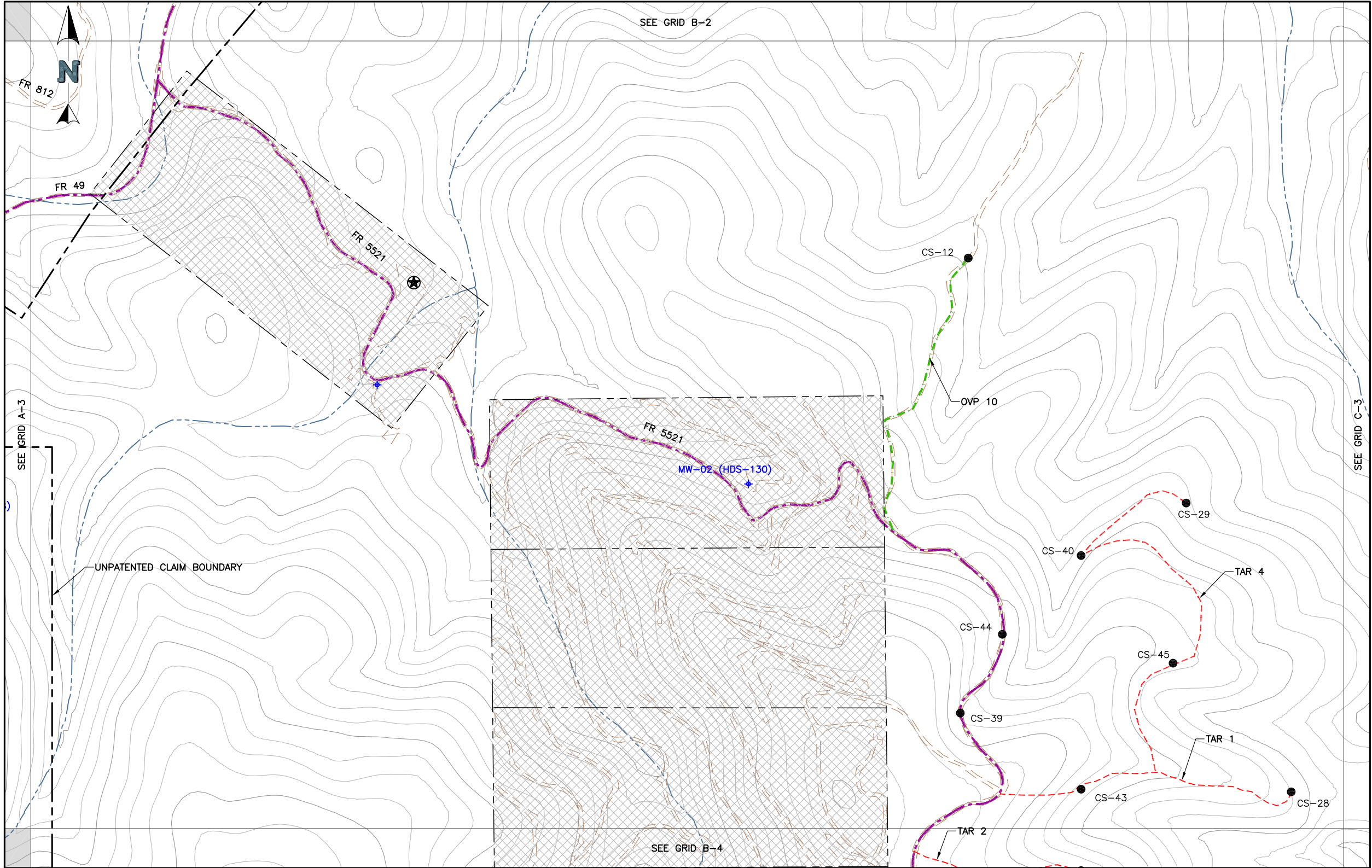


- LEGEND:**
- EXISTING GROUND CONTOURS
 - EXISTING FOREST ROAD (FR)
 - EXISTING DRAINAGES
 - UNPATENTED CLAIM BOUNDARY
 - GRID LINES
 - GRID AREA NOT SHOWN
 - EXISTING FR WITH MAINTENANCE REQUIRED



		CLIENT WILDCAT SILVER CORPORATION	
PROJECT HERMOSA PROJECT		FILENAME 14.003.036F	
TITLE DRILLING PLAN OF OPERATIONS ROAD USE PLAN GRID A-3		FIGURE NO. A-11	REVISION A

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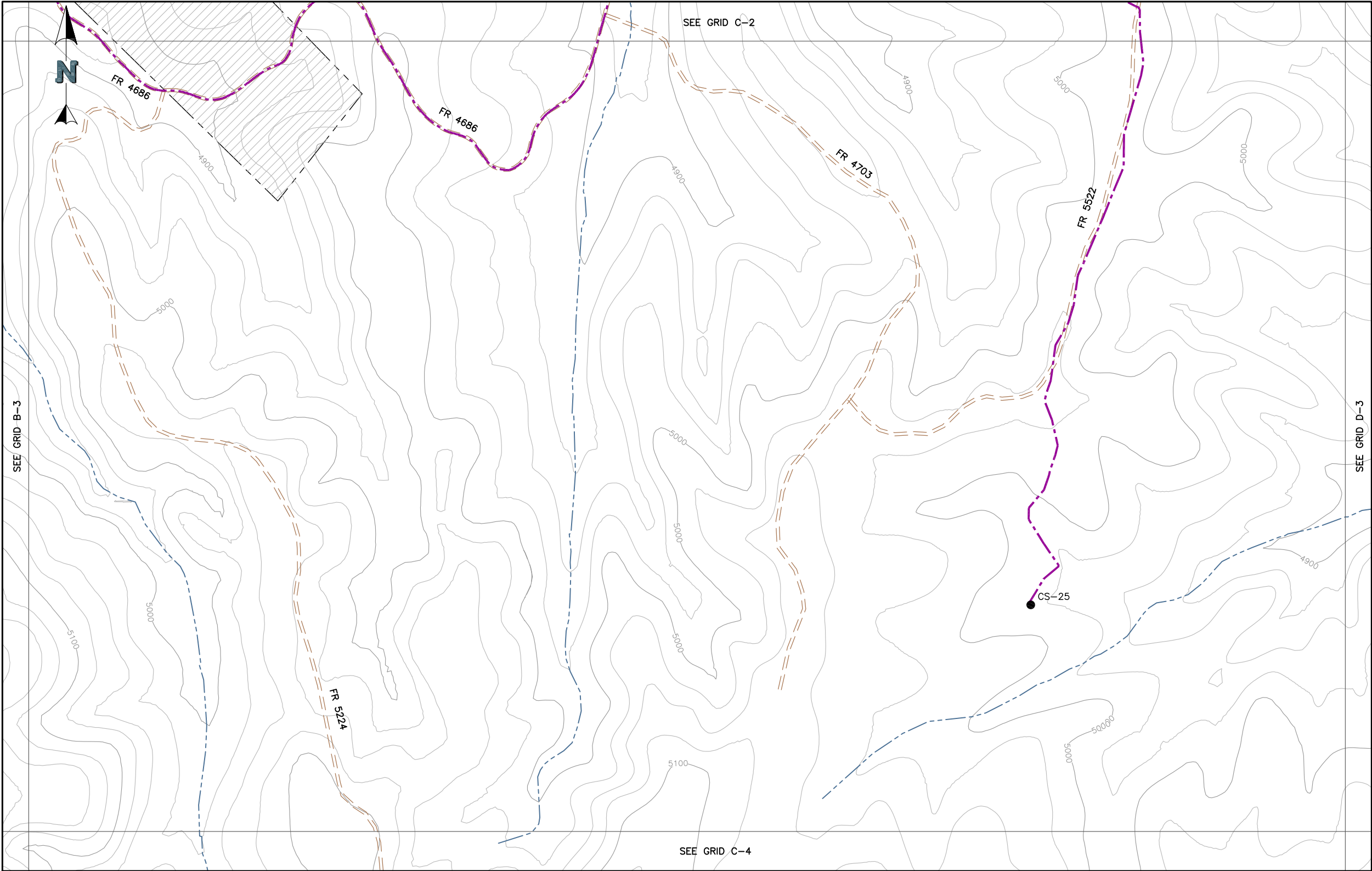


- LEGEND:**
- EXISTING GROUND CONTOURS
 - EXISTING FOREST ROAD (FR)
 - EXISTING DRAINAGES
 - GRID LINES
 - UNPATENTED CLAIM BOUNDARY
 - EXISTING FR WITH MAINTENANCE REQUIRED
 - PROPOSED TEMPORARY ACCESS ROAD (TAR)
 - PROPOSED OVERLAND ACCESS ROUTE (OVP)
 - MW-02 (HDS-130) EXISTING AMI PRODUCTION WELL
 - CS-38 CHARACTERIZATION SITE
 - PROJECT STAGING AREA
 - AMI PRIVATE LAND



NewFields		CLIENT WILDCAT SILVER CORPORATION	
PROJECT		HERMOSA PROJECT	
TITLE	DRILLING PLAN OF OPERATIONS ROAD USE PLAN GRID B-3	FILENAME 14.003.017F	
		FIGURE NO. A-12	REVISION A

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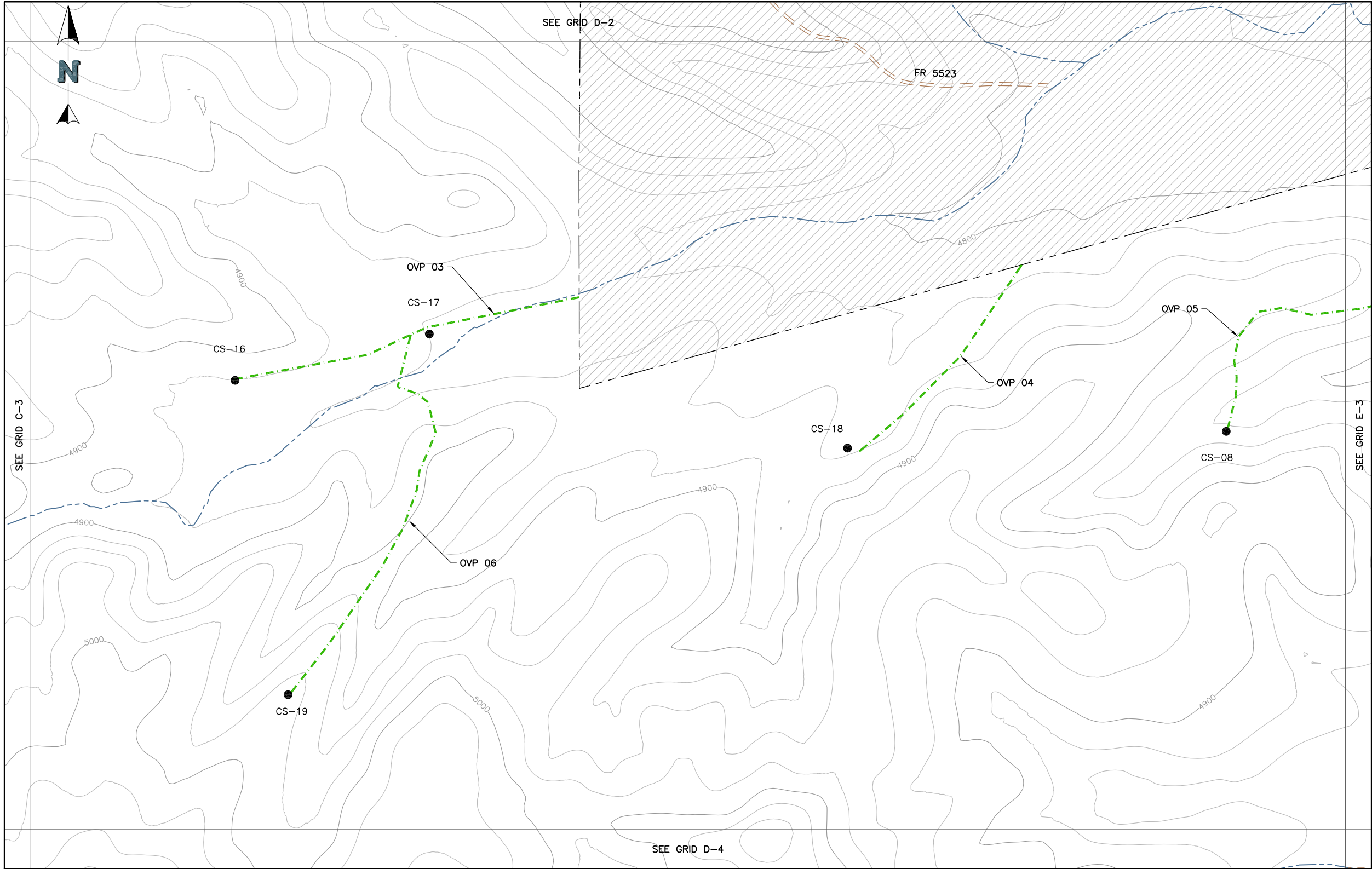


- LEGEND:**
- EXISTING GROUND CONTOURS
 - EXISTING FOREST ROAD (FR)
 - EXISTING DRAINAGES
 - GRID LINES
 - EXISTING FR WITH MAINTENANCE REQUIRED
 - CS-38 CHARACTERIZATION SITE



 NewFields		CLIENT WILDCAT SILVER CORPORATION	
PROJECT HERMOSA PROJECT			
TITLE DRILLING PLAN OF OPERATIONS ROAD USE PLAN GRID C-3		FILENAME 14.003.027F	
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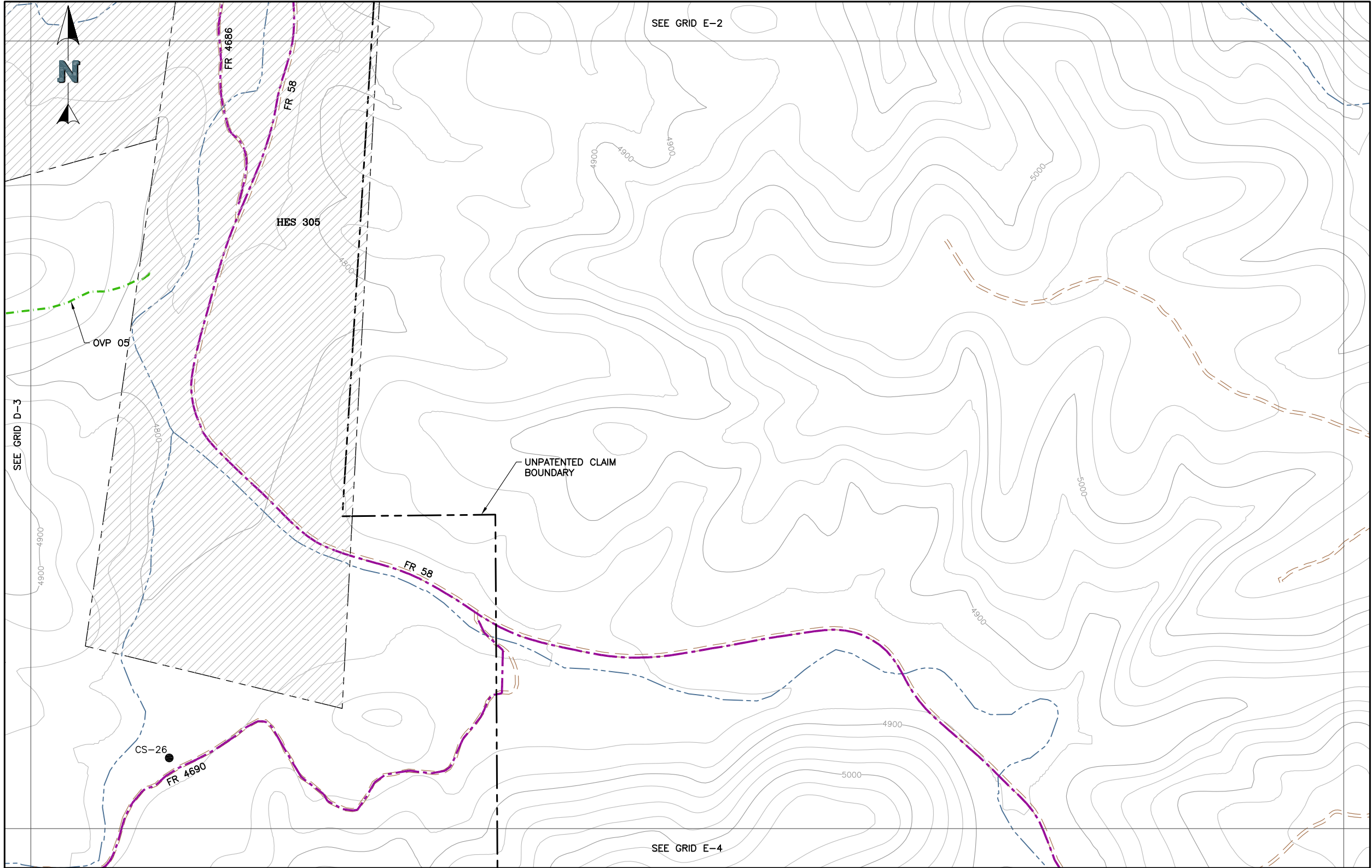
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- EXISTING GROUND CONTOURS
- EXISTING FOREST ROAD (FR)
- EXISTING DRAINAGES
- GRID LINES
- OTHER PRIVATE LAND
- PROPOSED OVERLAND VEHICLE PATH (OVP)
- CS-38 CHARACTERIZATION SITE



NewFields		CLIENT WILDCAT SILVER CORPORATION	
PROJECT		HERMOSA PROJECT	
TITLE	DRILLING PLAN OF OPERATIONS ROAD USE PLAN GRID D-3	FILENAME 14.003.030F	
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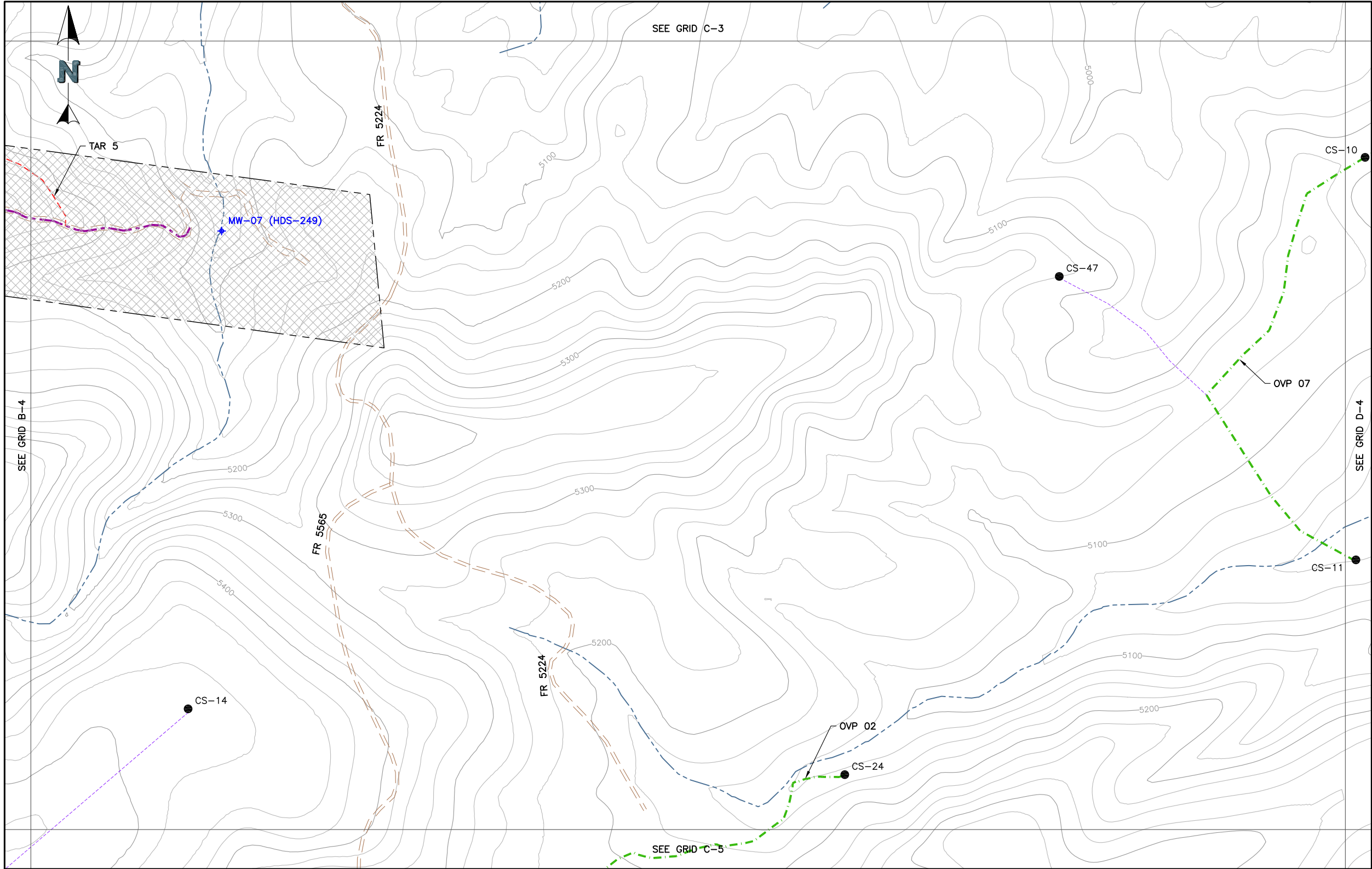


- LEGEND:**
- EXISTING GROUND CONTOURS
 - EXISTING FOREST ROAD (FR)
 - EXISTING DRAINAGES
 - PROJECT BOUNDARY
 - GRID LINES
 - OTHER PRIVATE LAND
 - EXISTING FR WITH MAINTENANCE REQUIRED
 - PROPOSED OVERLAND VEHICLE PATH (OVP)



NewFields		CLIENT WILDCAT SILVER CORPORATION	
PROJECT		HERMOSA PROJECT	
TITLE	DRILLING PLAN OF OPERATIONS ROAD USE PLAN GRID E-3	FILENAME 14.003.031F	
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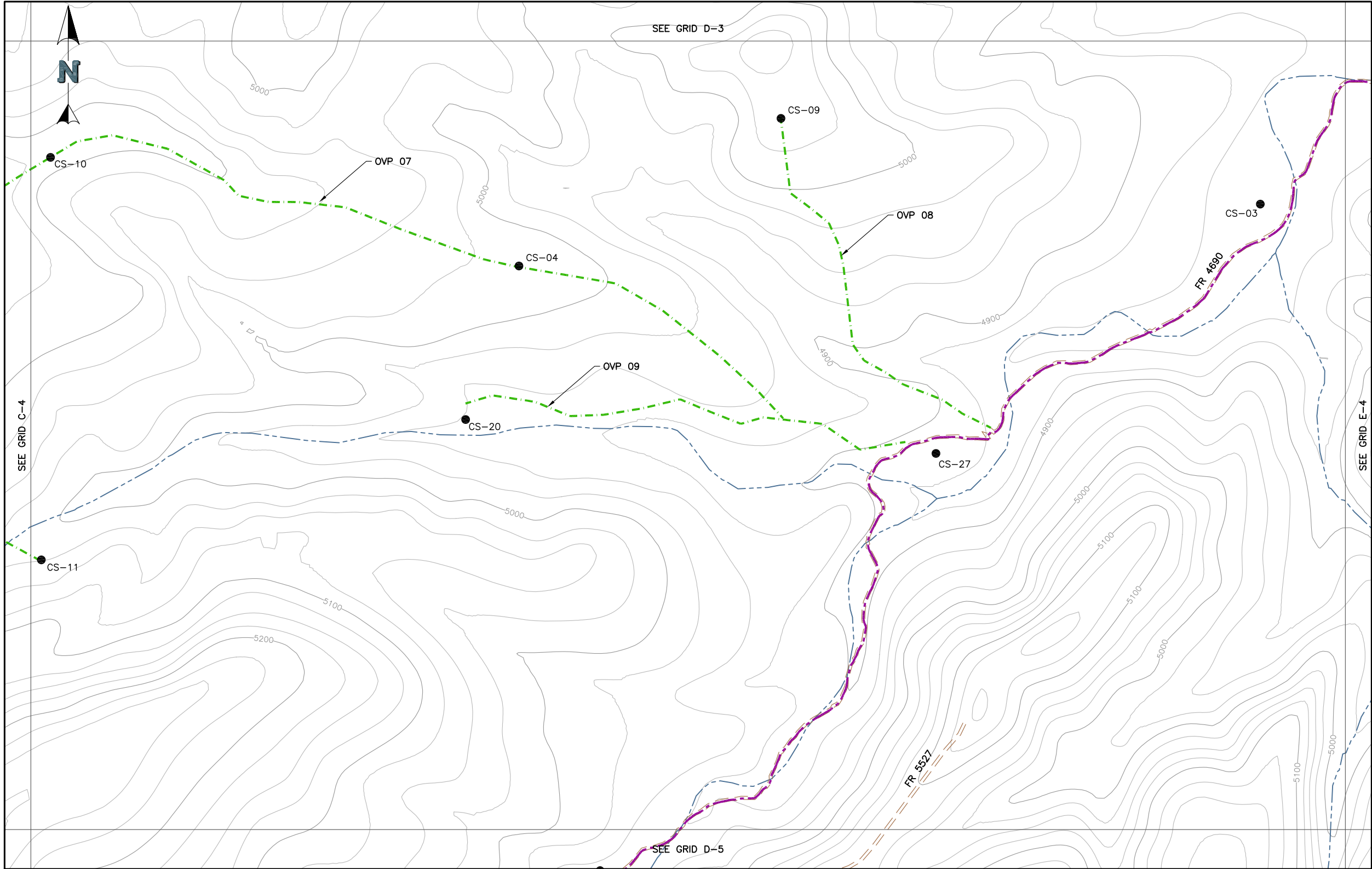
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- EXISTING FOREST ROAD (FR)
- EXISTING DRAINAGES
- PROPOSED OVERLAND FOOTPATH
- PROPOSED TEMPORARY ACCESS ROAD (TAR)
- PROPOSED OVERLAND VEHICLE PATH (OVP)
- CS-38 CHARACTERIZATION SITE
- GRID LINES
- EXISTING FR WITH MAINTENANCE REQUIRED
- AMI PRIVATE LAND
- MW-07 (HDS-249) EXISTING AMI MONITORING WELL



		CLIENT WILDCAT SILVER CORPORATION	
PROJECT		HERMOSA PROJECT	
TITLE	DRILLING PLAN OF OPERATIONS ROAD USE PLAN GRID C-4	FILENAME 14.003.024F	
		FIGURE NO. A-17	REVISION A

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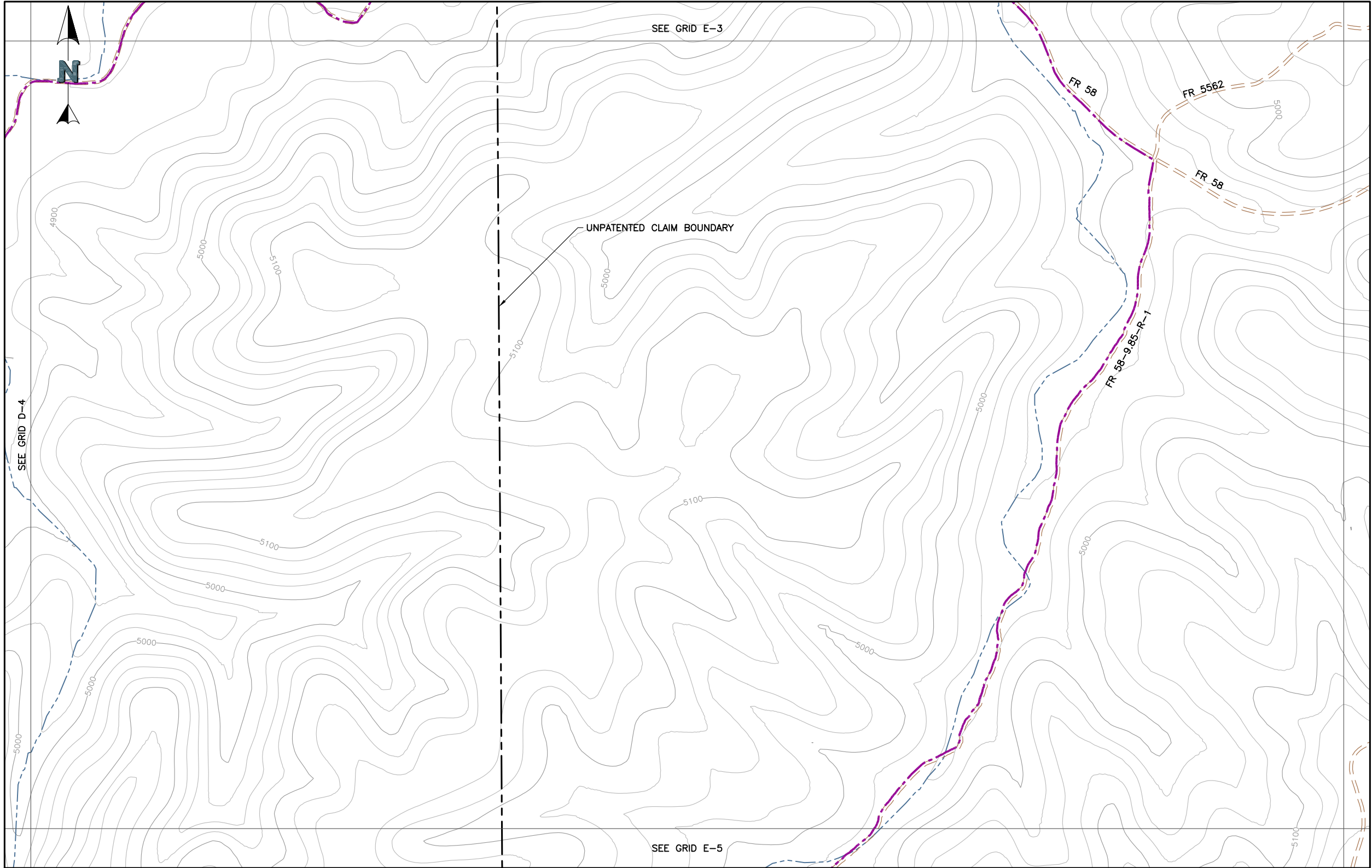
LEGEND:

- EXISTING GROUND CONTOURS
- EXISTING FOREST ROAD (FR)
- EXISTING DRAINAGES
- EXISTING FR WITH MAINTENANCE REQUIRED
- PROPOSED OVERLAND VEHICLE PATH (OVP)
- CS-38 CHARACTERIZATION SITE



NewFields		CLIENT WILDCAT SILVER CORPORATION	
PROJECT		HERMOSA PROJECT	
TITLE	DRILLING PLAN OF OPERATIONS ROAD USE PLAN GRID D-4	FILENAME 14.003.038F	
		FIGURE NO. A-18	REVISION A

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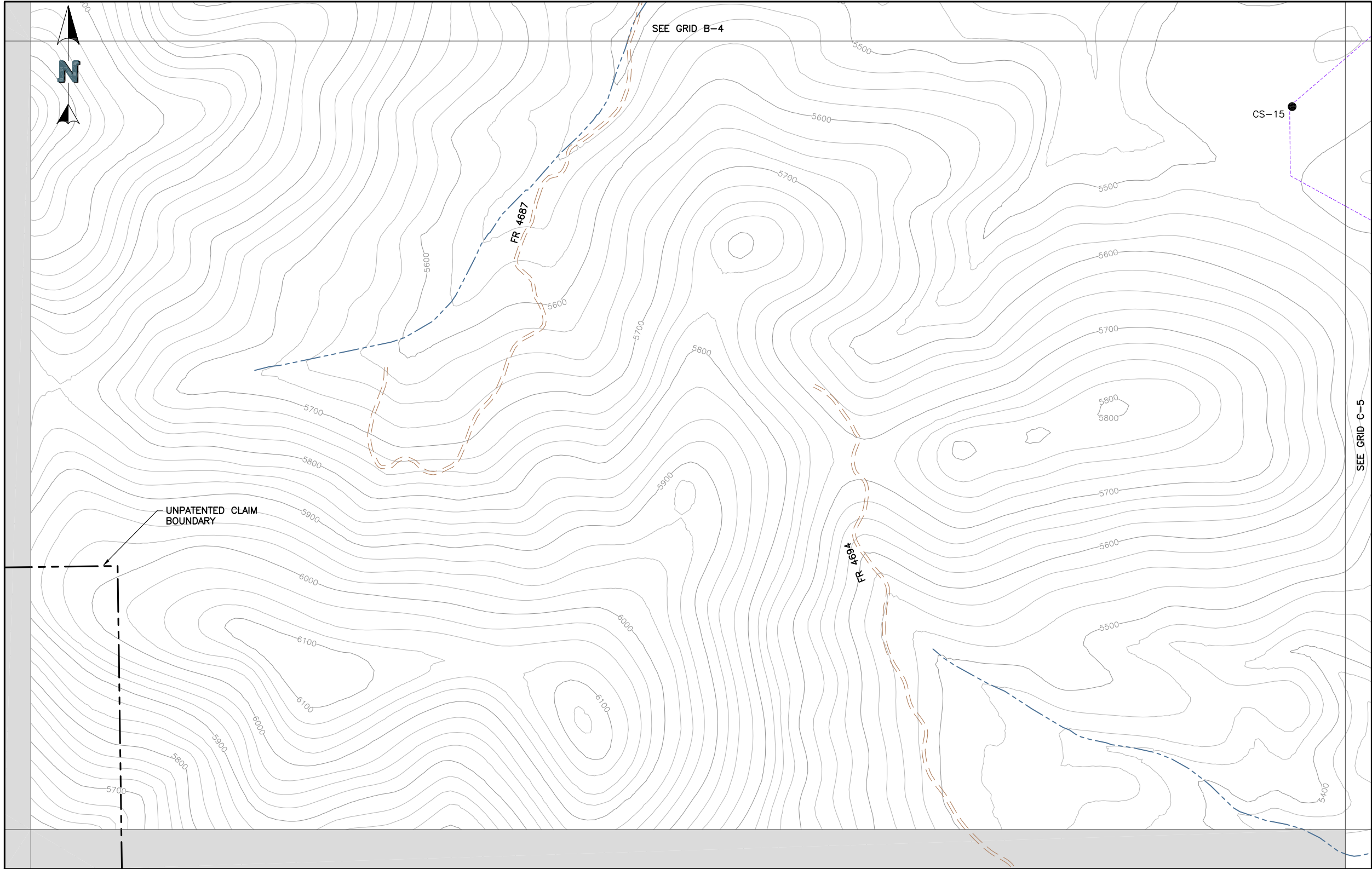


- LEGEND:**
- EXISTING GROUND CONTOURS
 - EXISTING FOREST ROAD (FR)
 - EXISTING DRAINAGES
 - EXISTING FR WITH MAINTENANCE REQUIRED
 - UNPATENTED CLAIM BOUNDARY



		CLIENT WILDCAT SILVER CORPORATION	
PROJECT		HERMOSA PROJECT	
TITLE DRILLING PLAN OF OPERATIONS ROAD USE PLAN GRID E-4		FILENAME 14.003.028F	
		FIGURE NO. A-19	REVISION A

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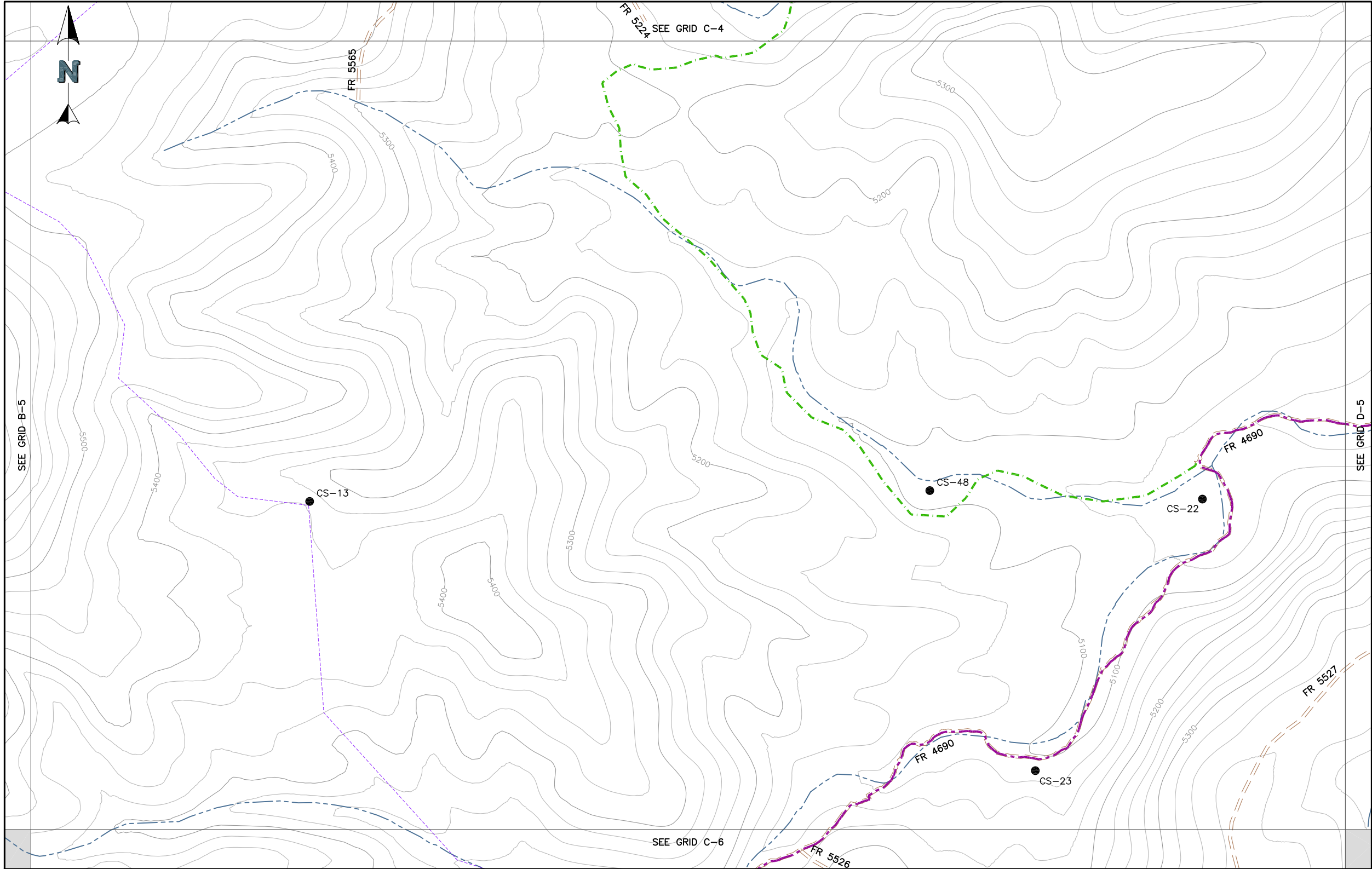
LEGEND:

- EXISTING GROUND CONTOURS
- EXISTING FOREST ROAD (FR)
- EXISTING DRAINAGES
- UNPATENTED CLAIM BOUNDARY
- PROPOSED OVERLAND FOOTPATH
- CS-38 CHARACTERIZATION SITE
- GRID AREA NOT SHOWN



NewFields		CLIENT WILDCAT SILVER CORPORATION	
PROJECT		HERMOSA PROJECT	
TITLE	DRILLING PLAN OF OPERATIONS ROAD USE PLAN GRID B-5	FILENAME 14.003.037F	
		FIGURE NO. A-20	REVISION A

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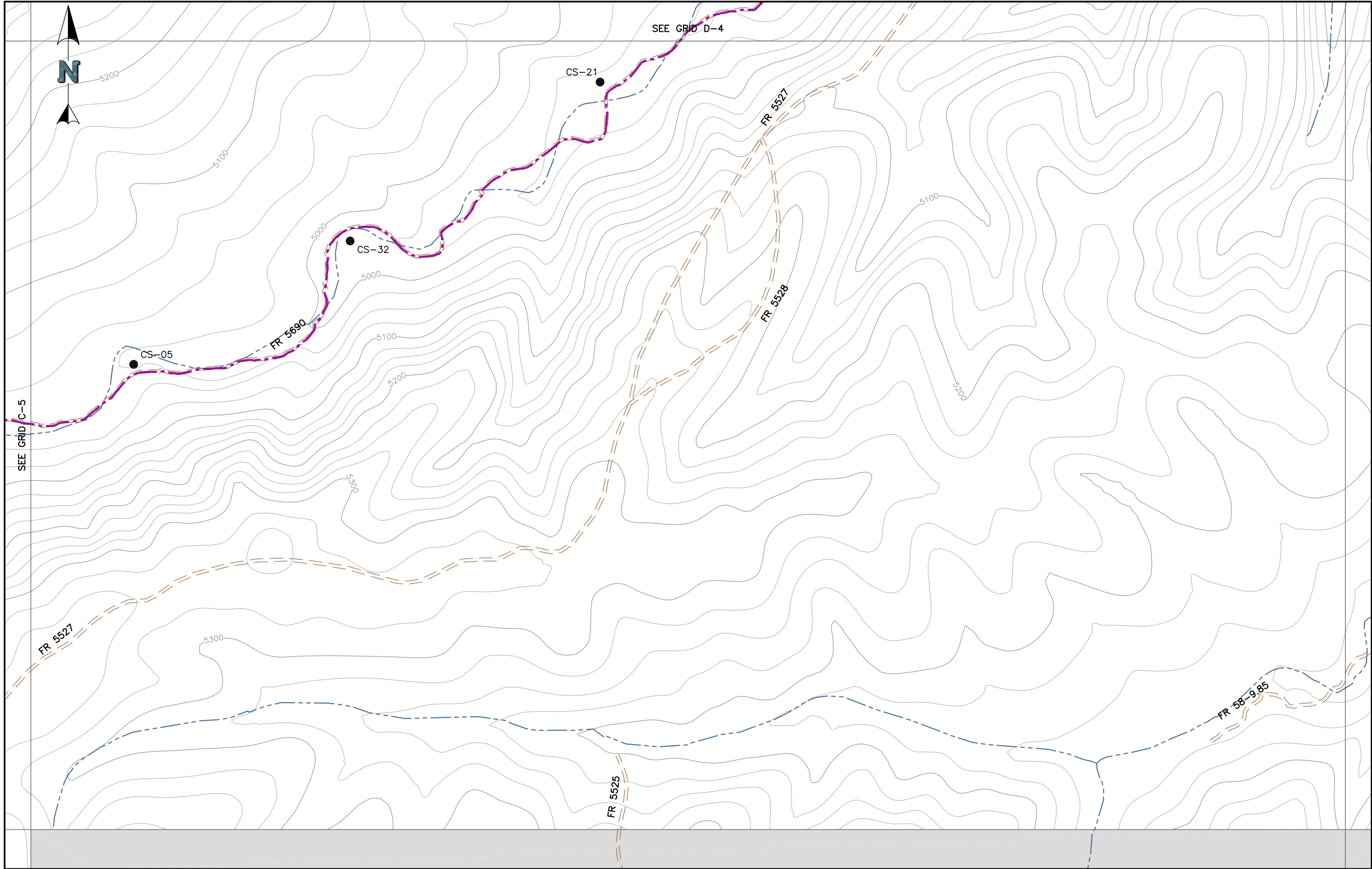
LEGEND:

- EXISTING GROUND CONTOURS
- EXISTING FOREST ROAD (FR)
- EXISTING DRAINAGES
- EXISTING FR WITH MAINTENANCE REQUIRED
- PROPOSED OVERLAND VEHICLE PATH (OVP)
- PROPOSED OVERLAND FOOTPATH
- CS-38 CHARACTERIZATION SITE
- GRID AREA NOT SHOWN



		CLIENT WILDCAT SILVER CORPORATION	
PROJECT		HERMOSA PROJECT	
TITLE	DRILLING PLAN OF OPERATIONS ROAD USE PLAN GRID C-5	FILENAME 14.003.035F	
		FIGURE NO. A-21	REVISION A

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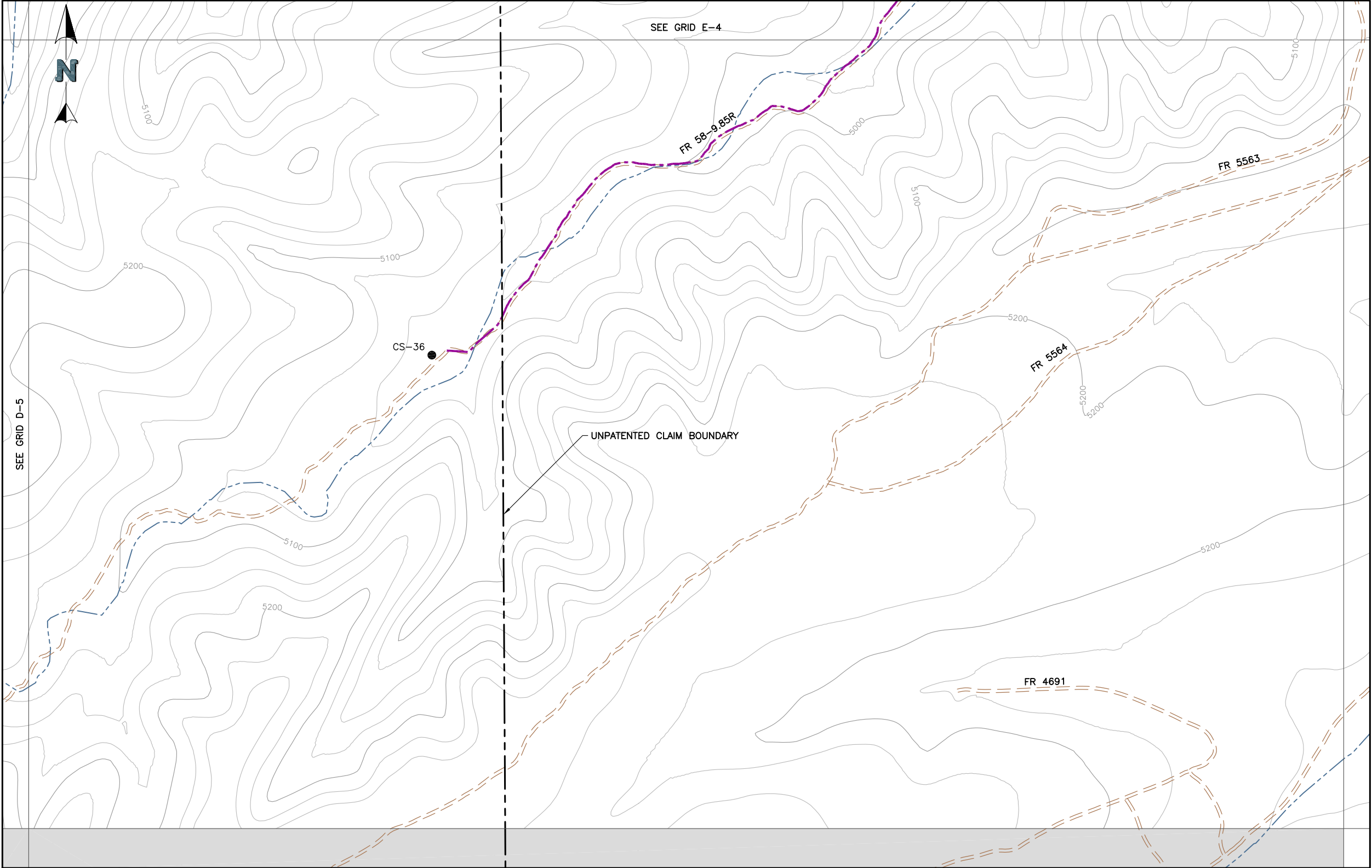


- LEGEND:**
- EXISTING GROUND CONTOURS
 - EXISTING FOREST ROAD (FR)
 - EXISTING DRAINAGES
 - EXISTING FR WITH MAINTENANCE REQUIRED
 - CS-38
 - CHARACTERIZATION SITE
 - GRID AREA NOT SHOWN



NewFields		CLIENT WILDCAT SILVER CORPORATION	
PROJECT		HERMOSA PROJECT	
TITLE DRILLING PLAN OF OPERATIONS ROAD USE PLAN GRID D-5		FILENAME 14.003.034F	
		FIGURE NO. A-22	REVISION A

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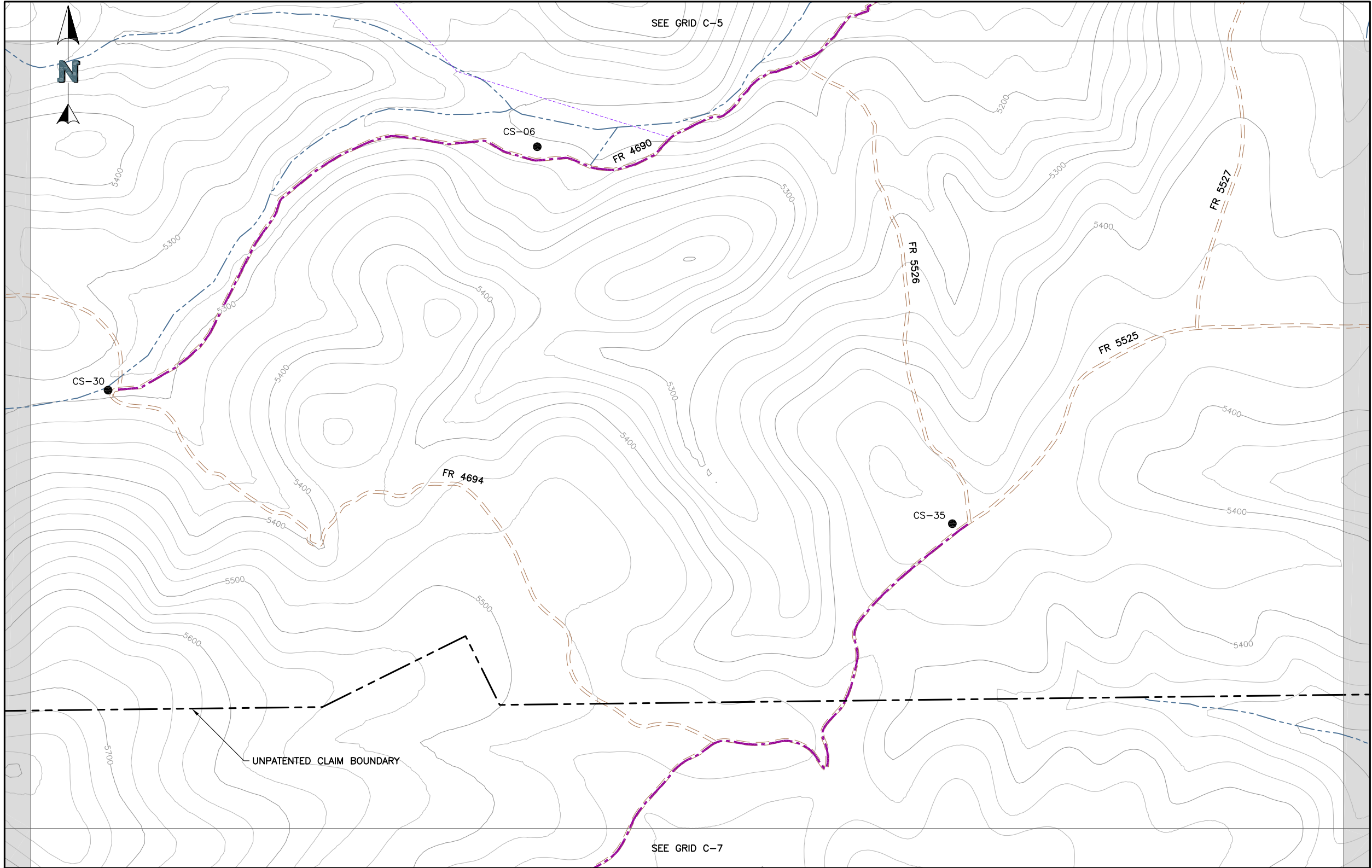
LEGEND:

- EXISTING GROUND CONTOURS
- EXISTING FOREST ROAD (FR)
- EXISTING DRAINAGES
- EXISTING FR WITH MAINTENANCE REQUIRED
- UNPATENTED CLAIM BOUNDARY
- CS-38 CHARACTERIZATION SITE
- GRID AREA NOT SHOWN



NewFields		CLIENT WILDCAT SILVER CORPORATION	
PROJECT		HERMOSA PROJECT	
TITLE	DRILLING PLAN OF OPERATIONS ROAD USE PLAN GRID E-5	FILENAME 14.003.033F	
		FIGURE NO. A-23	REVISION A

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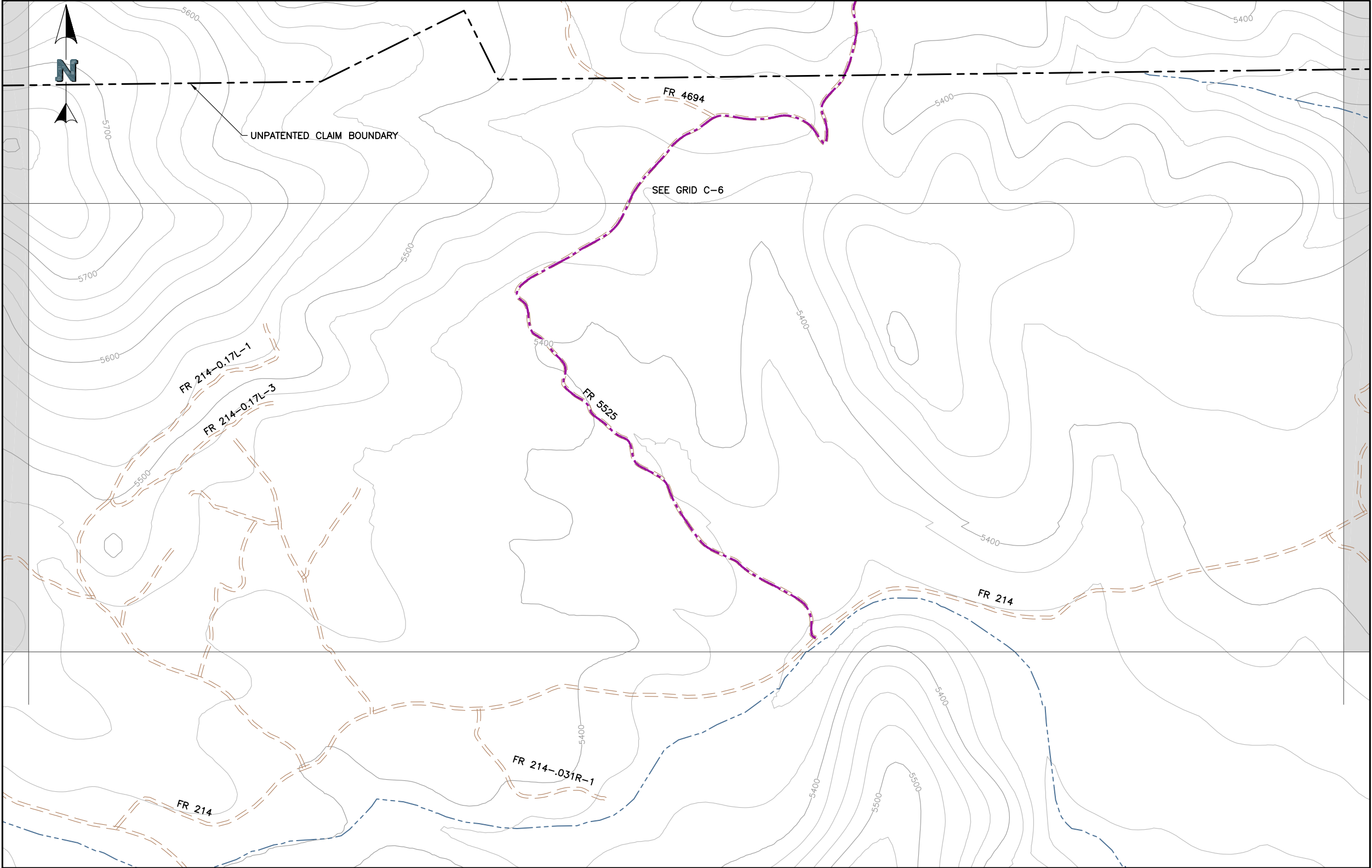


- LEGEND:**
- EXISTING GROUND CONTOURS
 - EXISTING FOREST ROAD (FR)
 - EXISTING DRAINAGES
 - GRID LINES
 - GRID AREA NOT SHOWN
 - EXISTING FR WITH MAINTENANCE REQUIRED
 - UNPATENTED CLAIM BOUNDARY
 - CS-38 CHARACTERIZATION SITE
 - PROPOSED OVERLAND FOOTPATH



NewFields		CLIENT WILDCAT SILVER CORPORATION	
PROJECT		HERMOSA PROJECT	
TITLE	DRILLING PLAN OF OPERATIONS ROAD USE PLAN GRID C-6	FILENAME 14.003.020F	
		FIGURE NO. A-24	REVISION A

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- LEGEND:**
- EXISTING GROUND CONTOURS
 - EXISTING FOREST ROAD (FR)
 - EXISTING DRAINAGES
 - GRID LINES
 - GRID AREA NOT SHOWN
 - EXISTING FR WITH MAINTENANCE REQUIRED
 - UNPATENTED CLAIM BOUNDARY

		CLIENT WILDCAT SILVER CORPORATION	
PROJECT		HERMOSA PROJECT	
TITLE	DRILLING PLAN OF OPERATIONS ROAD USE PLAN GRID C-7	FILENAME 14.003.025F	
		FIGURE NO. A-25	REVISION A

APPENDIX B

SURFACE DISTURBANCE ANALYSIS AND ASSUMPTIONS

Appendix B-1. Surface Disturbance Areas

Activity/Disturbance Type	Number of Sites	Length (feet)	Width (feet)	Area of Disturbance per Site/Road (square feet)	Area of Disturbance per Site/Road (acres)	Estimated Area of Disturbance (square feet)	Estimated Area of Disturbance (acres)
Characterization Sites							
<i>Exploration Boreholes</i>							
Wheeled Drill Pad ¹	9	90	50	4,500	0.10	40,500	0.93
Cut and Fill	9	80	35	2,800	0.06	25,200	0.58
						Sub Total	1.51
<i>Hydrogeologic Boreholes/Monitoring Wells</i>							
Wheeled Drill Pad ²	7	110	50	5,500	0.13	38,500	0.88
<i>Geotechnical Boreholes</i>							
Track-Mounted Drill Pad ³	10	80	30	2,400	0.06	24,000	0.55
Winkie Drill Pad ⁴	4	20	20	400	0.01	1,600	0.04
						Sub Total	0.59
<i>Test Pit Excavation</i>							
Track Excavator Pad ⁵	7	20	20	400	0.01	2,800	0.06
Co-located Characterization Sites							
<i>Exploration Boreholes</i>							
Wheeled Drill Pad ⁶	1	90	50	4,500	0.10	4,500	0.10
Cut and Fill	1	80	35	2,800	0.06	2,800	0.06
<i>Hydrogeologic Boreholes/Monitoring Wells</i>							
Wheeled Drill Pad ⁷	4	110	50	5,500	0.13	22,000	0.51
<i>Geotechnical Boreholes</i>							
Track-Mounted Drill Pad ⁸	6	80	30	2,400	0.06	14,400	0.33
Cut and Fill	1	70	20	1,400	0.03	1,400	0.03
						Sub Total	1.04
Temporary Access Roads							
TAR-01	1	1,200	25	30,000	0.69	30,000	0.69
TAR-02	1	700	25	17,500	0.40	17,500	0.40
TAR-03	1	350	25	8,750	0.20	8,750	0.20
TAR-04	1	1,900	25	47,500	1.09	47,500	1.09
TAR-05	1	200	25	5,000	0.11	5,000	0.11
						Sub Total	2.50
Overland Vehicle Paths							
OVP 1	1	2,100	5	10,500	0.24	10,500	0.24
OVP 2	1	4,450	5	22,250	0.51	22,250	0.51
OVP 3	1	1,360	5	6,800	0.16	6,800	0.16
OVP 4	1	950	5	4,750	0.11	4,750	0.11
OVP 5	1	1,350	5	6,750	0.15	6,750	0.15
OVP 6	1	1,610	5	8,050	0.18	8,050	0.18
OVP7	1	5,100	5	25,500	0.59	25,500	0.59
OVP 8	1	1,600	5	8,000	0.18	8,000	0.18
OVP 9	1	1,750	5	8,750	0.20	8,750	0.20
OVP 10	1	1,200	5	6,000	0.14	6,000	0.14
						Sub Total	2.46
Reconstruction of Roads on USFS Lands							
FR 4687	1	1,060	6	6,190	0.02	6,360	0.15
						Total	9.19

¹ Z-071, Z-075, Z-079, Z-087, Z-088, Z-089, Z-094, Z-102, Z-106

² MW-5, MW-10, MW-12, MW-13, MW-15, MW-18, MW-19

³ BH-01, BH-05, BH-08, BH-10, BH-17, BH-22, 1001, 1006, 1012, 1020

⁴ 1017, 1018, BH-12, BH-20

⁵ TP-7, TP-8, TP-9, TP-10, TP-20, TP-21, TP-24

⁶ Z-107(BH-18)

⁷ MW-6 (1004, TP-1), MW-9 (BH-9, TP-16), MW-11 (TP-19), MW-20 (BH-19)

⁸ BH-6 (TP-14), BH-11 (MW-08, TP-23), BH-21 (TP-22), BH-23 (TP-18), BH-24 (TP-17), 1005 (TP-15)

Appendix B-2. Surface Disturbance Assumptions for Characterization Sites and Access Roads

Characterization Sites /Access Roads	Surface Disturbance Assumptions
Wheeled Drill Pads	- Monitoring Well Pads will be 110 ft x 50 ft based on the area required for drilling provided from Newfields and Yellow Jacket. - Exploration Drill Pads will be 90 ft x 50 ft based on the area required for drilling provided from Wildcat. - Only the exploration drill sites and MW-08 will require cut and fill disturbance. - Cut slopes will be cut as close as they can to vertical 0.5:1. - Fill slopes are assumed to be the angle of repose at 1.5:1 slope. - Maximum of 5% slope across the drill pad.
Track Mounted Drill Pad	- Pads will be 80 ft x 30 ft based on the area required for drilling provided by Yellow Jacket. - There will be no disturbance outside of the 80 ft x 30 ft area.
Portable Winkie Drill Pad	Pads will be a 20 ft x 20 ft cleared area.
Track Mounted Excavator Pad	Pads will be a 20 ft x 20 ft cleared area.
Temporary Access Roads	- All TARs are assumed to have a 15 ft roadbed width and a 25 ft wide disturbance accounting for cut/fill slopes. - Cut slopes will be cut as close as they can to vertical 0.5:1. Fill slopes are assumed to be the angle of repose at 1.5:1 slope.
Reconstruction of Forest Roads	- The existing road bed is assumed to be an average width of 9 ft. - The road travelway will be widened to 12 ft. - The cut disturbance is assumed to be 1 ft. - The fill disturbance is assumed to be 2 ft. - Total new disturbance for reconstruction of existing roads is 6 ft
Overland Vehicle Paths	- The disturbance for overland vehicle paths is assumed to be the widths of the tracks on the drill rigs. - At 2.5 ft width per track, 5 ft of disturbance per linear ft was assumed.

APPENDIX C

**DETAILED DESCRIPTION
OF CHARACTERIZATION
SITES, ROAD ACCESS
AND ACTIVITIES**

Appendix C-1. Detailed Description of Characterization Sites and Activities (REV2 June 25, 2013)

Characterization Site	Characterization Activities	Location (Township, Range, Section)	Northing	Easting	Estimated Disturbance (feet ²)	Facility Description	Equipment Used	Phasing/Abandonment
CS-1	Geotech Borehole: 1001	T23S, R16E Sec. 4	166120	1075500	2,400	80 ft x 30 ft area for equipment and storage	<u>Borehole (Track Mounted Drill Rig):</u> 1 - CME 850/1250 Tracked Drill Rig or equivalent 1 - Air Compressor 1 - Tilt Hopper 1 - Morooka Support RigWater/Pipe Carrier	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Up to 2 weeks Concurrent Reclamation: After completion of drilling and testing activities the area will be reclaimed. Closure: Drill hole abandonment will be conducted in accordance with ACC R12-15, ARS Title 45, Chapter 2, Article 10, as administered by the ADWR. Cleared areas will be ripped and seeded with Forest Service-approved mix.
CS-2	Geotech Borehole: 1004 Test Pit: TP-1 Monitoring Well: MW-06	T23S, R16E Sec. 3	172787	1081760	5,500	110 ft x 50 ft drill pad area for equipment, storage, grading, fill, and mud pits	<u>Borehole (Track Mounted Drill Rig):</u> 1 - CME 850/1250 Tracked Drill Rig or equivalent 1 - Air Compressor 1 - Tilt Hopper 1 - Morooka Support RigWater/Pipe Carrier <u>Test Pit (Track Excavator):</u> 1 - Track Excavator 1 - Shovel 5 - 5-Gallon Bucket 1 - 4WD Pick-Up Truck <u>Monitoring Well (Wheeled Drill Rig):</u> 1 – Wheel or Track Mounted Drill Rig 1 – Pipe Truck 1 – Support Trailer 1 - Optional Mud Pump 1 - Air Compressor 1 - Optional Mud System 1 - Tank/Pit	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Geotech Borehole: Up to 2 weeks; Test Pit: Up to 1 day; Monitoring Well: 15 years ¹ Concurrent Reclamation: After completion of drilling and testing activities materials excavated from the test pit will be returned to the pit and compacted as needed and the pad will be graded and reclaimed. Closure: Drill hole and monitoring well abandonment will be conducted in accordance with ACC R12-15, ARS Title 45, Chapter 2, Article 10, as administered by the ADWR. Cleared areas will be ripped and seeded with Forest Service-approved mix ² .
CS-3	Geotech Borehole: 1005 Test Pit: TP-15	T23S, R16E Sec. 2	167239	1087280	2,400	80 ft x 30 ft area for equipment and storage	<u>Borehole (Track Mounted Drill Rig):</u> 1 - CME 850/1250 Tracked Drill Rig or equivalent 1 - Air Compressor 1 - Tilt Hopper 1 - Morooka Support RigWater/Pipe Carrier <u>Test Pit (Track Excavator):</u> 1 - Track Excavator 1 - Shovel 5 - 5-Gallon Bucket 1 - 4WD Pick-Up Truck	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Geotech Borehole: Up to 2 weeks; Test Pit: Up to 1 day Concurrent Reclamation: After completion of drilling and testing activities materials excavated from the test pit will be returned to the pit and compacted as needed and the area will be reclaimed. Closure: Drill hole abandonment will be conducted in accordance with ACC R12-15, ARS Title 45, Chapter 2, Article 10, as administered by the ADWR. Cleared areas will be ripped and seeded with Forest Service-approved mix.
CS-4	Geotech Borehole: 1006	T23S, R16E Sec. 2	167004	1084460	2,400	80 ft x 30 ft area for equipment and storage	<u>Borehole (Track Mounted Drill Rig):</u> 1 - CME 850/1250 Tracked Drill Rig or equivalent 1 - Air Compressor 1 - Tilt Hopper 1 - Morooka Support RigWater/Pipe Carrier	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Up to 2 weeks Concurrent Reclamation: After completion of drilling and testing activities the area will be reclaimed. Closure: Drill hole abandonment will be conducted in accordance with ACC R12-15, ARS Title 45, Chapter 2, Article 10, as administered by the ADWR. Cleared areas will be ripped and seeded with Forest Service-approved mix.

Appendix C-1. Detailed Description of Characterization Sites and Activities (REV2 June 25, 2013)

Characterization Site	Characterization Activities	Location (Township, Range, Section)	Northing	Easting	Estimated Disturbance (feet ²)	Facility Description	Equipment Used	Phasing/Abandonment
CS-5	Geotech Borehole: 1012	T23S, R16E Sec. 11	163630	1082990	2,400	80 ft x 30 ft area for equipment and storage	<u>Borehole (Track Mounted Drill Rig):</u> 1 - CME 850/1250 Tracked Drill Rig1 - Air Compressor1 - Tilt Hopper1 - Morooka Support RigWater/Pipe Carrier	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Up to 2 weeks Concurrent Reclamation: After completion of drilling and testing activities the area will be reclaimed. Closure: Drill hole abandonment will be conducted in accordance with ACC R12-15, ARS Title 45, Chapter 2, Article 10, as administered by the ADWR. Cleared areas will be ripped and seeded with Forest Service-approved mix.
CS-6	Geotech Borehole: 1020	T23S, R16E Sec. 10	161457	1079530	2,400	80 ft x 30 ft area for equipment and storage	<u>Borehole (Track Mounted Drill Rig):</u> 1 - CME 850/1250 Tracked Drill Rig or equivalent 1 - Air Compressor 1 - Tilt Hopper 1 - Morooka Support RigWater/Pipe Carrier	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Up to 2 weeks Concurrent Reclamation: After completion of drilling and testing activities the area will be reclaimed. Closure: Drill hole abandonment will be conducted in accordance with ACC R12-15, ARS Title 45, Chapter 2, Article 10, as administered by the ADWR. Cleared areas will be ripped and seeded with Forest Service-approved mix.
CS-7	Geotech Borehole: BH-1	T23S, R16E Sec. 2	173045	1085020	2,400	80 ft x 30 ft area for equipment and storage	<u>Borehole (Track Mounted Drill Rig):</u> 1 - CME 850/1250 Tracked Drill Rig or equivalent 1 - Air Compressor 1 - Tilt Hopper 1 - Morooka Support RigWater/Pipe Carrier	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Up to 2 weeks Concurrent Reclamation: After completion of drilling and testing activities the area will be reclaimed. Closure: Drill hole abandonment will be conducted in accordance with ACC R12-15, ARS Title 45, Chapter 2, Article 10, as administered by the ADWR. Cleared areas will be ripped and seeded with Forest Service-approved mix.
CS-8	Geotech Borehole: BH-5	T23S, R16E Sec. 2	169375	1087150	2,400	80 ft x 30 ft area for equipment and storage	<u>Borehole (Track Mounted Drill Rig):</u> 1 - CME 850/1250 Tracked Drill Rig or equivalent 1 - Air Compressor 1 - Tilt Hopper 1 - Morooka Support RigWater/Pipe Carrier	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Up to 2 weeks Concurrent Reclamation: After completion of drilling and testing activities the area will be reclaimed. Closure: Drill hole abandonment will be conducted in accordance with ACC R12-15, ARS Title 45, Chapter 2, Article 10, as administered by the ADWR. Cleared areas will be ripped and seeded with Forest Service-approved mix.
CS-9	Geotech Borehole: BH-8	T23S, R16E Sec. 2	167565	1085450	2,400	80 ft x 30 ft area for equipment and storage	<u>Borehole (Track Mounted Drill Rig):</u> 1 - CME 850/1250 Tracked Drill Rig or equivalent 1 - Air Compressor 1 - Tilt Hopper 1 - Morooka Support RigWater/Pipe Carrier	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Up to 2 weeks Concurrent Reclamation: After completion of drilling and testing activities the area will be reclaimed. Closure: Drill hole abandonment will be conducted in accordance with ACC R12-15, ARS Title 45, Chapter 2, Article 10, as administered by the ADWR. Cleared areas will be ripped and seeded with Forest Service-approved mix.

Appendix C-1. Detailed Description of Characterization Sites and Activities (REV2 June 25, 2013)

Characterization Site	Characterization Activities	Location (Township, Range, Section)	Northing	Easting	Estimated Disturbance (feet ²)	Facility Description	Equipment Used	Phasing/Abandonment
CS-10	Geotech Borehole: BH-10	T23S, R16E Sec. 2	167417	1082680	2,400	80 ft x 30 ft area for equipment and storage	<u>Borehole (Track Mounted Drill Rig):</u> 1 - CME 850/1250 Tracked Drill Rig or equivalent 1 - Air Compressor 1 - Tilt Hopper 1 - Morooka Support RigWater/Pipe Carrier	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Up to 2 weeks Concurrent Reclamation: After completion of drilling and testing activities the area will be reclaimed. Closure: Drill hole abandonment will be conducted in accordance with ACC R12-15, ARS Title 45, Chapter 2, Article 10, as administered by the ADWR. Cleared areas will be ripped and seeded with Forest Service-approved mix.
CS-11	Geotech Borehole: BH-11 Test Pit: TP-23 Monitoring Well: MW-8	T23S, R16E Sec. 3	165886	1082640	2,400	80 ft x 30 ft drill pad for equipment storage and, mud pit. Note MW-8 is the only hydrological borehole that will be drilled with a track-mounted rig.	<u>Borehole and Monitoring Well (Track Mounted Drill Rig):</u> 1 - CME 850/1250 Tracked Drill Rig or equivalent 1 - Air Compressor 1 - Tilt Hopper 1 - Morooka Support RigWater/Pipe Carrier <u>Test Pit (Track Excavator):</u> 1 - Track Excavator 1 - Shovel 5 - 5-Gallon Bucket 1 - 4WD Pick-Up Truck	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Geotech Borehole: Up to 2 weeks; Test Pit: Up to 1 day; Monitoring Well: 15 years ¹ Concurrent Reclamation: After completion of drilling and testing activities excavated materials from the test pit will be returned to the pit and compacted if necessary and the pad will be graded and reclaimed. Closure: Drill hole and monitoring well abandonment will be conducted in accordance with ACC R12-15, ARS Title 45, Chapter 2, Article 10, as administered by the ADWR. Cleared areas will be ripped and seeded with Forest Service-approved mix ² .
CS-12	Geotech Borehole: BH-17	T23S, R16E Sec. 4	170033	1076170	2,400	80 ft x 30 ft area for equipment and storage	<u>Borehole (Track Mounted Drill Rig):</u> 1 - CME 850/1250 Tracked Drill Rig or equivalent 1 - Air Compressor 1 - Tilt Hopper 1 - Morooka Support RigWater/Pipe Carrier	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Up to 2 weeks Concurrent Reclamation: After completion of drilling and testing activities the area will be reclaimed. Closure: Drill hole abandonment will be conducted in accordance with ACC R12-15, ARS Title 45, Chapter 2, Article 10, as administered by the ADWR. Cleared areas will be ripped and seeded with Forest Service-approved mix.
CS-13	Geotech Borehole: BH-12	T23S, R16E Sec. 10	163108	1078660	400	20 ft x 20 ft for equipment and storage	<u>Borehole (Winkie Drill Rig):</u> 1 - Portable Winkie Drill 1 - Gas Powered Water Pump 1 - 55 Gallon Tank 1 - Drill Pipe Cart	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Up to 2 weeks Concurrent Reclamation: After completion of drilling and testing activities the area will be reclaimed. Closure: Drill hole abandonment will be conducted in accordance with ACC R12-15, ARS Title 45, Chapter 2, Article 10, as administered by the ADWR. Cleared areas will be ripped and seeded with Forest Service-approved mix.
CS-14	Geotech Borehole: 1017	T23S, R16E Sec. 10	165319	1078200	400	20 ft x 20 ft for equipment and storage	<u>Borehole (Winkie Drill Rig):</u> 1 - Portable Winkie Drill 1 - Gas Powered Water Pump 1 - 55 Gallon Tank 1 - Drill Pipe Cart	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Up to 2 weeks Concurrent Reclamation: After completion of drilling and testing activities the area will be reclaimed. Closure: Drill hole abandonment will be conducted in accordance with ACC R12-15, ARS Title 45, Chapter 2, Article 10, as administered by the ADWR. Cleared areas will be ripped and seeded with Forest Service-approved mix.

Appendix C-1. Detailed Description of Characterization Sites and Activities (REV2 June 25, 2013)

Characterization Site	Characterization Activities	Location (Township, Range, Section)	Northing	Easting	Estimated Disturbance (feet ²)	Facility Description	Equipment Used	Phasing/Abandonment
CS-15	Geotech Borehole: 1018	T23S, R16E Sec. 10	164610	1077400	400	20 ft x 20 ft for equipment and storage	<u>Borehole (Winkie Drill Rig):</u> 1 - Portable Winkie Drill 1 - Gas Powered Water Pump 1 - 55 Gallon Tank 1 - Drill Pipe Cart	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Up to 2 weeks Concurrent Reclamation: After completion of drilling and testing activities the area will be reclaimed. Closure: Drill hole abandonment will be conducted in accordance with ACC R12-15, ARS Title 45, Chapter 2, Article 10, as administered by the ADWR. Cleared areas will be ripped and seeded with Forest Service-approved mix.
CS-16	Test Pit: TP-7	T23S, R16E Sec. 2	169569	1083360	400	20 ft x 20 ft for equipment, excavation trench and temporary stockpile	<u>Test Pit (Track Excavator):</u> 1 - Track Excavator1 - Shovel1 - 5-Gallon Bucket5 - 4WD Pick-Up Truck	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Up to 1 day Concurrent Reclamation: After completion of activities the excavated materials will be returned to the pit and compacted as needed. Closure: Cleared areas will be ripped and seeded with Forest Service-approved mix.
CS-17	Test Pit: TP-8	T23S, R16E Sec. 2	169745	1084120	400	20 ft x 20 ft for equipment, excavation trench and temporary stockpile	<u>Test Pit (Track Excavator):</u> 1 - Track Excavator 1 - Shovel 5 - 5-Gallon Bucket 1 - 4WD Pick-Up Truck	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Up to 1 day Concurrent Reclamation: After completion of activities the excavated materials will be returned to the pit and compacted as needed. Closure: Cleared areas will be ripped and seeded with Forest Service-approved mix.
CS-18	Test Pit: TP-9	T23S, R16E Sec. 2	169311	1085710	400	20 ft x 20 ft for equipment, excavation trench and temporary stockpile	<u>Test Pit (Track Excavator):</u> 1 - Track Excavator 1 - Shovel 5 - 5-Gallon Bucket 1 - 4WD Pick-Up Truck	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Up to 1 day Concurrent Reclamation: After completion of activities the excavated materials will be returned to the pit and compacted as needed. Closure: Cleared areas will be ripped and seeded with Forest Service-approved mix.
CS-19	Test Pit: TP-10	T23S, R16E Sec. 2	168373	1083580	400	20 ft x 20 ft for equipment, excavation trench and temporary stockpile	<u>Test Pit (Track Excavator):</u> 1 - Track Excavator 1 - Shovel 5 - 5-Gallon Bucket 1 - 4WD Pick-Up Truck	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Up to 1 day Concurrent Reclamation: After completion of activities the excavated materials will be returned to the pit and compacted as needed. Closure: Cleared areas will be ripped and seeded with Forest Service-approved mix.
CS-20	Geotech Borehole: BH-24 Test Pit: TP-17	T23S, R16E Sec. 2	166420	1084250	2400	80 ft x 30 ft area for equipment and storage	<u>Borehole (Track Mounted Drill Rig):</u> 1 - CME 850/1250 Tracked Drill Rig or equivalent 1 - Air Compressor 1 - Tilt Hopper 1 - Morooka Support RigWater/Pipe Carrier <u>Test Pit (Track Excavator):</u> 1 - Track Excavator 1 - Shovel 5 - 5-Gallon Bucket 1 - 4WD Pick-Up Truck	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Geotech Borehole: Up to 2 weeks; Test Pit: Up to 1 day Concurrent Reclamation: After completion of drilling and testing activities materials excavated from the test pit will be returned to the pit and compacted as needed and the area will be reclaimed. Closure: Drill hole abandonment will be conducted in accordance with ACC R12-15, ARS Title 45, Chapter 2, Article 10, as administered by the ADWR. Cleared areas will be ripped and seeded with Forest Service-approved mix.

Appendix C-1. Detailed Description of Characterization Sites and Activities (REV2 June 25, 2013)

Characterization Site	Characterization Activities	Location (Township, Range, Section)	Northing	Easting	Estimated Disturbance (feet ²)	Facility Description	Equipment Used	Phasing/Abandonment
CS-21	Geotech Borehole: BH-23 Test Pit: TP-18	T23S, R16E Sec. 11	164704	1084770	2,400	80 ft x 30 ft area for equipment and storage	<u>Borehole (Track Mounted Drill Rig):</u> 1 - CME 850/1250 Tracked Drill Rig or equivalent 1 - Air Compressor 1 - Tilt Hopper 1 - Morooka Support RigWater/Pipe Carrier <u>Test Pit (Track Excavator):</u> 1 - Track Excavator 1 - Shovel 5 - 5-Gallon Bucket 1 - 4WD Pick-Up Truck	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Up to 2 weeks Concurrent Reclamation: After completion of drilling and testing activities materials excavated from the test pit will be returned to the pit and compacted as needed and the pad will be reclaimed. Closure: Drill hole abandonment will be conducted in accordance with ACC R12-15, ARS Title 45, Chapter 2, Article 10, as administered by the ADWR. Cleared areas will be ripped and seeded with Forest Service-approved mix.
CS-22	Test Pit: TP-20	T23S, R16E Sec. 10	163117	1082060	400	20 ft x 20 ft for equipment, excavation trench and temporary stockpile	<u>Test Pit (Track Excavator):</u> 1 - Track Excavator 1 - Shovel 5 - 5-Gallon Bucket 1 - 4WD Pick-Up Truck	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Up to 1 day Concurrent Reclamation: After completion of activities the excavated materials will be returned to the pit and compacted as needed. Closure: Cleared areas will be ripped and seeded with Forest Service-approved mix.
CS-23	Test Pit: TP-21	T23S, R16E Sec. 10	162084	1081420	400	20 ft x 20 ft for equipment, excavation trench and temporary stockpile	<u>Test Pit (Track Excavator):</u> 1 - Track Excavator 1 - Shovel 5 - 5-Gallon Bucket 1 - 4WD Pick-Up Truck	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Up to 1 day Concurrent Reclamation: After completion of activities the excavated materials will be returned to the pit and compacted as needed. Closure: Cleared areas will be ripped and seeded with Forest Service-approved mix.
CS-24	Geotech Borehole: BH-21 Test Pit: TP-22	T23S, R16E Sec. 10	165069	1080700	2,400	80 ft x 30 ft area for equipment and storage	<u>Borehole (Track Mounted Drill Rig):</u> 1 - CME 850/1250 Tracked Drill Rig or equivalent 1 - Air Compressor 1 - Tilt Hopper 1 - Morooka Support RigWater/Pipe Carrier <u>Test Pit (Track Excavator):</u> 1 - Track Excavator 1 - Shovel 5 - 5-Gallon Bucket 1 - 4WD Pick-Up Truck	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Geotech Borehole: Up to 2 weeks; Test Pit: Up to 1 day Concurrent Reclamation: After completion of drilling and testing activities materials excavated from the test pit will be returned to the pit and compacted as needed and the pad will be reclaimed. Closure: Drill hole abandonment will be conducted in accordance with ACC R12-15, ARS Title 45, Chapter 2, Article 10, as administered by the ADWR. Cleared areas will be ripped and seeded with Forest Service-approved mix.
CS-25	Test Pit: TP-24	T23S, R16E Sec. 3	168720	1081410	400	20 ft x 20 ft for equipment, excavation trench and temporary stockpile	<u>Test Pit (Track Excavator):</u> 1 - Track Excavator 1 - Shovel 5 - 5-Gallon Bucket 1 - 4WD Pick-Up Truck	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Up to 1 day Concurrent Reclamation: After completion ofactivities excavated materials from the test pit will be returned to the pit and compacted as needed. Closure: Cleared areas will be ripped and seeded with Forest Service-approved mix.

Appendix C-1. Detailed Description of Characterization Sites and Activities (REV2 June 25, 2013)

Characterization Site	Characterization Activities	Location (Township, Range, Section)	Northing	Easting	Estimated Disturbance (feet ²)	Facility Description	Equipment Used	Phasing/Abandonment
CS-26	Geotech Borehole: BH-6 Test Pit: TP-14	T23S, R16E Sec. 1	168129	1088130	2,400	80 ft x 30 ft area for equipment and storage	<u>Borehole (Wheeled Drill Rig):</u> 1 -Wheel Mounted Drill Rig 1 - Optional Mud Pump 1 - Air Compressor 1 - Optional Mud System 1 - Tank/Pit 2 - Support Vehicles <u>Test Pit (Track Excavator):</u> 1 - Track Excavator 1 - Shovel 5 - 5-Gallon Bucket 1 - 4WD Pick-Up Truck	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Geotech Borehole: Up to 2 weeks; Test Pit: Up to 1 day Concurrent Reclamation: After completion of drilling and testing activities materials excavated from the test pit will be returned to the pit and compacted as needed and the pad will be reclaimed. Closure: Drill hole abandonment will be conducted in accordance with ACC R12-15, ARS Title 45, Chapter 2, Article 10, as administered by the ADWR. Cleared areas will be ripped and seeded with Forest Service-approved mix.
CS-27	Monitoring Well: MW-9 Geotech Borehole: BH-9 Test Pit: TP-16	T23S, R16E Sec. 2	166291	1086040	5,500	110 ft x 50 ft drill pad area for equipment, storage, grading, fill, and mud pits	<u>Monitoring Well (Wheeled Drill Rig):</u> 1 -Wheel or Track Mounted Drill Rig 1 - Optional Mud Pump 1 - Air Compressor 1 - Optional Mud System 1 - Tank/Pit <u>Borehole (Track Mounted Drill Rig):</u> 1 - CME 850/1250 Tracked Drill Rig or equivalent 1 - Air Compressor 1 - Tilt Hopper 1 - Morooka Support RigWater/Pipe Carrier <u>Test Pit (Track Excavator):</u> 1 - Track Excavator 1 - Shovel 5 - 5-Gallon Bucket 1 - 4WD Pick-Up Truck	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Geotech Borehole: Up to 2 weeks; Test Pit: Up to 1 day; Monitoring Well: 15 years ¹ Concurrent Reclamation: After completion of drilling and testing activities materials excavated from the test pit will be returned to the pit and compacted as needed and the pad will be graded and reclaimed. Closure: Drill hole and monitoring well abandonment will be conducted in accordance with ACC R12-15, ARS Title 45, Chapter 2, Article 10, as administered by the ADWR. Cleared areas will be ripped and seeded with Forest Service-approved mix ² .
CS-28	Exploration Borehole: Z-107 Geotech Borehole: BH-18	T23S, R16E Sec. 3	168000	1077400	4,500	90 ft x 50 ft drill pad area for equipment, storage, grading, fill, and mud pits	<u>Exploration (Wheeled Drill Rig):</u> 1 -Wheel Mounted Drill Rig 1 - Optional Mud Pump 1 - Air Compressor 1 - Optional Mud System 1 - Tank/Pit <u>Borehole (Track Mounted Drill Rig):</u> 1 - CME 850/1250 Tracked Drill Rig or equivalent 1 - Air Compressor 1 - Tilt Hopper 1 - Morooka Support RigWater/Pipe Carrier	Initiation Within 2 years of Plan acceptance Length of Occupancy: Geotech Borehole: Up to 2 weeks; Exploration Borehole: Up to 3 weeks Concurrent Reclamation: After completion of drilling and testing activities the pad will be graded and reclaimed. Closure: Drill hole abandonment will be conducted in accordance with ACC R12-15, ARS Title 45, Chapter 2, Article 10, as administered by the ADWR. Cleared areas will be ripped and seeded with Forest Service-approved mix.
CS-29	Exploration Borehole: Z-102	T23S, R16E Sec. 4	169100	1077000	4,500	90 ft x 50 ft drill pad area for equipment, storage, grading, fill, and mud pits	<u>Exploration (Wheeled Drill Rig):</u> 1 -Wheel Mounted Drill Rig 1 - Optional Mud Pump 1 - Air Compressor 1 - Optional Mud System 1 - Tank/Pit	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Up to 3 weeks Concurrent Reclamation: After completion of drilling and testing activities the pad will be graded and reclaimed. Closure: Drill hole abandonment will be conducted in accordance with ACC R12-15, ARS Title 45, Chapter 2, Article 10, as administered by the ADWR. Cleared areas will be ripped and seeded with Forest Service-approved mix.

Appendix C-1. Detailed Description of Characterization Sites and Activities (REV2 June 25, 2013)

Characterization Site	Characterization Activities	Location (Township, Range, Section)	Northing	Easting	Estimated Disturbance (feet ²)	Facility Description	Equipment Used	Phasing/Abandonment
CS-30	Monitoring Well: MW-05	T23S, R16E Sec. 10	160530	1077890	5,500	110 ft x 50 ft drill pad area for equipment, storage, grading, fill, and mud pits	<u>Monitoring Well (Wheeled Drill Rig):</u> 1 -Wheel or Track Mounted Drill Rig 1 - Optional Mud Pump 1 - Air Compressor 1 - Optional Mud System 1 - Tank/Pit	Initiation: Within 2 years of Plan acceptance Length of Occupancy: 15 years ¹ Concurrent Reclamation: After completion of drilling and testing activities the area will be reclaimed. Closure: Monitoring well abandonment will be conducted in accordance with ACC R12-15, ARS Title 45, Chapter 2, Article 10, as administered by the ADWR. Cleared areas will be ripped and seeded with Forest Service-approved mix ² .
CS-31	Monitoring Well: MW-10	T23S, R16E Sec. 9	165169	1074990	5,500	110 ft x 50 ft drill pad area for equipment, storage, grading, fill, and mud pits	<u>Monitoring Well (Wheeled Drill Rig):</u> 1 -Wheel or Track Mounted Drill Rig 1 - Optional Mud Pump 1 - Air Compressor 1 - Optional Mud System 1 - Tank/Pit	Initiation: Within 2 years of Plan acceptance Length of Occupancy: 15 years ¹ Concurrent Reclamation: After completion of drilling and testing activities the area will be reclaimed. Closure: Monitoring well abandonment will be conducted in accordance with ACC R12-15, ARS Title 45, Chapter 2, Article 10, as administered by the ADWR. Cleared areas will be ripped and seeded with Forest Service-approved mix ² .
CS-32	Monitoring Well: MW-11 Test Pit: TP-19	T23S, R16E Sec. 11	164099	1083810	5,500	110 ft x 50 ft drill pad area for equipment, storage, grading, fill, and mud pits	<u>Monitoring Well (Wheeled Drill Rig):</u> 1 -Wheel or Track Mounted Drill Rig 1 - Optional Mud Pump 1 - Air Compressor 1 - Optional Mud System 1 - Tank/Pit <u>Test Pit (Track Excavator):</u> 1 - Track Excavator 1 - Shovel 5 - 5-Gallon Bucket 1 - 4WD Pick-Up Truck	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Test Pit: Up to 1 day; Monitoring Well: 15 years ¹ Concurrent Reclamation: After completion of drilling and testing activities excavated materials from the test pit will be returned to the pit and compacted as needed and the area will be reclaimed. Closure: Monitoring well abandonment will be conducted in accordance with ACC R12-15, ARS Title 45, Chapter 2, Article 10, as administered by the ADWR. Cleared areas will be ripped and seeded with Forest Service-approved mix ² .
CS-33	Monitoring Well: MW-12	T23S, R16E Sec. 4	171840	1075190	5, 500	110 ft x 50 ft drill pad area for equipment, storage, grading, fill, and mud pits	<u>Monitoring Well (Wheeled Drill Rig):</u> 1 -Wheel or Track Mounted Drill Rig 1 - Optional Mud Pump 1 - Air Compressor 1 - Optional Mud System 1 - Tank/Pit	Initiation: Within 2 years of Plan acceptance Length of Occupancy: 15 years ¹ Concurrent Reclamation: After completion of drilling and testing activities the area will be reclaimed. Closure: Monitoring well abandonment will be conducted in accordance with ACC R12-15, ARS Title 45, Chapter 2, Article 10, as administered by the ADWR. Cleared areas will be ripped and seeded with Forest Service-approved mix ² .
CS-34	Monitoring Well: MW-13	T23S, R16E Sec. 5	168100	1070570	5,500	110 ft x 50 ft drill pad area for equipment, storage, grading, fill, and mud pits	<u>Monitoring Well (Wheeled Drill Rig):</u> 1 -Wheel or Track Mounted Drill Rig 1 - Optional Mud Pump 1 - Air Compressor 1 - Optional Mud System 1 - Tank/Pit	Initiation: Within 2 years of Plan acceptance Length of Occupancy: 15 years ¹ Concurrent Reclamation: After completion of drilling and testing activities the area will be reclaimed. Closure: Monitoring well abandonment will be conducted in accordance with ACC R12-15, ARS Title 45, Chapter 2, Article 10, as administered by the ADWR. Cleared areas will be ripped and seeded with Forest Service-approved mix ² .

Appendix C-1. Detailed Description of Characterization Sites and Activities (REV2 June 25, 2013)

Characterization Site	Characterization Activities	Location (Township, Range, Section)	Northing	Easting	Estimated Disturbance (feet ²)	Facility Description	Equipment Used	Phasing/Abandonment
CS-35	Monitoring Well: MW-15	T23S, R16E Sec. 15	160021	1081110	5,500	110 ft x 50 ft drill pad area for equipment, storage, grading, fill, and mud pits	<u>Monitoring Well (Wheeled Drill Rig):</u> 1 Wheel or Track Mounted Drill Rig 1 - Optional Mud Pump 1 - Air Compressor 1 - Optional Mud System 1 - Tank/Pit	Initiation: Within 2 years of Plan acceptance Length of Occupancy: 15 years ¹ Concurrent Reclamation: After completion of drilling and testing activities the area will be reclaimed. Closure: Monitoring well abandonment will be conducted in accordance with ACC R12-15, ARS Title 45, Chapter 2, Article 10, as administered by the ADWR. Cleared areas will be ripped and seeded with Forest Service-approved mix ² .
CS-36	Monitoring Well: MW-18	T23S, R16E Sec. 12	163661	1089130	5,500	110 ft x 50 ft drill pad area for equipment, storage, grading, fill, and mud pits	<u>Monitoring Well (Wheeled Drill Rig):</u> 1 -Wheel or Track Mounted Drill Rig 1 - Optional Mud Pump 1 - Air Compressor 1 - Optional Mud System 1 - Tank/Pit	Initiation: Within 2 years of Plan acceptance Length of Occupancy: 15 years ¹ Concurrent Reclamation: After completion of drilling and testing activities the area will be reclaimed. Closure: Monitoring well abandonment will be conducted in accordance with ACC R12-15, ARS Title 45, Chapter 2, Article 10, as administered by the ADWR. Cleared areas will be ripped and seeded with Forest Service-approved mix ² .
CS-37	Monitoring Well: MW-19	T22S, R16E Sec. 35	176645	1086670	5,500	110 ft x 50 ft drill pad area for equipment, storage, grading, fill, and mud pits	<u>Monitoring Well (Wheeled Drill Rig):</u> 1 -Wheel or Track Mounted Drill Rig 1 - Optional Mud Pump 1 - Air Compressor 1 - Optional Mud System 1 - Tank/Pit	Initiation: Within 2 years of Plan acceptance Length of Occupancy: 15 years ¹ Concurrent Reclamation: After completion of drilling and testing activities the area will be reclaimed. Closure: Monitoring well abandonment will be conducted in accordance with ACC R12-15, ARS Title 45, Chapter 2, Article 10, as administered by the ADWR. Cleared areas will be ripped and seeded with Forest Service-approved mix ² .
CS-38	Monitoring Well: MW-20 Geotech Borehole: BH-19	T22S, R16E Sec. 34	174230	1078600	5,500	110 ft x 50 ft drill pad area for equipment, storage, grading, fill, and mud pits	<u>Monitoring Well (Wheeled Drill Rig):</u> 1 -Wheel or Track Mounted Drill Rig 1 - Optional Mud Pump 1 - Air Compressor 1 - Optional Mud System 1 - Tank/Pit <u>Borehole (Track Mounted Drill Rig):</u> 1 - CME 850/1250 Tracked Drill Rig or equivalent 1 - Air Compressor 1 - Tilt Hopper 1 - Morooka Support RigWater/Pipe Carrier	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Geotech Borehole: Up to 2 weeks; Monitoring Well: 15 years ¹ Concurrent Reclamation: After completion of drilling and testing activities the area will be reclaimed. Closure: Drill hole and monitoring well abandonment will be conducted in accordance with ACC R12-15, ARS Title 45, Chapter 2, Article 10, as administered by the ADWR. Cleared areas will be ripped and seeded with Forest Service-approved mix ² .
CS-39	Exploration Borehole: Z-071	T23S, R16E Sec. 4	168300	1076140	4,500	90 ft x 50 ft drill pad area for equipment, storage, grading, fill, and mud pits	<u>Exploration (Wheeled Drill Rig):</u> 1 -Wheel Mounted Drill Rig 1 - Optional Mud Pump 1 - Air Compressor 1 - Optional Mud System 1 - Tank/Pit	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Up to 3 weeks Concurrent Reclamation: After completion of drilling and testing activities the pad will be graded and reclaimed. Closure: Drill hole abandonment will be conducted in accordance with ACC R12-15, ARS Title 45, Chapter 2, Article 10, as administered by the ADWR. Cleared areas will be ripped and seeded with Forest Service-approved mix.

Appendix C-1. Detailed Description of Characterization Sites and Activities (REV2 June 25, 2013)

Characterization Site	Characterization Activities	Location (Township, Range, Section)	Northing	Easting	Estimated Disturbance (feet ²)	Facility Description	Equipment Used	Phasing/Abandonment
CS-40	Exploration Borehole: Z-075	T23S, R16E Sec. 4	168600	1076300	4,500	90 ft x 50 ft drill pad area for equipment, storage, grading, fill, and mud pits	<u>Exploration (Wheeled Drill Rig):</u> 1 -Wheel Mounted Drill Rig 1 - Optional Mud Pump 1 - Air Compressor 1 - Optional Mud System 1 - Tank/Pit	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Up to 3 weeks Concurrent Reclamation: After completion of drilling and testing activities the pad will be graded and reclaimed. Closure: Drill hole abandonment will be conducted in accordance with ACC R12-15, ARS Title 45, Chapter 2, Article 10, as administered by the ADWR. Cleared areas will be ripped and seeded with Forest Service-approved mix.
CS-41	Exploration Borehole: Z-079	T23S, R16E Sec. 4	167500	1076350	4,500	90 ft x 50 ft drill pad area for equipment, storage, grading, fill, and mud pits	<u>Exploration (Wheeled Drill Rig):</u> 1 -Wheel Mounted Drill Rig 1 - Optional Mud Pump 1 - Air Compressor 1 - Optional Mud System 1 - Tank/Pit	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Up to 3 weeks Concurrent Reclamation: After completion of drilling and testing activities the pad will be graded and reclaimed. Closure: Drill hole abandonment will be conducted in accordance with ACC R12-15, ARS Title 45, Chapter 2, Article 10, as administered by the ADWR. Cleared areas will be ripped and seeded with Forest Service-approved mix.
CS-42	Exploration Borehole: Z-087	T23S, R16E Sec. 4	167700	1076600	4,500	90 ft x 50 ft drill pad area for equipment, storage, grading, fill, and mud pits	<u>Exploration (Wheeled Drill Rig):</u> 1 -Wheel Mounted Drill Rig 1 - Optional Mud Pump 1 - Air Compressor 1 - Optional Mud System 1 - Tank/Pit	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Up to 3 weeks Concurrent Reclamation: After completion of drilling and testing activities the pad will be graded and reclaimed. Closure: Drill hole abandonment will be conducted in accordance with ACC R12-15, ARS Title 45, Chapter 2, Article 10, as administered by the ADWR. Cleared areas will be ripped and seeded with Forest Service-approved mix.
CS-43	Exploration Borehole: Z-088	T23S, R16E Sec. 4	168010	1076600	4,500	90 ft x 50 ft drill pad area for equipment, storage, grading, fill, and mud pits	<u>Exploration (Wheeled Drill Rig):</u> 1 -Wheel Mounted Drill Rig 1 - Optional Mud Pump 1 - Air Compressor 1 - Optional Mud System 1 - Tank/Pit	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Up to 3 weeks Concurrent Reclamation: After completion of drilling and testing activities the pad will be graded and reclaimed. Closure: Drill hole abandonment will be conducted in accordance with ACC R12-15, ARS Title 45, Chapter 2, Article 10, as administered by the ADWR. Cleared areas will be ripped and seeded with Forest Service-approved mix.
CS-44	Exploration Borehole: Z-089	T23S, R16E Sec. 4	168900	1076600	4,500	90 ft x 50 ft drill pad area for equipment, storage, grading, fill, and mud pits	<u>Exploration (Wheeled Drill Rig):</u> 1 -Wheel Mounted Drill Rig 1 - Optional Mud Pump 1 - Air Compressor 1 - Optional Mud System 1 - Tank/Pit	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Up to 3 weeks Concurrent Reclamation: After completion of drilling and testing activities the pad will be graded and reclaimed. Closure: Drill hole abandonment will be conducted in accordance with ACC R12-15, ARS Title 45, Chapter 2, Article 10, as administered by the ADWR. Cleared areas will be ripped and seeded with Forest Service-approved mix.
CS-45	Exploration Borehole: Z-094	T23S, R16E Sec. 4	168490	1076950	4,500	90 ft x 50 ft drill pad area for equipment, storage, grading, fill, and mud pits	<u>Exploration (Wheeled Drill Rig):</u> 1 -Wheel Mounted Drill Rig 1 - Optional Mud Pump 1 - Air Compressor 1 - Optional Mud System 1 - Tank/Pit	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Up to 3 weeks Concurrent Reclamation: After completion of drilling and testing activities the pad will be graded and reclaimed. Closure: Drill hole abandonment will be conducted in accordance with ACC R12-15, ARS Title 45, Chapter 2, Article 10, as administered by the ADWR. Cleared areas will be ripped and seeded with Forest Service-approved mix.

Appendix C-1. Detailed Description of Characterization Sites and Activities (REV2 June 25, 2013)								
Characterization Site	Characterization Activities	Location (Township, Range, Section)	Northing	Easting	Estimated Disturbance (feet ²)	Facility Description	Equipment Used	Phasing/Abandonment
CS-46	Exploration Borehole: Z-106	T23S, R16E Sec. 4	167630	1077300	4,500	90 ft x 50 ft drill pad area for equipment, storage, grading, fill, and mud pits	<u>Exploration (Wheeled Drill Rig):</u> 1 -Wheel Mounted Drill Rig 1 - Optional Mud Pump 1 - Air Compressor 1 - Optional Mud System 1 - Tank/Pit	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Up to 3 weeks Concurrent Reclamation: After completion of drilling and testing activities the pad will be graded and reclaimed. Closure: Drill hole abandonment will be conducted in accordance with ACC R12-15, ARS Title 45, Chapter 2, Article 10, as administered by the ADWR. Cleared areas will be ripped and seeded with Forest Service-approved mix.
CS-47	Geotech Borehole: BH-20	T23S, R16E Sec. 3	166964	1081510	400	20 ft x 20 ft for equipment and storage	<u>Borehole (Winkie Drill Rig):</u> 1 - Portable Winkie Drill 1 - Gas Powered Water Pump 1 - 55 Gallon Tank 1 - Drill Pipe Cart	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Up to 2 weeks Concurrent Reclamation: After completion of drilling and testing activities the area will be reclaimed through closure. Closure: Drill hole abandonment will be conducted in accordance with ACC R12-15, ARS Title 45, Chapter 2, Article 10, as administered by the ADWR. Cleared areas will be ripped and seeded with Forest Service-approved mix.
CS-48	Geotech Borehole: BH-22	T23S, R16E Sec. 10	163150	1081020	2,400	80 ft x 30 ft area for equipment and storage	<u>Borehole (Track Mounted Drill Rig):</u> 1 - CME 850/1250 Tracked Drill Rig or equivalent 1 - Air Compressor 1 - Tilt Hopper 1 - Morooka Support RigWater/Pipe Carrier	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Up to 2 weeks Concurrent Reclamation: After completion of drilling and testing activities the area will be reclaimed. Closure: Drill hole abandonment will be conducted in accordance with ACC R12-15, ARS Title 45, Chapter 2, Article 10, as administered by the ADWR. Cleared areas will be ripped and seeded with Forest Service-approved mix.

¹ Whereas approval of this Plan would be in effect for 2 years, it is anticipated that future renewals would cover long-term monitoring at monitoring wells.

² Roads and vehicular admittance up to the well head will be maintained to allow support vehicles to access monitoring wells; the remainder of the pads will be reclaimed and seeded with Forest Service-approved mix.

Appendix C-2. Detailed Description of Road Access and Activities						
Road ID	Road Type	Location (Township, Range, Section)	Estimated Disturbance (feet ²)	Facility Description	Equipment Used	Phasing/Abandonment
OVP 1	Overland Vehicle Path	T23S, R16E Sec. 2	9,500	1,900 linear feet of road - Track width: 5 ft	1 - Track hoe 1 - Front end loader	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Up to 2 weeks Concurrent Reclamation: Any new disturbance along these roads will be reclaimed using hand tools after use is completed.
OVP 2	Overland Vehicle Path	T23S, R16E Sec. 10	22,250	4,450 linear feet of road - Track width: 5 ft	1 - Track hoe 1 - Front end loader	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Up to 4 weeks Concurrent Reclamation: Any new disturbance along these roads will be reclaimed using hand tools after use is completed.
OVP 3	Overland Vehicle Path	T23S, R16E Sec. 2	6,800	1,360 linear feet of road - Track width: 5 ft	1 - Track hoe 1 - Front end loader	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Approximately 3-5 days Concurrent Reclamation: Any new disturbance along these roads will be reclaimed using hand tools after use is completed.
OVP 4	Overland Vehicle Path	T23S, R16E Sec. 2	4,750	950 linear feet of road - Track width: 5 ft	1 - Track hoe 1 - Front end loader	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Approximately 1-2 days Concurrent Reclamation: Any new disturbance along these roads will be reclaimed using hand tools after use is completed.
OVP 5	Overland Vehicle Path	T23S, R16E Sec. 1	6,200	1,240 linear feet of road - Track width: 5 ft	1 - Track hoe 1 - Front end loader	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Up to two weeks Concurrent Reclamation: Any new disturbance along these roads will be reclaimed using hand tools after use is completed.
OVP 6	Overland Vehicle Path	T23S, R16E Sec. 2	8,050	1,610 linear feet of road - Track width: 5 ft	1 - Track hoe 1 - Front end loader	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Approximately 1-2 days Concurrent Reclamation: Any new disturbance along these roads will be reclaimed using hand tools after use is completed.
OVP 7	Overland Vehicle Path	T23S, R16E Sec. 2	25,500	5,100 linear feet of road - Track width: 5 ft	1 - Track hoe 1 - Front end loader	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Up to two years Concurrent Reclamation: Any new disturbance along these roads will be reclaimed using hand tools after use is completed.
OVP 8	Overland Vehicle Path	T23S, R16E Sec. 2	7,850	1,570 linear feet of road - Track width: 5 ft	1 - Track hoe 1 - Front end loader	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Up to two weeks Concurrent Reclamation: Any new disturbance along these roads will be reclaimed using hand tools after use is completed.
OVP 9	Overland Vehicle Path	T23S, R16E Sec. 3	8,750	1,750 linear feet of road - Track width: 5 ft	1 - Track hoe 1 - Front end loader	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Up to two weeks Concurrent Reclamation: Any new disturbance along these roads will be reclaimed using hand tools after use is completed.
OVP 10	Overland Vehicle Path	T23S, R16E Sec. 2	6,000	1,200 linear feet of road - Track width: 5 ft	1 - Track hoe 1 - Front end loader	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Up to two weeks Concurrent Reclamation: Any new disturbance along these roads will be reclaimed using hand tools after use is completed.
TAR-01	Temporary Access Road	T23S, R16E Sec. 4	30,000	- Improve old existing roadbed to achieve the High-Clearance Vehicles management standard 1,200 linear feet of road - Road width: 25 ft	1 - Track hoe 1 - Front end loader	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Up to 17 weeks Concurrent Reclamation: After completion of drilling operations, roads will be recontoured and reseeded to promote revegetation of disturbed areas.

Appendix C-2. Detailed Description of Road Access and Activities						
Road ID	Road Type	Location (Township, Range, Section)	Estimated Disturbance (feet ²)	Facility Description	Equipment Used	Phasing/Abandonment
TAR-02	Temporary Access Road	T23S, R16E Sec. 3	17,500	- Improve old existing roadbed to achieve the High-Clearance Vehicles management standard 700 linear feet of road - Road width: 25 ft	1 - Track hoe 1 - Front end loader	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Up to three weeks Concurrent Reclamation: After completion of drilling operations, roads will be recontoured and reseeded to promote revegetation of disturbed areas.
TAR-03	Temporary Access Road	T23S, R16E Sec. 4	8,750	- Improve old existing roadbed to achieve the High-Clearance Vehicles management standard 350 linear feet of road - Road width: 25 ft	1 - Track hoe 1 - Front end loader	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Up to three weeks Concurrent Reclamation: After completion of drilling operations, roads will be recontoured and reseeded to promote revegetation of disturbed areas.
TAR-04	Temporary Access Road	T23S, R16E Sec. 4	47,500	- Improve old existing roadbed to achieve the High-Clearance Vehicles management standard 1,900 linear feet of road - Road width: 25 ft	1 - Track hoe 1 - Front end loader	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Up to 9 weeks Concurrent Reclamation: After completion of drilling operations, roads will be recontoured and reseeded to promote revegetation of disturbed areas.
TAR-05	Temporary Access Road	T23S, R16E Sec. 4	5,000	- Improve old existing roadbed to achieve the High-Clearance Vehicles management standard 650 linear feet of road - Road width: 25 ft	1 - Track hoe 1 - Front end loader	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Up to 3 weeks Concurrent Reclamation: After completion of drilling operations, roads will be recontoured and reseeded to promote revegetation of disturbed areas.
FR 4687	Forest Service Road	T23S, R16E Sec. 4	6,360	- Cut back overgrowth and extent existing Forest Service road to achieve the High-Clearance Vehicles management standard 1,060 linear feet of road - Road width: 6 ft	1 - D-9 Cat Bulldozer 1 - Track hoe 1- Front end loader 1 - Backhoe	Initiation: Within 2 years of Plan acceptance Length of Occupancy: Up to two years Concurrent Reclamation: After completion of drilling operations, roads will be recontoured and reseeded to promote revegetation of disturbed areas.

Appendix C-3. Drilling Equipment Mobilization Schedule

[illegible]

APPENDIX D
RECLAMATION PLAN

HERMOSA DRILLING PROJECT PLAN OF OPERATIONS

APPENDIX D RECLAMATION PLAN

Prepared for:

**UNITED STATES DEPARTMENT
OF AGRICULTURE FOREST SERVICE**
Coronado National Forest
300 West Congress Street
Tucson, Arizona 85701

Prepared by:

ARIZONA MINERALS, INC.
4500 Cherry Creek Drive South
Denver, Colorado 80246

February 2013

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1. RECLAMATION PLAN

1.1. PURPOSE AND GOAL

The purpose of the Reclamation Plan is to summarize the methods Arizona Minerals Inc. (AMI) proposes to implement to return the land and vegetation to a stable state after the Hermosa Drilling Project (the Project) concludes.

In accordance with 36 CFR (Code of Federal Regulations) § 228 and the policies of Forest Service Manual (FSM) 2840, AMI will stabilize temporarily disturbed areas to prevent erosion and will restore the vegetation to pre-Project conditions to the extent practicable. The reclamation operations will be ongoing during the Project (concurrent reclamation) and will be completed within two years after start of the Project. This period will allow for vegetation to be re-established over more than one growing season.

1.2. MEASURES TO BE TAKEN PRIOR TO COMMENCEMENT OF THE PROJECT

Measures that will be taken prior to commencement of the project to minimize impact to Coronado National Forest (CNF) resources are listed below:

- AMI will accommodate recommendations and requests from CNF specialists to adjust the location of any planned characterization sites or access routes to reduce impacts to CNF resources.
- All drilling and earth-moving equipment will be inspected for leaks prior to operating within the boundaries of the CNF. Leaks will be remedied by repair and/or placement of leak containment beneath equipment.
- All AMI contractors will be briefed on the importance of maintaining clean work areas and minimizing impact to CNF resources.
- The proposed alignments of temporary access routes (TARs) and overland vehicle paths (OVPs) have been designed to minimize disturbance on CNF land.

1.3. PREVENTION OF UNNECESSARY DEGRADATION AND ADVERSE IMPACTS

Measures that will be taken to prevent or control onsite and off-site damage to the environment and CNF resources are derived from the general requirements established by 36 CFR § 228.8 (g) surface management regulations for reclamation as listed below:

- Drill holes will be properly constructed, maintained, and decommissioned to ensure protection of the groundwater resource.
- Surface disturbance will be minimized.
- Where suitable as a growth media, soils and alluvial material will be managed as a topsoil resource and replaced during reclamation.

- Straw wattles will be placed on site during exploration and characterization activities to reduce soil erosion and water runoff. These wattles will remain on site until reclamation and will be used as mulching material during reseeding.
- No access routes will cross wetlands.
- All vehicles will travel only on roads identified in the Hermosa Drilling Project Plan of Operations.

1.4. CONCURRENT RECLAMATION

AMI will conduct concurrent reclamation, closing characterization sites, TARs, and OVPs as associated activities are completed. This will minimize the size of the exposed area and the potential for soil erosion.

1.5. CHARACTERIZATION SITES

AMI will notify CNF prior to the commencement of reclamation activities. Following the completion of characterization activities, all materials, including equipment, pipe, lubricants and other products, tanks, cores, plastic sheeting, and any other supplies, will be removed from the site.

At characterization sites where monitoring well or exploration drilling is conducted, solids and desiccated drilling muds (inert materials) in the mud pits will be, where practicable, returned to the drill hole. If the drill hole is to be left open as a monitoring well or for other reasons, the cuttings will be backfilled and compacted in the sump. Any excess cuttings beyond what can be backfilled into the sump will be removed from the drill site for use as fill material on AMI land. The mud pits will then be returned to natural grade with a track hoe using rocks and soil set aside during site construction and mud pit excavation. Following the mud pit rehabilitation, the level of further site reclamation will be discussed with CNF. For sites that will be abandoned, the boreholes will be closed in accordance with Arizona Department of Water Resources (ADWR) protocols and requirements (see **Section 1.6**).

At characterization sites where geotechnical drilling is conducted, drill cuttings, where practicable will be returned to the drill hole. Any excess cuttings will be placed in a tilt hopper and removed from the drill site for use as fill material on AMI land. Geotechnical boreholes will be closed in accordance with ADWR protocols and requirements (see **Section 1.6**).

At characterization sites where test pit excavation is conducted, after samples have been collected, all remaining excavated material will be returned to the excavated pit and compacted as needed.

Each characterization site will then be ripped to reduce compaction, recontoured, and seeded in accordance with CNF guidance using approved seed mixes of certified native weed-free species. If the initial seeding effort is unsuccessful, up to two additional seedings will be attempted. For sites that will continue to be used long term for scheduled groundwater monitoring, it may be possible to reclaim a portion of the characterization site while still maintaining access to and parking at the monitor well. The same procedure will be followed for partial site reclamation as describe above, except that the borehole

(monitor well) will not be closed. At the time of closure of the monitor well, the borehole will be abandoned in accordance with ADWR regulations, and the remainder of the site will be reclaimed.

Stormwater best management practices (BMPs), such as water bars, culverts, and erosion-control features, would be repaired or removed as necessary and as specified by the CNF Officer.

1.6. DRILL HOLE ABANDONMENT

Drilling and drill hole abandonment would be conducted in accordance with Arizona Administrative Code (AAC) R12-15 and Arizona Revised Statutes (ARS) Title 45, Chapter 2, Article 10, as administered by the ADWR.

1.7. TEMPORARY ACCESS ROUTES

TARs will be reclaimed by ripping/roughing and seeding (up to three times) with an appropriate seed mix and placement of rocks or other protective materials. Areas of reseeding would be scarified (ripped) prior to seeding to break up compaction. Road-surfacing material, if any, may need to be removed and potentially redeposited on Forest Roads (FRs), as determined by the CNF Officer. Onsite straw wattles used to reduce runoff will be broken up and used as mulching material. Other stormwater BMPs, such as water bars, culverts, and erosion-control features, will be repaired or removed as necessary and as specified by the CNF Officer. TARs should be re-contoured as closely as possible to pre-disturbance condition. TARs will be blocked with an earthen berm or boulders at each access point.

1.8. OVERLAND VEHICLE PATHS

OVPs will be reclaimed by ripping/roughing with hand tools and seeding (up to three times) with an appropriate seed mix and placement of rocks or other protective materials. Areas of reseeding would be scarified (ripped) by hand prior to seeding to break up compaction.

1.9. FINAL RECLAMATION AND POST-PROJECT MONITORING

Once the Project is complete, AMI will reclaim any remaining disturbed areas in the manner described above.

Each characterization site and associated access route will receive a closure inspection within one growing season following final closure. Surveys will assess the effectiveness of natural vegetation establishment and document the presence or absence of noxious or invasive weeds. A site specific action plan will be developed and implemented if a site:

- Shows signs of significant surface erosion,
- Shows signs of noxious or invasive establishment, or

- Fails to show establishment of native species from the surrounding community.

AMI will document characterization site conditions before project activities begin and at closure with photographs in three locations for each site (e.g. characterization site, from characterization site to road, side view of characterization site). The closure photographs will be presented in a letter report which will provide a summary of observations regarding reclamation success, and include recommendations for additional corrective actions.

1.10. PROPOSED RECLAMATION MEASURES TO ACHIEVE POST-PROJECT LAND USE

1.10.1. Growth Media

Growth media salvaged from the proposed disturbance areas will be replaced. Where available (i.e. not in areas covered with rock), growth media will be saved and stockpiled in the side cast fill material for reclamation purposes and where reasonably practical to do so.

1.10.2. Revegetation, Seeding, and Planting

Generally, the final surface of characterization sites, TARs, and OVFs will be left in rough condition to hold seed and to optimize germination. Reclaimed areas will be hand broadcast seeded with the CNF-approved seed mix shown in **Table D-1**. Changes and/or adjustments to the seed mix and/or application rate may be made in consultation with the CNF Officer. Seeding will be completed at the appropriate time of year as advised by the CNF Officer. The straw wattles left on site during project operations will be broken up and used as mulching material to reduce erosion and improve water retention in the soil. At this time, AMI does not propose to utilize fertilizers. The approved seed is specific to the Huachuca Ecosystem Management Area of the Sierra Vista Ranger District. The specifications of the mixture in pounds of pure live seed per acre (lbs/PLS/Acre) are detailed in **Table D-1** below.

Table D-1. Reclamation Seed Specifications

CNF-Approved Reclamation Seed Mix	Species	lbs/PLS/Acre
Sideoats grama	<i>Bouteloua curtipendula</i>	1
Blue Grama	<i>Bouteloua gracilis</i>	0.75
Cane beardgrass	<i>Bothriochloa barbinodis</i>	0.5
Arizona cottontop	<i>Digitaria californica</i>	0.5
Hairy grama	<i>Bouteloua Hirsuta</i>	0.75
Plains bristlegrass	<i>Setaria vulpiseta</i>	1
Green sprangletop	<i>Leptochloa dubia</i>	0.75
Curly mesquite	<i>Hilaria belangeri</i>	0.5

The mixture is available locally from Arizona Revegetation and Monitoring Co. in Sonoita, Arizona; alternate sources are Granite Seed and Western Native Seed companies.

1.10.3. Noxious and Invasive Weed Control

AMI will implement BMPs to eliminate or minimize the introduction and spread of noxious weeds and

invasive species during the project. These include:

- All straw wattles used on site to reduce soil erosion will be composed of non-invasive plant species.
- All drill and excavator rigs and equipment will be rinsed and inspected for noxious or invasive species before they enter the CNF to begin the Project.
- Contractors will avoid driving, drilling, or parking in weedy areas.
- Drill and excavator rigs and transport vehicles will be power washed weekly or when moving from one CNF weed management area to another. An air compressor will accompany the drill and excavator rig and be used daily to remove weed parts and seed from all vehicles.
- The potential exists for noxious or invasive weeds to become established following drilling or excavation despite implementation of BMPs. Post-project observations will identify areas where noxious weeds have established and recommend treatment as part of the monitoring report.

1.10.4. Post Project Land Use

Final revegetation will be consistent with the post-project land uses of cattle grazing, wildlife habitat, and various forms of recreation including camping, hiking, mountain biking, bird watching, and hunting.

APPENDIX E

MATERIAL SAFETY DATA SHEETS

APPENDIX E

1. DOWNHOLE ADDITIVES, WELL CONSTRUCTION MATERIALS

APPENDIX E-1
MSDS -- DOWNHOLE ADDITIVES, WELL
CONSTRUCTION MATERIALS

AQUA CLEAR PFD
BENSEAL
BENTONITE CLAY
BENTONITE PELLETS ¼
BULLSEYE™ PIPE DOPE
CARBON AND ALLOY STEEL
COLORADO SILICA SAND
DIAMOND SEAL
PVC PLASTIC PIPE CEMENT
EP MUDLUBE
EZ-MUD GOLD
EZ-MUD PLUS
GROUT-WELL DF
HOLEPLUG ¾ (BAROID)
N-SEAL™
PORTLAND CEMENT
PVC PIPE
QUICK-TROL GOLD
QUIK FOAM
QUICK-GEL GOLD
QUIK-GEL
QUIK GROUT (BAROID)
QUIK -TROL LV
ROD EASE
SODA ASH

MATERIAL SAFETY DATA SHEET

Product Trade Name: **AQUA-CLEAR® PFD**

Revision Date: 02-Jun-2007

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: AQUA-CLEAR® PFD
Synonyms: None
Chemical Family: Blend
Application: Surfactant
Manufacturer/Supplier: Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000
Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

SUBSTANCE	CAS Number	PERCENT	ACGIH TLV-TWA	OSHA PEL-TWA
Anionic polyacrylamide		30 - 60%	Not applicable	Not applicable

3. HAZARDS IDENTIFICATION

Hazard Overview May cause eye, skin, and respiratory irritation.

4. FIRST AID MEASURES

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin Wash with soap and water. Get medical attention if irritation persists.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion Under normal conditions, first aid procedures are not required.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

Flash Point/Range (F):	Not Determined
Flash Point/Range (C):	Min: > 212
Flash Point Method:	Not Determined
Autoignition Temperature (F):	COC
Autoignition Temperature (C):	Not Determined
Flammability Limits in Air - Lower (%):	Not Determined
Flammability Limits in Air - Upper (%):	Not Determined

Fire Extinguishing Media Water fog, carbon dioxide, foam, dry chemical.

Special Exposure Hazards Decomposition in fire may produce toxic gases.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 1, Flammability 1, Reactivity 0

HMIS Ratings: Flammability 1, Reactivity 0, Health 1

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Spills of this product are very slippery.

Environmental Precautionary Measures Prevent from entering sewers, waterways, or low areas.

Procedure for Cleaning / Absorption Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing.

Storage Information Store away from oxidizers. Store in a cool, dry location. Product has a shelf life of 36 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area.

Respiratory Protection Not normally necessary.

Hand Protection Impervious rubber gloves.

Skin Protection Normal work coveralls.

Eye Protection Safety glasses.

Other Precautions None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Liquid
Color:	Yellowish
Odor:	Ammonia
pH:	6.5-7.5
Specific Gravity @ 20 C (Water=1):	1.3

9. PHYSICAL AND CHEMICAL PROPERTIES

Density @ 20 C (lbs./gallon):	10.84
Bulk Density @ 20 C (lbs/ft3):	81.16
Boiling Point/Range (F):	Not Determined
Boiling Point/Range (C):	Not Determined
Freezing Point/Range (F):	Not Determined
Freezing Point/Range (C):	Not Determined
Vapor Pressure @ 20 C (mmHg):	Not Determined
Vapor Density (Air=1):	Not Determined
Percent Volatiles:	50
Evaporation Rate (Butyl Acetate=1):	Not Determined
Solubility in Water (g/100ml):	Partially soluble
Solubility in Solvents (g/100ml):	Not Determined
VOCs (lbs./gallon):	Not Determined
Viscosity, Dynamic @ 20 C (centipoise):	Not Determined
Viscosity, Kinematic @ 20 C (centistrokes):	Not Determined
Partition Coefficient/n-Octanol/Water:	Not Determined
Molecular Weight (g/mole):	Not Determined

10. STABILITY AND REACTIVITY

Stability Data:	Stable
Hazardous Polymerization:	Will Not Occur
Conditions to Avoid	None anticipated
Incompatibility (Materials to Avoid)	Strong oxidizers.
Hazardous Decomposition Products	Carbon monoxide and carbon dioxide.
Additional Guidelines	Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure	Eye or skin contact, inhalation.
Inhalation	May cause respiratory irritation.
Skin Contact	Prolonged or repeated contact may cause slight skin irritation.
Eye Contact	May cause eye irritation.
Ingestion	Swallowing a relatively large amount of this material is unlikely to produce serious illness or death.
Aggravated Medical Conditions	None known.
Chronic Effects/Carcinogenicity	No data available to indicate product or components present at greater than 1% are chronic health hazards.
Other Information	None known.
Toxicity Tests	
Oral Toxicity:	LD50: > 10000 mg/kg (Rat)
Dermal Toxicity:	LD50: > 10000 mg/kg (Rabbit)
Inhalation Toxicity:	Not determined

Primary Irritation Effect:	Not determined
Carcinogenicity	Not determined
Genotoxicity:	Not determined
Reproductive / Developmental Toxicity:	Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air)	Not determined
Persistence/Degradability	Biodegradable
Bio-accumulation	Not Determined

Ecotoxicological Information

Acute Fish Toxicity:	Not determined
Acute Crustaceans Toxicity:	Not determined
Acute Algae Toxicity:	EC50: > 1000 mg/l (Skeletonema costatum)

Chemical Fate Information	Not determined
Other Information	Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method	Disposal should be made in accordance with federal, state, and local regulations.
Contaminated Packaging	Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

US TSCA Inventory	All components listed on inventory.
EPA SARA Title III Extremely Hazardous Substances	Not applicable
EPA SARA (311,312) Hazard Class	None
EPA SARA (313) Chemicals	This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372).
EPA CERCLA/Superfund Reportable Spill Quantity	Not applicable.
EPA RCRA Hazardous Waste Classification	If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA.
California Proposition 65	The California Proposition 65 regulations apply to this product.
MA Right-to-Know Law	One or more components listed.
NJ Right-to-Know Law	One or more components listed.
PA Right-to-Know Law	One or more components listed.

Canadian Regulations

Canadian DSL Inventory	All components listed on inventory.
WHMIS Hazard Class	Un-Controlled

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information	For additional information on the use of this product, contact your local Halliburton representative. For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.
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Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

END OF MSDS

MATERIAL SAFETY DATA SHEET

Product Trade Name: **BENSEAL®**

Revision Date: 20-Dec-2011

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: BENSEAL®
Synonyms: None
Chemical Family: Mineral
Application: Viscosifier

Manufacturer/Supplier Baroid Fluid Services
 Product Service Line of Halliburton
 P.O. Box 1675
 Houston, TX 77251
 Telephone: (281) 871-4000
 Emergency Telephone: (281) 575-5000

Prepared By Chemical Compliance
 Telephone: 1-580-251-4335
 e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

Substances	CAS Number	PERCENT	ACGIH TLV-TWA	OSHA PEL-TWA
Bentonite	1302-78-9	60 - 100%	Not applicable	Not applicable
Crystalline silica, cristobalite	14464-46-1	0 - 1%	0.025 mg/m ³	1/2 x 10 mg/m ³ %SiO ₂ + 2
Crystalline silica, tridymite	15468-32-3	0 - 1%	0.05 mg/m ³	1/2 x 10 mg/m ³ %SiO ₂ + 2
Crystalline silica, quartz	14808-60-7	1 - 5%	0.025 mg/m ³	10 mg/m ³ %SiO ₂ + 2

More restrictive exposure limits may be enforced by some states, agencies, or other authorities.

3. HAZARDS IDENTIFICATION

Hazard Overview

CAUTION! - ACUTE HEALTH HAZARD

May cause eye and respiratory irritation.

DANGER! - CHRONIC HEALTH HAZARD

Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposures below recommended exposure limits. Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. Review the Material Safety Data Sheet (MSDS) for this product, which has been provided to your employer.

4. FIRST AID MEASURES

Inhalation

If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin

Wash with soap and water. Get medical attention if irritation persists.

Eyes

In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion

Under normal conditions, first aid procedures are not required.

Notes to Physician

Treat symptomatically.

5. FIRE FIGHTING MEASURES

Flash Point/Range (F):	Not Determined
Flash Point/Range (C):	Not Determined
Flash Point Method:	Not Determined
Autoignition Temperature (F):	Not Determined
Autoignition Temperature (C):	Not Determined
Flammability Limits in Air - Lower (%):	Not Determined
Flammability Limits in Air - Upper (%):	Not Determined

Fire Extinguishing Media All standard firefighting media.

Special Exposure Hazards Not applicable.

Special Protective Equipment for Fire-Fighters Not applicable.

NFPA Ratings: Health 0, Flammability 0, Reactivity 0
HMIS Ratings: Health 0*, Flammability 0, Reactivity 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures None known.

Procedure for Cleaning / Absorption

Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal.

7. HANDLING AND STORAGE**Handling Precautions**

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.

Storage Information

Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Do not reuse empty container. Product has a shelf life of 60 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION**Engineering Controls**

Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits listed in Section 2.

Personal Protective Equipment

If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection

Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Dust/mist respirator. (95%)

Hand Protection

Normal work gloves.

Skin Protection

Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing.

Eye Protection

Wear safety glasses or goggles to protect against exposure.

Other Precautions

None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Solid
Color:	Various
Odor:	Odorless
pH:	9.9
Specific Gravity @ 20 C (Water=1):	2.6
Density @ 20 C (lbs./gallon):	62
Bulk Density @ 20 C (lbs/ft3):	63- 73
Boiling Point/Range (F):	Not Determined
Boiling Point/Range (C):	Not Determined
Freezing Point/Range (F):	Not Determined
Freezing Point/Range (C):	Not Determined
Vapor Pressure @ 20 C (mmHg):	Not Determined
Vapor Density (Air=1):	Not Determined
Percent Volatiles:	Not Determined
Evaporation Rate (Butyl Acetate=1):	Not Determined
Solubility in Water (g/100ml):	Insoluble
Solubility in Solvents (g/100ml):	Not Determined

9. PHYSICAL AND CHEMICAL PROPERTIES

VOCs (lbs./gallon):	Not Determined
Viscosity, Dynamic @ 20 C (centipoise):	Not Determined
Viscosity, Kinematic @ 20 C (centistrokes):	Not Determined
Partition Coefficient/n-Octanol/Water:	Not Determined
Molecular Weight (g/mole):	Not Determined

10. STABILITY AND REACTIVITY

Stability Data:	Stable
Hazardous Polymerization:	Will Not Occur
Conditions to Avoid	None anticipated
Incompatibility (Materials to Avoid)	Hydrofluoric acid.
Hazardous Decomposition Products	Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C).
Additional Guidelines	Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure	Eye or skin contact, inhalation.
Inhalation	Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A). Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).
Skin Contact	May cause mechanical skin irritation.
Eye Contact	May cause eye irritation.
Ingestion	None known
Aggravated Medical Conditions	Individuals with respiratory disease, including but not limited to asthma and bronchitis, or subject to eye irritation, should not be exposed to quartz dust.

Chronic Effects/Carcinogenicity Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.

Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to IARC Monograph 68, Silica, Some Silicates and Organic Fibres (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen". Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2).

There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.

Other Information For further information consult "Adverse Effects of Crystalline Silica Exposure" published by the American Thoracic Society Medical Section of the American Lung Association, American Journal of Respiratory and Critical Care Medicine, Volume 155, pages 761-768 (1997).

Toxicity Tests

Oral Toxicity:	Not determined
Dermal Toxicity:	Not determined
Inhalation Toxicity:	Not determined
Primary Irritation Effect:	Not determined
Carcinogenicity	Refer to <u>IARC Monograph 68, Silica, Some Silicates and Organic Fibres</u> (June 1997).
Genotoxicity:	Not determined
Reproductive / Developmental Toxicity:	Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air)	Not determined
Persistence/Degradability	Not determined
Bio-accumulation	Not determined

Ecotoxicological Information

Acute Fish Toxicity:	TLM96: 10000 ppm (Oncorhynchus mykiss)
Acute Crustaceans Toxicity:	Not determined

Acute Algae Toxicity:	Not determined
Chemical Fate Information	Not determined
Other Information	Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method	If practical, recover and reclaim, recycle, or reuse by the guidelines of an approved local reuse program. Should contaminated product become a waste, dispose of in a licensed industrial landfill according to federal, state, and local regulations.
Contaminated Packaging	Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR
Not restricted

Air Transportation

ICAO/IATA
Not restricted

Sea Transportation

IMDG
Not restricted

Other Transportation Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

US TSCA Inventory	All components listed on inventory or are exempt.
EPA SARA Title III Extremely Hazardous Substances	Not applicable
EPA SARA (311,312) Hazard Class	Acute Health Hazard Chronic Health Hazard
EPA SARA (313) Chemicals	This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372).

EPA CERCLA/Superfund Reportable Spill Quantity	Not applicable.
EPA RCRA Hazardous Waste Classification	If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA.
California Proposition 65	The California Proposition 65 regulations apply to this product.
MA Right-to-Know Law	One or more components listed.
NJ Right-to-Know Law	One or more components listed.
PA Right-to-Know Law	One or more components listed.
Canadian Regulations	
Canadian DSL Inventory	All components listed on inventory or are exempt.
WHMIS Hazard Class	D2A Very Toxic Materials Crystalline silica

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****



NATURAL SOURCING™
Specialists in Cosmeceutical Ingredients

341 Christian Street, Oxford, CT 06478 USA
Tel: (203) 267-6061 Fax: (203) 267-6065
www.naturalsourcing.com info@naturalsourcing.com

MATERIAL SAFETY DATA SHEET

BENTONITE CLAY

MSDS

1. PRODUCT NAME AND COMPANY IDENTIFICATION

Product Name: BENTONITE CLAY, SODIUM TYPE
Product Use: Personal Care Formulations
Company Name: Natural Sourcing
Company Address: 341 Christian Street, Oxford, CT 06478, USA
Date Issued: 6/1/2008
Emergency Telephone Number: Chemtrec Tel: (800) 262-8200

2. COMPOSITION/INGREDIENT INFORMATION

Ingredients: 100% natural mineral, raw material, montmorillonite. Naturally occurring hydrated aluminosilicate of sodium, calcium, magnesium, and iron.

Preservatives & Solvents: None

Other Gases & Liquids: None

Other Solids: Respirable crystalline silica (CAS #s 7631-86-9 and 14808-60-7). Estimated quantity less than 2%.

CAS #: 1302-78-9

3. HAZARDS IDENTIFICATION

Eyes: Mechanical irritant

Skin: Possible drying resulting in dermatitis

Ingestion: Not expected to be a hazard

Inhalation: Short term exposure to dust levels exceeding the PEL may cause irritation of respiratory tract resulting in a dry cough.

Chronic exposure to free silica contain in airborne bentonite dust where levels are higher than TLVs may lead to development of silicosis or other respiratory problems. Persistent dry cough and labored breathing upon exertion are symptomatic.

To use in complete safety, respect exposure limits.

Risk of Slips/Falls: Dampening the floor while cleaning a clay storage site may render it extremely slippery. Dry cleaning is recommended if people are required to continue working on the site.

4. FIRST AID MEASURES

Eyes: Flush with plenty of water or eye wash solution for 15 minutes. Get medical attention if irritation persists.

Skin: Due to its use in cosmetics, no adverse effects are expected. May dry mucous and skin. Wash with soap and water.

Ingestion:	No information
Inhalation:	Remove to fresh air. If symptoms of irritation persist, seek medical advice. Inhalation may aggravate respiratory illness.
Medical Conditions Generally Aggravated by Exposure:	Individuals with pulmonary and/or respiratory disease, including but not limited to asthma and bronchitis should be precluded from exposure to dust.

5. FIRE FIGHTING MEASURES

Extinguishing Media:	N/A
Special Firefighting Procedures:	N/A
Unusual Fire & Explosion Hazards:	N/A
Note:	Will not burn

6. ACCIDENTAL RELEASE MEASURES (STEPS FOR SPILLS)

Precautions:	Avoid dust formation. In the event of a high level exposure to volatile dust, wear a protective mask and safety goggles.
Methods for Cleaning Up:	Sweep up or vacuum small spills carefully. For large spills, use water sprays or ventilated evacuation systems to prevent dust prevention. Use caution when using water - very slippery when wet. Dispose of according to local regulations.

7. HANDLING AND STORAGE

Handling	
Safe Handling:	Avoid dust formation. Provide appropriate ventilation where dust forms. In the event where there is insufficient ventilation wear suitable breathing equipment.
Storage	
Requirements for Storage Areas and Containers:	Store in closed containers below 30°C in well ventilated areas. Very slippery when wet.

8. EXPOSURE CONTROL/PERSONAL PROTECTION

Exposure Value Limits:	Respect the regulatory provisions for dust (inhalable and breathable) and crystalline silica.
Eye:	Safety glasses should be worn.
Skin/Body:	Gloves should be worn.
Respiratory:	Use NIOSH/MSHA approved respirators for silica bearing dust.
Ventilation:	Provide appropriate ventilation and filters in places where dust may be generated.
Other:	Evaluate need based on application. Slip proof shoes may be worn where spills may occur.
Work/Hygiene Practice:	Normal work and hygiene practices

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Powder
Color:	Grey
Odor:	Characteristic
Solubility in Water:	Insoluble
Vapor Density:	>1

Specific Gravity: 2.45-2.6

10. STABILITY AND REACTIVITY

Stability: Stable
Incompatibility (Materials to Avoid): N/A

Hazardous Decomposition or Byproducts: N/A
Conditions to Avoid: N/A

11. TOXICOLOGICAL INFORMATION

Exposure Limits: OSHA PEL @ 8 hr. TWA) 15 mg/m³ (total dust)
5 mg/m³ (respirable dust)
Reparable crystalline silica : 0.1 mg/m³

Signs & Symptoms of Exposure: Prolonged or high exposure to respirable dust may cause shortness of breath and other respiratory effects.

Carcinogenicity: The international agency for research on cancer has determined that crystalline silica inhaled in the form of quartz or cristobalite in conjunction with the use of these materials from occupational sources is carcinogenic to humans. (Group 1 – carcinogenic to humans) (Refer to IARC monograph 68, Silica, some silicates and organic fibers published June 1997). The National Toxicology Program classifies respirable crystalline silica as “reasonable anticipated to be a carcinogen”. For further information, see: “Adverse Effects of Crystalline Silica Exposure” published by the American Thoracic Society, medical section of the American Lung Association, American Journal of Respiratory and Critical Care Medicine, Volume 155, pages 761-765, 1997.

The small quantities of crystalline silica (quartz) found in this material are, under normal conditions, naturally coated with an unremovable layer of amorphous silica and/or clay. IARC (Vol 68, 1997, pp 191-192) states that crystalline silica (quartz) can differ in toxicity depending on the minerals with which it is combined, citing studies in IARC (Vol 42, 1987, p 86) which states that the toxic effect of crystalline silica (quartz) is reduced by the protective effect.... Due mainly to clay minerals....”.

12. ECOLOGICAL INFORMATION

Ecotoxicity: No known ecological hazards are associated with this product.

13. DISPOSAL CONSIDERATIONS

Waste Disposal Methods: Dispose of according to local, state and federal regulations, and in a manner that does not pose a risk due to emission of breathable dust.

14. TRANSPORT INFORMATION

DOT Classification: Not classified

15. REGULATORY INFORMATION

No Information

16. ADDITIONAL INFORMATION

This information is provided for documentation purposes only.

The complete range of conditions or methods of use are beyond our control therefore we do not assume any responsibility and expressly disclaim any liability for any use of this product. Information contained herein is believed to be true and accurate however, all statements or suggestions are made without warranty, expressed or implied, regarding accuracy of the information, the hazards connected with the use of the material or the results to be obtained from the use thereof. Compliance with all applicable federal, state, and local laws and local regulations remains the responsibility of the user.

This safety sheet cannot cover all possible situations which the user may experience during processing.

Each aspect of your operation should be examined to determine if, or where, additional precautions may be necessary. All health and safety information contained in this bulletin should be provided to your employees or customers.

MATERIAL SAFETY DATA SHEET**Product Trade Name: BENTONITE PELLETS 1¼ Inch****Revision Date:** 20-Dec-2011**1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION**

Product Trade Name: BENTONITE PELLETS 1¼ Inch
Synonyms: None
Chemical Family: Mineral
Application: Weight Additive

Manufacturer/Supplier Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

Substances	CAS Number	PERCENT	ACGIH TLV-TWA	OSHA PEL-TWA
Bentonite	1302-78-9	60 - 100%	Not applicable	Not applicable
Crystalline silica, cristobalite	14464-46-1	0 - 1%	0.025 mg/m ³	1/2 x 10 mg/m ³ %SiO ₂ + 2
Crystalline silica, tridymite	15468-32-3	0 - 1%	0.05 mg/m ³	1/2 x 10 mg/m ³ %SiO ₂ + 2
Crystalline silica, quartz	14808-60-7	< 3	0.025 mg/m ³	10 mg/m ³ %SiO ₂ + 2

More restrictive exposure limits may be enforced by some states, agencies, or other authorities.

3. HAZARDS IDENTIFICATION

Hazard Overview

CAUTION! - ACUTE HEALTH HAZARD

May cause eye and respiratory irritation.

DANGER! - CHRONIC HEALTH HAZARD

Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposures below recommended exposure limits. Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. Review the Material Safety Data Sheet (MSDS) for this product, which has been provided to your employer.

4. FIRST AID MEASURES

Inhalation

If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin

Wash with soap and water. Get medical attention if irritation persists.

Eyes

In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion

Under normal conditions, first aid procedures are not required.

Notes to Physician

Treat symptomatically.

5. FIRE FIGHTING MEASURES

Flash Point/Range (F):	Not Determined
Flash Point/Range (C):	Not Determined
Flash Point Method:	Not Determined
Autoignition Temperature (F):	Not Determined
Autoignition Temperature (C):	Not Determined
Flammability Limits in Air - Lower (%):	Not Determined
Flammability Limits in Air - Upper (%):	Not Determined

Fire Extinguishing Media All standard firefighting media.

Special Exposure Hazards Not applicable.

Special Protective Equipment for Fire-Fighters Not applicable.

NFPA Ratings: Health 0, Flammability 0, Reactivity 0
HMIS Ratings: Health 0*, Flammability 0, Reactivity 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures None known.

Procedure for Cleaning / Absorption

Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal.

7. HANDLING AND STORAGE

Handling Precautions

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.

Storage Information

Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Do not reuse empty container.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls

Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits listed in Section 2.

Personal Protective Equipment

If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection

Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Dust/mist respirator. (95%)

Hand Protection

Normal work gloves.

Skin Protection

Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing.

Eye Protection

Wear safety glasses or goggles to protect against exposure.

Other Precautions

None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Solid
Color:	Various
Odor:	Odorless
pH:	9.9
Specific Gravity @ 20 C (Water=1):	2.55
Density @ 20 C (lbs./gallon):	62
Bulk Density @ 20 C (lbs/ft3):	71
Boiling Point/Range (F):	Not Determined
Boiling Point/Range (C):	Not Determined
Freezing Point/Range (F):	Not Determined
Freezing Point/Range (C):	Not Determined
Vapor Pressure @ 20 C (mmHg):	Not Determined
Vapor Density (Air=1):	Not Determined
Percent Volatiles:	Not Determined
Evaporation Rate (Butyl Acetate=1):	Not Determined
Solubility in Water (g/100ml):	Insoluble
Solubility in Solvents (g/100ml):	Not Determined
VOCs (lbs./gallon):	Not Determined

9. PHYSICAL AND CHEMICAL PROPERTIES

Viscosity, Dynamic @ 20 C (centipoise):	Not Determined
Viscosity, Kinematic @ 20 C (centistokes):	Not Determined
Partition Coefficient/n-Octanol/Water:	Not Determined
Molecular Weight (g/mole):	Not Determined

10. STABILITY AND REACTIVITY

Stability Data:	Stable
Hazardous Polymerization:	Will Not Occur
Conditions to Avoid	None anticipated
Incompatibility (Materials to Avoid)	Hydrofluoric acid.
Hazardous Decomposition Products	Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C).
Additional Guidelines	Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure	Eye or skin contact, inhalation.
Inhalation	Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A). Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).
Skin Contact	May cause mechanical skin irritation.
Eye Contact	May cause eye irritation.
Ingestion	None known
Aggravated Medical Conditions	Individuals with respiratory disease, including but not limited to asthma and bronchitis, or subject to eye irritation, should not be exposed to quartz dust.

Chronic Effects/Carcinogenicity Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.

Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to IARC Monograph 68, Silica, Some Silicates and Organic Fibres (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen". Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2).

There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.

Other Information For further information consult "Adverse Effects of Crystalline Silica Exposure" published by the American Thoracic Society Medical Section of the American Lung Association, American Journal of Respiratory and Critical Care Medicine, Volume 155, pages 761-768 (1997).

Toxicity Tests

Oral Toxicity:	Not determined
Dermal Toxicity:	Not determined
Inhalation Toxicity:	Not determined
Primary Irritation Effect:	Not determined
Carcinogenicity	Refer to <u>IARC Monograph 68, Silica, Some Silicates and Organic Fibres</u> (June 1997).
Genotoxicity:	Not determined
Reproductive / Developmental Toxicity:	Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air)	Not determined
Persistence/Degradability	Not determined
Bio-accumulation	Not determined

Ecotoxicological Information

Acute Fish Toxicity:	Not determined
Acute Crustaceans Toxicity:	Not determined

Acute Algae Toxicity:	Not determined
Chemical Fate Information	Not determined
Other Information	Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method	Bury in a licensed landfill according to federal, state, and local regulations.
Contaminated Packaging	Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR
Not restricted

Air Transportation

ICAO/IATA
Not restricted

Sea Transportation

IMDG
Not restricted

Other Transportation Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

US TSCA Inventory	All components listed on inventory or are exempt.
EPA SARA Title III Extremely Hazardous Substances	Not applicable
EPA SARA (311,312) Hazard Class	Acute Health Hazard Chronic Health Hazard
EPA SARA (313) Chemicals	This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372).
EPA CERCLA/Superfund Reportable Spill Quantity	Not applicable.

EPA RCRA Hazardous Waste Classification	If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA.
California Proposition 65	The California Proposition 65 regulations apply to this product.
MA Right-to-Know Law	One or more components listed.
NJ Right-to-Know Law	One or more components listed.
PA Right-to-Know Law	One or more components listed.
Canadian Regulations	
Canadian DSL Inventory	All components listed on inventory or are exempt.
WHMIS Hazard Class	D2A Very Toxic Materials Crystalline silica

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

JET-LUBE, INC.

MATERIAL SAFETY DATA SHEET

Product Name: BULLSEYE™

Chemical Family: Vegetable based lubricating grease.

Use: Nonmetallic, non-petroleum based thread compound & sealant.

Manufacturer/Supplier: JET-LUBE, INC.

Address: 4849 Homestead Rd., Ste. #200

Houston, TX, 77028 USA **Phone:** 713-674-7617

Emergency Phone: 713-674-7617 **Fax:** 713-678-4604

Chemtrec 24 hours (USA): 800-424-9300

Hazardous Components	CAS No.	Wt%	OSHA PEL	ACGIH TLV	Other Limits of Exposure
Nonhazardous Blend	79070147/8001794	100	UN	UN	STEL: UN
	13776744/68611449				
	9002840				

Main Hazards—Health Effects

Eyes: May cause irritation. **Inhalation:** Viscous nature may block breathing passages if inhaled. **Ingestion:** May cause diarrhea.

Skin: For hypersensitive persons, may irritate the skin after prolonged periods of contact.

Eyes: Flush with water until all residual material is gone. If irritation persists, seek medical help.

Inhalation: Clear air passage. If respiratory difficulty continues, seek medical help. **Ingestion:** Consult physician.

Skin: Wash thoroughly with hand cleanser, followed by soap & water. Contaminated clothing should be dry cleaned before reuse.

Extinguishing Media: Foam, dry powder, Halon®, carbon dioxide, sand, earth & water mist.

Unsuitable Extinguishing Media: Water jet. **Protective Equipment for Fire fighting:** Self-contained breathing apparatus.

Personal Precautions: Wear gloves & protective overalls. **Environmental Precautions:** Nonhazardous **Spillage:** Scrape up bulk, then wipe up remainder with cloth. To prevent walking hazard, pick up remaining residue with diatomaceous earth.

Handling: Do not allow it to enter drains (it may clog drain) **Storage:** Do not store at elevated temperatures.

Respiratory Protection: None needed.

Hand Protection: Protective gloves for hypersensitive persons.

Eye Protection: Glasses, if applied to parts in motion.

Body Protection: Overalls.

Physical State: Semisolid paste **Color:** Yellow **Odor:** Mild **pH:** Neutral **Boiling Range/Point °F (°C):** >600 (316)

Melting Point °F (°C): None **Flash Point (COC) °F (°C):** >540 (282) **Autoignition Temperature °F (°C):** >580 (360)

Explosive Properties: LEL: UN UEL: UN **Evaporation Rate (Butyl Acetate):** <0.01 **Partition Coefficient (Log Pow):** N/A

Vapor Pressure (kPa): <0.01 **Percent Volatiles:** Nil **Density (g/cm³):** 1.11 **Flammability:** Not flammable at ambient temperature.

OAR Value: N/A **Oxidizing Properties:** None **Water Solubility:** Not soluble **Vapor Density:** >5

Stability: Chemically stable under normal conditions. No photoreactive agents. **Conditions to Avoid:** Powerful sources of ignition & extreme temps. **Materials to Avoid:** Strong inorganic & organic acids, oxidizing agents. **Hazardous Decomposition Products:** Burning generates smoke, airborne soot, hydrocarbons & oxides of carbon, nitrogen & halocarbon fumes. Residue mainly comprised of soot & mineral oxides.

Acute Toxicity: Not known. **Irritancy—Skin:** Very mild. **Skin Sensitization:** Not known. **Subacute/Sub-chronic Toxicity:** Not known.

Genotoxicity: None known. **Chronic Toxicity:** None known. **California Prop 65:** N/A **Carcinogen:** NTP: No IARC: No OSHA: No

EC Classification (67/548/EEC): No **LC-50:** >4000mg/kg—extrapolated from component data. **LD-50:** N/A

Possible Effects: In extreme cases, may generate oil fraction that could act as a marine pollutant. Potential of this occurrence is highly unlikely. **Behavior:** Relatively well behaved. Bioaccumulation potential nil.

Environmental Fate: Highly unlikely to cause notable contamination. Nontoxic to marine or land organisms.

Product Disposal: Do not incinerate. Contact waste disposal company or local authority for advice. **Container Disposal:** Pails without liner—see Product Disposal section above. Pails with plastic liner—pail may only be disposed of via standard waste disposal services, recycled or reused. **Liner—see Product Disposal section above.**

Not classified as hazardous for transport. **D.O.T.:** Nonhazardous **UN No.:** Nonhazardous **Air Transport (ICAO & IATA):** Nonhazardous

Sea Transport (IMO & IMDG): Nonhazardous **Road & Rail Transport (ADR/RID):** Nonhazardous

Labeling Information: None needed **EC Annex 1 Classification:** Not Applicable. **R Phrases:** R22—harmful if swallowed.

S Phrases: None applicable, as known. **Ozone Depleting Chemicals:** Not applicable. **TSCA:** All components are listed.

WHMIS (Canada): Not controlled. **Canadian DSL:** All components listed. **40 CFR Part 372 (SARA Section 313):** N/A

CERCLA: Nonhazardous **RCRA Hazard Class:** Nonhazardous **SARA 311/312:** None **TSCA 12B Components:** None

New Jersey Right To Know: See Section II

Signature: 

Prepared by: Donald A. Oldiges

Date Issued: October 19, 2004

As of issue date, the information contained herein is accurate and reliable to the best of JET-LUBE'S knowledge. JET-LUBE® does not warrant or guarantee its accuracy or reliability and shall not be liable for any loss or damage arising out of the use thereof. It is the user's responsibility to satisfy itself that the information offered for its consideration is suitable for its particular use.

LEGEND

- I. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND COMPANY
- II. COMPOSITION INFORMATION ON INGREDIENTS
- III. HAZARDS IDENTIFICATION
- IV. FIRST AID MEASURES
- V. FIRE FIGHTING MEASURES
- VI. ACCIDENTAL RELEASE MEASURES
- VII. HANDLING AND STORAGE
- VIII. EXPOSURE CONTROL/PERSONAL PROTECTION
- IX. PHYSICAL AND CHEMICAL PROPERTIES
- X. STABILITY AND REACTIVITY
- XI. TOXICOLOGICAL INFORMATION
- XII. ECOLOGICAL INFORMATION
- XIII. WASTE DISPOSAL
- XIV. TRANSPORT INFORMATION
- XV. REGULATORY INFORMATION
- XVI. OTHER INFORMATION

HMIS SYMBOL

HEALTH	0
FLAMMABILITY	1
REACTIVITY	0
PPI	N/A

NFPA SYMBOL





FirstMiss Steel, Inc.

Hollsopple, PA 15935

Telephone: (814) 479-2551

FAX: (814) 479-2003

MATERIAL SAFETY DATA SHEET

I GENERAL INFORMATION

Identity: CARBON & ALLOY STEEL

Synonyms:

Family: Inorganic Compounds

Date: 26th August 1997

MSDS: #001

Revision: 1

Manufacturer's Name: FirstMiss Steel, Inc.

Manufacturer's Address: PO Box 509

Hollsopple, PA 15935-0509

Information Telephone Number: 814-479-2551

Prepared by John Durrant

Emergency Telephone Number: 814-479-2551

Fax Telephone Number: 814-479-2003

II INGREDIENTS

Ingredients	CAS #	% wt.		Exposure Limits	
				OSHA PEL mg/M3	ACGIH TLV mg/M3
Iron	1309-37-1	Bal.	PEL as Iron Oxide Fume	10	5
Carbon	7440-44-0	.01-1.0	PEL as Nuisance Dust	15	10
@ Manganese	7439-96-5	.10-1.65	PEL as Manganese Dust	5(c)	5
			as Manganese Fume	5(c)	1
Phosphorous	7723-14-0	.001-0.080	PEL as Nuisance Dust	15	10
Sulfur	7704-34-9	.001-0.10	PEL as Nuisance Dust	15	10
Silicon	7440-21-3	.001-0.6	PEL as Nuisance Dust	15	10
@ Chromium	7440-47-3	.050-9.00	PEL as Chromium Metal	1	.5
			as Chromium (VI)	.1	.05
@ Nickel	7440-02-0	.05-10.0	PEL as Nickel	1	1
Molybdenum	7439-98-7	.05-1.25	PEL Insoluble Compounds	15	10
Vanadium	7440-62-2	.02-0.12	PEL as V2O5 Fume	.1(c)	.5
@ Cobalt	7440-48-4	.01-4.75	PEL as Cobalt Fume&Dust	.1	.05
Titanium	7440-32-6	.001-0.70	Titanium Dioxide	15	10
Columbium	7440-03-1	.01-1.10	PEL as nuisance dust	15	10
Tantalum	7440-25-7	.01-1.10	Tantalum metal	5	5

@ denotes this product contains a toxic chemical of chemicals subject to the reporting requirements of section 313 of Title III of the Supervened Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

The above chemistries are provided for industrial hygiene and environmental purposes and are not intended to represent product specifications. This information has been compiled from data believed to be reliable. Elements such as aluminum, arsenic, boron, calcium, cadmium, chromium, cobalt, copper, lead, molybdenum, nickel, tin, titanium, vanadium and zirconium may be present in trace amounts. Steel products as shipped do not present an exposure hazard.

III PHYSICAL AND CHEMICAL CHARACTERISTICS

Boiling Point: N/A Melting Point: 2400-2800°F
Vapor Pressure: N/A Specific Gravity (H₂O = 1) 7.5 TO 8.5
(mm Hg)
Vapor Density: N/A
(Air = 1)
Solubility in Water: Insoluble Appearance and Odor: Solid Gray, odorless, metal

IV PHYSICAL AND CHEMICAL HAZARDS

Flash Point: Not Flammable LEL: N/A

Extinguishing Media:	N/A	UEL	N/A
Special Fire Fighting Procedures:	N/A		
Unusual Fire and Explosion Hazards:	N/A		

V REACTIVITY DATA

Stability: Stable	Conditions to avoid:	N/A
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Incompatibility: N/A

Hazardous decomposition or byproducts:	None
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Polymerization: Will not occur.

VI HEALTH HAZARD DATA

Routes of Entry	Inhalation:	Yes
	Skin:	No
	Ingestion:	No
	Eye contact:	No

Health Hazards:

Iron Oxide

Prolonged or repeated exposures to high concentrations may cause lung changes considered to be a benign pneumoconiosis (siderosis). Inhalation of iron oxide may cause irritation of eyes, nose, and throat, and metal fume fever.

Manganese

Exposure may cause irritation of eyes, nose, and throat, metallic taste in mouth and metal fume fever. Advanced exposure symptoms may include weakness, sleepiness, nervousness, lack of coordination, uncontrollable laughter, mental confusion, speech disturbances, and aggressiveness. Manganese may cause bronchitis, pneumonitis and central nervous system disturbances.

Chromium and/or Nickel

Certain forms of chromium and nickel have been associated with cancer of the lungs and nasal passages. Elemental, divalent and trivalent chromium compounds, i.e. as in steel, have not been found to cause cancer in humans. Nickel and chromium have been found to cause adverse skin and respiratory reactions including dermatitis, bronchitis, ulceration and perforation of the nasal septum, coughing, wheezing, and dyspnea. Skin contact generally under high temperature and humidity has been associated with a dermatitis known as "Nickel Itch".

Molybdenum

Slight irritation of eyes, nose and throat. Animal studies suggest the possibility of digestive disturbances such as: colic, diarrhea, weight loss, and the development of pneumoconiosis, anemia, and gout.

Vanadium

Irritation of respiratory tract and conjunctivae. Excessive exposure may result in skin pallor, greenish discoloration of the tongue, eczematous skin lesions, cough, bronchitis and chest pains. Long term exposure may cause pulmonary edema, pneumonia, chronic bronchitis, anemia, albuminuria and nervous complaints.

Cobalt

Mildly irritating to eyes and skin. Inhalation of dust may cause an asthma like disease with cough and dyspnea which may progress to pneumonia with marked fibrosis. Cobalt chromium alloys have been found to induce cancer in animals and are listed by IARC as potential carcinogens.

Coating Oils

Steel coated with an oil may result in a mild skin irritation upon prolonged and repeated contact. Wear gloves and/or wash skin following contact to prevent skin irritation.

CARCINOGENIC REFERENCES:

Certain substances in steel products such as arsenic, chromium, nickel, and cobalt-chromium alloys have been identified by the International Agency for Research on Cancer (IARC) and/or the National Toxicology Program (NTP) as potential cancer causing agents.

VII PRECAUTIONS FOR SAFE HANDLING AND USE

Product is a solid material as shipped. No potential for spill or leak.

VIII CONTROL MEASURES

Ventilation:

If your operation generates particulates when processing this product, local and general ventilation may be necessary to control employee exposures to within applicable limits.

Respiratory protection:

If the exposure limits indicated are exceeded, NIOSH approved respirators for protection against dust and/or fume should be worn in accordance with 29 CFR 1910.134.

Protective equipment:

Appropriate protective equipment should be worn when burning or welding this product. Gloves should be considered when handling material to prevent cuts and skin irritation. Approved eye protection is recommended for operations involving burning, grinding, brazing, welding, or machining.



Carmeuse Industrial Sands, Inc.
11 Stanwix Street, 11th Floor
Pittsburgh, PA 15222
Phone: 412-995-5500
Fax: 412-995-5594

Date of Revision: 06/10/08

Revision No. 2

Material Safety Data Sheet

Product Name:	SAND
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INFOTRAC: 800-535-5053 [In case of an emergency call this number 24 HOURS a day 7 DAYS a week.]

SECTION 1 - IDENTIFICATION OF THE SUBSTANCE AND COMPANY

1.1. Identification of the substance:

Chemical name: Silica
Product name & synonyms: Silica Sand, Colorado Silica Sand®, Glass Sand, Flint, Sand, Silica Sand, Quartz, Crystalline Silica, Flint, Ground Silica, Foundry Sand, Engine Sand, Frac Sand, Filtration Sand, Bunker Sand, Turf Sand, Glass Sand, Silica Flour
Formula: SiO₂
Material Uses: Industries such as gas & oil, water filtration, construction materials, cement, non-skid surfaces, fillers, golf course sand, artificial athletic sands and insecticides

1.2. Company:

Main Office:
11 Stanwix Street, 11th Floor
Pittsburgh, PA 15222
Telephone: 412-995-5500
Fax: 412-995-5594
Canadian Office:
P.O. Box 190
Ingersoll, Ontario N5C 3K5
Telephone: 519-423-6283
Fax: 519-423-6545

SECTION 2 - COMPOSITION / INFORMATION ON INGREDIENTS

<u>Ingredient</u>	<u>% by Weight</u>	<u>CAS #</u>	<u>Exposure Limits</u>
Crystalline silica quartz	90.0 – 99.9	14808-60-7	OSHA PEL: 30 mg/m ³ / (% silica + 2) (total) 10 mg/m ³ / (% silica + 2) (respirable) ACGIH TLV: 0.025 mg/m ³ (respirable)

This material is classified as hazardous under OSHA regulations.

WARNING: Never Use This Material for Sand Blasting

Product Name:	SAND (continued)
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SECTION 3 – HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: A white or tan sand, or ground sand. It is not flammable, combustible or explosive. Do not breathe this material. Crystalline silica (quartz) is not known to be an environmental hazard. Crystalline silica (quartz) is incompatible with hydrofluoric acid, fluorine, chlorine trifluoride or oxygen difluoride.

POTENTIAL HEALTH EFFECTS

EYE Contact can cause moderate to severe irritation of eyes, including discomfort or pain, local redness and swelling of the conjunctiva.

SKIN Contact can cause dryness or moderate irritation of skin.

INGESTION None known.

INHALATION If inhaled as dust, this product can cause irritation of the respiratory system resulting in coughing and/or sneezing. Higher exposures may cause a build-up of fluid in the lungs with severe shortness of breath. Inhalation of silica can also cause a chronic irreversible lung disorder, silicosis. Some medical reports state inhalation of silica dust may cause lung cancer.

Per ACGIH, adverse effects are not likely to occur in the workplace provided exposure levels do not exceed the appropriate TLVs/PELs. See Section 8. However, because of the wide variation in individual susceptibility, lower exposure limits may be appropriate for some individuals including persons with pre-existing medical conditions.

CHRONIC EFFECTS / CARCINOGENICITY: Silicosis, cancer, scleroderma, tuberculosis, nephrotoxicity and arthritis are potential chronic effects. See Section 11 for further information regarding these conditions

SIGNS AND SYMPTOMS OF EXPOSURE: There are generally no signs or symptoms of exposure to crystalline silica (quartz). Often, chronic silicosis has no symptoms. The symptoms of chronic silicosis, if present, are shortness of breath, wheezing, cough and sputum production. The symptoms of acute silicosis are the same; additionally, weight loss and fever are associated with acute silicosis. The symptoms of scleroderma include thickening and stiffness of the skin, particularly in the fingers, shortness of breath, difficulty swallowing and joint problems.

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE: The condition of individuals with lung disease (e.g., bronchitis, emphysema, chronic obstructive pulmonary disease) can be aggravated by exposure. See Section 11 for additional detail on potential adverse health effects.

POTENTIAL ENVIRONMENTAL EFFECTS: None known.

SECTION 4 – FIRST AID MEASURES

EYE Quickly and gently blot or brush away sand. Immediately flush the contaminated eye(s) with lukewarm, gently flowing water for at least 15 minutes or until the sand is removed, while holding the eyelid(s) open. Occasionally lift eyelid(s) to ensure thorough rinsing. Beyond flushing, do not attempt to remove material from eye(s). Do not rub eyes. Seek medical attention immediately.

SKIN Wash with soap and water. Seek medical attention if irritation persists.

INGESTION Never give anything by mouth if the victim is rapidly losing consciousness, or is unconscious or convulsing. Have victim rinse mouth thoroughly with water. If irritation or discomfort occurs, obtain medical advice immediately.

INHALATION Remove source of contamination or move victim to fresh air. Seek medical attention if necessary. If breathing has stopped, give artificial respiration.

Product Name:	SAND (continued)
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SECTION 5 – FIRE FIGHTING MEASURES

Flammable Properties

Flash Point: Not flammable

Method: N/A

EXTINGUISHING MEDIA None required. Use suitable extinguishing media for surrounding fire.

FIRE & EXPLOSION HAZARDS None

FIRE FIGHTING INSTRUCTIONS None

SECTION 6 – ACCIDENTAL RELEASE MEASURES

SPILL /LEAK PROCEDURES Use dustless methods (vacuum) and place in closable container for disposal or flush with water. Do not dry sweep. Use proper protective equipment indicated in Section 8.

SECTION 7 – HANDLING AND STORAGE

HANDLING Keep in tightly closed containers. Protect containers from physical damage. Avoid direct skin contact with the material.

Silica sand material contains fine dust. If you breathe this dust you can suffer severe, irreversible lung damage and death. Some medical reports state inhalation of silica dust may cause lung cancer. Medical reports also link breathing silica dust to crippling arthritis and skin and eye irritation. See Section 11 for further information.

You must never use this material without having a government-approved respirator. The work area must also be thoroughly ventilated by the use of forced air ventilation during and after use of this material.

If dusty, use protective goggles. An eye wash station should be readily available where this product is used.

Prior to use or handling, you are advised to review and thoroughly understand all health precautions outlined in the Material Safety Data Sheet (MSDS).

STORAGE Store in a cool, dry, and well-ventilated location. Do not store near incompatible materials. (See Section 10 for list of incompatible materials.) Avoid breakage of bagged materials or spills of bulk material.

Product Name:	SAND (continued)
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SECTION 8 – EXPOSURE CONTROLS / PERSONAL PROTECTION

ENGINEERING CONTROLS	Use sufficient local exhaust to reduce the level of respirable crystalline silica to below the PEL. See ACGIH “Industrial Ventilation, A Manual of Recommended Practice” (latest edition).																
RESPIRATORY PROTECTION	Use NIOSH/MSHA approved respirators if airborne concentration exceeds PEL. It is a violation of federal safety laws (OSHA) for employers to require workers to use this material without full respiratory protection. The federal laws that apply are: 29CFR 1910.134; 29CFR 1910.1000; 29CFR 1910.94. The following chart specifies the types of respirators that may provide respiratory protection for crystalline silica. <table> <tr> <th><u>Particulate Concentration</u></th><th colspan="2"><u>MINIMUM RESPIRATORY PROTECTION*</u></th></tr> <tr> <td>10 x PEL or less</td><td colspan="2"> Any particulate respirator, except single -use or quarter-mask respirator. Any fume respirator or high efficiency particulate filter respirator. Any supplied-air respirator. Any self-contained breathing apparatus. </td></tr> <tr> <td>50 x PEL or less</td><td colspan="2"> A high efficiency particulate filter respirator with a full facepiece. Any supplied-air respirator with a full facepiece, helmet, or hood. Any self-contained breathing apparatus with a full facepiece. </td></tr> <tr> <td>500 x PEL or less</td><td colspan="2"> A powered air-purifying respirator with a high efficiency particulate filter. A Type C supplied-air respirator operated in pressure-demand or other positive pressure or continuous-flow mode. </td></tr> <tr> <td>Greater than 500 x PEL or entry and escape from unknown concentrations</td><td colspan="2"> A type C, supplied-air respirator with a full facepiece, hood, or helmet, operated in a positive pressure mode (see 29 CFR 1910.94(a)(iii)). Also see 30 CFR Part 11. </td></tr> </table> *Use only NIOSH-approved or MSHA-approved equipment. See 29 CFR §1910.134 and 42 CFR §84. See also ANSI standard Z88.2 (latest revision) “American National Standard for Respiratory Protection”		<u>Particulate Concentration</u>	<u>MINIMUM RESPIRATORY PROTECTION*</u>		10 x PEL or less	Any particulate respirator, except single -use or quarter-mask respirator. Any fume respirator or high efficiency particulate filter respirator. Any supplied-air respirator. Any self-contained breathing apparatus.		50 x PEL or less	A high efficiency particulate filter respirator with a full facepiece. Any supplied-air respirator with a full facepiece, helmet, or hood. Any self-contained breathing apparatus with a full facepiece.		500 x PEL or less	A powered air-purifying respirator with a high efficiency particulate filter. A Type C supplied-air respirator operated in pressure-demand or other positive pressure or continuous-flow mode.		Greater than 500 x PEL or entry and escape from unknown concentrations	A type C, supplied-air respirator with a full facepiece, hood, or helmet, operated in a positive pressure mode (see 29 CFR 1910.94(a)(iii)). Also see 30 CFR Part 11.	
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Greater than 500 x PEL or entry and escape from unknown concentrations	A type C, supplied-air respirator with a full facepiece, hood, or helmet, operated in a positive pressure mode (see 29 CFR 1910.94(a)(iii)). Also see 30 CFR Part 11.																
SKIN PROTECTION	Use appropriate gloves to prevent skin contact. Clothing should fully cover arms and legs and be tight fitting at the cuffs, neck and ankles to prevent dust from contacting the body. Clothing should be regularly washed to prevent dust accumulation.																
EYE PROTECTION	Use safety goggles.																
EXPOSURE GUIDELINES	OSHA PEL	ACGIH TLV															
Crystalline silica (respirable)	$10 \text{ mg/m}^3 \div (\% \text{ silica in the dust plus } 2)$	0.025 mg/m^3															

Crystalline silica exists in several forms, the most common of which is quartz. If crystalline silica (quartz) is heated to more than 870°C it can change to a form of crystalline silica known as trydimite, and if crystalline silica (quartz) is heated to more than 1470°C, it can change to a form of crystalline silica known as cristobalite. Crystalline silica as trydimite and cristobalite are more fibrogenic than crystalline silica as quartz. The OSHA PEL for crystalline silica as trydimite and cristobalite is one-half the PEL for crystalline silica (quartz); the ACGIH TLV for crystalline silica as trydimite and cristobalite is one-half the TLV for crystalline silica as quartz.

Product Name:	SAND (continued)
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SECTION 9 – PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE	White or tan sand; granular, crushed, or ground
ODOR	Odorless
BOILING POINT	4046°F
MELTING POINT	3110°F
VAPOR PRESSURE	N/A
SOLUBILITY IN WATER	Insoluble
SPECIFIC GRAVITY	2.65
pH	N/Ap

SECTION 10 – STABILITY AND REACTIVITY

STABILITY	Chemically stable.
MATERIALS TO AVOID	Contact with powerful oxidizing agents such as fluorine, boron trifluoride, chlorine trifluoride, manganese trifluoride, oxygen difluoride, may cause fires and/or explosions.
CONDITIONS TO AVOID	None
HAZARDOUS DECOMPOSITION PRODUCTS	Silica will dissolve in hydrofluoric acid and produce a corrosive gas – silicon tetrafluoride.

SECTION 11 – TOXICOLOGICAL INFORMATION

No LD₅₀ or LC₅₀ have been identified for this product.

SILICOSIS

The major concern is silicosis, caused by the inhalation and retention of respirable crystalline silica dust. Silicosis can exist in several forms, chronic (or ordinary), accelerated, or acute.

Chronic or Ordinary Silicosis is the most common form of silicosis, and can occur after many years of exposure to relatively low levels of airborne respirable crystalline silica dust. It is further defined as either simple or complicated silicosis.

Simple silicosis is characterized by lung lesions (shown as radiographic opacities) less than 1 centimeter in diameter, primarily in the upper lung zones. Often, simple silicosis is not associated with symptoms, detectable changes in lung function or disability. Simple silicosis may be progressive and may develop into complicated silicosis or progressive massive fibrosis (PMF).

Complicated silicosis or PMF is characterized by lung lesions (shown as radiographic opacities) greater than 1 centimeter in diameter. Although there may be no symptoms associated with complicated silicosis or PMF, the symptoms, if present, are shortness of breath, wheezing, cough and sputum production. Complicated silicosis or PMF may be associated with decreased lung function and may be disabling. Advanced complicated silicosis or PMF may lead to death. Advanced complicated silicosis or PMF can result in heart disease secondary to the lung disease (cor pulmonale).

Accelerated Silicosis can occur with exposure to high concentrations of respirable crystalline silica over a relatively short period; the lung lesions can appear within five (5) years of the initial exposure. The progression can be rapid. Accelerated silicosis is similar to chronic or ordinary silicosis, except that the lung lesions appear earlier and the progression is more rapid.

Acute Silicosis can occur with exposures to very high concentrations of respirable crystalline silica over a very short time period, sometimes as short as a few months. The symptoms of acute silicosis include progressive shortness of breath, fever, cough and weight loss. Acute silicosis is fatal.

CANCER

IARC - The International Agency for Research on Cancer ("IARC") concluded that there was "*sufficient evidence* in humans for the carcinogenicity of crystalline silica in the forms of quartz or cristobalite from occupational sources", and that there is "*sufficient evidence* in experimental animals for the carcinogenicity of quartz and cristobalite." The overall IARC evaluation was that "crystalline silica inhaled in the form of quartz or cristobalite from occupational sources is *carcinogenic to humans*

Product Name:	SAND (continued)
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(Group 1).” The IARC evaluation noted that “carcinogenicity was not detected in all industrial circumstances studies. Carcinogenicity may be dependent on inherent characteristics of the crystalline silica or on external factors affecting its biological activity or distribution of its polymorphs.” For further information on the IARC evaluation, see IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, Volume 68, “Silica, Some Silicates...” (1997). (Emphasis added)

NTP - The National Toxicology Program, in its Sixth Annual Report on Carcinogens, concluded that “silica, crystalline (respirable)” may reasonably be anticipated to be a carcinogen, based on sufficient evidence in experimental animals and limited evidence in humans.

OSHA - Crystalline silica (quartz) is not regulated by the U. S. Occupational Safety and Health Administration as a carcinogen.

There is substantial literature on the issues of the carcinogenicity of crystalline silica, which the reader should consult for additional information. A summary of the literature is set forth in “Exposure to crystalline silica and risk of lung cancer; the epidemiological evidence”, Thorax, Volume 51, pp. 97-102 (1996). The official statement of the American Thoracic Society on the issue of silica carcinogenicity was published in “Adverse Effects of Crystalline Silica Exposure”, American Journal of Respiratory and Critical Care Medicine, Volume 155, pp. 761-765 (1997). The official statement concluded that “The available data support the conclusion that silicosis produces increased risk for bronchogenic carcinoma. The cancer risk may also be increased by smoking and other carcinogens in the workplace. Epidemiologic studies provide convincing evidence for increased cancer risk among tobacco smokers with silicosis. Less information is available for never-smokers and for workers exposed to silica but who do not have silicosis. For workers with silicosis, the risks for lung cancer are relatively high and consistent among various countries and investigators. Silicosis should be considered a condition that predisposes workers to an increased risk of lung cancer.” Id. at 763.

SCLERODERMA

There is evidence that exposure to respirable crystalline silica or that the disease silicosis is associated with the increased incidence of scleroderma, an immune system disorder manifested by a fibrosis (scarring) of the lungs, skin and other internal organs. Recently, the American Thoracic Society noted that “there is persuasive evidence relating scleroderma to occupational silica exposures in setting where there is appreciable silicosis risk.” The following may be consulted for additional information on silica, silicosis and scleroderma (also known as progressive systemic sclerosis): Occupational Lung Disorders, Third Edition, Chapter 12, entitled “Silicosis and Related Diseases”, Parkes, W. Raymond (1994). “Adverse Effects of Crystalline Silica Exposure”, American Journal of Respiratory and Critical Care Medicine, Volume 155, pp. 761-765 (1997).

TUBERCULOSIS

Individuals with silicosis are at increased risk to develop tuberculosis, if exposed to persons with tuberculosis. The following may be consulted for further information: Occupational Lung Disorders, Third Edition, Chapter 12, entitled “Silicosis and Related Diseases”, Parkes, W. Raymond (1994). “Adverse Effects of Crystalline Silica Exposure”, American Journal of Respiratory and Critical Care Medicine, Volume 155, pp. 761-765 (1997). Silica Sand (Brady, Colorado Springs, Riverside, Bakersfield)

NEPHROTOXICITY

There are several recent studies suggesting that exposure to respirable crystalline silica or that the disease silicosis is associated with the increased incidence of kidney disorders. The following may be consulted for additional information on silica, silicosis and nephrotoxicity: Occupational Lung Disorders, Third Edition, Chapter 12, entitled “Silicosis and Related Diseases”, Parkes, W. Raymond (1994). “Further evidence of human silica nephrotoxicity in occupationally exposed workers”, British Journal of Industrial Medicine, Vol. 50, No. 10, pp. 907-912 (1993). “Adverse Effects of Crystalline Silica Exposure”, American Journal of Respiratory and Critical Care Medicine, Volume 155, pp. 761-765 (1997).

ARTHRITIS

There are recent studies suggesting that exposure to respirable crystalline silica or that the disease silicosis is associated with the increased incidence of arthritis. The following may be consulted for additional information on silica exposure and arthritis: American Journal of Industrial Medicine, Volume 35, pp. 375-381 “Connective Tissue Disease and Silicosis”, Rosenman KD; Moore-Fuller M.; Reilly MJ. (1999). Environmental Health Perspective, Volume 107, pp. 793-802 “Occupational Exposure to Crystalline Silica and Autoimmune Disease”, Parks CG; Conrad K; Cooper GS. (1999).

Product Name:	SAND (continued)
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SECTION 12 – ECOLOGICAL INFORMATION

ECOTOXICITY: Crystalline silica (quartz) is not known to be ecotoxic; i.e., no data suggests that crystalline silica (quartz) is toxic to birds, fish, invertebrates, microorganisms or plants.

ENVIRONMENTAL FATE: This material shows no bioaccumulation effect or food chain concentration toxicity.

SECTION 13 – DISPOSAL CONSIDERATIONS

Dispose of in accordance with all applicable federal, state, and local environmental regulations. The material may be landfilled; however, used material may contain materials derived from other sources that because of contamination may not be disposed of in landfills. Disposed material should be covered to minimize generation of airborne dust.

RCRA: Crystalline silica (quartz) is not classified as a hazardous waste under the Resource Conservation and Recovery Act, or its regulations, 40 CFR §261 et seq. However, the material may be contaminated during use, and it is the responsibility of the user to assess the appropriate disposal of the used material.

SECTION 14 – TRANSPORT INFORMATION

US DOT	Not regulated
Proper Shipping Name	NA
Class	NA
UN Number	NA
Packing Group	NA

SECTION 15 – REGULATORY INFORMATION

United States

EPA

RCRA Hazardous Waste Number: not listed (40 CFR 261.33)

RCRA Hazardous Waste Classification (40 CFR 261): not classified

CERCLA Hazardous Substance (40 CFR 302.4) unlisted specific per RCRA, Sec. 3001; CWA, Sec. 311(b)(4); CWA, Sec. 307(a), CAA, Sec. 112

CERCLA Reportable Quantity (RQ): not listed.

SARA 311/312 Codes: not listed.

SARA Toxic Chemical (40 CFR 372.65): not listed.

SARA EHS (Extremely Hazardous Substance) (40 CFR 355): Not listed, Threshold Planning Quantity (TPQ): not listed.

TSCA: All chemical ingredients are listed on the U.S. TSCA Inventory List.

FDA: Silica is included in the list of substances that may be included in coatings used in food contact surfaces, 21 CFR §175.300(b)(3)(xxvi).

California Proposition 65: Respirable crystalline silica (quartz) is classified as a substance known to the state of California to be a carcinogen.

OSHA/MSHA Regulations

Air contaminant (29 CFR 1910.1000, Table Z-1, Z-1-A): 5 mg/m³ TWA-8

MSHA: not listed.

OSHA Specifically Regulated Substance (29CFR 1910): not listed.

SECTION 16 – OTHER INFORMATION

HMIS: Health Risks 0*, Flammability 0, Reactivity 0, Personal Protection, E

NFPA: Health Hazard 0, Fire Hazard 0, Reactivity 0

The information contained herein is believed to be accurate and reliable as of the date hereof. However, Carmeuse makes no representation, warranty or guarantee as to results or as to the information's accuracy, reliability or completeness. Carmeuse has no liability for any loss or damage that may result from use of the information. Each user is responsible to review this information, satisfy itself as to the information's suitability and completeness, and circulate the information to its employees, customers and other appropriate third parties.

MATERIAL SAFETY DATA SHEET

Product Trade Name: **DIAMOND SEAL**

Revision Date: 02-Jan-2007

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: DIAMOND SEAL

Synonyms: None

Chemical Family: Polymer

Application: Additive

Manufacturer/Supplier Baroid Drilling Fluids
a Product Service Line of Halliburton Energy Services, Inc.
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By Chemical Compliance
Telephone: 1-580-251-4335

2. COMPOSITION/INFORMATION ON INGREDIENTS

SUBSTANCE	CAS Number	PERCENT	ACGIH TLV-TWA	OSHA PEL-TWA
Contains no hazardous substances	Mixture	60 - 100%	Not applicable	Not applicable

3. HAZARDS IDENTIFICATION

Hazard Overview May cause eye irritation.

4. FIRST AID MEASURES

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin Wash with soap and water. Get medical attention if irritation persists.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion Under normal conditions, first aid procedures are not required.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

Flash Point/Range (F):	Not Determined
Flash Point/Range (C):	Not Determined
Flash Point Method:	Not Determined
Autoignition Temperature (F):	Not Determined
Autoignition Temperature (C):	Not Determined
Flammability Limits in Air - Lower (%):	Not Determined
Flammability Limits in Air - Upper (%):	Not Determined

Fire Extinguishing Media Carbon Dioxide, Dry Chemicals, Foam.

Special Exposure Hazards Decomposition in fire may produce toxic gases. Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 1, Flammability 1, Reactivity 0
HMIS Ratings: Flammability 1, Reactivity 0, Health 1

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust. Slippery when wet.

Environmental Precautionary Measures None known.

Procedure for Cleaning / Absorption Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid creating or inhaling dust. Wash hands after use. Slippery when wet.

Storage Information Store away from oxidizers. Store in a dry location.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls A well ventilated area to control dust levels.

Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Dust/mist respirator. (95%)

Hand Protection Normal work gloves.

Skin Protection Normal work coveralls.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State: Solid
Color: White
Odor: Odorless

9. PHYSICAL AND CHEMICAL PROPERTIES

pH:	4-11
Specific Gravity @ 20 C (Water=1):	0.65- 0.85
Density @ 20 C (lbs./gallon):	Not Determined
Bulk Density @ 20 C (lbs/ft3):	40-50
Boiling Point/Range (F):	Not Determined
Boiling Point/Range (C):	Not Determined
Freezing Point/Range (F):	Not Determined
Freezing Point/Range (C):	Not Determined
Vapor Pressure @ 20 C (mmHg):	Not Determined
Vapor Density (Air=1):	Not Determined
Percent Volatiles:	Not Determined
Evaporation Rate (Butyl Acetate=1):	Not Determined
Solubility in Water (g/100ml):	Insoluble
Solubility in Solvents (g/100ml):	Not Determined
VOCs (lbs./gallon):	Not Determined
Viscosity, Dynamic @ 20 C (centipoise):	Not Determined
Viscosity, Kinematic @ 20 C (centistrokes):	Not Determined
Partition Coefficient/n-Octanol/Water:	Not Determined
Molecular Weight (g/mole):	Not Determined

10. STABILITY AND REACTIVITY

Stability Data:	Stable
Hazardous Polymerization:	Will Not Occur
Conditions to Avoid	None known.
Incompatibility (Materials to Avoid)	Strong oxidizers.
Hazardous Decomposition Products	Oxides of nitrogen. Ammonia. Hydrocarbons. Carbon monoxide and carbon dioxide. In the event of oxygen depletion, hydrocyanic acid can be formed.
Additional Guidelines	Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure	Eye or skin contact, inhalation.
Inhalation	May cause mild respiratory irritation.
Skin Contact	None known.
Eye Contact	May cause eye irritation.
Ingestion	None known
Aggravated Medical Conditions	None known.
Chronic Effects/Carcinogenicity	No data available to indicate product or components present at greater than 1% are chronic health hazards.
Other Information	None known.
Toxicity Tests	
Oral Toxicity:	LD50: > 5000 mg/kg (Rat)
Dermal Toxicity:	LD50: > 2000 mg/kg (Rabbit)

Inhalation Toxicity:	Not determined
Primary Irritation Effect:	Not determined
Carcinogenicity	Not determined
Genotoxicity:	Not determined
Reproductive / Developmental Toxicity:	Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air)	Not determined
Persistence/Degradability	Not readily biodegradable.
Bio-accumulation	Not Determined

Ecotoxicological Information

Acute Fish Toxicity:	Not determined
Acute Crustaceans Toxicity:	Not determined
Acute Algae Toxicity:	Not determined

Chemical Fate Information	Not determined
Other Information	Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method	Bury in a licensed landfill according to federal, state, and local regulations.
Contaminated Packaging	Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

US TSCA Inventory	All components listed on inventory.
EPA SARA Title III Extremely Hazardous Substances	Not applicable
EPA SARA (311,312) Hazard Class	None
EPA SARA (313) Chemicals	This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372).
EPA CERCLA/Superfund Reportable Spill Quantity For This Product	Not applicable.
EPA RCRA Hazardous Waste Classification	If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA.
California Proposition 65	The California Proposition 65 regulations apply to this product.
MA Right-to-Know Law	One or more components listed.
NJ Right-to-Know Law	One or more components listed.
PA Right-to-Know Law	One or more components listed.

Canadian Regulations

Canadian DSL Inventory	All components listed on inventory.
WHMIS Hazard Class	Un-Controlled

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information	For additional information on the use of this product, contact your local Halliburton representative. For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.
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Disclaimer Statement	This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.
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END OF MSDS



GHS SAFETY DATA SHEET

COMSTAR CLR WINTER GRADE Low VOC PVC Plastic Pipe Cement

Date Revised: **APR 2010**

Supersedes:

SECTION 1 - PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: COMSTAR CLR WINTER GRADE Low VOC PVC Plastic Pipe Cement**PRODUCT USE:** Low VOC Solvent Cement for PVC Plastic Pipe**SUPPLIER:****MANUFACTURER:** PARABOND*

P. O. BOX 70013, SANTA ANA, CA, 92725-0013

(310) 898-3300

(310) 898-3392 fax

EMERGENCY: Transportation: Tel. 800.424.9300, 703.527.3887 CHEMTREC (International)**Medical:** Tel. 800.451.8346, 760.602.8703 3E Company (International)

SECTION 2 - HAZARDS IDENTIFICATION

GHS CLASSIFICATION:

Health	Environmental	Physical
Acute Toxicity: Category 4 Skin Irritation: Category 3 Skin Sensitization: NO Eye: Category 2B	Acute Toxicity: None Known Chronic Toxicity: None Known	Flammable Liquid Category 2

GHS LABEL:

OR

**Signal Word:**
Danger**WHMS CLASSIFICATION:** CLASS B, DIVISION 2

Hazard Statements

H225: Highly flammable liquid and vapor
H319: Causes serious eye irritation
H332: Harmful if inhaled
H335: May cause respiratory irritation
H336: May cause drowsiness or dizziness
EUH019: May form explosive peroxides

Precautionary Statements

P210: Keep away from heat/sparks/open flames/hot surfaces – No smoking
P261: Avoid breathing dust/fume/gas/mist/vapors/spray
P280: Wear protective gloves/protective clothing/eye protection/face protection
P304+P340: IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P403+P233: Store in a well ventilated place. Keep container tightly closed
P501: Dispose of contents/container in accordance with local regulation

SECTION 3 - COMPOSITION/INFORMATION ON INGREDIENTS

	CAS#	EINECS #	REACH Pre-registration Number	CONCENTRATION % by Weight
Tetrahydrofuran (THF)	109-99-9	203-726-8	05-2116297729-22-0000	20 - 40
Methyl Ethyl Ketone (MEK)	78-93-3	201-159-0	05-2116297728-24-0000	30 - 45
Cyclohexanone	108-94-1	203-631-1	05-2116297718-25-0000	15 - 25

All of the constituents of this adhesive product are listed on the TSCA inventory of chemical substances maintained by the US EPA, or are exempt from that listing.

* Indicates this chemical is subject to the reporting requirements of Section 313 of the Emergency Planning and Community Right-to-Know Act of 1986 (40CFR372).

SECTION 4 - FIRST AID MEASURES

Contact with eyes: Flush eyes immediately with plenty of water for 15 minutes and seek medical advice immediately.
Skin contact: Remove contaminated clothing and shoes. Wash skin thoroughly with soap and water. If irritation develops, seek medical advice.
Inhalation: Remove to fresh air. If breathing is stopped, give artificial respiration. If breathing is difficult, give oxygen. Seek medical advice.
Ingestion: Rinse mouth with water. Give 1 or 2 glasses of water or milk to dilute. Do not induce vomiting. Seek medical advice immediately.

SECTION 5 - FIREFIGHTING MEASURES

Suitable Extinguishing Media: Dry chemical powder, carbon dioxide gas, foam, Halon, water fog.
Unsuitable Extinguishing Media: Water spray or stream.
Exposure Hazards: Inhalation and dermal contact
Combustion Products: Oxides of carbon, hydrogen chloride and smoke
Protection for Firefighters: Self-contained breathing apparatus or full-face positive pressure airline masks.

Health	2	2	0-Minimal
Flammability	3	3	1-Slight
Reactivity	0	0	2-Moderate
			3-Serious
			4-Severe

SECTION 6 - ACCIDENTAL RELEASE MEASURES

Personal precautions: Keep away from heat, sparks and open flame.
Provide sufficient ventilation, use explosion-proof exhaust ventilation equipment or wear suitable respiratory protective equipment.
Prevent contact with skin or eyes (see section 8).
Environmental Precautions: Prevent product or liquids contaminated with product from entering sewers, drains, soil or open water course.
Methods for Cleaning up: Clean up with sand or other inert absorbent material. Transfer to a closable steel vessel.
Materials not to be used for clean up: Aluminum or plastic containers

SECTION 7 - HANDLING AND STORAGE

Handling: Avoid breathing of vapor, avoid contact with eyes, skin and clothing.
Keep away from ignition sources, use only electrically grounded handling equipment and ensure adequate ventilation/fume exhaust hoods.
Do not eat, drink or smoke while handling.
Storage: Store in ventilated room or shade below 44°C (110°F) and away from direct sunlight.
Keep away from ignition sources and incompatible materials: caustics, ammonia, inorganic acids, chlorinated compounds, strong oxidizers and isocyanates.
Follow all precautionary information on container label, product bulletins and solvent cementing literature.

SECTION 8 - PRECAUTIONS TO CONTROL EXPOSURE / PERSONAL PROTECTION

EXPOSURE LIMITS:	Component	ACGIH TLV	ACGIH STEL	OSHA PEL	OSHA STEL:
	Tetrahydrofuran (THF)	50 ppm	100 ppm	200 ppm	
	Methyl Ethyl Ketone (MEK)	200 ppm	300 ppm	200 ppm	
	Cyclohexanone	20 ppm	50 ppm	50 ppm	

Engineering Controls: Use local exhaust as needed.**Monitoring:** Maintain breathing zone airborne concentrations below exposure limits.**Personal Protective Equipment (PPE):****Eye Protection:** Avoid contact with eyes, wear splash-proof chemical goggles, face shield, safety glasses (spectacles) with brow guards and side shields, etc. as may be appropriate for the exposure.**Skin Protection:** Prevent contact with the skin as much as possible. Butyl rubber gloves should be used for frequent immersion.
Use of solvent-resistant gloves or solvent-resistant barrier cream should provide adequate protection when normal adhesive application practices and procedures are used for making structural bonds.**Respiratory Protection:** Prevent inhalation of the solvents. Use in a well-ventilated room. Open doors and/or windows to ensure airflow and air changes. Use local exhaust ventilation to remove airborne contaminants from employee breathing zone and to keep contaminants below levels listed above.
With normal use, the Exposure Limit Value will not usually be reached. When limits approached, use respiratory protection equipment.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Clear, regular syrupy liquid	Odor Threshold:	0.88 ppm (Cyclohexanone)
Odor:	Ketone	Boiling Range:	66 °C (151 °F) to 156 °C (313 °F)
pH:	Not Applicable	Evaporation Rate:	> 1.0 (BUAC = 1)
Melting/Freezing Point:	-108 °C (-162 °F) Based on first melting component: THF	Flammability:	Category 2
Boiling Point:	67 °C (151 °F) Based on first boiling component: THF	Flammability Limits:	LEL: 1.1% based on Cyclohexanone
Flash Point:	-14 °C (7 °F) TCC based on THF		UEL: 11.8% based on THF
Specific Gravity:	0.934 @23 °C (73 °F)	Vapor Pressure:	129 mm Hg @ 20 °C (68 °F) based on THF
Solubility:	Solvent portion soluble in water. Resin portion separates out.	Vapor Density:	>2 (Air = 1)
Partition Coefficient n-octanol/water:	Not Available	Other Data: Viscosity:	Regular bodied
Auto-ignition Temperature:	321 °C (609.8 °F) based on THF		
Decomposition Temperature:	Not Applicable		
VOC Content:	When applied as directed, per SCAQMD Rule 1168, Test Method 316A, VOC content is: ≤ 510 g/l.		

SECTION 10 - STABILITY AND REACTIVITY

Stability:	Stable
Hazardous decomposition products:	None in normal use. When forced to burn, this product gives off oxides of carbon, hydrogen chloride and smoke.
Conditions to avoid:	Keep away from heat, sparks, open flame and other ignition sources.
Incompatible Materials:	Oxidizers, strong acids and bases, amines, ammonia

SECTION 11 - TOXICOLOGICAL INFORMATION

Likely Routes of Exposure: Inhalation, Eye and Skin Contact

Acute symptoms and effects:

Inhalation:	Severe overexposure may result in nausea, dizziness, headache. Can cause drowsiness, irritation of eyes and nasal passages.
Eye Contact:	Vapors slightly uncomfortable. Overexposure may result in severe eye injury with corneal or conjunctival inflammation on contact with the liquid.
Skin Contact:	Liquid contact may remove natural skin oils resulting in skin irritation. Dermatitis may occur with prolonged contact.
Ingestion:	May cause nausea, vomiting, diarrhea and mental sluggishness.

Chronic (long-term) effects: None known to humans

Toxicity:	LD ₅₀	LC ₅₀
Tetrahydrofuran (THF)	Oral: 2842 mg/kg (rat)	Inhalation 3 hrs. 21,000 mg/m ³ (rat)
Methyl Ethyl Ketone (MEK)	Oral: 2737 mg/kg (rat), Dermal: 6480 mg/kg (rabbit)	Inhalation 8 hrs. 23,500 mg/m ³ (rat)
Cyclohexanone	Oral: 1535 mg/kg (rat), Dermal: 948 mg/kg (rabbit)	Inhalation 4 hrs. 8,000 PPM (rat)

Reproductive Effects	Teratogenicity	Mutagenicity	Embryotoxicity	Sensitization to Product	Synergistic Products
Not Established	Not Established	Not Established	Not Established	Not Established	Not Established

SECTION 12 - ECOLOGICAL INFORMATION

Ecotoxicity:	None Known
Mobility:	In normal use, emission of volatile organic compounds (VOC's) to the air takes place, typically at a rate of ≤ 510 g/l.
Degradability:	Biodegradable
Bioaccumulation:	Minimal to none.

SECTION 13 - WASTE DISPOSAL CONSIDERATIONS

Follow local and national regulations. Consult disposal expert.

SECTION 14 - TRANSPORT INFORMATION

Proper Shipping Name:	Adhesives
Hazard Class:	3
Secondary Risk:	None
Identification Number:	UN 1133
Packing Group:	PG II
Label Required:	Class 3 Flammable Liquid
Marine Pollutant:	NO

EXCEPTION for Ground Shipping

DOT Limited Quantity: Up to 5L per inner packaging, 30 kg gross weight per package.
Consumer Commodity: Depending on packaging, these quantities may qualify under DOT as "ORM-D" .

TDG INFORMATION

TDG CLASS:	FLAMMABLE LIQUID 3
SHIPPING NAME:	ADHESIVES
UN NUMBER/PACKING GROUP:	UN 1133, PG II

SECTION 15 - REGULATORY INFORMATION

Precautionary Label Information:	Highly Flammable, Irritant	Ingredient Listings:	USA TSCA, Europe EINECS, Canada DSL, Australia AICS, Korea ECL/TCCL, Japan MITI (ENCS)
Symbols:	F, Xi		
Risk Phrases:	R11: Highly flammable. R20: Harmful by inhalation. R36/37: Irritating to eyes and respiratory system.	Safety Phrases:	S26: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S33: Take precautionary measures against static discharges. S46: If swallowed, seek medical advice immediately and show this container or label.
			R66: Repeated exposure may cause skin dryness or cracking R67: Vapors may cause drowsiness and dizziness

SECTION 16 - OTHER INFORMATION

Specification Information:		
Department issuing data sheet:	IPS, Safety Health & Environmental Affairs	All ingredients are compliant with the requirements of the European Directive on RoHS (Restriction of Hazardous Substances).
E-mail address:	<EHSinfo@ipscorp.com>	
Training necessary:	Yes, training in practices and procedures contained in product literature.	
Reissue date / reason for reissue:	4/29/2010 / New GHS Standard Format	
Intended Use of Product:	Solvent Cement for PVC Plastic Pipe	

This product is intended for use by skilled individuals at their own risk. The information contained herein is based on data considered accurate based on current state of knowledge and experience. However, no warranty is expressed or implied regarding the accuracy of this data or the results to be obtained from the use thereof.

MATERIAL SAFETY DATA SHEET

Product Trade Name: EP MUDLUBE®

Revision Date: 03-Dec-2009

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: EP MUDLUBE®
Synonyms: None
Chemical Family: Organic hydrocarbon
Application: Lubricant
Manufacturer/Supplier: Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000
Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

SUBSTANCE	CAS Number	PERCENT	ACGIH TLV-TWA	OSHA PEL-TWA
Hydrotreated light petroleum distillate	64742-47-8	10 - 30%	200 mg/m ³	Not applicable

3. HAZARDS IDENTIFICATION

Hazard Overview May cause eye, skin, and respiratory irritation. May cause headache, dizziness, and other central nervous system effects. May be harmful if swallowed. Combustible.

4. FIRST AID MEASURES

Inhalation If inhaled, remove to fresh air. If not breathing give artificial respiration, preferably mouth-to-mouth. If breathing is difficult give oxygen. Get medical attention.

Skin Wash with soap and water. Get medical attention if irritation persists. Remove contaminated clothing and launder before reuse.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion Get medical attention! If vomiting occurs, keep head lower than hips to prevent aspiration.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

Flash Point/Range (F):	146
Flash Point/Range (C):	63
Flash Point Method:	PMCC
Autoignition Temperature (F):	Not Determined
Autoignition Temperature (C):	Not Determined
Flammability Limits in Air - Lower (%):	Not Determined
Flammability Limits in Air - Upper (%):	Not Determined

Fire Extinguishing Media Carbon Dioxide, Dry Chemicals, Foam.

Special Exposure Hazards Use water spray to cool fire exposed surfaces. Decomposition in fire may produce toxic gases.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 1, Flammability 2, Reactivity 0

HMIS Ratings: Health 1, Flammability 2, Reactivity 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Wear self-contained breathing apparatus in enclosed areas.

Environmental Precautionary Measures Prevent from entering sewers, waterways, or low areas.

Procedure for Cleaning / Absorption Isolate spill and stop leak where safe. Remove ignition sources and work with non-sparking tools. Contain spill with sand or other inert materials. Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. Launder contaminated clothing before reuse. Wash hands after use. Do not open storage containers or enter confined spaces without adequate ventilation and respiratory protection due to hydrogen sulfide accumulation.

Storage Information Store away from oxidizers. Store in a cool well ventilated area. Keep from heat, sparks, and open flames. Keep container closed when not in use. Product has a shelf life of 36 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area. Local exhaust ventilation should be used in areas without good cross ventilation.

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Organic vapor respirator.

Hand Protection Impervious rubber gloves.

Skin Protection	Rubber apron.
Eye Protection	Chemical goggles; also wear a face shield if splashing hazard exists.
Other Precautions	Eyewash fountains and safety showers must be easily accessible.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Liquid
Color:	Brown-black
Odor:	Acrid
pH:	4.5
Specific Gravity @ 20 C (Water=1):	0.94
Density @ 20 C (lbs./gallon):	7.8
Bulk Density @ 20 C (lbs/ft3):	Not Determined
Boiling Point/Range (F):	302
Boiling Point/Range (C):	150
Freezing Point/Range (F):	-4
Freezing Point/Range (C):	-20
Vapor Pressure @ 20 C (mmHg):	Not Determined
Vapor Density (Air=1):	Not Determined
Percent Volatiles:	Not Determined
Evaporation Rate (Butyl Acetate=1):	Not Determined
Solubility in Water (g/100ml):	Insoluble
Solubility in Solvents (g/100ml):	Not Determined
VOCs (lbs./gallon):	Not Determined
Viscosity, Dynamic @ 20 C (centipoise):	500-1000
Viscosity, Kinematic @ 20 C (centistrokes):	Not Determined
Partition Coefficient/n-Octanol/Water:	Not Determined
Molecular Weight (g/mole):	Not Determined

10. STABILITY AND REACTIVITY

Stability Data:	Stable
Hazardous Polymerization:	Will Not Occur
Conditions to Avoid	None anticipated
Incompatibility (Materials to Avoid)	Strong oxidizers.
Hazardous Decomposition Products	Oxides of sulfur. Carbon monoxide and carbon dioxide.
Additional Guidelines	Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure	Eye or skin contact, inhalation.
Inhalation	May cause respiratory irritation. May cause central nervous system depression including headache, dizziness, drowsiness, incoordination, slowed reaction time, slurred speech, giddiness and unconsciousness.
Skin Contact	May cause skin defatting with prolonged exposure. Can dry skin.
Eye Contact	May cause eye irritation.

Ingestion	Irritation of the mouth, throat, and stomach. Aspiration into the lungs may cause chemical pneumonitis including coughing, difficulty breathing, wheezing, coughing up blood and pneumonia, which can be fatal.
Aggravated Medical Conditions	None known.
Chronic Effects/Carcinogenicity	No data available to indicate product or components present at greater than 1% are chronic health hazards.
Other Information	None known.
Toxicity Tests	
Oral Toxicity:	Not determined
Dermal Toxicity:	Not determined
Inhalation Toxicity:	Not determined
Primary Irritation Effect:	Not determined
Carcinogenicity	Not determined
Genotoxicity:	Not determined
Reproductive / Developmental Toxicity:	Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air)	Not determined
Persistence/Degradability	Not determined
Bio-accumulation	Not Determined

Ecotoxicological Information

Acute Fish Toxicity:	TLM48: 181 mg/l (Arcatia tonsa)
Acute Crustaceans Toxicity:	TLM96: 31900 ppm (Mysidopsis bahia) SPP @ 2 ppb
Acute Algae Toxicity:	E(B)C50: 491 mg/l (Skeletonema costatum)

Chemical Fate Information	Not determined
Other Information	Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method	Disposal should be made in accordance with federal, state, and local regulations.
Contaminated Packaging	Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

DOT (Bulk)

Combustible Liquid, N.O.S., Combustible Liquid, NA1993, III
(Contains Petroleum Distillates)

Canadian TDG

Not restricted

ADR

Not restricted

Air Transportation**ICAO/IATA**

Not restricted

Sea Transportation**IMDG**

Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION**US Regulations****US TSCA Inventory**

All components listed on inventory or are exempt.

EPA SARA Title III Extremely Hazardous Substances

Not applicable

EPA SARA (311,312) Hazard Class

Acute Health Hazard
Fire Hazard

EPA SARA (313) Chemicals

This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372).

EPA CERCLA/Superfund Reportable Spill Quantity

Not applicable.

EPA RCRA Hazardous Waste Classification

If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA.

California Proposition 65

All components listed do not apply to the California Proposition 65 Regulation.

MA Right-to-Know Law

Does not apply.

NJ Right-to-Know Law

Does not apply.

PA Right-to-Know Law

Does not apply.

Canadian Regulations**Canadian DSL Inventory**

Product contains one or more components not listed on inventory.

WHMIS Hazard Class

B3 Combustible Liquids
D2B Toxic Materials

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

MATERIAL SAFETY DATA SHEET

Product Trade Name: **EZ-MUD GOLD**

Revision Date: 02-Jun-2007

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: EZ-MUD GOLD
Synonyms: None
Chemical Family: Anionic Polymer
Application: Additive

Manufacturer/Supplier Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

SUBSTANCE	CAS Number	PERCENT	ACGIH TLV-TWA	OSHA PEL-TWA
Contains no hazardous substances	Mixture	60 - 100%	Not applicable	Not applicable

3. HAZARDS IDENTIFICATION

Hazard Overview May cause eye and skin irritation. Airborne dust may be explosive.

4. FIRST AID MEASURES

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin Wash with soap and water. Get medical attention if irritation persists.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion Do not induce vomiting. Slowly dilute with 1-2 glasses of water or milk and seek medical attention. Never give anything by mouth to an unconscious person.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

Flash Point/Range (F):	Not Determined
Flash Point/Range (C):	Not Determined
Flash Point Method:	Not Determined
Autoignition Temperature (F):	Not Determined
Autoignition Temperature (C):	Not Determined
Flammability Limits in Air - Lower (%):	Not Determined
Flammability Limits in Air - Upper (%):	Not Determined

Fire Extinguishing Media Water fog, carbon dioxide, foam, dry chemical.

Special Exposure Hazards Decomposition in fire may produce toxic gases. Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 1, Flammability 0, Reactivity 0
HMS Ratings: Flammability 0, Reactivity 0, Health 1

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust. Slippery when wet.

Environmental Precautionary Measures Prevent from entering sewers, waterways, or low areas.

Procedure for Cleaning / Absorption Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust. Slippery when wet.

Storage Information Store away from oxidizers. Store in a cool, dry location. Product has a shelf life of 36 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area.

Respiratory Protection Dust/mist respirator. (95%) Not normally needed. But if significant exposures are possible then the following respirator is recommended:

Hand Protection Normal work gloves.

Skin Protection Normal work coveralls.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Granules
Color:	Off white
Odor:	Odorless
pH:	7.75 (1%)
Specific Gravity @ 20 C (Water=1):	0.8-1.0
Density @ 20 C (lbs./gallon):	6.66-8.33
Bulk Density @ 20 C (lbs/ft3):	52
Boiling Point/Range (F):	Not Determined
Boiling Point/Range (C):	Not Determined
Freezing Point/Range (F):	Not Determined
Freezing Point/Range (C):	Not Determined
Vapor Pressure @ 20 C (mmHg):	Not Determined
Vapor Density (Air=1):	Not Determined
Percent Volatiles:	Not Determined
Evaporation Rate (Butyl Acetate=1):	Not Determined
Solubility in Water (g/100ml):	Soluble
Solubility in Solvents (g/100ml):	Not Determined
VOCs (lbs./gallon):	Not Determined
Viscosity, Dynamic @ 20 C (centipoise):	Not Determined
Viscosity, Kinematic @ 20 C (centistrokes):	Not Determined
Partition Coefficient/n-Octanol/Water:	Not Determined
Molecular Weight (g/mole):	Not Determined

10. STABILITY AND REACTIVITY

Stability Data:	Stable
Hazardous Polymerization:	Will Not Occur
Conditions to Avoid	None anticipated
Incompatibility (Materials to Avoid)	Strong oxidizers.
Hazardous Decomposition Products	Ammonia. Oxides of nitrogen. Carbon monoxide and carbon dioxide.
Additional Guidelines	Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure	Eye or skin contact, inhalation.
Inhalation	None known.
Skin Contact	May cause mild skin irritation.
Eye Contact	May cause mild eye irritation.
Ingestion	None known
Aggravated Medical Conditions	None known.
Chronic Effects/Carcinogenicity	No data available to indicate product or components present at greater than 1% are chronic health hazards.
Other Information	None known.
Toxicity Tests	

Oral Toxicity:	LD50: > 5000 mg/kg (Rat)
Dermal Toxicity:	Not determined
Inhalation Toxicity:	Not determined
Primary Irritation Effect:	Not determined
Carcinogenicity	Not determined
Genotoxicity:	Not determined
Reproductive / Developmental Toxicity:	Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air)	Not determined
Persistence/Degradability	Not readily biodegradable.
Bio-accumulation	Will not bio-accumulate.

Ecotoxicological Information

Acute Fish Toxicity:	TLM96: >1000 mg/l (Pimephales promelas)
Acute Crustaceans Toxicity:	Not determined
Acute Algae Toxicity:	EC50: > 500 mg/l (Selenastrum capricornutum)

Chemical Fate Information	Not determined
Other Information	Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method	Bury in a licensed landfill according to federal, state, and local regulations.
Contaminated Packaging	Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

US TSCA Inventory	All components listed on inventory.
EPA SARA Title III Extremely Hazardous Substances	Not applicable
EPA SARA (311,312) Hazard Class	None
EPA SARA (313) Chemicals	This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372).
EPA CERCLA/Superfund Reportable Spill Quantity	Not applicable.
EPA RCRA Hazardous Waste Classification	If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA.
California Proposition 65	The California Proposition 65 regulations apply to this product.
MA Right-to-Know Law	One or more components listed.
NJ Right-to-Know Law	One or more components listed.
PA Right-to-Know Law	One or more components listed.

Canadian Regulations

Canadian DSL Inventory	All components listed on inventory.
WHMIS Hazard Class	Un-Controlled

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information	For additional information on the use of this product, contact your local Halliburton representative. For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.
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Disclaimer Statement	This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.
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*****END OF MSDS*****

MATERIAL SAFETY DATA SHEET

Product Trade Name: EZ-MUD®

Revision Date: 02-Jan-2007

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: EZ-MUD®
Synonyms: None
Chemical Family: Blend
Application: Shale Inhibitor

Manufacturer/Supplier Baroid Drilling Fluids
a Product Service Line of Halliburton Energy Services, Inc.
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By Chemical Compliance
Telephone: 1-580-251-4335

2. COMPOSITION/INFORMATION ON INGREDIENTS

SUBSTANCE	CAS Number	PERCENT	ACGIH TLV-TWA	OSHA PEL-TWA
Hydrotreated light petroleum distillate	64742-47-8	10 - 30%	200 mg/m ³	Not applicable

3. HAZARDS IDENTIFICATION

Hazard Overview May cause eye, skin, and respiratory irritation. May cause headache, dizziness, and other central nervous system effects. May be harmful if swallowed.

4. FIRST AID MEASURES

Inhalation If inhaled, remove to fresh air. If not breathing give artificial respiration, preferably mouth-to-mouth. If breathing is difficult give oxygen. Get medical attention.

Skin Wash with soap and water. Get medical attention if irritation persists. Remove contaminated shoes and discard.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion Get medical attention! If vomiting occurs, keep head lower than hips to prevent aspiration.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

Flash Point/Range (F):	> 200Min: > 200
Flash Point/Range (C):	Not DeterminedMin: > 93
Flash Point Method:	PMCC
Autoignition Temperature (F):	> 392
Autoignition Temperature (C):	> 200
Flammability Limits in Air - Lower (%):	Not Determined
Flammability Limits in Air - Upper (%):	Not Determined

Fire Extinguishing Media Water fog, carbon dioxide, foam, dry chemical.

Special Exposure Hazards Decomposition in fire may produce toxic gases. Use water spray to cool fire exposed surfaces.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 2, Flammability 1, Reactivity 0

HMIS Ratings: Flammability 1, Reactivity 0, Health 2

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment.

Environmental Precautionary Measures Prevent from entering sewers, waterways, or low areas.

Procedure for Cleaning / Absorption Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. Wash hands after use. Launder contaminated clothing before reuse.

Storage Information Store away from oxidizers. Keep container closed when not in use.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls A well ventilated area to control dust levels. Local exhaust ventilation should be used in areas without good cross ventilation.

Respiratory Protection Organic vapor respirator with a dust/mist filter. In high concentrations, supplied air respirator or a self-contained breathing apparatus.

Hand Protection Impervious rubber gloves.

Skin Protection Rubber apron.

Eye Protection Chemical goggles; also wear a face shield if splashing hazard exists.

Other Precautions Eyewash fountains and safety showers must be easily accessible.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Liquid
Color:	White to gray
Odor:	Mild hydrocarbon
pH:	6-8

9. PHYSICAL AND CHEMICAL PROPERTIES

Specific Gravity @ 20 C (Water=1):	1.0
Density @ 20 C (lbs./gallon):	8.3
Bulk Density @ 20 C (lbs/ft3):	Not Determined
Boiling Point/Range (F):	347
Boiling Point/Range (C):	175
Freezing Point/Range (F):	Not Determined
Freezing Point/Range (C):	Not Determined
Vapor Pressure @ 20 C (mmHg):	0.002
Vapor Density (Air=1):	Not Determined
Percent Volatiles:	70
Evaporation Rate (Butyl Acetate=1):	< 1
Solubility in Water (g/100ml):	Partially soluble
Solubility in Solvents (g/100ml):	Not Determined
VOCs (lbs./gallon):	Not Determined
Viscosity, Dynamic @ 20 C (centipoise):	Not Determined
Viscosity, Kinematic @ 20 C (centistokes):	Not Determined
Partition Coefficient/n-Octanol/Water:	Not Determined
Molecular Weight (g/mole):	Not Determined

10. STABILITY AND REACTIVITY

Stability Data:	Stable
Hazardous Polymerization:	Will Not Occur
Conditions to Avoid	Keep away from heat, sparks and flame.
Incompatibility (Materials to Avoid)	Strong oxidizers.
Hazardous Decomposition Products	Ammonia. Oxides of nitrogen. Carbon monoxide and carbon dioxide.
Additional Guidelines	Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure	Eye or skin contact, inhalation.
Inhalation	May cause respiratory irritation. May cause central nervous system depression including headache, dizziness, drowsiness, incoordination, slowed reaction time, slurred speech, giddiness and unconsciousness.
Skin Contact	May cause skin irritation.
Eye Contact	May cause severe eye irritation.
Ingestion	Aspiration into the lungs may cause chemical pneumonitis including coughing, difficulty breathing, wheezing, coughing up blood and pneumonia, which can be fatal. May cause central nervous system depression including headache, dizziness, drowsiness, muscular weakness, incoordination, slowed reaction time, fatigue blurred vision, slurred speech, giddiness, tremors and convulsions.
Aggravated Medical Conditions	Lung disorders.
Chronic Effects/Carcinogenicity	No data available to indicate product or components present at greater than 1% are chronic health hazards.

Other Information None known.

Toxicity Tests

Oral Toxicity: Not determined

Dermal Toxicity: Not determined

Inhalation Toxicity: Not determined

Primary Irritation Effect: Not determined

Carcinogenicity Not determined

Genotoxicity: Not determined

**Reproductive /
Developmental Toxicity:** Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined

Persistence/Degradability BOD(28 Day): 40% of COD

Bio-accumulation Not Determined

Ecotoxicological Information

Acute Fish Toxicity: TLM96: >1000 mg/l (Pimephales promelas)

Acute Crustaceans Toxicity: TLM48: 98 mg/l (Acartia tonsa)

Acute Algae Toxicity: EC50: 16.70 mg/l (Skeletonema costatum)

Chemical Fate Information Not determined

Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Disposal should be made in accordance with federal, state, and local regulations.

Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

US TSCA Inventory	All components listed on inventory.
EPA SARA Title III Extremely Hazardous Substances	Not applicable
EPA SARA (311,312) Hazard Class	Acute Health Hazard
EPA SARA (313) Chemicals	This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372).
EPA CERCLA/Superfund Reportable Spill Quantity For This Product	Not applicable.
EPA RCRA Hazardous Waste Classification	If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA.
California Proposition 65	All components listed do not apply to the California Proposition 65 Regulation.
MA Right-to-Know Law	Does not apply.
NJ Right-to-Know Law	Does not apply.
PA Right-to-Know Law	Does not apply.

Canadian Regulations

Canadian DSL Inventory	All components listed on inventory.
WHMIS Hazard Class	D2B Toxic Materials

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

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*****END OF MSDS*****

GROUT-WELL[®]

GROUT-WELL DF[®]

By WYO-BEN, INC.

PRODUCT SUBMITTAL

- Product Information
- MSDS Sheets



GHP Systems, Inc.
1000 32nd Avenue
Brookings, SD 57006
www.ghpsystems.com

(605) 697-7867 tel
(605) 697- 9118 fax
888-447-7757 toll-free



GROUT-WELL[®] AND GROUT-WELL[®] DF



GROUT-WELL[®] and GROUT-WELL[®] DF are one step bentonite grouting materials designed to achieve low permeability seals in water wells, monitor wells, geotechnical borings, and heat pump holes. They achieve a range of solids contents, 17% to 20% solids by weight. GROUT-WELL[®] DF's granular nature **reduces dusty conditions** during mixing operations.

Placement of the GROUT-WELL[®] products is best done using a positive displacement or progressive cavity pump. When pumping must be done with gear or diaphragm pumps, you may have to use additional make-up water to insure pumpability due to the limited pressure generated by these types of pumps.

When adding the grouts to make-up water, the slurry will resemble "pancake batter", a creamy consistency with lumps. This is the ideal time to pump the fluid since all the bentonite has not fully hydrated. Once in place, the particles continue to swell, sealing off cracks and crevices while gelling to form its caulk-like consistency.

Provided local regulations allow, it is always recommended that the tremie line be withdrawn as the grout is being pumped. This permits the grout to continue its "set" undisturbed, reduces pump pressure, and minimizes unnecessary migration into surrounding formations.

MATERIAL SPECIFICATIONS:

Permeability: 1×10^{-8} cm/sec
Slurry Density: 9.4 – 9.5 lbs/gal
pH Range: 8.0 – 10.0
Dry Bulk Density: 55 - 60 lbs/cu ft
Thermal Conductivity: .42 BTU/hr-ft-degree F

	17.7% Solids	20.0% Solids
Grout-Well [®] DF	50 lbs	50 lbs
Water	28 gal	24 gal
Usable Slurry	31 gal	27 gal

TYPICAL E.P. TOXICITY ANALYSIS

	Standard (ppm)	Set Grout (ppm)
Arsenic	5.0	<0.10
Barium	100.0	0.50
Cadmium	1.0	<0.05
Chromium	5.0	<0.10
Lead	5.0	<0.10
Mercury	0.2	<0.02
Selenium	1.0	<0.05
Silver	5.0	<0.10

TYPICAL CHEMICAL ANALYSIS %

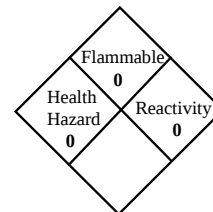
SiO ₂	63.54	MgO	1.67
Al ₂ O ₃	19.28	CaO ₃	0.38
Fe ₂ O ₃	3.48	TiO ₂	0.22
K ₂ O	0.10	Na ₂ O	2.34
MnO	0.02	H ₂ O	4.50
L.O.I. *	4.37		
*Loss on Ignition			

GROUT-WELL[®] and GROUT-WELL[®] DF are packaged in 50 pound bags.



WYO-BEN, INC.

MATERIAL SAFETY DATA SHEET



NFPA FIRE HAZARD
IDENTIFICATION SYSTEM

I. PRODUCT IDENTIFICATION

Trade Name(s): **GROUT-WELL®**

Generic Name(s): Wyoming (Western) Bentonite; Bentonite Clay (CAS No. 1302-78-9) and other proprietary ingredients

Chemical Name(s): Sodium Montmorillonite (CAS No. 1318-93-0) and other proprietary ingredients

Manufacturer: **WYO-BEN, INC.**
Address: P.O. Box 1979
Billings, Montana 59103

Telephone Numbers:
Information: (406) 652-6351
EMERGENCY: (406) 652-6351

II. HAZARDOUS INGREDIENTS

Ingredient	CAS NO.	%	Hazard
Crystalline Silica (SiO ₂) as Quartz	14808-60-7	See Note	Low concentrations of crystalline silica (SiO ₂) in the form of quartz may be present in airborne bentonite dust. See Section VI for discussion of health hazard.

Note 1: The specific chemical identity of this product is being withheld as a trade secret. In the event of a medical emergency it will be provided to a treating medical professional under the provisions of 29 CFR 1910.1200(i).

Note 2: Although the typical quartz content of western bentonite is in the range of 2 to 6% most of the quartz particles are larger than the 10 μ respirable threshold size. The actual respirable quartz concentration in airborne bentonite dust will depend upon bentonite source, fineness of product, moisture content of product, local humidity and wind condition at point of use and other use specific factors.

III. PHYSICAL DATA

Boiling Point (°F): NA	Specific Gravity (H ₂ O=1): 2.45-2.55
Vapor Pressure (mm. Hg): NA	Melting Point: Approx. 1450°C
Vapor Density (Air = 1): NA	Evaporation Rate (Butyl Acetate = 1): NA
Solubility in Water: Insoluble, forms colloidal suspension.	pH: 8-10 (5% aqueous suspension)
Density (at 20° C): 55 lbs./cu.ft. as product.	
Appearance and Odor: Bluegray to green as moist solid, light tan to gray as dry powder. No odor.	

IV. FIRE AND EXPLOSION DATA

Flash Point: NA	Flammable Limits: LEL: NA UEL: NA
Special Fire Fighting Procedures: NA	
Unusual Fire and Explosion Hazards: None. Product will not support combustion.	
Extinguishing Media: None for product. Any media can be used for the packaging. Product becomes slippery when wet.	

V. REACTIVITY

Stability: Stable
Hazardous Polymerization: None
Incompatibility: None
Hazardous Decomposition Products: None
NA = Not Applicable ND = Not Determined

VI. HEALTH HAZARD INFORMATION

Routes of Exposure and Effects:

Skin: Possible drying resulting in dermatitis.

Eyes: Mechanical irritant.

Inhalation: *Acute* (short term) exposure to dust levels exceeding the PEL may cause irritation of respiratory tract resulting in a dry cough. *Chronic* (long term) exposure to airborne bentonite dust containing respirable size ($\leq 10 \mu$) quartz particles, where respirable quartz particle levels are higher than TLV's, may lead to development of silicosis or other respiratory problems. Persistent dry cough and labored breathing upon exertion may be symptomatic.

Ingestion: No adverse effects.

Permissible Exposure Limits:

(for air contaminants)

OSHA PEL

(8hr. TWA)

ACGIH TLV

Bentonite as "Particulates not otherwise regulated"
(formerly nuisance dust)

Total dust

15mg/m³

ND

Respirable dust

5mg/m³

ND

Crystalline Silica: Quartz (respirable)

10 mg/m³
% Silica + 2

0.025 mg/m³

Carcinogenicity: Bentonite is not listed by ACGIH, IARC, NTP or OSHA. IARC, 1997, concludes that there is sufficient evidence in humans for the carcinogenicity of inhaled crystalline silica from occupational sources (IARC Class 1), that carcinogenicity was not detected in all industrial circumstances studied and that carcinogenicity may depend on characteristics of the crystalline silica or on external factors affecting its biological activity. NTP classifies respirable crystalline silica as "known to be a human carcinogen" (NTP 9th Report on Carcinogens – 2000). ACGIH classifies crystalline silica, quartz, as a suspected human carcinogen (A2).

Acute Oral LD₅₀: ND

Acute Dermal LD₅₀: ND

Aquatic Toxicology LC₅₀: ND

Emergency and First Aid Procedures:

Skin: Wash with soap and water until clean.

Eyes: Flush with water until irritation ceases.

Inhalation: Move to area free from dust. If symptoms of irritation persist contact physician. Inhalation may aggravate existing respiratory illness.

VII. HANDLING AND USE PRECAUTIONS

Steps to be Taken if Material is Released or Spilled: Avoid breathing dust; wear respirator approved for silica bearing dust. Vacuum up to avoid generating airborne dust. Avoid using water. Product slippery when wetted.

Waste Disposal Methods: Product should be disposed of in accordance with applicable local, state and federal regulations.

Handling and Storage Precautions: Use NIOSH/MSHA respirators approved for silica bearing dust when free silica containing airborne bentonite dust levels exceed PEL/TLV's. Clean up spills promptly to avoid making dust. Storage area floors may become slippery if wetted.

VIII. INDUSTRIAL HYGIENE CONTROL MEASURES

Ventilation Requirements: Mechanical, general room ventilation. Use local ventilation to maintain PEL's/TLV's.

Respirator: Use respirators approved by NIOSH/MSHA for silica bearing dust.

Eye Protection: Generally not necessary. Personal preference.

Gloves: Generally not necessary. Personal preference.

Other Protective Clothing or Equipment: None

IX. SPECIAL PRECAUTIONS

Avoid prolonged inhalation of airborne dust.

DEPARTMENT OF TRANSPORTATION HAZARDOUS MATERIAL INFORMATION

Shipping Name: NA (Not Regulated)

Hazard Class: NA

Hazardous Substance: NA

Caution Labeling: NA

Date Prepared: January 4, 2010

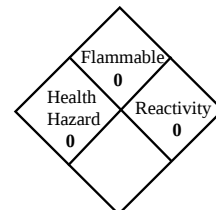
Doc #: 4330-00

All information presented herein is believed to be accurate; however, it is the user's responsibility to determine in advance of need that the information is current and suitable for their circumstances. No warranty or guarantee, expressed or implied is made by WYO-BEN, INC. as to this information, or as to the safety, toxicity or effect of the use of this product.



WYO-BEN, INC.

MATERIAL SAFETY DATA SHEET



NFPA FIRE HAZARD
IDENTIFICATION SYSTEM

I. PRODUCT IDENTIFICATION

Trade Name(s): **GROUT-WELL® DF**

Generic Name(s): Wyoming (Western) Bentonite; Bentonite Clay (CAS No. 1302-78-9) and other proprietary ingredients

Chemical Name(s): Sodium Montmorillonite (CAS No. 1318-93-0) and other proprietary ingredients

Manufacturer: **WYO-BEN, INC.**
Address: P.O. Box 1979
Billings, Montana 59103

Telephone Numbers:
Information: (406) 652-6351
EMERGENCY: (406) 652-6351

II. HAZARDOUS INGREDIENTS

Ingredient	CAS NO.	%	Hazard
Crystalline Silica (SiO ₂) as Quartz	14808-60-7	See Note	Low concentrations of crystalline silica (SiO ₂) in the form of quartz may be present in airborne bentonite dust. See Section VI for discussion of health hazard.

Note 1: The specific chemical identity of this product is being withheld as a trade secret. In the event of a medical emergency it will be provided to a treating medical professional under the provisions of 29 CFR 1910.1200(i).

Note 2: Although the typical quartz content of western bentonite is in the range of 2 to 6% most of the quartz particles are larger than the 10 µ respirable threshold size. The actual respirable quartz concentration in airborne bentonite dust will depend upon bentonite source, fineness of product, moisture content of product, local humidity and wind condition at point of use and other use specific factors.

III. PHYSICAL DATA

Boiling Point (°F): NA	Specific Gravity (H ₂ O=1): 2.45-2.55
Vapor Pressure (mm. Hg): NA	Melting Point: Approx. 1450°C
Vapor Density (Air = 1): NA	Evaporation Rate (Butyl Acetate = 1): NA
Solubility in Water: Insoluble, forms colloidal suspension.	pH: 8-10 (5% aqueous suspension)
Density (at 20° C): 60 lbs./cu.ft. as product.	
Appearance and Odor: Bluegray to green as moist solid, light tan to gray as dry powder. No odor.	

IV. FIRE AND EXPLOSION DATA

Flash Point: NA	Flammable Limits: LEL: NA UEL: NA
Special Fire Fighting Procedures: NA	
Unusual Fire and Explosion Hazards: None. Product will not support combustion.	
Extinguishing Media: None for product. Any media can be used for the packaging. Product becomes slippery when wet.	

V. REACTIVITY

Stability: Stable
Hazardous Polymerization: None
Incompatibility: None
Hazardous Decomposition Products: None
NA = Not Applicable ND = Not Determined

VI. HEALTH HAZARD INFORMATION

Routes of Exposure and Effects:

Skin: Possible drying resulting in dermatitis.

Eyes: Mechanical irritant.

Inhalation: *Acute* (short term) exposure to dust levels exceeding the PEL may cause irritation of respiratory tract resulting in a dry cough. *Chronic* (long term) exposure to airborne bentonite dust containing respirable size ($\leq 10 \mu$) quartz particles, where respirable quartz particle levels are higher than TLV's, may lead to development of silicosis or other respiratory problems. Persistent dry cough and labored breathing upon exertion may be symptomatic.

Ingestion: No adverse effects.

Permissible Exposure Limits: (for air contaminants)

OSHA PEL
(8hr. TWA)

ACGIH TLV

Bentonite as "Particulates not otherwise regulated"
(formerly nuisance dust)

Total dust

15mg/m³

ND

Respirable dust

5mg/m³

ND

Crystalline Silica: Quartz (respirable)

10 mg/m³
% Silica + 2

0.025 mg/m³

Carcinogenicity: Bentonite is not listed by ACGIH, IARC, NTP or OSHA. IARC, 1997, concludes that there is sufficient evidence in humans for the carcinogenicity of inhaled crystalline silica from occupational sources (IARC Class 1), that carcinogenicity was not detected in all industrial circumstances studied and that carcinogenicity may depend on characteristics of the crystalline silica or on external factors affecting its biological activity. NTP classifies respirable crystalline silica as "known to be a human carcinogen" (NTP 9th Report on Carcinogens – 2000). ACGIH classifies crystalline silica, quartz, as a suspected human carcinogen (A2).

Acute Oral LD₅₀: ND

Acute Dermal LD₅₀: ND

Aquatic Toxicology LC₅₀: ND

Emergency and First Aid Procedures:

Skin: Wash with soap and water until clean.

Eyes: Flush with water until irritation ceases.

Inhalation: Move to area free from dust. If symptoms of irritation persist contact physician. Inhalation may aggravate existing respiratory illness.

VII. HANDLING AND USE PRECAUTIONS

Steps to be Taken if Material is Released or Spilled: Avoid breathing dust; wear respirator approved for silica bearing dust. Vacuum up to avoid generating airborne dust. Avoid using water. Product slippery when wetted.

Waste Disposal Methods: Product should be disposed of in accordance with applicable local, state and federal regulations.

Handling and Storage Precautions: Use NIOSH/MSHA respirators approved for silica bearing dust when free silica containing airborne bentonite dust levels exceed PEL/TLV's. Clean up spills promptly to avoid making dust. Storage area floors may become slippery if wetted.

VIII. INDUSTRIAL HYGIENE CONTROL MEASURES

Ventilation Requirements: Mechanical, general room ventilation. Use local ventilation to maintain PEL's/TLV's.

Respirator: Use respirators approved by NIOSH/MSHA for silica bearing dust.

Eye Protection: Generally not necessary. Personal preference.

Gloves: Generally not necessary. Personal preference.

Other Protective Clothing or Equipment: None

IX. SPECIAL PRECAUTIONS

Avoid prolonged inhalation of airborne dust.

DEPARTMENT OF TRANSPORTATION HAZARDOUS MATERIAL INFORMATION

Shipping Name: NA (Not Regulated)

Hazard Class: NA

Hazardous Substance: NA

Caution Labeling: NA

Date Prepared: January 4, 2010

Doc #: 4335-40

All information presented herein is believed to be accurate; however, it is the user's responsibility to determine in advance of need that the information is current and suitable for their circumstances. No warranty or guarantee, expressed or implied is made by WYO-BEN, INC. as to this information, or as to the safety, toxicity or effect of the use of this product.

MATERIAL SAFETY DATA SHEET**Product Trade Name:** HOLEPLUG® 3/4**Revision Date:** 03-Jan-2008**1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION**

Product Trade Name: HOLEPLUG® 3/4
Synonyms: None
Chemical Family: Mineral
Application: Fluid Loss Additive

Manufacturer/Supplier Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

SUBSTANCE	CAS Number	PERCENT	ACGIH TLV-TWA	OSHA PEL-TWA
Crystalline silica, cristobalite	14464-46-1	0 - 1%	0.025 mg/m ³	1/2 x 10 mg/m ³ %SiO ₂ + 2
Crystalline silica, tridymite	15468-32-3	0 - 1%	0.05 mg/m ³	1/2 x 10 mg/m ³ %SiO ₂ + 2
Crystalline silica, quartz	14808-60-7	1 - 5%	0.025 mg/m ³	10 mg/m ³ %SiO ₂ + 2
Bentonite	1302-78-9	60 - 100%	Not applicable	Not applicable

More restrictive exposure limits may be enforced by some states, agencies, or other authorities.

3. HAZARDS IDENTIFICATION

Hazard Overview

CAUTION! - ACUTE HEALTH HAZARD

May cause eye and respiratory irritation.

DANGER! - CHRONIC HEALTH HAZARD

Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposures below recommended exposure limits. Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. Review the Material Safety Data Sheet (MSDS) for this product, which has been provided to your employer.

4. FIRST AID MEASURES

Inhalation

If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin

Wash with soap and water. Get medical attention if irritation persists.

Eyes

In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion

Under normal conditions, first aid procedures are not required.

Notes to Physician

Treat symptomatically.

5. FIRE FIGHTING MEASURES

Flash Point/Range (F):

Not Determined

Flash Point/Range (C):

Not Determined

Flash Point Method:

Not Determined

Autoignition Temperature (F):

Not Determined

Autoignition Temperature (C):

Not Determined

Flammability Limits in Air - Lower (%):

Not Determined

Flammability Limits in Air - Upper (%):

Not Determined

Fire Extinguishing Media

All standard firefighting media.

Special Exposure Hazards

Not applicable.

Special Protective Equipment for Fire-Fighters

Not applicable.

NFPA Ratings:

Health 0, Flammability 0, Reactivity 0

HMIS Ratings:

Flammability 0, Reactivity 0, Health 0*

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures

None known.

Procedure for Cleaning / Absorption

Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal.

7. HANDLING AND STORAGE

Handling Precautions

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.

Storage Information

Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Do not reuse empty container. Product has a shelf life of 36 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls

Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits listed in Section 2.

Respiratory Protection

Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product.

Hand Protection

Normal work gloves.

Skin Protection

Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing.

Eye Protection

Wear safety glasses or goggles to protect against exposure.

Other Precautions

None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Solid
Color:	Tan to Gray
Odor:	Mild earthy
pH:	7.5
Specific Gravity @ 20 C (Water=1):	2.12
Density @ 20 C (lbs./gallon):	Not Determined
Bulk Density @ 20 C (lbs/ft3):	51- 60
Boiling Point/Range (F):	Not Determined
Boiling Point/Range (C):	Not Determined
Freezing Point/Range (F):	Not Determined
Freezing Point/Range (C):	Not Determined
Vapor Pressure @ 20 C (mmHg):	Not Determined
Vapor Density (Air=1):	Not Determined
Percent Volatiles:	Not Determined
Evaporation Rate (Butyl Acetate=1):	Not Determined
Solubility in Water (g/100ml):	Insoluble
Solubility in Solvents (g/100ml):	Not Determined
VOCs (lbs./gallon):	Not Determined
Viscosity, Dynamic @ 20 C (centipoise):	Not Determined
Viscosity, Kinematic @ 20 C (centistrokes):	Not Determined
Partition Coefficient/n-Octanol/Water:	Not Determined
Molecular Weight (g/mole):	Not Determined

10. STABILITY AND REACTIVITY

Stability Data:	Stable
Hazardous Polymerization:	Will Not Occur
Conditions to Avoid	None anticipated
Incompatibility (Materials to Avoid)	Hydrofluoric acid.
Hazardous Decomposition Products	Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C).
Additional Guidelines	Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure	Eye or skin contact, inhalation.
Inhalation	Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A). Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).
Skin Contact	May cause mechanical skin irritation.
Eye Contact	May cause eye irritation.
Ingestion	None known
Aggravated Medical Conditions	Individuals with respiratory disease, including but not limited to asthma and bronchitis, or subject to eye irritation, should not be exposed to quartz dust.

Chronic Effects/Carcinogenicity Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.

Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to IARC Monograph 68, Silica, Some Silicates and Organic Fibres (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen". Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2).

There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.

Other Information For further information consult "Adverse Effects of Crystalline Silica Exposure" published by the American Thoracic Society Medical Section of the American Lung Association, American Journal of Respiratory and Critical Care Medicine, Volume 155, pages 761-768 (1997).

Toxicity Tests

Oral Toxicity:	Not determined
Dermal Toxicity:	Not determined
Inhalation Toxicity:	Not determined
Primary Irritation Effect:	Not determined
Carcinogenicity	Refer to <u>IARC Monograph 68, Silica, Some Silicates and Organic Fibres</u> (June 1997).
Genotoxicity:	Not determined
Reproductive / Developmental Toxicity:	Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air)	Not determined
Persistence/Degradability	Not determined
Bio-accumulation	Not Determined

Ecotoxicological Information

Acute Fish Toxicity:	Not determined
Acute Crustaceans Toxicity:	Not determined

Acute Algae Toxicity:	Not determined
Chemical Fate Information	Not determined
Other Information	Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method	Bury in a licensed landfill according to federal, state, and local regulations.
Contaminated Packaging	Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

US TSCA Inventory	All components listed on inventory.
EPA SARA Title III Extremely Hazardous Substances	Not applicable
EPA SARA (311,312) Hazard Class	Acute Health Hazard Chronic Health Hazard
EPA SARA (313) Chemicals	This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372).
EPA CERCLA/Superfund Reportable Spill Quantity	Not applicable.
EPA RCRA Hazardous Waste Classification	If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA.
California Proposition 65	The California Proposition 65 regulations apply to this product.

MA Right-to-Know Law	One or more components listed.
NJ Right-to-Know Law	One or more components listed.
PA Right-to-Know Law	One or more components listed.
Canadian Regulations	
Canadian DSL Inventory	All components listed on inventory.
WHMIS Hazard Class	D2A Very Toxic Materials Crystalline silica

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

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END OF MSDS

MATERIAL SAFETY DATA SHEET

Product Trade Name: N-SEAL™

Revision Date: 19-Mar-2009

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: N-SEAL™
Synonyms: None
Chemical Family: Silicate
Application: Viscosifier
Manufacturer/Supplier: Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000
Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

SUBSTANCE	CAS Number	PERCENT	ACGIH TLV-TWA	OSHA PEL-TWA
Slag wool fiber	65996-69-2	60 - 100%	Not applicable	Not applicable

3. HAZARDS IDENTIFICATION

Hazard Overview May cause eye and respiratory irritation.

4. FIRST AID MEASURES

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin Wash with soap and water. Get medical attention if irritation persists.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion Under normal conditions, first aid procedures are not required.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

Flash Point/Range (F):	Not Determined
Flash Point/Range (C):	Not Determined
Flash Point Method:	Not Determined
Autoignition Temperature (F):	Not Determined
Autoignition Temperature (C):	Not Determined
Flammability Limits in Air - Lower (%):	Not Determined
Flammability Limits in Air - Upper (%):	Not Determined

Fire Extinguishing Media Water fog, carbon dioxide, foam, dry chemical.

Special Exposure Hazards Not applicable.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 0, Flammability 0, Reactivity 0

HMIS Ratings: Health 0, Flammability 0, Reactivity 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment.

Environmental Precautionary Measures None known.

Procedure for Cleaning / Absorption Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing.

Storage Information Store in a dry location.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area.

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Dust/mist respirator. (95%)

Hand Protection Normal work gloves.

Skin Protection Normal work coveralls.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State: fibers

9. PHYSICAL AND CHEMICAL PROPERTIES

Color:	White to gray
Odor:	Odorless
pH:	Not Determined
Specific Gravity @ 20 C (Water=1):	2.6
Density @ 20 C (lbs./gallon):	Not Determined
Bulk Density @ 20 C (lbs/ft3):	12-26
Boiling Point/Range (F):	Not Determined
Boiling Point/Range (C):	Not Determined
Freezing Point/Range (F):	Not Determined
Freezing Point/Range (C):	Not Determined
Vapor Pressure @ 20 C (mmHg):	Not Determined
Vapor Density (Air=1):	Not Determined
Percent Volatiles:	Not Determined
Evaporation Rate (Butyl Acetate=1):	Not Determined
Solubility in Water (g/100ml):	Insoluble
Solubility in Solvents (g/100ml):	Not Determined
VOCs (lbs./gallon):	Not Determined
Viscosity, Dynamic @ 20 C (centipoise):	Not Determined
Viscosity, Kinematic @ 20 C (centistrokes):	Not Determined
Partition Coefficient/n-Octanol/Water:	Not Determined
Molecular Weight (g/mole):	Not Determined

10. STABILITY AND REACTIVITY

Stability Data:	Stable
Hazardous Polymerization:	Will Not Occur
Conditions to Avoid	None anticipated
Incompatibility (Materials to Avoid)	Strong acids.
Hazardous Decomposition Products	Carbon monoxide and carbon dioxide.
Additional Guidelines	Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure	Eye or skin contact, inhalation.
Inhalation	May cause respiratory irritation.
Skin Contact	May cause mechanical skin irritation.
Eye Contact	May cause mechanical irritation to eye.
Ingestion	None known
Aggravated Medical Conditions	None known.
Chronic Effects/Carcinogenicity	No data available to indicate product or components present at greater than 1% are chronic health hazards.
Other Information	None known.
Toxicity Tests	
Oral Toxicity:	Not determined

Dermal Toxicity:	Not determined
Inhalation Toxicity:	Not determined
Primary Irritation Effect:	Not determined
Carcinogenicity	Not determined
Genotoxicity:	Not determined
Reproductive / Developmental Toxicity:	Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air)	Not determined
Persistence/Degradability	Not determined
Bio-accumulation	Not Determined

Ecotoxicological Information

Acute Fish Toxicity:	Not determined
Acute Crustaceans Toxicity:	LC50: > 1,000,000 ppm 96-hour (Americamysis bahia)

Acute Algae Toxicity:	Not determined
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Chemical Fate Information	Not determined
Other Information	Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method	Bury in a licensed landfill according to federal, state, and local regulations.
Contaminated Packaging	Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR
Not restricted

Air Transportation

ICAO/IATA
Not restricted

Sea Transportation

IMDG

Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION**US Regulations**

US TSCA Inventory	All components listed on inventory or are exempt.
EPA SARA Title III Extremely Hazardous Substances	Not applicable
EPA SARA (311,312) Hazard Class	Acute Health Hazard
EPA SARA (313) Chemicals	This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372).
EPA CERCLA/Superfund Reportable Spill Quantity	Not applicable.
EPA RCRA Hazardous Waste Classification	If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA.
California Proposition 65	All components listed do not apply to the California Proposition 65 Regulation.
MA Right-to-Know Law	One or more components listed.
NJ Right-to-Know Law	Does not apply.
PA Right-to-Know Law	Does not apply.

Canadian Regulations

Canadian DSL Inventory	Product contains one or more components not listed on inventory.
WHMIS Hazard Class	D2B Toxic Materials

16. OTHER INFORMATION**The following sections have been revised since the last issue of this MSDS**

Not applicable

Additional Information	For additional information on the use of this product, contact your local Halliburton representative. For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.
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Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

Material Safety Data Sheet for PORTLAND CEMENT

Section 1 - IDENTIFICATION

Product Names: Texas-Lehigh Portland Cement - Types I, II, III, Oilwell Classes A and H

MSDS Information

This MSDS was produced in May 1999 and supercedes and replaces any prior versions.

Product Code

Standard Industrial Classification: 3241

Chemical Family

Calcium compounds. Calcium silicate compounds and other calcium compounds containing iron and aluminum make up the majority of this product. Major compounds:

$3\text{CaO} \equiv \text{SiO}_2$	Tricalcium silicate	CAS#12168-85-3
$2\text{CaO} \equiv \text{SiO}_2$	Dicalcium silicate	CAS#10034-77-2
$3\text{CaO} \cdot \text{Al}_2\text{O}_3$	Tricalcium aluminate	CAS#12042-78-3
$4\text{CaO} \equiv \text{Al}_2\text{O}_3 \equiv \text{Fe}_2\text{O}_3$	Tetracalcium aluminoferrite	CAS#12068-35-8
$\text{CaSO}_4 \equiv 2\text{H}_2\text{O}$	Calcium sulfate dihydrate or Gypsum	CAS#7778-18-9

Chemical Name and Synonyms

Portland cement. Also known as hydraulic cement.

Formula

This product consists of finely ground portland cement clinker mixed with a small amount of calcium sulfate.*

Supplier/Manufacturer

TEXAS LEHIGH CEMENT COMPANY, LP
701 Cement Plant Road
Buda, Texas 78610

Emergency Contact Information

Herb Schneider, 512-295-6111

*Trace Elements

Portland cement is made from materials mined from the earth and is processed using energy provided by fuels; and therefore may contain trace amounts of naturally occurring materials which might be detected during chemical analysis. For example: Portland cement may contain up to 0.75% insoluble residue, of which <0.1% may be free crystalline silica. Other trace constituents may include potassium and sodium sulfate compounds, chromium compounds, and nickel compounds.

Section 2 - COMPONENTS

<u>Hazardous Substances</u>	<u>OSHA PEL (8-Hour TWA)</u>	<u>ACGIH TLV-TWA (1995 - 1996)</u>	<u>NIOSH REL (8-Hour TWA)</u>
Portland Cement Clinker (CAS#65997-15-1) Nominal 95% by weight	50 million particles/ft ³	10mg total dust/m ³	
Calcium sulfate(CAS#7778-18-9) [Gypsum (CAS#13397-24-5)] Nominal 5% by weight	5mg respirable dust/m ³ 10mg total dust/m ³	10mg total dust/m ³	
Calcium Oxide (CAS#1306-78-8) (Free Lime) < 4% by weight	5mg/m ³	2mg/m ³	
Magnesium Oxide (CAS #1309-48-4) < 5% by weight	15mg total dust/m ³	10mg total dust/m ³	

Section 3 - HAZARDS IDENTIFICATION/TOXICOLOGICAL INFORMATION

Emergency Overview:

Portland cement is a light gray powder that poses little immediate hazard. A single short term exposure to the dry powder is not likely to cause serious harm. However, exposure of sufficient duration to wet portland cement can cause serious, potentially irreversible tissue (including skin or eye) destruction in the form of chemical (caustic) burns, including third degree burns. The same type of tissue destruction can occur if wet or moist areas of the body are exposed for sufficient duration to dry portland cement.

Potential Health Effects:

Potential effects resulting from **eye contact:**

Exposure to airborne dust may cause immediate or delayed irritation or inflammation.

Eye contact by larger amounts of dry powder or splashes of wet portland cement may cause effects ranging from moderate eye irritation to chemical burns and blindness. Such exposures require immediate first aid (see Section 4) and medical attention to prevent significant damage to the eye.

Potential effects resulting from **skin contact:**

Discomfort or pain cannot be relied upon to alert a person to a hazardous skin exposure. Consequently, the only effective means of avoiding skin injury or illness involves minimizing or avoiding skin contact, particularly contact with wet cement. Persons exposed to wet cement may not feel discomfort until hours after the exposure has ended and significant injury has occurred.

Exposure to dry portland cement may cause drying of the skin with consequent mild irritation or more significant effects attributable to aggravation of other conditions. Dry portland cement contacting wet skin or exposure to moist or wet portland cement may cause more severe skin effects including thickening, cracking or fissuring of the skin. Prolonged exposure can cause severe skin damage in the form of (caustic) chemical burns.

Some individuals may exhibit an allergic response upon exposure to portland cement, possibly due to trace amounts of chromium. The response may appear in a variety of forms ranging from a mild rash to severe skin ulcers. Persons already sensitized may react to their first contact with the product. Other persons may first experience this effect after years of contact with hydraulic cement products.

Potential effects resulting from **inhalation:**

Portland cement may contain trace amounts (<0.1%) of free crystalline silica. Prolonged exposure to respirable free crystalline silica may aggravate other lung conditions. It also may cause delayed lung injury including silicosis, a disabling and potentially fatal lung disease.

Exposure to portland cement may cause irritation to the moist mucous membranes of the nose, throat, and upper respiratory system. It may also leave unpleasant deposits in the nose.

Potential effects resulting from **ingestion:**

Although small quantities of dust are not known to be harmful, ill effects are possible if larger quantities are consumed. Portland cement should not be eaten under any circumstances.

Carcinogenic Potential:

Portland cement is not listed as a carcinogen by IARC, NTP, or OSHA. It does, however, contain trace amounts (<0.1%) of substances listed as carcinogens by some of these organizations. Crystalline silica is now classified by IARC as a known human carcinogen (Group 1). NTP has characterized respirable crystalline silica as “reasonably anticipated to be (a) carcinogen”.

Medical Conditions Which May Be Aggravated By Inhalation or Dermal Exposure:

- Pre-existing upper respiratory and lung diseases.
- Unusual (hyper) sensitivity to hexavalent chromium (chromium +6) salts.

Section 4 - FIRST AID

Eyes

Immediately flush eyes thoroughly with water. Continue flushing eyes for at least 15 minutes, including under lids, to remove all particles. Call physician immediately.

Skin

Wash skin with cool water and pH-neutral soap or a mild detergent intended for use on skin. Seek medical treatment in all cases of prolonged exposure to wet cement, cement mixtures, liquids from fresh cement products, or prolonged wet skin exposures to dry cement.

Inhalation of Airborne Dust

Remove to fresh air. Seek medical help if coughing and other symptoms do not subside. (Inhalation of gross amounts of portland cement requires immediate medical attention.)

Ingestion

Do not induce vomiting. If conscious, have the victim drink plenty of water and call a physician immediately.

Section 5 - FIRE & EXPLOSION DATA

Flash Point	None
Lower Explosive Limit	None
Upper Explosive Limit	None
Auto Ignition Temperature	Not combustible
Extinguishing Media	Not combustible
Special Fire Fighting Procedures	None (Although portland cement poses no fire-related hazards, a self-contained breathing apparatus is recommended to limit exposure to combustion products when fighting any fire.)
Hazardous Combustion Products	None
Unusual Fire and Explosion Hazards	None

Section 6 - ACCIDENTAL RELEASE MEASURES

Collect dry material using a scoop. Avoid actions that cause dust to become airborne. Avoid inhalation of dust and contact with skin. Wear appropriate personal protective equipment as described in Section 8.

Scrape up wet material and place in an appropriate container. Allow the material to “dry” before disposal. Do not attempt to wash portland cement down drains.

Dispose of waste material according to local, state and federal regulations.

Section 7 - HANDLING AND STORAGE

Keep portland cement dry until used. Normal temperature and pressure do not affect the materials.

Promptly remove dusty clothing or clothing which is wet with cement fluids and launder before reuse. Wash thoroughly after exposure to dust or wet cement mixture or fluids.

Section 8 - EXPOSURE CONTROL/PERSONAL PROTECTION**Skin Protection**

Prevention is essential to avoiding potentially severe skin injury. Avoid contact with unhardened (wet) portland cement products. If contact occurs, promptly wash affected area with soap and water. Where prolonged exposure to unhardened portland cement products might occur, wear impervious clothing and gloves and boots to eliminate skin contact.

Respiratory Protection

Avoid actions that cause dust to become airborne. Use local or general ventilation to control exposures below applicable exposure limits. Use NIOSH/MSHA-approved respirators in poorly ventilated areas when dust causes discomfort or irritation, or where there is an applicable exposure limit (Advisory: Respirators and filters purchased after July 10, 1998 must be certified under 42 CFR 84).

Ventilation

Use local exhaust or general dilution ventilation to control exposure below applicable limits.

Eye Protection

When engaged in activities where cement dust or wet cement or concrete could contact the eye, wear safety glasses with side shields or goggles. In extremely dusty environments and unpredictable environments, wear unvented or indirectly vented goggles to avoid eye irritation or injury. Contact lenses should not be worn when working with portland cement or fresh cement products.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Gray or White powder
Odor	No distinct odor
Physical state	Solid (powder)
pH (in water)(ASTM D 1293-95)	12 to 13
Solubility in water	Slightly soluble (0.1 to 1.0%)
Vapor pressure	Not applicable
Vapor density	Not applicable
Boiling point	Not applicable (i.e. > 1000 ^B C)
Melting point	Not applicable
Specific gravity (H ₂ O = 1.0)	3.15
Evaporation rate	Not applicable

Section 10 - STABILITY AND REACTIVITY**Stability**

Stable

Conditions To Avoid

Unintentional contact with water.

Incompatibility

Wet portland cement is alkaline. As such it is incompatible with acids, ammonium salts and aluminum metal.

Hazardous Decomposition

Will not spontaneously occur. Adding water results in hydration and produces (caustic) calcium hydroxide.

Hazardous Polymerization

Will not occur.

Section 11 - TOXICOLOGICAL INFORMATION - See Section 3**Section 12 - ECOLOGICAL INFORMATION****Ecotoxicity**

No recognized unusual toxicity to plants or animals.

Relevant Physical and Chemical Properties

(See Sections 9 and 10).

Section 13 - DISPOSAL

Dispose of waste material, including bags, according to local, state, and federal regulations.

Section 14 - TRANSPORTATION DATA**Hazardous Materials Description/Proper Shipping Name**

Portland cement is not hazardous under U.S. Department of Transportation (DOT) regulations.

Section 15 - OTHER REGULATORY INFORMATION

Status Under USDOL-OSHA Hazard Communication Rule 29 CFR 1910.1200

Portland cement is considered a “hazardous chemical” under this regulation, and should be part of any hazard communication program.

Status Under CERCLA/Superfund 40 CFR 117 and 302(v)

Not listed.

Hazard Category Under SARA (Title III) Section 311 and 312

Portland cement qualifies as a “hazardous substance” with delayed health effects.

Status Under SARA (Title III) Section 313

Not subject to reporting requirements under Section 313.

Status Under TSCA (as of May 1997)

Some substances in portland cement are on the TSCA inventory list.

Status Under the Federal Hazardous Substances Act

Portland cement is a “hazardous substance” subject to statutes promulgated under the subject act.

Status Under WHMIS

Portland cement is considered to be a hazardous material under the Hazardous Products Act as defined by the Controlled Products regulations (class E - corrosive material) and is therefore subject to the labeling and MSDS requirements of the workplace hazardous materials information system (WHMIS).

Section 16 - OTHER INFORMATION**Prepared By**

TEXAS LEHIGH CEMENT COMPANY, LP
701 Cement Plant Road
Buda, Texas 78610

Revision Date

May 1999

Other Important Information

Portland cement should only be used by knowledgeable persons. Inexperienced product users must obtain proper training before using this product. A key to using the product safely requires the user to recognize that portland cement chemically reacts with water, and that some of the intermediate products of this reaction (that is, those present while a portland cement product is “setting”) pose a far more severe hazard than does portland cement itself.

While the information provided in this material safety data sheet is believed to provide a useful summary of the hazards of portland cement as it is commonly used, the sheet cannot, and does not, anticipate and provide all of the information that might be needed in every situation. In particular, the data furnished in this sheet does not address hazards that may be posed by other materials mixed with portland cement products. Users therefore, should review other applicable material safety data sheets before working with this portland cement or working on portland cement products, for example, portland cement concrete.

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MATERIAL SAFETY DATA SHEET

Effective Date: March 8, 2007

**1. PRODUCT AND
COMPANY
IDENTIFICATION**

Trade Name: Polyvinyl Chloride Pipe
Chemical Name: Mixture
Synonyms: Not applicable
Chemical Family: Mixture of Polyvinyl Chloride Homopolymer
Formula: Mixture, see below.

COMPANY ADDRESS: North American Pipe Corporation
2801 Post Oak Blvd.
Houston, TX 77056

EMERGENCY CONTACT: CALL 1-217-324-6515
THESE NUMBERS ARE AVAILABLE DAYS, NIGHTS, WEEKENDS, AND HOLIDAYS, EXCEPT ON DECEMBER 24 TO 26.

2. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS Number	% By Weight	OSHA PEL-TWA mg/m ³	ACGIH TLV-TWA mg/m ³
Polyvinyl chloride resin (chloroethene homopolymer), treated as nuisance particulate	9002-86-2	95	5 (respirable fraction) 15 (total dust)	3 (respirable particulate) 10 (total particulate)
Calcium carbonate	1317-65-3	3-4	5 (respirable fraction) 15 (total dust)	10 (total particulate)
Waxes	NE	1-2	NE	2 (as Paraffin Wax Fume)
Titanium dioxide	13463-67-7	<1	15 (total dust)	10 (total particulate)

NE = Not Established

3. HAZARDS IDENTIFICATION

This product is non-hazardous under Hazard Communication Standard 29 CFR 1910.1200.

HAZARD RATINGS

Degree of hazard (0 = low, 4 = extreme)

National Fire Protection
Association

Health: 1 Flammability: 1 Reactivity: 0 Specific Hazard: None

Hazardous Materials
Identification System

Health: 1 Flammability: 1 Reactivity: 0

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MATERIAL SAFETY DATA SHEET

4. FIRST AID MEASURES

EYE CONTACT:	Immediately flush with large amounts of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Consult a physician immediately.
SKIN CONTACT:	Cool skin rapidly if contacted with molten polymer. Obtain medical attention for thermal burns or skin irritation.
INHALATION:	The product is not expected to present an inhalation hazard, unless mechanically chipped or pulverized or if melted during fire. If dust or fumes are inhaled, remove to fresh air.
SWALLOWING:	No adverse health effects expected from ingestion.

5. FIRE FIGHTING MEASURES

Flash Point:	<u>Not applicable</u>
Lower Explosive Limit:	<u>Not applicable</u>
Upper Explosive Limit:	<u>Not applicable</u>
Autoignition Temp:	<u>849°F (470°C)</u>

EXTINGUISHING MEDIA:	Use water spray, dry chemical, or foam.
SPECIAL FIRE FIGHTING PROCEDURES:	Use NIOSH/MSHA approved self-contained breathing apparatus and full protective clothing if involved in fire.
UNUSUAL FIRE AND EXPLOSION HAZARDS:	PVC homopolymers are self-extinguishing plastic materials. They will burn in the presence of other materials that support combustion and will generate hydrogen chloride, phosgene, benzene, carbon monoxide, carbon dioxide, aromatic and aliphatic hydrocarbons, and other gases.

6. STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Collect scrap for reprocessing, or for landfill in compliance with local regulations.

7. HANDLING/STORAGE

Use any methods that keep dust to a minimum. General storage procedures are acceptable.

8. EXPOSURE CONTROLS/ PERSONAL PROTECTION

EYE PROTECTION:	Safety glasses are required if there is a possibility of getting dust particles in eyes. Have eye wash equipment nearby.
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MATERIAL SAFETY DATA SHEET

SKIN PROTECTION: None required.

8. EXPOSURE CONTROLS/ PERSONAL PROTECTION (CONT'D)

VENTILATION: Local exhaust ventilation is recommended to control airborne dust.

RESPIRATORY PROTECTION: If dust or fumes exist, use a NIOSH/MSHA approved respirator. At unknown concentrations and for fire fighting, use self-contained breathing apparatus (SCBA). Always use respirators in accordance with instructions.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical Form:	<u>Solid</u>
Boiling Point:	<u>Not available</u>
Heat Deflection Temperature:	<u>168°F (76°C)</u>
Vapor Density:	<u>Not applicable</u>
Vapor Pressure (mm Hg):	<u>Not applicable</u>
Evaporation Rate:	<u>Not applicable</u>
% Volatile by Volume:	<u>Not applicable</u>
Density:	<u>Not determined</u>
Specific Gravity:	<u>1.42</u>
Solubility in Water (20 °C):	<u>Insoluble</u>
Melting Point:	<u>Not available</u>
Viscosity:	<u>Not applicable</u>
Odor:	<u>Plastic, resin odor</u>
Appearance:	<u>Blue, Green, Purple, Light Gray, or White plastic pipe</u>
pH:	<u>Not applicable</u>

10. STABILITY/REACTIVITY

Stability: Stable under normal storage conditions.

CONDITIONS TO AVOID: None known.

INCOMPATIBLE MATERIALS: None known.

HAZARDOUS DECOMPOSITION PRODUCTS: Hydrogen chloride, benzene, carbon monoxide, carbon dioxide, aromatic and aliphatic hydrocarbons, and other gases could be released in fire.

POLYMERIZATION: Hazardous polymerization not expected.

11. TOXICOLOGICAL INFORMATION

No toxicological data were found for this product. The effects reported are those anticipated based on the components of this product.

POTENTIAL ROUTES: Inhalation of dust is the most likely route of exposure to this

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MATERIAL SAFETY DATA SHEET

OF EXPOSURE: product.

SIGNS, SYMPTOMS, AND
TOXIC EFFECTS OF
OVEREXPOSURE: Exposure to high concentrations of dust of this product will cause irritation of the respiratory tract with cough, difficulty breathing, dryness of the throat, or eye irritation.

**11. TOXICOLOGICAL
INFORMATION
(CONT'D)**

ANIMAL TOXICITY DATA:

Component	Inhalation LC ₅₀	Dermal LD ₅₀ (mg/kg)	Oral LD ₅₀ (mg/kg)
PVC homopolymer	No data found.	No data found.	No data found.
Calcium carbonate	No data found.	No data found.	No data found.
Titanium dioxide	No data found.	No data found.	No data found.

REPRODUCTIVE EFFECTS: No data were found regarding reproductive effects in humans or animals for any component of this product.

MUTAGENICITY DATA: No mutagenicity data were found for any component of this product.

DESIGNATION AS POTENTIAL
CARCINOGEN: IARC designates PVC homopolymer and titanium dioxide as Group 3, "not classifiable as to its carcinogenicity in humans."

MEDICAL CONDITIONS
AGGRAVATED BY EXPOSURE: No data were found regarding this issue.

INTERACTIONS WITH
CHEMICALS THAT ENHANCE
TOXICITY: No data were found regarding this issue.

**12. ECOLOGICAL
INFORMATION**

No data were found regarding adverse ecological impacts of this product.

**13. DISPOSAL
CONSIDERATIONS**

Disposal should conform to federal, state, and local regulations. If hazardous according to 40 CFR part 261.31 or 32, or possesses characteristics of 40 CFR 261 Subpart C, dispose in a facility meeting the requirements of 40 CFR 264 or 265. If non-hazardous, dispose in a facility meeting the requirements of 40 CFR 257. Before attempting cleanup, refer to hazard information and personal protection information in other sections of this MSDS. If waste is determined to be hazardous, use licensed hazardous waste transporter and disposal facility.

RCRA Status of Unused Material: If discarded in unaltered form, should be tested in accordance to 40CFR 261 Subpart C and disposed as specified above.

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MATERIAL SAFETY DATA SHEET

14. TRANSPORTATION INFORMATION

U.S.D.O.T. SHIPPING NAME, ID NO, HAZARD CLASS: Not Regulated (also, Canada via rail and truck.)

15. REGULATORY INFORMATION

SARA 313 LISTING: This product does not contain any substance subject to the reporting requirements of section 313 of the Emergency Planning and Community Right-To-Know Act of 1986 and of 40 CFR 372.

SARA 312 HAZARD CLASS: Not applicable.

SARA EXTREMELY
HAZARDOUS SUBSTANCES: Not applicable.

EPA HAZARDOUS SUBSTANCES
LIST: (40 CFR 302.4): Not hazardous.

CA PROPOSITION 65: This product does not contain any substance listed in the State of California Safe Drinking Water and Toxic Enforcement Act of 1986, as updated (February 23, 2001).

PENN. RIGHT-TO-KNOW: All required components are identified.

N.J. RIGHT-TO-KNOW: All required components are identified.

MASS. RIGHT-TO-KNOW: All required components are identified.

TSCA INVENTORY STATUS: All components of this product are listed on the TSCA Inventory.

CANADIAN WHMIS CLASS: Not applicable.

16. OTHER INFORMATION

REVISIONS: Entire MSDS reviewed March 8, 2007.

PREPARED BY: Tetra Tech EM, Inc., using standard references and information provided and directed by North American Pipe Corporation.

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MATERIAL SAFETY DATA SHEET

Product Trade Name: **QUIK-TROL GOLD LV**

Revision Date: 30-Mar-2012

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: QUIK-TROL GOLD LV
Synonyms: None
Chemical Family: Carbohydrate
Application: Fluid Loss Additive

Manufacturer/Supplier Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

Substances	CAS Number	PERCENT	ACGIH TLV-TWA	OSHA PEL-TWA
Polysaccharide		60 - 100%	Not applicable	Not applicable

3. HAZARDS IDENTIFICATION

Hazard Overview May cause eye, skin, and respiratory irritation. Airborne dust may be explosive.

4. FIRST AID MEASURES

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin Wash with soap and water. Get medical attention if irritation persists.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

Flash Point/Range (F):	Not Determined
Flash Point/Range (C):	Not Determined
Flash Point Method:	Not Determined
Autoignition Temperature (F):	> 698
Autoignition Temperature (C):	> 370
Flammability Limits in Air - Lower (%):	Not Determined
Flammability Limits in Air - Upper (%):	Not Determined

Fire Extinguishing Media Water fog, carbon dioxide, foam, dry chemical.

Special Exposure Hazards Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 1, Flammability 1, Reactivity 0

HMS Ratings: Health 1, Flammability 1, Physical Hazard 0 , PPE: A

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Avoid creating and breathing dust. Slippery when wet.

Environmental Precautionary Measures None known.

Procedure for Cleaning / Absorption Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust. Avoid dust accumulations. Slippery when wet. Ground and bond containers when transferring from one container to another. Wash hands after use. Launder contaminated clothing before reuse. Do NOT consume food, drink, or tobacco in contaminated areas.

Storage Information Store away from oxidizers. Keep container closed when not in use. Store in a cool, dry location. Store away from direct sunlight. Keep from heat, sparks, and open flames. Store in a well ventilated area. Product has a shelf life of 36 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls A well ventilated area to control dust levels. Local exhaust ventilation should be used in areas without good cross ventilation.

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Dust/mist respirator. (95%)

Hand Protection Normal work gloves.

Skin Protection Normal work coveralls.

Eye Protection	Wear safety glasses or goggles to protect against exposure.
Other Precautions	Eyewash fountains and safety showers must be easily accessible.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Powder
Color:	White to off white
Odor:	Odorless
pH:	5-9 (1%)
Specific Gravity @ 20 C (Water=1):	Not Determined
Density @ 20 C (lbs./gallon):	Not Determined
Bulk Density @ 20 C (lbs/ft3):	37-56
Boiling Point/Range (F):	Not Determined
Boiling Point/Range (C):	Not Determined
Freezing Point/Range (F):	Not Determined
Freezing Point/Range (C):	Not Determined
Vapor Pressure @ 20 C (mmHg):	Not Determined
Vapor Density (Air=1):	Not Determined
Percent Volatiles:	Not Determined
Evaporation Rate (Butyl Acetate=1):	Not Determined
Solubility in Water (g/100ml):	Forms gel
Solubility in Solvents (g/100ml):	Not Determined
VOCs (lbs./gallon):	Not Determined
Viscosity, Dynamic @ 20 C (centipoise):	Not Determined
Viscosity, Kinematic @ 20 C (centistokes):	Not Determined
Partition Coefficient/n-Octanol/Water:	Not Determined
Molecular Weight (g/mole):	Not Determined

10. STABILITY AND REACTIVITY

Stability Data:	Stable
Hazardous Polymerization:	Will Not Occur
Conditions to Avoid	None known.
Incompatibility (Materials to Avoid)	Strong oxidizers.
Hazardous Decomposition Products	Carbon monoxide and carbon dioxide.
Additional Guidelines	Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure	Eye or skin contact, inhalation.
Inhalation	May cause mild respiratory irritation.
Skin Contact	May cause mild skin irritation. May cause an allergic skin reaction.
Eye Contact	May cause mild eye irritation.
Ingestion	May cause allergic reaction.
Aggravated Medical Conditions	None known.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 1% are chronic health hazards.

Other Information None known.

Toxicity Tests

Oral Toxicity: Not determined

Dermal Toxicity: Not determined

Inhalation Toxicity: Not determined

Primary Irritation Effect: Not determined

Carcinogenicity Not determined

Genotoxicity: Not determined

**Reproductive /
Developmental Toxicity:** Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined

Persistence/Degradability Will not ferment

Bio-accumulation Not determined

Ecotoxicological Information

Acute Fish Toxicity: TLM96: 100-1000 ppm (*Lepomis macrochirus*)
TLM96: 100-1000 ppm (*Oncorhynchus mykiss*)

Acute Crustaceans Toxicity: Not determined

Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined

Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Disposal should be made in accordance with federal, state, and local regulations.

Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR

Not restricted

Air Transportation**ICAO/IATA**

Not restricted

Sea Transportation**IMDG**

Not restricted

Other Transportation Information

Labels: None

15. REGULATORY INFORMATION**US Regulations**

US TSCA Inventory	All components listed on inventory or are exempt.
EPA SARA Title III Extremely Hazardous Substances	Not applicable
EPA SARA (311,312) Hazard Class	None
EPA SARA (313) Chemicals	This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372).
EPA CERCLA/Superfund Reportable Spill Quantity	Not applicable.
EPA RCRA Hazardous Waste Classification	If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA.
California Proposition 65	All components listed do not apply to the California Proposition 65 Regulation.
MA Right-to-Know Law	Does not apply.
NJ Right-to-Know Law	Does not apply.
PA Right-to-Know Law	Does not apply.

Canadian Regulations

Canadian DSL Inventory	All components listed on inventory or are exempt.
WHMIS Hazard Class	Un-Controlled

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS
Not applicable

Additional Information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

MATERIAL SAFETY DATA SHEET

Product Trade Name: **QUIK-FOAM®**

Revision Date: 03-Jan-2008

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: QUIK-FOAM®
Synonyms: None
Chemical Family: Blend
Application: Foaming Agent
Manufacturer/Supplier: Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000
Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

SUBSTANCE	CAS Number	PERCENT	ACGIH TLV-TWA	OSHA PEL-TWA
Ethanol	64-17-5	5 - 10%	1000 ppm	1000 ppm
Isopropanol	67-63-0	5 - 10%	200 ppm	400 ppm

3. HAZARDS IDENTIFICATION

Hazard Overview May cause eye, skin, and respiratory irritation. May cause headache, dizziness, and other central nervous system effects. May be absorbed through the skin. May be harmful if swallowed. Repeated overexposure may cause liver and kidney effects. Flammable.

4. FIRST AID MEASURES

Inhalation If inhaled, remove to fresh air. If not breathing give artificial respiration, preferably mouth-to-mouth. If breathing is difficult give oxygen. Get medical attention.

Skin In case of contact, immediately flush skin with plenty of soap and water for at least 15 minutes. Get medical attention. Remove contaminated clothing and launder before reuse.

Eyes In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing.

Ingestion Do not induce vomiting. Slowly dilute with 1-2 glasses of water or milk and seek medical attention. Never give anything by mouth to an unconscious person.

5. FIRE FIGHTING MEASURES

Flash Point/Range (F):	74
Flash Point/Range (C):	23
Flash Point Method:	PMCC
Autoignition Temperature (F):	750
Autoignition Temperature (C):	398
Flammability Limits in Air - Lower (%):	2
Flammability Limits in Air - Upper (%):	12

Fire Extinguishing Media Water fog, carbon dioxide, foam, dry chemical.

Special Exposure Hazards May be ignited by heat, sparks or flames. Use water spray to cool fire exposed surfaces. Closed containers may explode in fire. Decomposition in fire may produce toxic gases.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 1, Flammability 3, Reactivity 0
HMIS Ratings: Flammability 3, Reactivity 0, Health 1

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment.

Environmental Precautionary Measures Prevent from entering sewers, waterways, or low areas.

Procedure for Cleaning / Absorption Isolate spill and stop leak where safe. Remove ignition sources and work with non-sparking tools. Contain spill with sand or other inert materials. Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. Wash hands after use. Launder contaminated clothing before reuse. Ground and bond containers when transferring from one container to another.

Storage Information Store away from oxidizers. Keep from heat, sparks, and open flames. Keep container closed when not in use. Product has a shelf life of 24 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area. Local exhaust ventilation should be used in areas without good cross ventilation.

Respiratory Protection Organic vapor respirator.

Hand Protection Impervious rubber gloves.

Skin Protection Rubber apron.

Eye Protection Chemical goggles; also wear a face shield if splashing hazard exists.

Other Precautions Eyewash fountains and safety showers must be easily accessible.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Liquid
Color:	Light yellow
Odor:	Alcohol
pH:	7.3-7.8
Specific Gravity @ 20 C (Water=1):	1.02
Density @ 20 C (lbs./gallon):	8.52
Bulk Density @ 20 C (lbs/ft3):	Not Determined
Boiling Point/Range (F):	Not Determined
Boiling Point/Range (C):	Not Determined
Freezing Point/Range (F):	Not Determined
Freezing Point/Range (C):	Not Determined
Vapor Pressure @ 20 C (mmHg):	Not Determined
Vapor Density (Air=1):	Not Determined
Percent Volatiles:	Not Determined
Evaporation Rate (Butyl Acetate=1):	Not Determined
Solubility in Water (g/100ml):	Soluble
Solubility in Solvents (g/100ml):	Not Determined
VOCs (lbs./gallon):	Not Determined
Viscosity, Dynamic @ 20 C (centipoise):	192
Viscosity, Kinematic @ 20 C (centistokes):	Not Determined
Partition Coefficient/n-Octanol/Water:	Not Determined
Molecular Weight (g/mole):	Not Determined

10. STABILITY AND REACTIVITY

Stability Data:	Stable
Hazardous Polymerization:	Will Not Occur
Conditions to Avoid	Keep away from heat, sparks and flame.
Incompatibility (Materials to Avoid)	Strong oxidizers. Strong alkalis.
Hazardous Decomposition Products	Oxides of sulfur. Oxides of nitrogen. Ammonia. Carbon monoxide and carbon dioxide.
Additional Guidelines	Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure	Eye or skin contact, inhalation.
Inhalation	May cause respiratory irritation. May cause central nervous system depression including headache, dizziness, drowsiness, incoordination, slowed reaction time, slurred speech, giddiness and unconsciousness.
Skin Contact	May cause skin irritation. May be absorbed through the skin and produce effects similar to those caused by inhalation and/or ingestion.
Eye Contact	May cause eye irritation.
Ingestion	Irritation of the mouth, throat, and stomach. May cause central nervous system depression including headache, dizziness, drowsiness, muscular weakness, incoordination, slowed reaction time, fatigue blurred vision, slurred speech, giddiness, tremors and convulsions. May cause kidney damage.

Aggravated Medical Conditions	None known.
Chronic Effects/Carcinogenicity	Repeated overexposure may cause liver and kidney effects.
Other Information	None known.

Toxicity Tests

Oral Toxicity:	LD50: 5840 mg/kg (Rat)
Dermal Toxicity:	Not determined
Inhalation Toxicity:	Not determined
Primary Irritation Effect:	Not determined
Carcinogenicity	Not determined
Genotoxicity:	Not determined
Reproductive / Developmental Toxicity:	Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air)	Not determined
Persistence/Degradability	Not determined
Bio-accumulation	Not Determined

Ecotoxicological Information

Acute Fish Toxicity:	Not determined
Acute Crustaceans Toxicity:	Not determined
Acute Algae Toxicity:	Not determined

Chemical Fate Information	Not determined
Other Information	Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method	Disposal should be made in accordance with federal, state, and local regulations.
Contaminated Packaging	Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT

Flammable Liquid, N.O.S., 3, UN1993, III, (23.3 C)
(Contains Ethanol, Isopropanol)

NAERG 128

Not Restricted when shipped in containers less than 119 gallons as authorized by 49 CFR 173.150(e)(1) and 49 CFR 173.150(f)(2).

DOT BULK

Canadian TDG

Flammable Liquid, N.O.S.(Contains Ethanol, Isopropanol), 3, UN1993, III, (23.3 C)

ADR

UN1993,Flammable Liquid, N.O.S.(Contains Ethanol, Isopropanol), 3, III

Air Transportation**ICAO/IATA**

UN1993,Flammable Liquid, N.O.S., 3, III
(Contains Ethanol, Isopropanol Solution)

Sea Transportation**IMDG**

UN1993,Flammable Liquid, N.O.S.(Contains Ethanol, Isopropanol), 3, III, (23.3 C)
EmS F-E, S-E

Other Shipping Information

Labels: Flammable Liquid

15. REGULATORY INFORMATION

US Regulations

US TSCA Inventory All components listed on inventory.

EPA SARA Title III Extremely Hazardous Substances Not applicable

EPA SARA (311,312) Hazard Class Acute Health Hazard
Chronic Health Hazard
Fire Hazard

EPA SARA (313) Chemicals This product contains toxic chemical(s) listed below which is(are) subject to the reporting requirements of Section 313 of Title III of SARA and 40 CFR Part 372:
Isopropanol//67-63-0

EPA CERCLA/Superfund Reportable Spill Quantity Not applicable.

EPA RCRA Hazardous Waste Classification If product becomes a waste, it does meet the criteria of a hazardous waste as defined by the US EPA, because of:

Ignitability D001

California Proposition 65 All components listed do not apply to the California Proposition 65 Regulation.

MA Right-to-Know Law One or more components listed.

NJ Right-to-Know Law One or more components listed.

PA Right-to-Know Law One or more components listed.

Canadian Regulations

Canadian DSL Inventory	All components listed on inventory.
WHMIS Hazard Class	B2 Flammable Liquids D2B Toxic Materials

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

Safety Data Sheet (2001/58/EC)

Product Trade Name: **QUIK-GEL GOLD™**

Revision Date: 12-Sep-2007

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

Identification of Substance or Preparation

Product Trade Name: QUIK-GEL GOLD™
Synonyms: None
Chemical Family: Mineral
Application: Viscosifier

Company Undertaking Identification
Halliburton Manufacturing Services, Ltd.
Deveron Facility, Howemoss Place
Kirkhill Industrial Estate
Dyce
Aberdeen, AB21 0GS
United Kingdom

Emergency Phone Number: +44 1224 795277 or +1 281 575 5000

www.halliburton.com

Prepared By Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. HAZARDS IDENTIFICATION

Risk Phrases
None

Hazard Overview

CAUTION! - ACUTE HEALTH HAZARD

May cause eye and respiratory irritation.

DANGER! - CHRONIC HEALTH HAZARD

Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposures below recommended exposure limits. Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. Review the Material Safety Data Sheet (MSDS) for this product, which has been provided to your employer.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance	CAS Number	Percent	EINECS NUMBER:	UK WEL	Germany MAK/TRK	Netherlands MAC	EEC Classification
Crystalline silica, cristobalite	14464-46-1	0 - 1%	238-455-4	0.1 mg/m ³	0,15 mg/m ³	0,075 mg/m ³	Not applicable
Crystalline silica, tridymite	15468-32-3	0 - 1%	239-487-1	0.1 mg/m ³	Not applicable	0,075 mg/m ³	Not applicable
Crystalline silica, quartz	14808-60-7	1 - 5%	238-878-4	0.1 mg/m ³	0,15 mg/m ³	0,075 mg/m ³	Not applicable
Bentonite	1302-78-9	60 - 100%	215-108-5	10 mg/m ³	Not applicable	Not applicable	Not applicable

More restrictive exposure limits may be enforced by some states, agencies, or other authorities.

4. FIRST AID MEASURES

Inhalation	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Skin	Wash with soap and water. Get medical attention if irritation persists.
Eyes	In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.
Ingestion	Under normal conditions, first aid procedures are not required.
Notes to Physician	Treat symptomatically.

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media	All standard fire fighting media
Unsuitable Extinguishing Media	None known
Special Exposure Hazards	Not applicable.
Special Protective Equipment for Fire-Fighters	Not applicable.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures	Use Appropriate protective equipment. Avoid creating and breathing dust.
Environmental Precautionary Measures	None known.
Procedure for Cleaning/Absorption	Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal.

7. HANDLING AND STORAGE

Handling Precautions	This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.
Storage Information	Do not reuse empty container. Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Keep from excessive heat. Product has a shelf life of 12 months

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls	Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits listed in Section 2.
Respiratory Protection	Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product.
Hand Protection	Normal work gloves.
Skin Protection	Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing.
Eye Protection	Wear safety glasses or goggles to protect against exposure.
Other Precautions	None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Powder
Colour:	Tan
Odour:	Mild earthy
pH:	8.5-9.5 (3%)
Specific Gravity @ 20 C (Water=1):	2.5 - 2.6
Density @ 20 C (kg/l):	Not Determined
Bulk Density @ 20 C (kg/l):	Not Determined
Boiling Point/Range (C):	Not Determined
Freezing Point/Range (C):	Not Determined
Pour Point/Range (C):	Not Determined
Flash Point/Range (C):	Not Determined
Flash Point Method:	Not Determined
Autoignition Temperature (C):	Not Determined
Flammability Limits in Air - Lower (g/m³):	Not Determined
Flammability Limits in Air - Lower (%):	Not Determined
Flammability Limits in Air - Upper (g/m³):	Not Determined
Flammability Limits in Air - Upper (%):	Not Determined
Vapour Pressure @ 20 C (mmHg):	Not Determined
Vapour Density (Air=1):	Not Determined
Percent Volatiles:	Not Determined
Evaporation Rate (Butyl Acetate = 1):	Not determined.
Solubility in Water (g/100ml):	Slightly soluble
Solubility in Solvents (g/100ml):	Not Determined
VOCs (g/l):	Not Determined
Viscosity, Dynamic @ 20 C (centipoise):	Not Determined
Viscosity, Kinematic @ 20 C (centistokes):	Not Determined
Partition Coefficient/n-Octanol/Water:	Not Determined
Molecular Weight (g/mole):	Not Determined
Decomposition Temperature (C):	Not Determined

10. STABILITY AND REACTIVITY

Stability Data:	Stable
Hazardous Polymerisation:	Will Not Occur
Conditions to Avoid	None anticipated

Incompatibility (Materials to Avoid)	Hydrofluoric acid
Hazardous Decomposition Products	Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C).
Additional Guidelines	Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure	Eye or skin contact, inhalation.
Inhalation	Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A). Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See Chronic Effects/Carcinogenicity" subsection below). "
Skin Contact	May cause mechanical injury.
Eye Contact	May cause eye irritation.
Ingestion	None known
Aggravated Medical Conditions	Individuals with respiratory disease, including but not limited to asthma and bronchitis, or subject to eye irritation, should not be exposed to quartz dust.
Chronic Effects/Carcinogenicity	Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis. Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to <u>IARC Monograph 68, Silica, Some Silicates and Organic Fibres</u> (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as Known to be a human carcinogen". Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2). " There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.
Other Information	For further information consult Adverse Effects of Crystalline Silica Exposure" published by the American Thoracic Society Medical Section of the American Lung Association, American Journal of Respiratory and Critical Care Medicine, Volume 155, pages 761-768 (1997)."

Toxicity Tests

Oral Toxicity:	Not determined
Dermal Toxicity:	Not determined.
Inhalation Toxicity:	Not determined
Primary Irritation Effect:	Not determined
Carcinogenicity:	Refer to <u>IARC Monograph 68, Silica, Some Silicates and Organic Fibres</u> (June 1997).
Genotoxicity:	Not determined
Reproductive/Developmental Toxicity:	Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air)	Not determined
Persistence/Degradability	Not determined
Bio-accumulation	Not Determined

Ecotoxicological Information

Acute Fish Toxicity:	TLM96: 10000 ppm (Oncorhynchus mykiss)
Acute Crustaceans Toxicity:	Not determined
Acute Algae Toxicity:	Not determined

Chemical Fate Information	Not determined
Other Information	Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method	Bury in a licensed landfill according to federal, state, and local regulations.
Contaminated Packaging	Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels:	None
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15. REGULATORY INFORMATION

EC Supply labelling Requirements:	This product is not subject to the labelling requirements of EC Directives 67/548/EEC and 88/379/EEC as amended.
Classification	Crystalline silica is not classified as a carcinogen in EU Council Directives 67/548/EEC and 88/379/EEC.
Risk Phrases	None
Safety Phrases	None
EINECS Inventory	All components are listed on the inventory.
Germany, Water Endangering Classes (WGK):	WGK 0: Generally not water endangering.

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS:

Not applicable

Additional Information	For additional information on the use of this product, contact your local Halliburton representative. For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Product Stewardship at 1-580-251-4335.
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Disclaimer Statement	This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.
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END OF MSDS

MATERIAL SAFETY DATA SHEET**Product Trade Name:** **QUIK-GEL®****Revision Date:** 03-Jan-2008**1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION**

Product Trade Name: QUIK-GEL®
Synonyms: None
Chemical Family: Mineral
Application: Viscosifier

Manufacturer/Supplier Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

SUBSTANCE	CAS Number	PERCENT	ACGIH TLV-TWA	OSHA PEL-TWA
Bentonite	1302-78-9	60 - 100%	Not applicable	Not applicable
Crystalline silica, quartz	14808-60-7	1 - 5%	0.025 mg/m ³	10 mg/m ³ %SiO ₂ + 2
Crystalline silica, cristobalite	14464-46-1	0 - 1%	0.025 mg/m ³	1/2 x 10 mg/m ³ %SiO ₂ + 2
Crystalline silica, tridymite	15468-32-3	0 - 1%	0.05 mg/m ³	1/2 x 10 mg/m ³ %SiO ₂ + 2

More restrictive exposure limits may be enforced by some states, agencies, or other authorities.

3. HAZARDS IDENTIFICATION

Hazard Overview

CAUTION! - ACUTE HEALTH HAZARD

May cause eye and respiratory irritation.

DANGER! - CHRONIC HEALTH HAZARD

Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposures below recommended exposure limits. Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. Review the Material Safety Data Sheet (MSDS) for this product, which has been provided to your employer.

4. FIRST AID MEASURES

Inhalation

If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin

Wash with soap and water. Get medical attention if irritation persists.

Eyes

In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion

Under normal conditions, first aid procedures are not required.

Notes to Physician

Treat symptomatically.

5. FIRE FIGHTING MEASURES

Flash Point/Range (F):

Not Determined

Flash Point/Range (C):

Not Determined

Flash Point Method:

Not Determined

Autoignition Temperature (F):

Not Determined

Autoignition Temperature (C):

Not Determined

Flammability Limits in Air - Lower (%):

Not Determined

Flammability Limits in Air - Upper (%):

Not Determined

Fire Extinguishing Media

All standard firefighting media.

Special Exposure Hazards

Not applicable.

Special Protective Equipment for Fire-Fighters

Not applicable.

NFPA Ratings:

Health 0, Flammability 0, Reactivity 0

HMIS Ratings:

Health 0*, Flammability 0, Physical Hazard 0 , PPE: E

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures

None known.

Procedure for Cleaning / Absorption

Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal.

7. HANDLING AND STORAGE

Handling Precautions

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.

Storage Information

Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Keep from excessive heat. Do not reuse empty container.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls

Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits listed in Section 2.

Respiratory Protection

Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product.

Hand Protection

Normal work gloves.

Skin Protection

Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing.

Eye Protection

Wear safety glasses or goggles to protect against exposure.

Other Precautions

None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:

Powder

Color:

Various

Odor:

Mild earthy

pH:

8-10

Specific Gravity @ 20 C (Water=1):

2.6

Density @ 20 C (lbs./gallon):

Not Determined

Bulk Density @ 20 C (lbs/ft3):

47.6-72.1

Boiling Point/Range (F):

Not Determined

Boiling Point/Range (C):

Not Determined

Freezing Point/Range (F):

Not Determined

Freezing Point/Range (C):

Not Determined

Vapor Pressure @ 20 C (mmHg):

Not Determined

Vapor Density (Air=1):

Not Determined

Percent Volatiles:

Not Determined

Evaporation Rate (Butyl Acetate=1):

Not Determined

Solubility in Water (g/100ml):

Slightly soluble

Solubility in Solvents (g/100ml):

Not Determined

VOCs (lbs./gallon):

Not Determined

Viscosity, Dynamic @ 20 C (centipoise):

Not Determined

Viscosity, Kinematic @ 20 C (centistokes):

Not Determined

Partition Coefficient/n-Octanol/Water:

Not Determined

9. PHYSICAL AND CHEMICAL PROPERTIES

Molecular Weight (g/mole):

Not Determined

10. STABILITY AND REACTIVITY

Stability Data: Stable

Hazardous Polymerization: Will Not Occur

Conditions to Avoid None anticipated

Incompatibility (Materials to Avoid) Hydrofluoric acid.

Hazardous Decomposition Products Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C).

Additional Guidelines Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure Eye or skin contact, inhalation.

Inhalation Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A).

Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).

Skin Contact May cause mechanical skin irritation.

Eye Contact May cause eye irritation.

Ingestion None known

Aggravated Medical Conditions Individuals with respiratory disease, including but not limited to asthma and bronchitis, or subject to eye irritation, should not be exposed to quartz dust.

Chronic Effects/Carcinogenicity Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.

Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to IARC Monograph 68, Silica, Some Silicates and Organic Fibres (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen". Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2).

There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.

Other Information For further information consult "Adverse Effects of Crystalline Silica Exposure" published by the American Thoracic Society Medical Section of the American Lung Association, American Journal of Respiratory and Critical Care Medicine, Volume 155, pages 761-768 (1997).

Toxicity Tests

Oral Toxicity:	Not determined
Dermal Toxicity:	Not determined
Inhalation Toxicity:	Not determined
Primary Irritation Effect:	Not determined
Carcinogenicity	Refer to <u>IARC Monograph 68, Silica, Some Silicates and Organic Fibres</u> (June 1997).
Genotoxicity:	Not determined
Reproductive / Developmental Toxicity:	Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air)	Not determined
Persistence/Degradability	Not determined
Bio-accumulation	Not Determined

Ecotoxicological Information

Acute Fish Toxicity:	TLM96: 10000 ppm (Oncorhynchus mykiss)
Acute Crustaceans Toxicity:	Not determined

Acute Algae Toxicity:	Not determined
Chemical Fate Information	Not determined
Other Information	Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method	Bury in a licensed landfill according to federal, state, and local regulations.
Contaminated Packaging	Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

US TSCA Inventory	All components listed on inventory.
EPA SARA Title III Extremely Hazardous Substances	Not applicable
EPA SARA (311,312) Hazard Class	Acute Health Hazard Chronic Health Hazard
EPA SARA (313) Chemicals	This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372).
EPA CERCLA/Superfund Reportable Spill Quantity	Not applicable.
EPA RCRA Hazardous Waste Classification	If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA.
California Proposition 65	The California Proposition 65 regulations apply to this product.

MA Right-to-Know Law	One or more components listed.
NJ Right-to-Know Law	One or more components listed.
PA Right-to-Know Law	One or more components listed.
Canadian Regulations	
Canadian DSL Inventory	All components listed on inventory.
WHMIS Hazard Class	D2A Very Toxic Materials Crystalline silica

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

END OF MSDS

MATERIAL SAFETY DATA SHEET

Product Trade Name: **QUIK-GROUT®**

Revision Date: 05-Jan-2006

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: QUIK-GROUT®

Synonyms: None

Chemical Family: Mineral

Application: Grouting Material

Manufacturer/Supplier Baroid Drilling Fluids
a Product Service Line of Halliburton Energy Services, Inc.
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By Chemical Compliance
Telephone: 1-580-251-4335

2. COMPOSITION/INFORMATION ON INGREDIENTS

SUBSTANCE	CAS Number	PERCENT	ACGIH TLV-TWA	OSHA PEL-TWA
Crystalline silica, cristobalite	14464-46-1	0 - 1%	0.05 mg/m ³	1/2 x 10 mg/m ³ %SiO ₂ + 2
Crystalline silica, tridymite	15468-32-3	0 - 1%	0.05 mg/m ³	1/2 x 10 mg/m ³ %SiO ₂ + 2
Ammonium bisulfate	7783-20-2	1 - 5%	Not applicable	Not applicable
Crystalline silica, quartz	14808-60-7	1 - 5%	0.05 mg/m ³	10 mg/m ³ %SiO ₂ + 2
Bentonite	1302-78-9	60 - 100%	Not applicable	Not applicable

3. HAZARDS IDENTIFICATION

Hazard Overview

CAUTION! - ACUTE HEALTH HAZARD

May cause eye and respiratory irritation.

DANGER! - CHRONIC HEALTH HAZARD

Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposures below recommended exposure limits. Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. Review the Material Safety Data Sheet (MSDS) for this product, which has been provided to your employer.

4. FIRST AID MEASURES

Inhalation	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Skin	Wash with soap and water. Get medical attention if irritation persists.
Eyes	In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.
Ingestion	Under normal conditions, first aid procedures are not required.
Notes to Physician	Treat symptomatically.

5. FIRE FIGHTING MEASURES

Flash Point/Range (F):	Not Determined
Flash Point/Range (C):	Not Determined
Flash Point Method:	Not Determined
Autoignition Temperature (F):	Not Determined
Autoignition Temperature (C):	Not Determined
Flammability Limits in Air - Lower (%):	Not Determined
Flammability Limits in Air - Upper (%):	Not Determined

Fire Extinguishing Media All standard firefighting media.

Special Exposure Hazards Not applicable.

Special Protective Equipment for Fire-Fighters Not applicable.

NFPA Ratings: Health 0, Flammability 0, Reactivity 0
HMIS Ratings: Flammability 0, Reactivity 0, Health 0*

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures None known.

Procedure for Cleaning / Absorption Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal.

7. HANDLING AND STORAGE

Handling Precautions	This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.
Storage Information	Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Do not reuse empty container.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls	Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits listed in Section 2.
Respiratory Protection	Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product.
Hand Protection	Normal work gloves.
Skin Protection	Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing.
Eye Protection	Wear safety glasses or goggles to protect against exposure.
Other Precautions	None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Solid
Color:	Beige to Tan
Odor:	Odorless
pH:	8-10
Specific Gravity @ 20 C (Water=1):	2.5
Density @ 20 C (lbs./gallon):	Not Determined
Bulk Density @ 20 C (lbs/ft3):	74
Boiling Point/Range (F):	Not Determined
Boiling Point/Range (C):	Not Determined
Freezing Point/Range (F):	Not Determined
Freezing Point/Range (C):	Not Determined
Vapor Pressure @ 20 C (mmHg):	Not Determined
Vapor Density (Air=1):	Not Determined
Percent Volatiles:	Not Determined
Evaporation Rate (Butyl Acetate=1):	Not Determined
Solubility in Water (g/100ml):	Insoluble
Solubility in Solvents (g/100ml):	Not Determined
VOCs (lbs./gallon):	Not Determined
Viscosity, Dynamic @ 20 C (centipoise):	Not Determined
Viscosity, Kinematic @ 20 C (centistrokes):	Not Determined
Partition Coefficient/n-Octanol/Water:	Not Determined
Molecular Weight (g/mole):	Not Determined

10. STABILITY AND REACTIVITY

Stability Data:	Stable
Hazardous Polymerization:	Will Not Occur

Conditions to Avoid	None anticipated
Incompatibility (Materials to Avoid)	Copper and copper alloys. Zinc.
Hazardous Decomposition Products	Oxides of sulfur. Oxides of nitrogen. Ammonia. Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C).
Additional Guidelines	Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure	Eye or skin contact, inhalation.
Inhalation	Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A). Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).
Skin Contact	May cause mechanical skin irritation.
Eye Contact	May cause eye irritation.
Ingestion	None known
Aggravated Medical Conditions	Individuals with respiratory disease, including but not limited to asthma and bronchitis, or subject to eye irritation, should not be exposed to quartz dust.
Chronic Effects/Carcinogenicity	Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis. Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to <u>IARC Monograph 68, Silica, Some Silicates and Organic Fibres</u> (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen". Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2). There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.

Other Information	For further information consult "Adverse Effects of Crystalline Silica Exposure" published by the American Thoracic Society Medical Section of the American Lung Association, American Journal of Respiratory and Critical Care Medicine, Volume 155, pages 761-768 (1997).
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Toxicity Tests

Oral Toxicity:	Not determined
Dermal Toxicity:	Not determined
Inhalation Toxicity:	Not determined
Primary Irritation Effect:	Not determined
Carcinogenicity	Refer to <u>IARC Monograph 68, Silica, Some Silicates and Organic Fibres</u> (June 1997).
Genotoxicity:	Not determined
Reproductive / Developmental Toxicity:	Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air)	Not determined
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Persistence/Degradability	Not determined
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Bio-accumulation	Not Determined
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Ecotoxicological Information

Acute Fish Toxicity:	Not determined
Acute Crustaceans Toxicity:	Not determined
Acute Algae Toxicity:	Not determined

Chemical Fate Information	Not determined
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Other Information	Not applicable
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13. DISPOSAL CONSIDERATIONS

Disposal Method	Bury in a licensed landfill according to federal, state, and local regulations.
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Contaminated Packaging	Follow all applicable national or local regulations.
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14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG

Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

US TSCA Inventory All components listed on inventory.

EPA SARA Title III Extremely Hazardous Substances Not applicable

EPA SARA (311,312) Hazard Class Acute Health Hazard
Chronic Health Hazard

EPA SARA (313) Chemicals This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372).

EPA CERCLA/Superfund Reportable Spill Quantity For This Product Not applicable.

EPA RCRA Hazardous Waste Classification If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA.

California Proposition 65 The California Proposition 65 regulations apply to this product.

MA Right-to-Know Law One or more components listed.

NJ Right-to-Know Law One or more components listed.

PA Right-to-Know Law One or more components listed.

Canadian Regulations

Canadian DSL Inventory All components listed on inventory.

WHMIS Hazard Class D2A Very Toxic Materials
Crystalline silica

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS
Not applicable

Additional Information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

MATERIAL SAFETY DATA SHEET

Product Trade Name: **QUIK-TROL® LV**

Revision Date: 02-Jun-2007

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: QUIK-TROL® LV
Synonyms: None
Chemical Family: Carbohydrate
Application: Filtrate Reducer
Manufacturer/Supplier: Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000
Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

SUBSTANCE	CAS Number	PERCENT	ACGIH TLV-TWA	OSHA PEL-TWA
Cellulose derivative		60 - 100%	Not applicable	Not applicable

3. HAZARDS IDENTIFICATION

Hazard Overview May cause eye, skin, and respiratory irritation. Airborne dust may be explosive.

4. FIRST AID MEASURES

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin Wash with soap and water. Get medical attention if irritation persists.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion Under normal conditions, first aid procedures are not required.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

Flash Point/Range (F):	430
Flash Point/Range (C):	221
Flash Point Method:	Not Determined
Autoignition Temperature (F):	752
Autoignition Temperature (C):	400
Flammability Limits in Air - Lower (%):	Not Determined
Flammability Limits in Air - Upper (%):	Not Determined

Fire Extinguishing Media Water fog, carbon dioxide, foam, dry chemical.

Special Exposure Hazards Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 0, Flammability 0, Reactivity 0
HMIS Ratings: Flammability 0, Reactivity 0, Health 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Avoid creating and breathing dust.

Environmental Precautionary Measures None known.

Procedure for Cleaning / Absorption Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid creating or inhaling dust. Avoid dust accumulations.

Storage Information Store away from oxidizers. Store in a dry location. Product has a shelf life of 36 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls A well ventilated area to control dust levels. Local exhaust ventilation should be used in areas without good cross ventilation.

Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Dust/mist respirator. (95%)

Hand Protection Normal work gloves.

Skin Protection Normal work coveralls.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State: Solid

9. PHYSICAL AND CHEMICAL PROPERTIES

Color:	White to off white
Odor:	Mild
pH:	7.75 @ 1%
Specific Gravity @ 20 C (Water=1):	1.6
Density @ 20 C (lbs./gallon):	Not Determined
Bulk Density @ 20 C (lbs/ft3):	40-55
Boiling Point/Range (F):	Not Determined
Boiling Point/Range (C):	Not Determined
Freezing Point/Range (F):	Not Determined
Freezing Point/Range (C):	Not Determined
Vapor Pressure @ 20 C (mmHg):	Not Determined
Vapor Density (Air=1):	Not Determined
Percent Volatiles:	Not Determined
Evaporation Rate (Butyl Acetate=1):	Not Determined
Solubility in Water (g/100ml):	Forms gel
Solubility in Solvents (g/100ml):	Not Determined
VOCs (lbs./gallon):	Not Determined
Viscosity, Dynamic @ 20 C (centipoise):	Not Determined
Viscosity, Kinematic @ 20 C (centistrokes):	Not Determined
Partition Coefficient/n-Octanol/Water:	Not Determined
Molecular Weight (g/mole):	Not Determined

10. STABILITY AND REACTIVITY

Stability Data:	Stable
Hazardous Polymerization:	Will Not Occur
Conditions to Avoid	None known.
Incompatibility (Materials to Avoid)	Strong oxidizers.
Hazardous Decomposition Products	Carbon monoxide and carbon dioxide.
Additional Guidelines	Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure	Eye or skin contact, inhalation.
Inhalation	May cause mild respiratory irritation.
Skin Contact	May cause mild skin irritation.
Eye Contact	May cause mild eye irritation.
Ingestion	None known
Aggravated Medical Conditions	None known.
Chronic Effects/Carcinogenicity	No data available to indicate product or components present at greater than 1% are chronic health hazards.
Other Information	None known.
Toxicity Tests	
Oral Toxicity:	LD50: 1260 mg/kg (Rat)

Dermal Toxicity:	Not determined
Inhalation Toxicity:	Not determined
Primary Irritation Effect:	Not determined
Carcinogenicity	Not determined
Genotoxicity:	Not determined
Reproductive / Developmental Toxicity:	Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air)	Not determined
Persistence/Degradability	Readily biodegradable
Bio-accumulation	Not Determined

Ecotoxicological Information

Acute Fish Toxicity:	TLM96: > 500 mg/l (Golden orfe)
Acute Crustaceans Toxicity:	Not determined
Acute Algae Toxicity:	Not determined

Chemical Fate Information	Not determined
Other Information	Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method	Bury in a licensed landfill according to federal, state, and local regulations.
Contaminated Packaging	Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

US TSCA Inventory	All components listed on inventory.
EPA SARA Title III Extremely Hazardous Substances	Not applicable
EPA SARA (311,312) Hazard Class	None
EPA SARA (313) Chemicals	This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372).
EPA CERCLA/Superfund Reportable Spill Quantity	Not applicable.
EPA RCRA Hazardous Waste Classification	If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA.
California Proposition 65	All components listed do not apply to the California Proposition 65 Regulation.
MA Right-to-Know Law	Does not apply.
NJ Right-to-Know Law	Does not apply.
PA Right-to-Know Law	Does not apply.

Canadian Regulations

Canadian DSL Inventory	All components listed on inventory.
WHMIS Hazard Class	Un-Controlled

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information	For additional information on the use of this product, contact your local Halliburton representative. For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.
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Disclaimer Statement	This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.
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END OF MSDS



A Schlumberger Company

MATERIAL SAFETY DATA SHEET

MSDS No. 12011

Trade Name: ROD EASE*

Revision Date: 08/04/2011

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Trade Name: ROD EASE*

Chemical Family: Mixture

Product Use: Drilling fluid additive. Lubricant.

Supplied by: M-I L.L.C.
P.O. Box 42842
Houston, TX 77242
www.miswaco.slb.com

Telephone Number: 281-561-1511

Emergency Telephone (24 hr.): 281-561-1600

Prepared by: Product Safety Group

Revision No. 7

HMIS Rating

Health: 1

Flammability: 1

Physical Hazard: 0

PPE: J

4=Severe, 3=Serious, 2=Moderate, 1=Slight, 0=Minimal Hazard. *Chronic effects - See Section 11. See Section 8 for Personal Protective Equipment recommendations.

2. HAZARDS IDENTIFICATION

Emergency Overview: Occupational exposure not expected to present a health or physical hazard. Prolonged exposure, however, may cause eye, skin and respiratory irritation.

Canadian Classification:

UN PIN No: Not regulated.

WHMIS Class: Not a controlled product.

Physical State: Thick Liquid Color: Dark brown. Odor: Distinctive

Potential Health Effects:

Acute Effects

Eye Contact: Not expected to irritate eyes. Prolonged contact, however, may cause irritation.

Skin Contact: Not expected to irritate skin. Prolonged contact, however, may cause irritation.

Inhalation: Not expected to be an inhalation hazard. Prolonged inhalation of vapors or mists, however, may cause irritation.

Ingestion: May cause gastric distress, nausea and vomiting if ingested.

Carcinogenicity & Chronic Effects:

See Section 11 for additional information.

Routes of Exposure:

Eyes. Dermal (skin) contact. Inhalation.

Target Organs/Medical

Inhalation. Dermal (skin) contact. Eyes.

Conditions Aggravated by Overexposure:

MATERIAL SAFETY DATA SHEET

MSDS No. 12011

Trade Name: **ROD EASE***

Revision Date: 08/04/2011

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3. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient	CAS No.	Wt. %	Comments:
Vegetable oil		60 - 100	No comments.
Additives		10 - 30	No comments.

Composition Comments: Component LD50 and LC50 values are provided in Section 11, if available.

4. FIRST AID MEASURES

Eye Contact: Promptly wash eyes with lots of water while lifting eye lids. Look for and remove contact lenses. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

Skin Contact: Wash skin thoroughly with soap and water. Remove contaminated clothing and launder before reuse. Get medical attention if any discomfort continues.

Inhalation: Move person to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Ingestion: Dilute with 2 - 3 glasses of water or milk, if conscious. Never give anything by mouth to an unconscious person. Get medical attention.

General notes: Persons seeking medical attention should carry a copy of this MSDS with them.

5. FIRE FIGHTING MEASURES

Flammable Properties

Flash Point: F (C): 734F (390C)
Flash Point Method: CC
Flammable Limits in Air - Lower (%): ND
Flammable Limits in Air - Upper (%): ND
Autoignition Temperature: F (C): ND
Explosion Data - Sensitivity to Mechanical Impact: NA
Explosion Data - Sensitivity to Static Discharge: If applicable, information is provided in Section 5 Special Fire-Fighting Procedures, Other Flammable Properties and Section 6 Spill Procedures.

Flammability Class: IIIB
Extinguishing Media: Carbon dioxide. Dry chemical. Foam. Water mist.

Protection Of Fire-Fighters:

Special Fire-Fighting Procedures: Do not enter fire area without proper personal protective equipment, including NIOSH/MSHA approved self-contained breathing apparatus. Evacuate area and fight fire from a safe distance. Water spray may be used to keep fire-exposed containers cool. Keep water run off out of sewers and waterways.

Hazardous Combustion Products: Oxides of Carbon. Sulfur.

Conditions of Flammability: Products are classified as flammable/combustible based on flash point as defined in the Health Canada Controlled Products Regulations, U.S. Occupational Health and Safety Administration Hazard Communication Standard and transportation regulations. See Sections 1, 2, 5, 14 and 15 for flammable/combustible classification information. Flammable/combustible materials may ignite and burn if exposed to a flame or other sources of ignition.

Other Flammable Properties: ND

MATERIAL SAFETY DATA SHEET

MSDS No. 12011

Trade Name: **ROD EASE***
Revision Date: 08/04/2011

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6. ACCIDENTAL RELEASE MEASURES

- Personal Precautions:** Use personal protective equipment identified in Section 8.
- Spill Procedures:** Evacuate the spill area with the exception of the spill response team. Keep personnel removed and upwind of spill. Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. Shut off leak if it can be done safely. Contain spilled material. Do not allow spilled material to enter sewers, storm drains or surface waters. Absorb in vermiculite, dry sand or earth. Place into containers for disposal.
- Environmental Precautions:** Waste must be disposed of in accordance with federal, state and local laws. In the U.S., for products with reportable quantity (RQ) components - if the RQ is exceeded, report to National Spill Response Office at 1 800 424 8802.

7. HANDLING AND STORAGE

- Handling:** Put on appropriate personal protective equipment. Avoid contact with skin and eyes. Avoid breathing vapors or spray mists. Use only in a well ventilated area. Wash thoroughly after handling.
- Storage:** Store in dry, well-ventilated area. Keep container closed. Keep away from heat, sparks and flames. Store away from incompatibles. Follow safe warehousing practices regarding palletizing, banding, shrink-wrapping and/or stacking.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure Limits (TLV & PEL - 8H TWA):

Ingredient	CAS No.	Wt. %	ACGIH TLV	OSHA PEL	Other	Notes
Vegetable oil		60 - 100	NA	NA	NA	(3) Oil mist.
Additives		10 - 30	NA	NA	NA	None

Notes

(3) For Oil mist, mineral: ACGIH TLV 5 mg/m³, STEL 10 mg/m³; OSHA PEL 5 mg/m³

Engineering Controls: Local exhaust ventilation as necessary to maintain exposures to within applicable limits.

Personal Protection Equipment

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazards present and the risk of exposure to those hazards. The PPE recommendations below are based on our assessment of the chemical hazards associated with this product. The risk of exposure and need for respiratory protection will vary from workplace to workplace and should be assessed by the user.

Eye/Face Protection: Wear chemical safety goggles.

Skin Protection: Wear appropriate clothing to prevent repeated or prolonged skin contact. Wear chemical resistant gloves such as nitrile or neoprene.

MATERIAL SAFETY DATA SHEET

MSDS No. 12011

Trade Name: **ROD EASE***

Revision Date: 08/04/2011

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Respiratory Protection:

All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent.

If exposed to airborne mist/aerosol of this product, use at least a NIOSH-approved N95 half-mask disposable or re-usable particulate respirator. In work environments containing oil mist/aerosol, use at least a NIOSH-approved P95 half-mask disposable or reuseable particulate respirator.

General Hygiene Considerations: Wash promptly with soap and water if skin becomes contaminated. Change work clothing daily if there is any possibility of contamination.

9. PHYSICAL AND CHEMICAL PROPERTIES

Color:	Dark brown.
Odor:	Distinctive
Physical State:	Thick Liquid
pH:	7 - 7.5
Specific Gravity (H ₂ O = 1):	0.887
Solubility (Water):	ND
Flash Point: F (C):	734F (390C)
Melting/Freezing Point:	-13F (-25C)
Boiling Point:	>572F (>300C)
Vapor Pressure:	ND
Vapor Density (Air=1):	ND
Evaporation Rate:	ND
Octanol/Water Partition Coefficient:	ND
Odor Threshold(s):	ND

10. STABILITY AND REACTIVITY

Chemical Stability:	Stable
Conditions to Avoid:	Keep away from heat, sparks and flame.
Materials to Avoid:	Oxidizers.
Conditions of Reactivity:	See Conditions and Materials to Avoid, if applicable.
Hazardous Decomposition Products:	For thermal decomposition products, see Section 5.
Hazardous Polymerization	Will not occur

11. TOXICOLOGICAL INFORMATION

Acute Exposure Effects, Irritation and Sensitization: See Section 2.

Chronic, Carcinogenicity, Reproductive Toxicity, Teratogenicity, Embryotoxicity, Mutagenicity Effects: See Component Toxicological Summary and Product Toxicological Information, if available.

Synergistic Products/Effects: ND

Component Toxicological Data: Any adverse component toxicological effects and acute toxicity values (LD50s, LC50s) are listed below. If no effects or acute values are listed for components, no such data were identified.

Product Toxicological Information: Oral LD50: >5000 mg/kg (rat).

MATERIAL SAFETY DATA SHEET

MSDS No. 12011

Trade Name: **ROD EASE***
Revision Date: 08/04/2011

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12. ECOLOGICAL INFORMATION

Component Ecotoxicity Data: Component ecotoxicity data are listed below. If no data are listed, none were found in the component review.

Product Ecotoxicity Data: Contact M-I Environmental Affairs Department for available product ecotoxicity data.

Biodegradation: ND

Bioaccumulation: ND

13. DISPOSAL CONSIDERATIONS

Waste Classification: This product does not meet the criteria of a hazardous waste if discarded in its purchased form.

Waste Management: Under U.S. Environmental Protection Agency (EPA) Resource Conservation and Recovery Act (RCRA), it is the responsibility of the user to determine at the time of disposal, whether the product meets RCRA criteria for the hazardous waste. This is because product uses, transformations, mixtures, processes, etc., may render the resulting materials hazardous. Empty containers retain residues. All labeled precautions must be observed.

Disposal Method: Recover and reclaim or recycle, if practical. Should this product become a waste, dispose of in a permitted industrial landfill. Ensure that the containers are empty by the RCRA criteria prior to disposal in a permitted industrial landfill.

14. TRANSPORT INFORMATION

U.S. DOT Shipping Description:	Not regulated for transportation by DOT, TDG, IMDG, ICAO/IATA.
Canada TDG Shipping Description:	Not regulated.
UN PIN No:	Not regulated.
IMDG Shipping Description:	Not regulated.
ICAO/IATA Shipping Description:	Not regulated.

15. REGULATORY INFORMATION

U.S. Federal and State Regulations

SARA 311/312 Hazard Categories: Immediate (acute) health hazard.

SARA 302/304, 313; CERCLA RQ, California Proposition 65: Note: If no components are listed below, this product is not subject to the referenced SARA and CERCLA regulations and is not known to contain a Proposition 65 listed chemical at a level that is expected to pose a significant risk under anticipated use conditions.

International Chemical Inventories

MATERIAL SAFETY DATA SHEET

MSDS No. 12011

Trade Name: **ROD EASE***
Revision Date: 08/04/2011

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Australia AICS - Contains a component that is not listed.
Canada DSL - Components are listed or exempt from listing.
China Inventory - Components are listed or exempt from listing.
European Union EINECS/ELINCS - Components are listed or exempt from listing.
Japan METI ENCS - Contains a component that is not listed.
Korea TCCL ECL - Components are listed or exempt from listing.
New Zealand - Contains a component that may only be used under a group standard.
Philippine PICCS - Contains a component that is not listed.
U.S. TSCA - Components are listed or exempt from listing.
U.S. TSCA - No components are subject to TSCA 12(b) export notification requirements.

Canadian Classification:

Controlled Products Regulations Statement: This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

WHMIS Class: Not a controlled product.

16. OTHER INFORMATION

The following sections have been revised: 1, 2, 5, 8, 15, 16. Format changes.

NA - Not Applicable, ND - Not Determined.

*A mark of M-I L.L.C.

Disclaimer:

MSDS furnished independent of product sale. While every effort has been made to accurately describe this product, some of the data are obtained from sources beyond our direct supervision. We can not make any assertions as to its reliability or completeness; therefore, user may rely on it only at user's risk. We have made no effort to censor or conceal deleterious aspects of this product. Since we cannot anticipate or control the conditions under which this information and product may be used, we make no guarantee that the precautions we have suggested will be adequate for all individuals and/or situations. It is the obligation of each user of this product to comply with the requirements of all applicable laws regarding use and disposal of this product. Additional information will be furnished upon request to assist the user; however, no warranty, either expressed or implied, nor liability of any nature with respect to this product or to the data herein is made or incurred hereunder.

MATERIAL SAFETY DATA SHEET

SODA ASH

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

TRADE NAME: SODA ASH

CHEMICAL CLASS: Sodium carbonate

APPLICATIONS: Oil well drilling fluid additive. Calcium precipitation

EMERGENCY TELEPHONE: 281-561-1600

SUPPLIER: Supplied by a Business Unit of
M-I L.L.C.
P.O. Box 42842, Houston, Texas 77242-2842
See cover sheet for local supplier.

TELEPHONE: 281-561-1509

FAX: 281-561-7240

CONTACT PERSON: Sam Hoskin - Manager, Occupational Health

2. COMPOSITION, INFORMATION ON INGREDIENTS

INGREDIENT NAME:	CAS No.:	CONTENTS :	EPA RQ:	TPQ:
Sodium carbonate	497-19-8	100 %		

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW:

CAUTION! MAY CAUSE EYE, SKIN AND RESPIRATORY TRACT IRRITATION. Avoid contact with eyes, skin and clothing. Avoid breathing airborne product. Keep container closed. Use with adequate ventilation. Wash thoroughly after handling.

amber white powder. Slippery when wet. A nuisance dust.

ACUTE EFFECTS:

HEALTH HAZARDS, GENERAL:

Particulates may cause mechanical irritation to the eyes, nose, throat and lungs. Particulate inhalation may lead to pulmonary fibrosis, chronic bronchitis, emphysema and bronchial asthma. Dermatitis and asthma may result from short contact periods.

INHALATION: May be irritating to the respiratory tract if inhaled.

INGESTION: May cause gastric distress, nausea and vomiting if ingested.

SKIN: May be irritating to the skin.

EYES: May be irritating to the eyes.

CHRONIC EFFECTS:

CARCINOGENICITY:

IARC: Not listed. OSHA: Not regulated. NTP: Not listed.

ROUTE OF ENTRY:

Inhalation. Skin and/or eye contact.

TARGET ORGANS:

Respiratory system, lungs. Skin. Eyes.

4. FIRST AID MEASURES

GENERAL: Persons seeking medical attention should carry a copy of this MSDS with them.

INHALATION: Move the exposed person to fresh air at once. Perform artificial respiration if breathing has stopped. Get medical attention.

INGESTION: Drink a couple of glasses water or milk. Do not give victim anything to drink if he is unconscious. Get medical attention.

SKIN: Wash skin thoroughly with soap and water. Remove contaminated clothing. Get medical attention if any discomfort continues.

EYES: Promptly wash eyes with lots of water while lifting the eye lids. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

5. FIRE FIGHTING MEASURES

AUTO IGNITION TEMP. (°F): N/D

FLAMMABILITY LIMIT - LOWER(%): N/D

FLAMMABILITY LIMIT - UPPER(%): N/D

EXTINGUISHING MEDIA:

Carbon dioxide (CO₂). Dry chemicals. Foam. Water spray, fog or mist.

SPECIAL FIRE FIGHTING PROCEDURES:

No specific fire fighting procedure given.

UNUSUAL FIRE & EXPLOSION HAZARDS:

No unusual fire or explosion hazards noted.

HAZARDOUS COMBUSTION PRODUCTS:

Irritating gases/vapors/fumes. Oxides of: Carbon. and Sodium.

6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS:

Wear proper personal protective equipment (see MSDS Section 8).

SPILL CLEAN-UP PROCEDURES:

Carefully sweep up and put in closed containers. Avoid making dust. Do not contaminate drainage or waterways. Repackage or recycle if possible.

7. HANDLING AND STORAGE

HANDLING PRECAUTIONS:

Avoid handling causing generation of dust. Wear full protective clothing for prolonged exposure and/or high concentrations. Eye wash and emergency shower must be available at the work place. Wash hands often and change clothing when needed. Provide good ventilation. Mechanical ventilation or local exhaust ventilation is required.

STORAGE PRECAUTIONS:

Store at moderate temperatures in dry, well ventilated area. Keep in original container.

8. EXPOSURE CONTROLS, PERSONAL PROTECTION

INGREDIENT NAME:	CAS No.:	OSHA PEL:		ACGIH TLV:		OTHER:		UNITS:
		TWA:	STEL:	TWA:	STEL:	TWA:	STEL:	
Sodium carbonate	497-19-8	5		3				mg/m3 resp.dust

INGREDIENT COMMENTS:

Exposure limits are for Particulates Not Otherwise Classified (PNOC).

PROTECTIVE EQUIPMENT:**ENGINEERING CONTROLS:**

Use appropriate engineering controls such as, exhaust ventilation and process enclosure, to reduce air contamination and keep worker exposure below the applicable limits.

VENTILATION: Supply natural or mechanical ventilation adequate to exhaust airborne product and keep exposures below the applicable limits.

RESPIRATORS: Use at least a NIOSH-approved N95 half-mask disposable or reuseable particulate respirator. In work environments containing oil mist/aerosol use at least a NIOSH-approved P95 half-mask disposable or reuseable particulate respirator.

PROTECTIVE GLOVES:

Use suitable protective gloves if risk of skin contact.

EYE PROTECTION:

Wear dust resistant safety goggles where there is danger of eye contact.

PROTECTIVE CLOTHING:

Wear appropriate clothing to prevent repeated or prolonged skin contact.

HYGIENIC WORK PRACTICES:

Wash promptly with soap and water if skin becomes contaminated. Change work clothing daily if there is any possibility of contamination.

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE/PHYSICAL STATE:	Powder, dust.	
COLOR:	White.	
ODOR:	Odorless or no characteristic odor.	
SOLUBILITY DESCRIPTION:	Soluble in water.	
MELT./FREEZ. POINT (°F, interval):	1564	
DENSITY/SPECIFIC GRAVITY (g/ml):	2.509	TEMPERATURE (°F): 68
BULK DENSITY:	48 lb/ft3; 769 kg/m3	
VAPOR DENSITY (air=1):	N/A	
VAPOR PRESSURE:	N/A	TEMPERATURE (°F):
pH-VALUE, DILUTED SOLUTION:	11.4	CONCENTRATION (%M): 1%

10. STABILITY AND REACTIVITY

STABILITY: Normally stable.

CONDITIONS TO AVOID:
Reacts with hydrated lime to form sodium hydroxide.

HAZARDOUS POLYMERIZATION:
Will not polymerize.

POLYMERIZATION DESCRIPTION:
Not relevant.

MATERIALS TO AVOID:
Strong acids.

HAZARDOUS DECOMPOSITION PRODUCTS:
No specific hazardous decomposition products noted.

11. TOXICOLOGICAL INFORMATION

Component: Sodium carbonate

TOXICOLOGICAL DATA:

Corrosive effects.	Eye irritation test.	24 hours.	Eye.	Rabbit.	100 mg - Moderate Irritation
Corrosive effects.		24 hours.	Skin.	Rabbit.	500 mg - Mild Irritation

TOXIC DOSE - LD 50: 4090 mg/kg (oral rat)
TOXIC CONC. - LC 50: 1200 mg/m³/2h (inh-mus)

12. ECOLOGICAL INFORMATION

ACUTE AQUATIC TOXICITY:

This product is approved for use under the U.S. Environmental Protection Agency (EPA) Region IX (California) General NPDES Permit which regulates offshore discharges of drilling fluids. Contact M-I's Environmental Affairs Department for more information.

This product passes the mysid shrimp toxicity test required by the U.S. Environmental Protection Agency (EPA) Region VI (Gulf of Mexico) NPDES Permit, which regulates offshore discharge of drilling fluids, when tested in a standard drilling fluid. Contact M-I's Environmental Affairs Department for more information.

13. DISPOSAL CONSIDERATIONS

WASTE MANAGEMENT:

This product does not meet the criteria of a hazardous waste if discarded in its purchased form. Under RCRA, it is the responsibility of the user of the product to determine at the time of disposal, whether the product meets RCRA criteria for hazardous waste. This is because product uses, transformations, mixtures, processes, etc, may render the resulting materials hazardous.

DISPOSAL METHODS:

Recover and reclaim or recycle, if practical. Should this product become a waste, dispose of in a permitted industrial landfill. Ensure that containers are empty by RCRA criteria prior to disposal in a permitted industrial landfill.

14. TRANSPORT INFORMATION

PRODUCT RQ: N/A

U.S. DOT:
U.S. DOT CLASS: Not regulated.

CANADIAN TRANSPORT:
TDGR CLASS: Not regulated.

SEA TRANSPORT:
IMDG CLASS: Not regulated.

AIR TRANSPORT:
ICAO CLASS: Not regulated.

15. REGULATORY INFORMATION

REGULATORY STATUS OF INGREDIENTS:

NAME:	CAS No:	TSCA:	CERCLA:	SARA 302:	SARA 313:	DSL(CAN):
Sodium carbonate	497-19-8	Yes	No	No	No	Yes

US FEDERAL REGULATIONS: WASTE CLASSIFICATION:

Not a hazardous waste by U.S. RCRA criteria. See Section 13.

REGULATORY STATUS:

This Product or its components, if a mixture, is subject to following regulations (Not meant to be all inclusive - selected regulations represented):

SECTION 313: This product does not contain toxic chemical subject to the reporting requirements of Section 313 of Title III of the Superfund Amendment and Reauthorization Act of 1986 and 40 CFR Part 372.

SARA 311 Categories:
1: Immediate (Acute) Health Effects.

The components of this product are listed on or are exempt from the following international chemical registries:
TSCA (U.S.)
EINECS (Europe)
DSL (Canada)

STATE REGULATIONS: STATE REGULATORY STATUS:

This product or its components, if a mixture, is subject to following regulations (Not meant to be all inclusive - selected regulations represented):.

None.

PROPOSITION 65: This product does not contain chemicals considered by the State of California's Safe Drinking Water and Toxic Enforcement Act of 1986 as causing cancer or reproductive toxicity, and for which warnings are now required.

CANADIAN REGULATIONS: LABELS FOR SUPPLY:



REGULATORY STATUS:

This Material Safety Data Sheet has been prepared in compliance with the Controlled Product Regulations.

Canadian WHMIS Classification: D2B - Other Toxic Effects: Toxic Material

16. OTHER INFORMATION

NPCA HMIS HAZARD INDEX: 1 Slight Hazard
FLAMMABILITY: 1 Slight Hazard
REACTIVITY: 0 Minimal Hazard
NPCA HMIS PERS. PROTECT. INDEX: E - Safety Glasses, Gloves, Dust Respirator

USER NOTES: N/A = Not applicable N/D = Not determined

INFORMATION SOURCES: OSHA Permissible Exposure Limits, 29 CFR 1910, Subpart Z, Section 1910.1000, Air Contaminants.

ACGIH Threshold Limit Values and Biological Exposure Indices for Chemical Substances and Physical Agents (latest edition).

Sax's Dangerous Properties of Industrial Materials, 9th ed., Lewis, R.J. Sr., (ed.), VNR, New York, New York, (1997).
Product information provided by the commercial vendor(s).

PREPARED BY: Sam Hoskin/bb

REVISION No./Repl. MSDS of: 2/January 27, 1998

MSDS STATUS: Approved.

DATE: June 16, 2000

DISCLAIMER:

MSDS furnished independent of product sale. While every effort has been made to accurately describe this product, some of the data are obtained from sources beyond our direct supervision. We cannot make any assertions as to its reliability or completeness; therefore, user may rely on it only at user's risk. We have made no effort to censor or conceal deleterious aspects of this product. Since we cannot anticipate or control the conditions under which this information and product may be used, we make no guarantee that the precautions we have suggested will be adequate for all individuals and/or situations. It is the obligation of each user of this product to comply with the requirements of all applicable laws regarding use and disposal of this product. Additional information will be furnished upon request to assist the user; however, no warranty, either expressed or implied, nor liability of any nature with respect to this product or to the data herein is made or incurred hereunder.

APPENDIX E

2. HAZARDOUS MATERIALS FOR USE IN PROJECT

APPENDIX E-2
MSDS -- HAZARDOUS MATERIALS FOR USE IN PROJECT

ACETYLENE
ALCONOX
BESTOLIFE 3000 JOINT GREASE
CHEVRON DELO 400
CHEVRON H HYDRAULIC OIL AW ISO 32, 46, 68
DIAMOND BITS AND BLADES
DIATHON WHITE-FIRE EXTINGUISHER
EXCALIBUR 7018 H4R
GOJO HAND CLEANER
GRINDING AND CUTTING WHEELS
IDP-214
IDP-585
JOHN DEERE HY-GARD
MARKING CHALK-BLUE
MYSTICK JT-6 MULTIPURPOSE GREASE, NO. 2
NO. 2 DIESEL
OXYGEN
TEXACO PREDILUTED 50/50 COOLANT/ANTIFREEZE
TROPARTIC MOTOR OIL
UNLEADED GASOLINE
VITRIFIED GRINDING WHEELS

Material Safety Data Sheet



Acetylene

Section 1. Chemical product and company identification

Product name : Acetylene
Supplier : AIRGAS INC., on behalf of its subsidiaries
259 North Radnor-Chester Road
Suite 100
Radnor, PA 19087-5283
1-610-687-5253
Product use : Synthetic/Analytical chemistry.
Synonym : acetylen; acetylene ; ethine; ethyne; narcylen
MSDS # : 001001
Date of Preparation/Revision : 5/11/2011.
In case of emergency : 1-866-734-3438

Section 2. Hazards identification

Physical state : Gas.
Emergency overview : WARNING!
FLAMMABLE GAS.
MAY CAUSE FLASH FIRE.
MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA.
CONTENTS UNDER PRESSURE.
Keep away from heat, sparks and flame. Do not puncture or incinerate container. May cause target organ damage, based on animal data. Use only with adequate ventilation. Keep container closed.
Contact with rapidly expanding gases can cause frostbite.
Target organs : May cause damage to the following organs: lungs, upper respiratory tract, central nervous system (CNS).
Routes of entry : Inhalation
Potential acute health effects
Eyes : Contact with rapidly expanding gas may cause burns or frostbite.
Skin : Contact with rapidly expanding gas may cause burns or frostbite.
Inhalation : Acts as a simple asphyxiant.
Ingestion : Ingestion is not a normal route of exposure for gases
Potential chronic health effects
Chronic effects : May cause target organ damage, based on animal data.
Target organs : May cause damage to the following organs: lungs, upper respiratory tract, central nervous system (CNS).
Medical conditions aggravated by over-exposure : Pre-existing disorders involving any target organs mentioned in this MSDS as being at risk may be aggravated by over-exposure to this product.

See toxicological information (Section 11)

Section 3. Composition, Information on Ingredients

<u>Name</u>	<u>CAS number</u>	<u>% Volume</u>	<u>Exposure limits</u>
Acetylene	74-86-2	100	NIOSH REL (United States, 6/2009). CEIL: 2662 mg/m ³ CEIL: 2500 ppm

Section 4. First aid measures

No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

- Eye contact** : Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.
- Skin contact** : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.
- Frostbite** : Try to warm up the frozen tissues and seek medical attention.
- Inhalation** : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.
- Ingestion** : As this product is a gas, refer to the inhalation section.

Section 5. Fire-fighting measures

- Flammability of the product** : Flammable.
- Auto-ignition temperature** : 305°C (581°F)
- Flash point** : Closed cup: -18.15°C (-0.7°F).
- Flammable limits** : Lower: 2.5% Upper: 100%
- Products of combustion** : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
- Fire hazards in the presence of various substances** : Extremely flammable in the presence of the following materials or conditions: open flames, sparks and static discharge, heat and oxidizing materials.
- Fire-fighting media and instructions** : In case of fire, use water spray (fog), foam or dry chemical.

In case of fire, allow gas to burn if flow cannot be shut off immediately. Apply water from a safe distance to cool container and protect surrounding area. If involved in fire, shut off flow immediately if it can be done without risk.

Contains gas under pressure. Flammable gas. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion.
- Special protective equipment for fire-fighters** : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

- Personal precautions** : Immediately contact emergency personnel. Keep unnecessary personnel away. Use suitable protective equipment (section 8). Shut off gas supply if this can be done safely. Isolate area until gas has dispersed.
- Environmental precautions** : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.
- Methods for cleaning up** : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see section 1 for emergency contact information and section 13 for waste disposal.

Section 7. Handling and storage

- Handling** : Use only with adequate ventilation. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. High pressure gas. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Keep container closed. Keep away from heat, sparks and flame. To avoid fire, eliminate ignition sources. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.
- Storage** : Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame). Segregate from oxidizing materials. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

Section 8. Exposure controls/personal protection

- Engineering controls** : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.
- Personal protection**
- Eyes** : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.
- Skin** : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
- Respiratory** : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.
- The applicable standards are (US) 29 CFR 1910.134 and (Canada) Z94.4-93
- Hands** : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.
- Personal protection in case of a large spill** : Self-contained breathing apparatus (SCBA) should be used to avoid inhalation of the product.

Product name

Ethyne

NIOSH REL (United States, 6/2009).

CEIL: 2662 mg/m³

CEIL: 2500 ppm

Consult local authorities for acceptable exposure limits.

Section 9. Physical and chemical properties

- Molecular weight** : 26.04 g/mole
- Molecular formula** : C₂H₂
- Melting/freezing point** : Sublimation temperature: -81.8°C (-115.2 to °F)
- Critical temperature** : 35.3°C (95.5°F)
- Vapor pressure** : 635 (psig)
- Vapor density** : 0.907 (Air = 1)
- Specific Volume (ft³/lb)** : 14.7058
- Gas Density (lb/ft³)** : 0.0691 (-80°C / -112 to °F)

Section 10. Stability and reactivity

- Stability and reactivity** : The product is stable.
- Incompatibility with various substances** : Extremely reactive or incompatible with the following materials: oxidizing materials.
- Hazardous decomposition products** : Under normal conditions of storage and use, hazardous decomposition products should not be produced.
- Hazardous polymerization** : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Toxicity data

- Chronic effects on humans** : May cause damage to the following organs: lungs, upper respiratory tract, central nervous system (CNS).
- Other toxic effects on humans** : No specific information is available in our database regarding the other toxic effects of this material to humans.
- Specific effects**
- Carcinogenic effects** : No known significant effects or critical hazards.
- Mutagenic effects** : No known significant effects or critical hazards.
- Reproduction toxicity** : No known significant effects or critical hazards.

Section 12. Ecological information

Aquatic ecotoxicity

Not available.

- Products of degradation** : Products of degradation: carbon oxides (CO, CO₂) and water.
- Environmental fate** : Not available.
- Environmental hazards** : This product shows a low bioaccumulation potential.
- Toxicity to the environment** : Not available.

Section 13. Disposal considerations

Product removed from the cylinder must be disposed of in accordance with appropriate Federal, State, local regulation. Return cylinders with residual product to Airgas, Inc. Do not dispose of locally.

Section 14. Transport information

Regulatory information	UN number	Proper shipping name	Class	Packing group	Label	Additional information
DOT Classification	UN1001	ACETYLENE, DISSOLVED	2.1	Not applicable (gas).		Limited quantity Yes. Packaging instruction Passenger aircraft Quantity limitation: Forbidden. Cargo aircraft Quantity limitation: 15 kg

Acetylene						
TDG Classification	UN1001	ACETYLENE, DISSOLVED	2.1	Not applicable (gas).		<u>Explosive Limit and Limited Quantity Index</u> 0 <u>Passenger Carrying Ship Index</u> 75 <u>Passenger Carrying Road or Rail Index</u> Forbidden <u>Special provisions</u> 38, 42
Mexico Classification	UN1001	ACETYLENE, DISSOLVED	2.1	Not applicable (gas).		-

“Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product.”

Section 15. Regulatory information

United States

U.S. Federal regulations

:
TSCA 8(a) IUR: Partial exemption
United States inventory (TSCA 8b): This material is listed or exempted.
SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: Ethyne
SARA 311/312 MSDS distribution - chemical inventory - hazard identification:
Ethyne: Fire hazard, reactive, Sudden release of pressure, Immediate (acute) health hazard

Clean Air Act (CAA) 112 accidental release prevention - Flammable Substances:
Acetylene

State regulations

:
Connecticut Carcinogen Reporting: This material is not listed.
Connecticut Hazardous Material Survey: This material is not listed.
Florida substances: This material is not listed.
Illinois Chemical Safety Act: This material is not listed.
Illinois Toxic Substances Disclosure to Employee Act: This material is not listed.
Louisiana Reporting: This material is not listed.
Louisiana Spill: This material is not listed.
Massachusetts Spill: This material is not listed.
Massachusetts Substances: This material is listed.
Michigan Critical Material: This material is not listed.
Minnesota Hazardous Substances: This material is not listed.
New Jersey Hazardous Substances: This material is listed.
New Jersey Spill: This material is not listed.
New Jersey Toxic Catastrophe Prevention Act: This material is not listed.
New York Acutely Hazardous Substances: This material is not listed.
New York Toxic Chemical Release Reporting: This material is not listed.
Pennsylvania RTK Hazardous Substances: This material is listed.

Acetylene

Rhode Island Hazardous Substances: This material is not listed.

Canada

WHMIS (Canada) : Class A: Compressed gas.
Class B-1: Flammable gas.
Class F: Dangerously reactive material.
CEPA Toxic substances: This material is not listed.
Canadian ARET: This material is not listed.
Canadian NPRI: This material is listed.
Alberta Designated Substances: This material is not listed.
Ontario Designated Substances: This material is not listed.
Quebec Designated Substances: This material is not listed.

Section 16. Other information

United States

Label requirements : FLAMMABLE GAS.
MAY CAUSE FLASH FIRE.
MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA.
CONTENTS UNDER PRESSURE.

Canada

Label requirements : Class A: Compressed gas.
Class B-1: Flammable gas.
Class F: Dangerously reactive material.

Hazardous Material Information System (U.S.A.)	:	Health	*	1
		Flammability		4
		Physical hazards		2



Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

ALCONOX MSDS

Section 1 : MANUFACTURER INFORMATION

Product name: Alconox

Supplier: Same as manufacturer.

Manufacturer: Alconox, Inc.
30 Glenn St.
Suite 309
White Plains, NY 10603.

Manufacturer emergency 800-255-3924.

phone number: 813-248-0585 (outside of the United States).

Manufacturer: Alconox, Inc.
30 Glenn St.
Suite 309
White Plains, NY 10603.

Supplier MSDS date: 2005/03/09

D.O.T. Classification: Not regulated.

Section 2 : HAZARDOUS INGREDIENTS

C.A.S.	CONCENTRATION %	Ingredient Name	T.L.V.	LD/50	LC/50
25155-30-0	10-30	SODIUM DODECYLBENZENESULFONATE	NOT AVAILABLE	438 MG/KG RAT ORAL 1330 MG/KG MOUSE ORAL	NOT AVAILABLE
497-19-8	7-13	SODIUM CARBONATE	NOT AVAILABLE	4090 MG/KG RAT ORAL 6600 MG/KG MOUSE ORAL	2300 MG/M3/2H RAT INHALATION 1200 MG/M3/2H MOUSE INHALATION
7722-88-5	10-30	TETRASODIUM PYROPHOSPHATE	5 MG/M3	4000 MG/KG RAT ORAL 2980 MG/KG MOUSE ORAL	NOT AVAILABLE
7758-29-4	10-30	SODIUM PHOSPHATE	NOT AVAILABLE	3120 MG/KG RAT ORAL 3100 MG/KG MOUSE ORAL >4640 MG/KG RABBIT DERMAL	NOT AVAILABLE

Section 2A : ADDITIONAL INGREDIENT INFORMATION

Note: (supplier).

CAS# 497-19-8: LD50 4020 mg/kg - rat oral.

CAS# 7758-29-4: LD50 3100 mg/kg - rat oral.

Section 3 : PHYSICAL / CHEMICAL CHARACTERISTICS

Physical state: Solid

Appearance & odor: Almost odourless.
White granular powder.

Odor threshold (ppm): Not available.

Vapour pressure (mmHg): Not applicable.

Vapour density (air=1): Not applicable.

By weight: Not available.

Evaporation rate (butyl acetate = 1): Not applicable.

Boiling point (°C): Not applicable.

Freezing point (°C): Not applicable.

pH: (1% aqueous solution).
9.5

Specific gravity @ 20 °C: (water = 1).
0.85 - 1.10

Solubility in water (%): 100 - > 10% w/w

Coefficient of water\oil dist.: Not available.

VOC: None

Section 4 : FIRE AND EXPLOSION HAZARD DATA

Flammability: Not flammable.

Conditions of flammability: Surrounding fire.

Extinguishing media: Carbon dioxide, dry chemical, foam.
Water
Water fog.

Special procedures: Self-contained breathing apparatus required.
Firefighters should wear the usual protective gear.

Auto-ignition temperature: Not available.

Flash point (°C), method: None

Lower flammability limit (% vol): Not applicable.

Upper flammability limit (% vol): Not applicable.

Not available.

Sensitivity to mechanical impact: Not applicable.

Hazardous combustion products: Oxides of carbon (COx).
Hydrocarbons.

Rate of burning: Not available.

Explosive power: None

Section 5 : REACTIVITY DATA

Chemical stability: Stable under normal conditions.

Conditions of instability: None known.

Hazardous polymerization: Will not occur.

Incompatible substances: Strong acids.
Strong oxidizers.

Hazardous decomposition products: See hazardous combustion products.

Section 6 : HEALTH HAZARD DATA

Route of entry: Skin contact, eye contact, inhalation and ingestion.

Effects of Acute

Exposure

Eye contact: May cause irritation.

Skin contact: Prolonged contact may cause irritation.

Inhalation: Airborne particles may cause irritation.

Ingestion: May cause vomiting and diarrhea.
May cause abdominal pain.
May cause gastric distress.

Effects of chronic exposure: Contains an ingredient which may be corrosive.

LD50 of product, species & route: > 5000 mg/kg rat oral.

LC50 of product, species & route: Not available for mixture, see the ingredients section.

Exposure limit of material: Not available for mixture, see the ingredients section.

Sensitization to product: Not available.

Carcinogenic effects: Not listed as a carcinogen.

Reproductive effects: Not available.

Teratogenicity: Not available.

Mutagenicity: Not available.

Synergistic materials: Not available.

Medical conditions aggravated by exposure: Not available.

First Aid

Skin contact: Remove contaminated clothing.
Wash thoroughly with soap and water.
Seek medical attention if irritation persists.

Eye contact: Check for and remove contact lenses.
Flush eyes with clear, running water for 15 minutes while holding eyelids open: if irritation persists, consult a physician.

Inhalation: Remove victim to fresh air.
Seek medical attention if symptoms persist.

Ingestion: Dilute with two glasses of water.
Never give anything by mouth to an unconscious person.
Do not induce vomiting, seek immediate medical attention.

Section 7 : PRECAUTIONS FOR SAFE HANDLING AND USE

Leak / Spill: Contain the spill.
Recover uncontaminated material for re-use.
Wear appropriate protective equipment.
Contaminated material should be swept or shoveled into appropriate waste container for disposal.

Waste disposal: In accordance with municipal, provincial and federal regulations.

Handling procedures and equipment: Protect against physical damage.
Avoid breathing dust.
Wash thoroughly after handling.
Keep out of reach of children.
Avoid contact with skin, eyes and clothing.
Launder contaminated clothing prior to reuse.

Storage requirements: Keep containers closed when not in use.
Store away from strong acids or oxidizers.
Store in a cool, dry and well ventilated area.

Section 8 : CONTROL MEASURES

Precautionary Measures

Gloves / Type:



Neoprene or rubber gloves.

Respiratory / Type:



If exposure limit is exceeded, wear a NIOSH approved respirator.

Eye / Type:



Safety glasses with side-shields.

Footwear / Type: Safety shoes per local regulations.

Clothing / Type: As required to prevent skin contact.

Other / Type: Eye wash facility should be in close proximity.
Emergency shower should be in close proximity.

Ventilation requirements: Local exhaust at points of emission.



Material Safety Data Sheet

NFPA	HMIS	PPE	Symbol(s)						
	<table><tr><td>Health Hazard</td><td>1</td></tr><tr><td>Fire Hazard</td><td>1</td></tr><tr><td>Reactivity</td><td>0</td></tr></table>	Health Hazard	1	Fire Hazard	1	Reactivity	0		
Health Hazard	1								
Fire Hazard	1								
Reactivity	0								

Preparation Date 3-Dec-2009

Revision Date 9-November-2011

Revision Number 1

1. PRODUCT AND COMPANY IDENTIFICATION

Product Description: 3000®
MSDS #: 0070 325G
Recommended Use For industrial use only
Manufacturer
Bestolife Corporation
2777 Stemmons Freeway, Suite 1800
Dallas, Texas 75207
USA
Internet: www.bestolife.com

Telephone Number
(214) 631-6070

Emergency Telephone Number CHEMTREC: 800-424-9300 or 703-527-3887 (Transportation Emergencies; 24-hours/day)

2. HAZARDS IDENTIFICATION

Emergency Overview

Appearance Black	May cause skin irritation Physical State Solid.	Odor Petroleum odor.
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Potential Health Effects

Principle Routes of Exposure

The two major means of exposure are skin absorption and ingestion.

Acute Effects

Eyes

Contact with eyes may cause irritation.

Skin

Skin contact may cause irritation.

Inhalation

Not an expected route of entry.

Ingestion

This product may be absorbed by the digestive system. Ingestion can result in both acute and chronic overexposure.

Chronic Effects

Prolonged and repeated contact with the product may cause a defatting of the skin, dermatitis, folliculitis and/or oil acne.

See Section 11 for additional Toxicological information.

Aggravated Medical Conditions

Preexisting eye or skin disorders may be aggravated by prolonged contact with this product.

Potential Environmental Effects

No information available.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No	Weight %
-----------	--------	----------

Lubricating greases	74869-21-9	30-60
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Other Non-Hazardous Ingredients

Contains: <3% DMSO-extractable components

4. FIRST AID MEASURES

Eye Contact	Flush with copious amounts of water. Get immediate medical attention.
Skin Contact	Wash thoroughly with soap and water. If irritation occurs, get medical attention.
Inhalation	Remove from exposure. Get medical attention if experiencing cough, irritation or difficult breathing.
Ingestion	Get immediate medical attention. DO NOT INDUCE VOMITING! Possible aspiration hazard.
Notes to Physician	The hydrocarbons contained in this product may be mild irritants of the eyes and mucous membranes. Prolonged or repeated skin contact, especially with poor personal hygiene, may cause skin disorders. For combustion product effects see Hazardous Combustion Products in Section 5. Fire-Fighting Measures.
Protection of First-aiders	Avoid contact with skin, eyes and clothing. Use personal protective equipment.

5. FIRE-FIGHTING MEASURES

Flammable Properties	No information available
Suitable Extinguishing Media	Dry chemical, water fog, foam, or carbon dioxide may be suitable for extinguishing fires involving this product.
Unsuitable extinguishing media.	Observe caution when using water or foam as frothing may occur.
Explosion Limits	
Hazardous Combustion Products	Combustion products are highly dependent on the combustion conditions. CO, CO ₂ , CaO, oxygenates, and unidentified organic compounds may be formed during combustion, High temperatures may produce vapor and/or dust, Combustion products may cause effects of overexposure as noted in Section 2. Hazards Identification, They may also cause headache; dizziness; coma; convulsion; weakness; drowsiness; tachypnea; nausea; paresthesias; dyspnea; asphyxiation; mild to severe eye, skin or respiratory tract irritation; cough; pneumoconiosis; and/or lung damage, Other unidentified health effects may occur.
Impact Sensitivity	Not applicable.
Sensitivity to static discharge	Not applicable.
Specific Hazards Arising from the Chemical	Product fume and/or vapor may be irritating or toxic if inhaled.
Protective Equipment and Precautions for Firefighters	Use full-body protection and full-face, self-contained breathing apparatus operated in a positive-pressure mode. Use water spray (fog) to cool containers and disperse vapors.
NFPA	Health 1 Flammability 1 Instability 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions	Avoid contact with the skin and the eyes.
Environmental Precautions	Keep petroleum products out of streams and waterways. Assure conformity with applicable government regulations.
Methods for cleaning up	Clean area with an appropriate cleanser.
Other Information	Not applicable

7. HANDLING AND STORAGE

Handling	Avoid skin contact and use personal protection when handling product, waste product, or contaminated equipment. Wash with soap and water after use. Prolonged and repeated contact can cause defatting action of the skin and may cause disorders such as dermatitis, folliculitis, and oil acne. Work clothes and equipment should remain in designated areas. Before reuse, launder contaminated clothing separate from personal clothing. This product is intended for industrial use only. Isolate from children and their environment. This product may separate. Stir well before use. The flash point of this product depends on the degree of separation.
Storage	Store in a cool, dry area where accidental contact with acids is not possible. Keep storage containers closed when not in use. Do not store or handle near high temperature or open flame.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

NIOSH IDLH: Not applicable.

Engineering Measures	No special ventilation requirements under conditions of normal use (air concentrations below PEL/TLV levels).
Personal Protective Equipment	
Eye/Face Protection	Vented goggles or safety glasses with side shields should be worn when using this product.
Skin Protection	Clothing appropriate for an industrial environment should be worn. Oil-resistant gloves should be worn when handling this product.
Respiratory Protection	No respiratory equipment is required for normal use.
General Hygiene Considerations	When using, do not eat, drink or smoke. Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Black	Odor	Petroleum odor
Odor Threshold	No information available	Physical State	Solid
pH	No information available	Flash Point	196 °C / 385 °F
Flash Point Method	ASTM D 92, C.O.C.	Autoignition Temperature	No information available
Boiling Point/Range	288 °C / 550 °F	Melting Point	No information available
Dropping Point	260 °C / 500 °F	Flammability Limits in Air	No information available
Vapour Density	>1	Vapour Pressure	No information available
Specific Gravity	1.3	Solubility	Negligible
Partition Coefficient (n-octanol/water)	809.1	Viscosity	No information available
Evaporation Rate	No information available	Freezing Point	No information available

10. STABILITY AND REACTIVITY

Chemical Stability	Not Applicable.
Conditions to Avoid	Not applicable.
Incompatible Products	Strong oxidizers or acids.
Hazardous Decomposition Products	Under normal temperatures this product will not decompose.
Possibility of Hazardous Reactions	Not applicable

11. TOXICOLOGICAL INFORMATION

Acute Toxicity

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Lubricating greases	2280 mg/kg (Rat)		

Irritation	Product may cause irritation to the eyes and/or skin. Ingestion of the product may cause gastrointestinal irritation and upset.
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Chronic Toxicity Carcinogenicity

Passes IP 346 Method<3% DMSO-extractable components

12. ECOLOGICAL INFORMATION

Ecotoxicity

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Lubricating greases		LC50> 2000 mg/L Salmo gairdneri 96 h		

13. DISPOSAL CONSIDERATIONS

Waste disposal methods

Discard in accordance with local, state, and federal regulations. Empty containers are exempt from RCRA Subtitle C if they contain no more than 2.5 cm of their original contents in the bottom of the container or less than 3% of the original net weight (less than 0.3% by weight for containers over 110 gallons), or if the residue is analyzed and demonstrated to be nonhazardous.

Contaminated Packaging

"Empty" containers retain residue and can be dangerous. DO NOT PRESSURIZE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS OR OTHER SOURCES OF IGNITION; THEY MAY EXPLODE AND CAUSE INJURY AND/OR DEATH. "Empty" containers should be completely drained and properly sealed. Recycle or discard plastic liner, pail or drum in accordance with local, state, and federal regulations. "Empty" drums may be sent to a drum reconditioner.

14. TRANSPORT INFORMATION

DOT
TDG
IATA
IMDG/IMO

Not Regulated
Not Regulated
Not Regulated
Not Regulated

15. REGULATORY INFORMATION

International Inventories

Component	TSCA	DSL	NDSL	EINECS/EL INCS	ENCS	CHINA	KECL	PICCS	AICS
Lubricating greases				278-011-7		X		X	

U.S. Federal Regulations

SARA 313

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372.

SARA 311/312 Hazardous Categorization

Chronic Health Hazard	Yes
Acute Health Hazard	Yes
Fire Hazard	No
Sudden Release of Pressure Hazard	No
Reactive Hazard	No

CERCLA

U.S. State Regulations

California Proposition 65

This product does not contain any Proposition 65 chemicals.

State Right-to-Know

Other International Regulations

Mexico - Grade

No information available

Canada

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS Hazard Class

Non-controlled

16. OTHER INFORMATION

Preparation Date 3-Dec-2009
Revision Date 9-November-2011
Revision Number 1

Revision Summary

Update of WHMIS classification; Update in Section 9. Physical and Chemical Properties

Disclaimer

The information provided on this MSDS is correct to the best of our knowledge, information and belief at the date of its publication. The information is designed only as a guide for safe handling, use, processing, storage, transportation, disposal and release and WE MAKE NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, CONCERNING THE ACCURACY OR COMPLETENESS OF THE INFORMATION HEREIN. Accordingly, we will not be responsible for damages resulting from use or reliance upon information contained herein regardless of whether it is claimed that the information is inaccurate, incomplete, or otherwise misleading. The information relates only to the specific material designated and may not be valid for such material used in combination with any other material or in any process, unless specified in the text.

End of MSDS



Material Safety Data Sheet

Chevron Delo® 400

MSDS: 6711 Revision #: 2 Revision Date: 11/08/00

[Click here to search the product data sheet database](#)

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

CHEVRON DELO 400

PRODUCT NUMBER(S): CPS235101 CPS235109 CPS235117 CPS235118
CPS235119 CPS235120 CPS235200 CPS235246

SYNONYM: CHEVRON DELO 400 ESI Multigrade SAE 15W-40
CHEVRON DELO 400 Multigrade SAE 15W-40
CHEVRON DELO 400 SAE 10W
CHEVRON DELO 400 SAE 10W-30
CHEVRON DELO 400 SAE 20
CHEVRON DELO 400 SAE 30
CHEVRON DELO 400 SAE 40
CHEVRON DELO 400 SAE 50

COMPANY IDENTIFICATION

Chevron Products Company
Lubricants and Specialty Products
6001 Bollinger Canyon Rd., T3325/B10
San Ramon, CA 94583
www.chevron-lubricants.com

EMERGENCY TELEPHONE NUMBERS

HEALTH (24 hr): (800)231-0623 or
(510)231-0623 (International)
TRANSPORTATION (24 hr): CHEMTREC
(800)424-9300 or (703)527-3887
Emergency Information Centers
are located in U.S.A.
Int'l collect calls accepted

PRODUCT INFORMATION: MSDS Request: (800)414-6737 email: lubemsds@chevron.com
Environmental, Safety, & Health Info: (925) 842-5535
Product Information: (800) 582-3835

2. COMPOSITION/INFORMATION ON INGREDIENTS

100.0 % CHEVRON DELO 400

CONTAINING

COMPONENTS	AMOUNT	LIMIT/QTY	AGENCY/TYPE
LUBRICATING BASE OIL			
SEVERELY REFINED PETROLEUM DISTILLATE	> 75.00%	5 mg/m3 (mist)	ACGIH TWA
		10 mg/m3 (mist)	ACGIH STEL
		5 mg/m3 (mist)	OSHA PEL

The BASE OIL may be a mixture of any of the following: CAS 64741884, CAS 64741895, CAS 64741964, CAS 64741975, CAS 64742014, CAS 64742525, CAS 64742536, CAS 64742547, CAS 64742627, CAS 64742650, or CAS 72623837.

ADDITIVES INCLUDING THE FOLLOWING

< 25.00%

ZINC ALKYL DITHIOPHOSPHATE

Chemical Name: PHOSPHORODITHIOIC ACID,O,O-DI-C1-14-ALKYL ESTERS, ZINC SALT
CAS68649423 < 1.60% NONE NA

COMPOSITION COMMENT:

All the components of this material are on the Toxic Substances Control Act Chemical Substances Inventory.

This product fits the ACGIH definition for mineral oil mist. The ACGIH TLV is 5 mg/m³, the OSHA PEL is 5 mg/m³.

3. HAZARDS IDENTIFICATION

IMMEDIATE HEALTH EFFECTS

EYE:

Not expected to cause prolonged or significant eye irritation.

SKIN:

Contact with the skin is not expected to cause prolonged or significant irritation. Not expected to be harmful to internal organs if absorbed through the skin.

INGESTION:

Not expected to be harmful if swallowed.

INHALATION:

Contains a petroleum-based mineral oil. May cause respiratory irritation or other pulmonary effects following prolonged or repeated inhalation of oil mist at airborne levels above the recommended mineral oil mist exposure limit.

4. FIRST AID MEASURES

EYE:

No specific first aid measures are required because this material is not expected to cause eye irritation. As a precaution remove contact lenses, if worn, and flush eyes with water.

SKIN:

No specific first aid measures are required because this material is not expected to be harmful if it contacts the skin. As a precaution, remove clothing and shoes if contaminated. Wash skin with soap and water. Wash or clean contaminated clothing and shoes before reuse.

INGESTION:

No specific first aid measures are required because this material is not expected to be harmful if swallowed. Do not induce vomiting. As a precaution, give the person a glass of water or milk to drink and get medical advice. Never give anything by mouth to an unconscious person.

INHALATION:

If exposed to excessive levels of material in the air, move the exposed person to fresh air. Get medical attention if coughing or respiratory

discomfort occurs.

5. FIRE FIGHTING MEASURES

FIRE CLASSIFICATION:

Classification (29 CFR 1910.1200): Not classified by OSHA as flammable or combustible.

FLAMMABLE PROPERTIES:

FLASH POINT: (COC) 392F (200C) min.

AUTOIGNITION: NDA

FLAMMABILITY LIMITS (% by volume in air): Lower: NA Upper: NA

EXTINGUISHING MEDIA:

CO2, Dry Chemical, Foam, Water Fog

NFPA RATINGS: Health 1; Flammability 1; Reactivity 0.

FIRE FIGHTING INSTRUCTIONS:

This material will burn although it is not easily ignited. For fires involving this material, do not enter any enclosed or confined fire space without proper protective equipment, including self-contained breathing apparatus.

COMBUSTION PRODUCTS:

Normal combustion forms carbon dioxide and water vapor and may produce oxides of sulfur, nitrogen, phosphorus, and boron. Incomplete combustion can produce carbon monoxide.

6. ACCIDENTAL RELEASE MEASURES

CHEMTREC EMERGENCY NUMBER (24 hr): (800)424-9300 or (703)527-3887

International Collect Calls Accepted

ACCIDENTAL RELEASE MEASURES:

Stop the source of the leak or release. Clean up releases as soon as possible. Contain liquid to prevent further contamination of soil, surface water or groundwater. Clean up small spills using appropriate techniques such as sorbent materials or pumping. Where feasible and appropriate, remove contaminated soil. Follow prescribed procedures for reporting and responding to larger releases.

7. HANDLING AND STORAGE

Container is not designed to contain pressure. Do not use pressure to empty container or it may rupture with explosive force. Empty containers retain product residue (solid, liquid, and/or vapor) and can be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, static electricity, or other sources of ignition. They may explode and cause injury or death. Empty containers should be completely drained, properly closed, and promptly returned to a drum reconditioner, or properly disposed of. Avoid contaminating soil or releasing this material into sewage and drainage systems and bodies of water.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

GENERAL CONSIDERATIONS:

Consider the potential hazards of this material (see Section 3), applicable exposure limits, job activities, and other substances in the work place when designing engineering controls and selecting personal protective equipment. If engineering controls or work practices are not adequate to prevent exposure to harmful levels of this material, the personal protective equipment listed below is recommended. The user should read and understand all instructions and limitations supplied with the equipment since protection is usually provided for a limited time or under certain circumstances.

ENGINEERING CONTROLS

Use in a well-ventilated area. If user operations generate an oil mist, use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below the recommended mineral oil mist exposure limits.

PERSONAL PROTECTIVE EQUIPMENT

EYE/FACE PROTECTION:

No special eye protection is normally required. Where splashing is possible, wear safety glasses with side shields as a good safety practice.

SKIN PROTECTION:

No special protective clothing is normally required. Where splashing is possible, select protective clothing depending on operations conducted, physical requirements and other substances. Suggested materials for protective gloves include: <Viton> <Nitrile> <Silver Shield> <4H>

RESPIRATORY PROTECTION:

No respiratory protection is normally required. If user operations generate an oil mist, determine if airborne concentrations are below the recommended mineral oil mist exposure limits. If not wear a NIOSH approved respirator that provides adequate protection from measured concentrations of this material. Use the following elements for air-purifying respirators: particulate.

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL DESCRIPTION:

Dark brown liquid.

pH: NA

VAPOR PRESSURE: <0.01 mm Hg at 100F

VAPOR DENSITY

(AIR=1): Heavier than air.

BOILING POINT: >600F (>315C)

FREEZING POINT: NA

MELTING POINT: NA

SOLUBILITY: Soluble in hydrocarbon solvents; insoluble in water.

SPECIFIC GRAVITY: 0.87 - 0.89 @ 15.6/15.6C

VOLATILE ORGANIC

COMPOUNDS (VOC): 1.1 wt.%, 9.256 g/l

VISCOSITY: 5.9 - 18.6 cSt @ 100C (min.)

10. STABILITY AND REACTIVITY

HAZARDOUS DECOMPOSITION PRODUCTS:

H₂S may be released at high temperatures.

CHEMICAL STABILITY:

Stable.

CONDITIONS TO AVOID:

No data available.

INCOMPATIBILITY WITH OTHER MATERIALS:

May react with strong oxidizing agents, such as chlorates, nitrates, peroxides, etc.

HAZARDOUS POLYMERIZATION:

Polymerization will not occur.

11. TOXICOLOGICAL INFORMATION

EYE EFFECTS:

The eye irritation hazard is based on data for a similar material.

SKIN EFFECTS:

The skin irritation hazard is based on data for a similar material.

ACUTE ORAL EFFECTS:

The acute oral toxicity is based on data for a similar material.

ACUTE INHALATION EFFECTS:

The acute respiratory toxicity is based on data for a similar material.

ADDITIONAL TOXICOLOGY INFORMATION:

This product contains petroleum base oils which may be refined by various processes including severe solvent extraction, severe hydrocracking, or severe hydrotreating. None of the oils requires a cancer warning under the OSHA Hazard Communication Standard (29 CFR 1910.1200). These oils have not been listed in the National Toxicology Program (NTP) Annual Report nor have they been classified by the International Agency for Research on Cancer (IARC) as; carcinogenic to humans (Group 1), probably carcinogenic to humans (Group 2A), or possibly carcinogenic to humans (Group 2B).

This product contains zinc alkyl dithiophosphates (ZDDPs). Several ZDDPs have been reported to have weak mutagenic activity in cultured mammalian cells but only at concentrations that were toxic to the test cells. We do not believe that there is any mutagenic risk to workers exposed to ZDDPs.

During use in engines, contamination of oil with low levels of cancer-causing combustion products occurs. Used motor oils have been shown to cause skin cancer in mice following repeated application and continuous exposure. Brief or intermittent skin contact with used motor oil is not expected to have serious effects in humans if the oil is thoroughly removed by washing with soap and water. See Chevron Material Safety Data Sheet No. 1793 for additional information on used motor oil.

12. ECOLOGICAL INFORMATION

ECOTOXICITY:

The toxicity of this material to aquatic organisms has not been evaluated. Consequently, this material should be kept out of sewage and drainage systems and all bodies of water.

ENVIRONMENTAL FATE:

This material is not expected to be readily biodegradable.

13. DISPOSAL CONSIDERATIONS

Oil collection services and collection centers are available for used motor oil recycling or disposal. Some service stations, automotive service centers, and retailers provide motor oil collection facilities.

Place contaminated materials in containers and dispose of in a manner consistent with applicable regulations. Contact your sales representative or local environmental or health authorities for approved disposal or recycling methods.

14. TRANSPORT INFORMATION

The description shown may not apply to all shipping situations. Consult 49CFR, or appropriate Dangerous Goods Regulations, for additional description requirements (e.g., technical name) and mode-specific or quantity-specific shipping requirements.

DOT SHIPPING NAME: NONE

DOT HAZARD CLASS: NONE

DOT IDENTIFICATION NUMBER: NONE

DOT PACKING GROUP: N/A

ADDITIONAL INFO: Petroleum Lubricating Oil - Not Hazardous by U.S. DOT.
ADR/RID Hazard class - Not applicable.

15. REGULATORY INFORMATION

SARA 311 CATEGORIES:	1. Immediate (Acute) Health Effects:	NO
	2. Delayed (Chronic) Health Effects:	NO
	3. Fire Hazard:	NO
	4. Sudden Release of Pressure Hazard:	NO
	5. Reactivity Hazard:	NO

REGULATORY LISTS SEARCHED:

01=SARA 313	11=NJ RTK	22=TSCA Sect 5(a)(2)
02=MASS RTK	12=CERCLA 302.4	23=TSCA Sect 6
03=NTP Carcinogen	13=MN RTK	24=TSCA Sect 12(b)
04=CA Prop 65-Carcin	14=ACGIH TWA	25=TSCA Sect 8(a)
05=CA Prop 65-Repro Tox	15=ACGIH STEL	26=TSCA Sect 8(d)
06=IARC Group 1	16=ACGIH Calc TLV	27=TSCA Sect 4(a)
07=IARC Group 2A	17=OSHA PEL	28=Canadian WHMIS
08=IARC Group 2B	18=DOT Marine Pollutant	29=OSHA CEILING
09=SARA 302/304	19=Chevron TWA	30=Chevron STEL
10=PA RTK	20=EPA Carcinogen	

The following components of this material are found on the regulatory lists indicated.

PHOSPHORODITHIOIC ACID, O,O-DI-C1-14-ALKYL ESTERS, ZINC SALTS

is found on lists: 01, 11,

SEVERELY REFINED PETROLEUM DISTILLATE

is found on lists: 14, 15, 17,

NEW JERSEY RTK CLASSIFICATION:

Under the New Jersey Right-to-Know Act L. 1983 Chapter 315 N.J.S.A. 34:5A-1 et. seq., the product is to be identified as follows:

PETROLEUM OIL

WHMIS CLASSIFICATION:

This product is not considered a controlled product according to the criteria of the Canadian Controlled Products Regulations.

16. OTHER INFORMATION

NFPA RATINGS: Health 1; Flammability 1; Reactivity 0;
HMIS RATINGS: Health 1; Flammability 1; Reactivity 0;
(0-Least, 1-Slight, 2-Moderate, 3-High, 4-Extreme, PPE:- Personal Protection Equipment Index recommendation, *- Chronic Effect Indicator). These values are obtained using the guidelines or published evaluations prepared by the National Fire Protection Association (NFPA) or the National Paint and Coating Association (for HMIS ratings).

REVISION STATEMENT:

this revision updates Section 4 (First Aid Measures), Section 9 (Physical and Chemical Properties), and Section 15 (Regulatory Information).

ABBREVIATIONS THAT MAY HAVE BEEN USED IN THIS DOCUMENT:

TLV - Threshold Limit Value	TWA - Time Weighted Average
STEL - Short-term Exposure Limit	TPQ - Threshold Planning Quantity
RQ - Reportable Quantity	PEL - Permissible Exposure Limit
C - Ceiling Limit	CAS - Chemical Abstract Service Number
A1-5 - Appendix A Categories	() - Change Has Been Proposed
NDA - No Data Available	NA - Not Applicable

Prepared according to the OSHA Hazard Communication Standard (29 CFR 1910.1200) and the ANSI MSDS Standard (Z400.1) by the Toxicology and Health Risk Assessment Unit, CRTC, P.O. Box 1627, Richmond, CA 94804

The above information is based on the data of which we are aware and is believed to be correct as of the date hereof. Since this information may be applied under conditions beyond our control and with which we may be unfamiliar and since data made available subsequent to the date hereof may suggest modification of the information, we do not assume any responsibility for the results of its use. This information is furnished upon condition that the person receiving it shall make his own determination of the suitability of the material for his particular purpose.

THIS IS THE LAST PAGE OF THIS MSDS



Material Safety Data Sheet

Chevron Hydraulic Oil AW ISO 22, 32, 46, 68

MSDS: 7457 Revision #: 3 Revision Date: 11/11/00

Click here to search the product data sheet database

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

CHEVRON Hydraulic Oil AW

PRODUCT NUMBER(S): CPS255673 CPS255674 CPS255675 CPS255676

SYNONYM: CHEVRON Hydraulic Oil AW ISO 22

CHEVRON Hydraulic Oil AW ISO 32

CHEVRON Hydraulic Oil AW ISO 46

CHEVRON Hydraulic Oil AW ISO 68

COMPANY IDENTIFICATION EMERGENCY TELEPHONE NUMBERS

Chevron Products Company HEALTH (24 hr): (800)231-0623 or

Lubricants and Specialty Products (510)231-0623 (International)

6001 Bollinger Canyon Rd., T3325/B10 TRANSPORTATION (24 hr): CHEMTREC

San Ramon, CA 94583 (800)424-9300 or (703)527-3887

www.chevron-lubricants.com Emergency Information Centers

are located in U.S.A.

Int'l collect calls accepted

PRODUCT INFORMATION: MSDS Request:(800)414-6737 email:lubemsds@chevron.com

Environmental, Safety, & Health Info: (925) 842-5535

Product Information: (800) 582-3835

2. COMPOSITION/INFORMATION ON INGREDIENTS

100.0 % CHEVRON Hydraulic Oil AW

CONTAINING

COMPONENTS AMOUNT LIMIT/QTY AGENCY/TYPE

✓ LUBRICATING BASE OIL

SEVERELY REFINED PETROLEUM DISTILLATE

> 98.00% 5 mg/m³ (mist) ACGIH TWA

10 mg/m³ (mist) ACGIH STEL

5 mg/m³ (mist) OSHA PEL

The BASE OIL may be a mixture of any of the following: CAS 64741884, CAS 64741895, CAS 64741964, CAS 64741975, CAS 64742014, CAS 64742525, CAS 64742536, CAS 64742547, CAS 64742627, CAS 64742650, or CAS 72623837.

ADDITIVES INCLUDING THE FOLLOWING

< 2.00%

ZINC ALKYL DITHIOPHOSPHATE

Chemical Name: PHOSPHORODITHIOIC ACID,O,O-DI-C1-14-ALKYL ESTERS, ZINC SALT
CAS68649423 < 1.00% NONE NA

COMPOSITION COMMENT:

All the components of this material are on the Toxic Substances Control Act Chemical Substances Inventory.

✓ This product fits the ACGIH definition for mineral oil mist. The ACGIH TLV is 5 mg/m³, the OSHA PEL is 5 mg/m³.

3. HAZARDS IDENTIFICATION

IMMEDIATE HEALTH EFFECTS

EYE:

Not expected to cause prolonged or significant eye irritation.

SKIN:

Contact with the skin is not expected to cause prolonged or significant irritation. Not expected to be harmful to internal organs if absorbed through the skin. High-Pressure Equipment Information: Accidental high-velocity injection under the skin of materials of this type may result in serious injury. Seek medical attention at once should an accident like this occur. The initial wound at the injection site may not appear to be serious at first; but, if left untreated, could result in

✓ disfigurement or amputation of the affected part.

INGESTION:

Not expected to be harmful if swallowed.

INHALATION:

Contains a petroleum-based mineral oil. May cause respiratory irritation or other pulmonary effects following prolonged or repeated inhalation of oil mist at airborne levels above the recommended mineral oil mist exposure limit.

4. FIRST AID MEASURES

EYE:

No specific first aid measures are required because this material is not expected to cause eye irritation. As a precaution remove contact lenses, if worn, and flush eyes with water.

SKIN:

No specific first aid measures are required because this material is not expected to be harmful if it contacts the skin. As a precaution, remove clothing and shoes if contaminated. Wash skin with soap and water. Wash or clean contaminated clothing and shoes before reuse.

INGESTION:

No specific first aid measures are required because this material is not expected to be harmful if swallowed. Do not induce vomiting. As a precaution, give the person a glass of water or milk to drink and get medical advice. Never give anything by mouth to an unconscious person.

INHALATION:

If exposed to excessive levels of material in the air, move the exposed person to fresh air. Get medical attention if coughing or respiratory discomfort occurs.

NOTE TO PHYSICIANS:

In an accident involving high-pressure equipment, this product may be injected under the skin. Such an accident may result in a small, sometimes bloodless, puncture wound. However, because of its driving force, material injected into a fingertip can be deposited into the palm of the hand. Within 24 hours, there is usually a great deal of swelling, discoloration, and intense throbbing pain. Immediate treatment at a surgical emergency center is recommended.

5. FIRE FIGHTING MEASURES

SPECIAL NOTES: Leaks/ruptures in high pressure systems using materials of this type can create a fire hazard when in the vicinity of ignition sources (eg. open flame, pilot lights, sparks, or electric arcs).

FIRE CLASSIFICATION:

Classification (29 CFR 1910.1200): Not classified by OSHA as flammable or combustible.

FLAMMABLE PROPERTIES:

FLASH POINT: (COC) 302F (150C) Min.

AUTOIGNITION: NDA

FLAMMABILITY LIMITS (% by volume in air): Lower: NA Upper: NA

EXTINGUISHING MEDIA:

CO2, Dry Chemical, Foam, Water Fog

NFPA RATINGS: Health 0; Flammability 1; Reactivity 0.

FIRE FIGHTING INSTRUCTIONS:

This material will burn although it is not easily ignited. For fires involving this material, do not enter any enclosed or confined fire space without proper protective equipment, including self-contained breathing apparatus.

COMBUSTION PRODUCTS:

Normal combustion forms carbon dioxide and water vapor; incomplete combustion can produce carbon monoxide.

6. ACCIDENTAL RELEASE MEASURES

CHEMTREC EMERGENCY NUMBER (24 hr): (800)424-9300 or (703)527-3887

International Collect Calls Accepted

ACCIDENTAL RELEASE MEASURES:

Stop the source of the leak or release. Clean up releases as soon as possible, observing precautions in Exposure Controls/Personal Protection. Contain liquid to prevent further contamination of soil, surface water or groundwater. Clean up small spills using appropriate techniques such as sorbent materials or pumping. Where feasible and appropriate, remove contaminated soil. Follow prescribed procedures for reporting and responding to larger releases.

7. HANDLING AND STORAGE

DO NOT USE IN HIGH PRESSURE SYSTEMS in the vicinity of flames, sparks and hot surfaces. Use only in well ventilated areas. Keep container closed.

Container is not designed to contain pressure. Do not use pressure to empty container or it may rupture with explosive force. Empty containers retain product residue (solid, liquid, and/or vapor) and can be dangerous.

Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, static electricity, or other sources of ignition. They may explode and cause injury or death. Empty containers

should be completely drained, properly closed, and promptly returned to a drum reconditioner, or properly disposed of. Avoid contaminating soil or releasing this material into sewage and drainage systems and bodies of water.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

GENERAL CONSIDERATIONS:

Consider the potential hazards of this material (see Section 3), applicable exposure limits, job activities, and other substances in the work place when designing engineering controls and selecting personal protective equipment. If engineering controls or work practices are not adequate to prevent exposure to harmful levels of this material, the personal protective equipment listed below is recommended. The user should read and understand all instructions and limitations supplied with the equipment since protection is usually provided for a limited time or under certain circumstances.

ENGINEERING CONTROLS

Use in a well-ventilated area. If user operations generate an oil mist, use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below the recommended mineral oil mist exposure limits.

PERSONAL PROTECTIVE EQUIPMENT

EYE/FACE PROTECTION:

No special eye protection is normally required. Where splashing is possible, wear safety glasses with side shields as a good safety practice.

SKIN PROTECTION:

No special protective clothing is normally required. Where splashing is possible, select protective clothing depending on operations conducted, physical requirements and other substances. Suggested materials for protective gloves include: <Nitrile> <Silver Shield> <Viton>

RESPIRATORY PROTECTION:

No respiratory protection is normally required. If user operations generate an oil mist, determine if airborne concentrations are below the recommended mineral oil mist exposure limits. If not wear a NIOSH approved respirator that provides adequate protection from measured concentrations of this material. Use the following elements for air-purifying respirators: particulate.

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL DESCRIPTION:

Pale yellow liquid.

pH: NA

VAPOR PRESSURE: <0.01 mm Hg at 100F

VAPOR DENSITY

(AIR=1): Heavier than air.

BOILING POINT: >600F (>315C)

FREEZING POINT: NA

MELTING POINT: NA

SOLUBILITY: Soluble in hydrocarbon solvents; insoluble in water.

SPECIFIC GRAVITY: 0.86 - 0.88 @ 15.6/15.6C

VOLATILE ORGANIC

COMPOUNDS (VOC): <2.2 (wt.%); 19 g/l (estimated)

VISCOSITY: 22 - 61.2 cSt @ 40C (Min.)

POUR POINT: -27C (Max.)

10. STABILITY AND REACTIVITY

HAZARDOUS DECOMPOSITION PRODUCTS:

No data available.

CHEMICAL STABILITY:

Stable.

CONDITIONS TO AVOID:

No data available.

INCOMPATIBILITY WITH OTHER MATERIALS:

May react with strong oxidizing agents, such as chlorates, nitrates, peroxides, etc.

HAZARDOUS POLYMERIZATION:

Polymerization will not occur.

11. TOXICOLOGICAL INFORMATION

EYE EFFECTS:

The eye irritation hazard is based on data for a similar material.

SKIN EFFECTS:

The skin irritation hazard is based on data for a similar material.

ACUTE ORAL EFFECTS:

The acute oral toxicity is based on data for a similar material.

ACUTE INHALATION EFFECTS:

— The acute respiratory toxicity is based on data for a similar material.

ADDITIONAL TOXICOLOGY INFORMATION:

This product contains petroleum base oils which may be refined by various processes including severe solvent extraction, severe hydrocracking, or severe hydrotreating. None of the oils requires a cancer warning under the OSHA Hazard Communication Standard (29 CFR 1910.1200). These oils have not been listed in the National Toxicology Program (NTP) Annual Report nor have they been classified by the International Agency for Research on Cancer (IARC) as; carcinogenic to humans (Group 1), probably carcinogenic to humans (Group 2A), or possibly carcinogenic to humans (Group 2B).

This product contains zinc alkyl dithiophosphates (ZDDPs). Several ZDDPs have been reported to have weak mutagenic activity in cultured mammalian cells but only at concentrations that were toxic to the test cells. We do not believe that there is any mutagenic risk to workers exposed to ZDDPs.

12. ECOLOGICAL INFORMATION

ECOTOXICITY:

The 48-hour EC50 for daphnia (*Daphnia magna*) is > 1000 mg/l (WAF).

ENVIRONMENTAL FATE:

This material is not expected to be readily biodegradable.

13. DISPOSAL CONSIDERATIONS

Oil collection services are available for used oil recycling or disposal. Place contaminated materials in containers and dispose of in a manner consistent with applicable regulations. Contact your sales representative or local environmental or health authorities for approved disposal or recycling methods.

14. TRANSPORT INFORMATION

The description shown may not apply to all shipping situations. Consult 49CFR, or appropriate Dangerous Goods Regulations, for additional description requirements (e.g., technical name) and mode-specific or quantity-specific shipping requirements.

DOT SHIPPING NAME: NONE

DOT HAZARD CLASS: NONE

DOT IDENTIFICATION NUMBER: NONE

DOT PACKING GROUP: N/A

ADDITIONAL INFO: Petroleum Lubricating Oil - Not Hazardous by U.S. DOT.

ADR/RID Hazard class - Not applicable.

15. REGULATORY INFORMATION

SARA 311 CATEGORIES: 1. Immediate (Acute) Health Effects: NO

2. Delayed (Chronic) Health Effects: NO

3. Fire Hazard: NO

4. Sudden Release of Pressure Hazard: NO

5. Reactivity Hazard: NO

REGULATORY LISTS SEARCHED:

01=SARA 313 11=NJ RTK 22=TSCA Sect 5(a)(2)

02=MASS RTK 12=CERCLA 302.4 23=TSCA Sect 6

03=NTP Carcinogen 13=MN RTK 24=TSCA Sect 12(b)

04=CA Prop 65-Carcin 14=ACGIH TWA 25=TSCA Sect 8(a)

05=CA Prop 65-Repro Tox 15=ACGIH STEL 26=TSCA Sect 8(d)

06=IARC Group 1 16=ACGIH Calc TLV 27=TSCA Sect 4(a)

07=IARC Group 2A 17=OSHA PEL 28=Canadian WHMIS

08=IARC Group 2B 18=DOT Marine Pollutant 29=OSHA CEILING

09=SARA 302/304 19=Chevron TWA 30=Chevron STEL

10=PA RTK 20=EPA Carcinogen

The following components of this material are found on the regulatory lists indicated.

PHOSPHORODITHIOIC ACID,O,O-DI-C1-14-ALKYL ESTERS, ZINC SALTS

is found on lists: 01,11,

SEVERELY REFINED PETROLEUM DISTILLATE

is found on lists: 14,15,17,

NEW JERSEY RTK CLASSIFICATION:

Under the New Jersey Right-to-Know Act L. 1983 Chapter 315 N.J.S.A.

34:5A-1 et. seq., the product is to be identified as follows:

PETROLEUM OIL

WHMIS CLASSIFICATION:

This product is not considered a controlled product according to the criteria of the Canadian Controlled Products Regulations.

16. OTHER INFORMATION

NFPA RATINGS: Health 0; Flammability 1; Reactivity 0;
HMIS RATINGS: Health 1; Flammability 1; Reactivity 0;
(0-Least, 1-Slight, 2-Moderate, 3-High, 4-Extreme, PPE:- Personal
Protection Equipment Index recommendation, *- Chronic Effect
Indicator). These values are obtained using the guidelines or
published evaluations prepared by the National Fire Protection
Association (NFPA) or the National Paint and Coating Association
(for HMIS ratings).

REVISION STATEMENT:

This revision updates Section 4 (First Aid Measures), Section 9
(Physical and Chemical Properties), and Section 15 (Regulatory
Information).

ABBREVIATIONS THAT MAY HAVE BEEN USED IN THIS DOCUMENT:

TLV - Threshold Limit Value TWA - Time Weighted Average
STEL - Short-term Exposure Limit TPQ - Threshold Planning Quantity
RQ - Reportable Quantity PEL - Permissible Exposure Limit
C - Ceiling Limit CAS - Chemical Abstract Service Number
A1-5 - Appendix A Categories () - Change Has Been Proposed
NDA - No Data Available NA - Not Applicable

Prepared according to the OSHA Hazard Communication Standard
(29 CFR 1910.1200) and the ANSI MSDS Standard (Z400.1) by the Toxicology
and Health Risk Assessment Unit, CRTC, P.O. Box 1627, Richmond, CA 94804

The above information is based on the data of which we are aware and is
believed to be correct as of the date hereof. Since this information may
be applied under conditions beyond our control and with which we may be
unfamiliar and since data made available subsequent to the date hereof may
suggest modification of the information, we do not assume any responsibil-
ity for the results of its use. This information is furnished upon
condition that the person receiving it shall make his own determination
of the suitability of the material for his particular purpose.

THIS IS THE LAST PAGE OF THIS MSDS

MATERIAL SAFETY DATA SHEET (M.S.D.S)

Complies to OSHA Hazardous
Communications Standard,
29 CFR 1910.1200. Standard must be consulted for specific requirements

**TRADE NAME**

DIAMOND CORE BITS, DIAMOND BLADES, CUP GRINDERS,
DIAMOND SEGMENTS, DIAMOND WIRE and GRINDING DISCS

NOTE: Blank spaces are not permitted.
If any item is not applicable, the
space must be marked to
indicate that.

SECTION 1 - COMPANY INFORMATION

Manufacturers Name

Diamond Products, LLC

Manufacturers Address (Number, Street, City, State and Zip Code)

**333 Prospect Street
Elyria, OH 44035**

Emergency Telephone Number

(440) 323-4616

Telephone Number for Information

(440) 323-4616

Date Prepared

Revised 04/04/08

Signature of Preparer (Optional)

Distributed by:

STIHL Incorporated

536 Viking Drive

Virginia Beach, VA 23452

(757) 486-9160

SECTION 2 - HAZARDOUS INGREDIENTS/IDENTITY

Hazardous Components (Specify Chemical and Common Names)	OSHA PEL	ACGIH TLV	Percentage
Cobalt Metal, 744-48-4 Cobalt	.1 mg/m3	.02 mg/m3	1 to 100
Carbonyl Iron Metal, 7439-86-6 Iron	10 mg/m3	5 mg/m3	1 to 50
Copper Metal, 7440-50-8 Copper	1 mg/m3	1 mg/m3	1 to 60
Tungsten Carbide, 12070-12-4 Tungsten	NE-PNOR	5 mg/m3	1 to 50
Nickel Metal, 7440-02-0 Nickel	1 mg/m3	1.5 mg/m3	1 to 75
Titanium Metal	NE-PNOR	NE-PNOR	1 to 3
Tin Metal, 7440-31-50 Tin	2 mg/m3	2 mg/m3	1 to 20
Silver Metal, 7440-22-4 Silver	0.01 mg/m3	.01 mg/m3	1 to 15
Manganese Metal, 7439-96-5	C-5 mg/m3-C	0.2 mg/m3	.5 to 3
Chromium Carbide, 12012-35-0	1 mg/m3	0.5 mg/m3	.1 to 3
Carbon, 7782-40-3 Industrial Diamonds	N/A	N/A	3 to 18
As a nuisance particulate covered under "Particulates Not Otherwise Regulated" (PNOR) by OSHA or "Particulates Not Otherwise Classified" (PNOC) by ACGIH	15 mg/m3	10 mg/m3	

SECTION 3 - PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point	N/A	Specific Gravity (H2O = 1)	8.5 to 15.0
Vapor Pressure (mm Hg)	N/A	Melting Point	2719 degrees F.
Vapor Density (Air = 1)	N/A	Evaporation Rate (Butyl Acetate = 1)	N/A
Solubility in Water	None	Appearance and Odor	Metallic - silver-grey to black - Odorless

SECTION 4 - FIRE and EXPLOSION HAZARD DATA

DIAMOND CORE BITS, DIAMOND BLADES, CUP GRINDERS, DIAMOND SEGMENTS, DIAMOND WIRE and GRINDING DISCS present no fire or explosive hazards. There are no special fire fighting procedure needed and have no flash point or flammable limits.

SECTION 5 - REACTIVITY DATA

Stability: Stable	Conditions to Avoid: None	Incompatibility (Materials to Avoid): Strong oxidizers, Strong acids
Hazardous Decomposition By-Products: None	Hazardous Polymerization: Will Not Occur	Conditions to Avoid: None Known

SECTION 6 - ENVIRONMENTAL

Spill or Leak Procedures	N/A
Waste Disposal Methods	Disposal must comply with applicable federal, state and local disposal laws.

SECTION 7 - HEALTH HAZARD DATA

These products in their manufactured state do not present an inhalation or contact hazard. Operations such as grinding, cutting welding or brazing may release fumes and dust, which may present health hazards. Prolonged exposure to dust, fumes or mists containing cobalt and nickel may cause serious respiratory illness or skin reaction. The by-product of dry cutting or drilling (dust) any substance containing silica has been known to cause silicosis.

Proper protective equipment is recommended (See **SECTION 8**)

Effects of Over Exposure:

Acute - Dust or fumes may cause irritation to eyes, nose or throat. Over-exposure to dusts generated during use can cause coughing or wheezing and shortness of breath. Exposure to welding or brazing fumes may leave a metallic taste in the mouth. Inhalation of metal oxides produced in welding or brazing may produce flu-like symptoms commonly known as "metal fume fever".

Chronic - Repeated over-exposure to dusts and fumes generated during use can create the health hazards described below:

COBALT (metal as dust and fume)* - Lung inflammation and damage, and diffuse pulmonary fibrosis from inhalation. The National Toxicology Program (NTP) has identified Cobalt as a potential carcinogen.

COPPER (dust and fume, Cu)* - Inhalation may cause nose and throat irritation and prolonged contact dermatitis

CHROMIUM (metal)* - May enter and affect the body through inhalation, ingestion, or skin contact. The NTP (National Toxicology Program) and IARC (International Agency for Research on Cancer) report they possess sufficient evidence to establish a causal relationship for human cancer from chromium.

IRON (oxide as dust and fume)* - Inhalation of iron oxide fume or dust may result in a condition known as siderosis.

MANGANESE (compounds and fume as Mn)* - Inhalation may result in symptoms such as headache, restlessness, neurological dysfunction or muscular weakness.

NICKEL (metal and other compounds as Ni)* - Inhalation may result in inflammation of the respiratory tract and fever. The International Agency for Research on Cancer (IARC), and the National Toxicology Program (NTP) have identified Nickel as a potential carcinogen.

SILVER (metal dust and soluble compounds as Ag)* - May cause irritation to eyes, nasal, septum, throat and skin, and may cause intestinal disturbance.

TIN (metallic flake, powder)* - May cause eye, skin, and respiratory system irritation.

TUNGSTEN CARBIDE * - May contain trace amounts of Cobalt or Nickel. The International Agency for Research on Cancer (IARC), and the National Toxicology Program (NTP) have identified Tungsten Carbide as a potential carcinogen.

SILICA (airborne particles of respirable size, not a direct component of product) - During the use of this product the generation of silica, crystalline (airborne particles of respirable size) may be released from the material being cut. Silica, Crystalline (airborne particles of respirable size) are known to the State of California to cause cancer and/or birth defects or other reproductive harm.

* The information contained in this MSDS was obtained from various sources including OSHA, NIOSH and MSDS provided by material suppliers.

SECTION 8 - PERSONAL PROTECTION EQUIPMENT

RESPIRATORY PROTECTION

Use of an appropriate NIOSH-approved respirator for operators and bystanders is mandatory if airborne concentrations exceed the appropriate OSHA PEL and TLV levels and is always highly recommended. (See OSHA 29 CFR 1910.1000 - air contaminants; 1910.134 - respirators). Use of adequate ventilation and/or water spray mist to reduce generated dust concentration is recommended wherever possible (see OSHA 29 CFR 1910.94 - ventilation).

GENERAL PROTECTIVE REQUIREMENTS

Use of eye and face protection is mandatory when cutting (see OSHA 29 CFR 1910.133 - eye and face protection). The use of hearing protection is mandatory to control noise exposure (see OSHA 29 CFR 1910.95 - noise exposure). The use of skin protection and good hygiene practice is mandatory to control skin exposure (see OSHA 29 CFR 1910.138 - skin exposure). The use of all machine safety guards is mandatory (see OSHA 1910.211 -222 - safety guards).

NOTE: The statements contained herein are offered for informational purposes only and are based upon technical data that Diamond Products believes to be accurate. It is intended for use only by persons having the necessary technical skill and at their own discretion and risk. Since conditions and manner of use are outside our control, we make NO WARRANTY, EXPRESS or IMPLIED, of MERCHANTABILITY, FITNESS, or OTHERWISE.

M A T E R I A L S A F E T Y D A T A S H E E T

DIATHON PEARL WHITE, WHITE, & BRITE WHITE

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4/15/2005

PRODUCT NAME: DIATHON PEARL WHITE, WHITE, & BRITE WHITE
PRODUCT CODE: DI-PW-55, DI-W-55, DI-BW-55

~~~~ SECTION 1 ~~~~ MANUFACTURER IDENTIFICATION ~~~~

Manufacturer's Name : UNITED COATINGS MANUFACTURING CO  
Address : 19011 EAST CATALDO AVE.  
                      : SPOKANE VALLEY, WASHINGTON 99016-9423  
                      : INITIAL(FIRST CALL)CHEMTREC(800)424-9300  
INFORMATION PHONE : (509)926-7143  
TOLL FREE : BACKUP(800)541-4383  
DATE PRINTED : 4/15/2005  
DATE REVISED : April 2005

~~~~ SECTION 2 ~~~~ HAZARDOUS INGREDIENTS/SARA III INFORMATION ~~~~

| Reportable Components | CAS Number | MM HG @ Temp | Weight % |
|---|------------|--------------|----------|
| Acrylic polymer | MIXTURE | 17 68F/20C | 42 |
| Contains: Aqua Ammonia, CAS#1336-21-6, 0.2%Max,. OSHA PEL: 50ppm,
ACGIH TWA 25 ppm STEL 35ppm No other exposure limits have been established
~ | | | |
| Calcium carbonate | 1317-65-3 | N/A N/A | 29 |
| OSHA PEL-15MG/M3, Total Dust, 5MG/M3, Respirable Dust
ACGIH TLV-10 MG/M3, total dust containing no asbestos and <1% free Silica.
If silica levels above 1.0% are present, the TLV value is 0.1mg of
Respirable silica per cubic meter for both OSHA PEL and ACGIH TLV.
~ | | | |
| Aluminum trihydroxide | 21645-51-2 | N/A N/A | 11 |
| OSHA, PEL 15mg/m3 total dust, 5mg/m3 respirable dust.
ACGIH, TLV 10mg/m3 total dust
~ | | | |
| Water | 7732-18-5 | UNK UNK | 10 |
| No OEL's Established
~ | | | |
| Titanium dioxide | 13463-67-7 | N/A N/A | 3 |
| Contains: Titanium dioxide, CAS#13463-67-7,
ACGIH TLV TWA: 10mg/m3, total dust, OSHA PEL TWA: 15mg/m3, total dust.
Aluminum hydroxide, CAS#21645-51-2, no exposure limits established.
Amorphous silica, CAS# 112926-00-8, (7631-86-9) ACGIH TLV TWA: 10mg/m3,
OSHA PEL TWA: 10mg/m3
~ | | | |
| Aluminum trihydroxide | 21645-51-2 | N/A N/A | 1 |
| OSHA, PEL 15mg/m3 total dust, 5mg/m3 respirable dust.
ACGIH, TLV 10mg/m3 total dust
~ | | | |

* Indicates toxic chemical(s) subject to the reporting
requirements of section 313 of Title III and of 40 CFR 372.

DIATHON PEARL WHITE, WHITE, & BRITE WHITE

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Indicates carcinogenic chemical.

NOTE: If tinted may contain Carbon Black CAS#1333-86-4 AND/OR Crystalline Silica CAS#14808-60-7. If tinted DARK GRAY or BLACK consider these levels to be reportable.

This MSDS may be used for other colors and container sizes of this product.

~~~~ **SECTION 3** ~~~~ **HAZARDS IDENTIFICATION** ~~~~

**Potential Health Effects**

**Eyes:**

May cause slight/moderate irritation to the eye.

**Skin:**

Contact causes moderate skin irritation. Causes drying of the skin

**Ingestion:**

While this material has a low degree of toxicity, ingestion of large quantities may cause irritation of the digestive tract.

**Inhalation:**

May cause irritation to respiratory tract.

~~~~ **SECTION 4** ~~~~ **FIRST AID MEASURES** ~~~~

Eyes:

Immediately flush with copious amounts of water for at least 15 minutes. If redness, itching, or burning sensations persist consult a physician or ophthalmologist immediately.

Skin:

Wash with plenty of soap and water. Remove contaminated clothing and shoes, wash before reuse. Consult a physician immediately.

Ingestion:

Not considered a potential route of exposure. If swallowed, give 2 glasses of water to drink. Never give anything by mouth to an unconscious person. Consult a physician immediately.

Inhalation:

Remove from source of exposure and into fresh air. If symptoms persist consult a physician immediately. If not breathing, give artificial respiration and call emergency medical services immediately.

Note to Physician:

No specific antidote. Supportive care, treatment based on judgment of the physician in response to reactions of the patient.

~~~~ **SECTION 5** ~~~~ **FIRE FIGHTING MEASURES** ~~~~

**DIATHON PEARL WHITE, WHITE, & BRITE WHITE**

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**Flammable Properties**

**Flash Point:** N/A

**Lower Flammable Limits:** N/A

**Upper Flammable Limit:** N/A

**Auto Ignition Temperature:** N/A

**Extinguishing Media:**

Foam, CO2, dry chemical, water fog or spray, as appropriate for surrounding fire.

**Special Fire Fighting Procedures:**

Do not enter any enclosed or confined fire space without full protective equipment, including self-contained breathing apparatus (pressure-demand MSHA/NIOSH approved or equivalent) to protect against the hazardous effects of combustion products and oxygen deficiency.

**~~~~ SECTION 6 ~~~~ ACCIDENTAL RELEASE MEASURES ~~~~**

**Small Spill:**

Stop spill at source. Pick up with mop and shovel. Rinse well with water.

**Large Spill:**

Persons not wearing protective equipment should be excluded from area of spill until clean-up has been completed. Stop spill at source, dike area of spill to prevent spreading, pump liquid to salvage tank. Remaining liquid may be taken up with sand, clay, earth, or other inert absorbent material and shoveled into containers. Do not flush into sewers. Material should be placed in a container for recovery or transfer to a disposal facility.

**~~~~ SECTION 7 ~~~~ HANDLING AND STORAGE ~~~~**

**Handling & Storage:**

Keep from freezing. Keep container cool and dry. Use and store this product with adequate ventilation. Keep product containers tightly closed when not in use. Avoid subjecting this product to extreme temperature variations.

**Other Precautions:**

Containers, even those that have been emptied, will retain product residue & vapors. Always obey hazard warnings and handle empty containers as if they were full. Do not get in eyes, on skin or on clothing. Avoid prolonged or repeated breathing of vapor or spray mist. Use only in a well ventilated area. Keep out of the reach of children.

**~~~~ SECTION 8 ~~~~ EXPOSURE CONTROLS/PERSONAL PROTECTION ~~~~**

**DIATHON PEARL WHITE, WHITE, & BRITE WHITE**

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**Engineering Controls:**

In outside spray, mixing and rolling applications situate workers upwind of operation & provide airflow in a downwind direction so as to carry fumes and residual spray away from workers. Local exhaust ventilation recommended if generating vapor, dust or mist. Turn off heating and/or air conditioning equipment to prevent contaminating building. If exhaust ventilation is not adequate, use MSHA or NIOSH approved respirator. Refer to OSHA standard 29 CFR 1910.94 for guidelines.

**Respiratory Protection:**

Wear a NIOSH approved respirator appropriate for the vapor or mist concentration at the point of use. Appropriate respirators may be a full-face piece or a half mask air-purifying cartridge respirator equipped for organic vapors/mists, a self-contained breathing apparatus in the pressure demand mode, or a supplied-air respirator. Refer to OSHA standard 29 CFR 1910.134 for additional information.

**Skin Protection:**

Chemical resistant gloves determined to be impervious under the conditions of use.

**Eye Protection:**

Safety glasses with side shields

~~~~ SECTION 9 ~~~~ PHYSICAL AND CHEMICAL PROPERTIES ~~~~

Boiling Range: 212F/100C

Specific Gravity(H2O=1): 1.433

Vapor Density(Air=1): Lighter than air

Evaporation Rate(N-Butyl Acetate=1) : Slower than ether

Coating V.O.C.: 0.09 lb/gl Coating V.O.C.: 11 g/l

Material V.O.C.: 0.05 lb/gl Material V.O.C.: 6 g/l

Solubility in Water: Soluble

Appearance: Moderately viscous pigmented liquid, various colors.

Odor: AMMONIA ODOR pH: 8.0

~~~~ SECTION 10 ~~~~ STABILITY & REACTIVITY DATA ~~~~

**Stability:**

Stable

**Conditions To Avoid:**

Extremely hot or cold temperatures

**Incompatible Materials:**

Avoid contact with strong acids and strong oxidizing materials.

**Hazardous Decomposition Products**

Thermal decomposition may yield carbon monoxide and carbon dioxide. Unidentified organic compounds in fumes and smoke may be

M A T E R I A L   S A F E T Y   D A T A   S H E E T

DIATHON PEARL WHITE, WHITE, & BRITE WHITE

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formed during combustion.

**Hazardous Polymerization:**

Not expected to occur

~~~~ SECTION 11 ~~~~ TOXICOLOGICAL INFORMATION ~~~~

*Data is for individual components of preparation.

Materials having a known chronic/acute effects on eyes:

NO DATA

Materials having a known dermal toxicity.

Titanium Dioxide CAS#13463-67-7 Dermal LD50 (rabbit) >10g/kg

Materials having a known oral toxicity.

Aluminum Trihydrate CAS# 21645-51-2 LD50 Oral (rat): >5,000mg/kg

TITANIUM DIOXIDE CAS#13463-67-7 Oral LD50 (rat) >25 g/kg

Materials having a known Inhalation hazard:

TITANIUM DIOXIDE CAS#13463-67-7 LC50 (rat)>6.82 mg/l(4 hr)

Identified Carcinogens/Longterm Effects:

There are no reported health effects associated with repeated or prolonged exposure to pure calcium carbonate. Chronic exposure to limestone dust at concentrations exceeding occupational exposure limits may cause pneumoconiosis (lung disease). This product contains crystalline silica (quartz) as an impurity. Chronic exposure to crystalline silica dust at concentrations exceeding occupational exposure limits may cause silicosis. The NTP's Ninth Report on Carcinogens lists crystalline silica (respirable size) as a known human carcinogen. IARC concluded that there is sufficient evidence in humans for the carcinogenicity of inhaled (respirable) crystalline silica.

Identified Acute/ Short-term Effects:

Headache, nausea, abdominal pain and irritation of the nose, throat and lungs. Skin and eye irritation.

Identified Teratogens:

NO DATA

Identified Reproductive toxins :

NO DATA.

Identified Mutagens:

NO DATA.

~~~~ SECTION 12 ~~~~ ECOLOGICAL INFORMATION ~~~~

**Ecotoxicological effects on plants and animals:**

Aluminum Trihydrate CAS#21645-51-2

EC50 (fish): >10g/l

EC50 (Daphnia): >10g/l

Titanium Dioxide CAS#13463-67-7 96 Hr LC50 (Fathead minnows)>1,000mg/l

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## **Chemical Fate :**

This product is not expected to be biodegradable. Avoid spillage into the environment.

## **~~~~ SECTION 13 ~~~~ DISPOSAL CONSIDERATIONS ~~~~**

### **Instructions:**

Dispose of unused product or contaminated product and materials used in cleaning up spills or leaks in a manner approved for this material. Consult appropriate federal, state and local regulatory agencies to ascertain proper disposal procedures. Incineration is acceptable and the preferred method of disposal, however; nitrogen oxide emissions controls may be required to meet specifications. Chemical and biological degradation is possible. Empty containers will retain product residue and vapors and are subject to proper waste disposal, as above.

## **~~~~ SECTION 14 ~~~~ TRANSPORT INFORMATION ~~~~**

### **Shipping Information:**

DOT INFORMATION: 49 CFR 172.101

DOT DESCRIPTION: NON HAZARDOUS

## **~~~~ SECTION 15 ~~~~ REGULATORY INFORMATION ~~~~**

**(Not meant to be all inclusive-selected regulations represented)**

### **US Regulations:**

#### **Status Of Substances Lists:**

The Concentrations Shown In Section II Are Maximum Ceiling Levels (Weight %) to be used for calculations for regulations.

A reportable quantity is a quantity of a hazardous substance that triggers reporting requirements under the Comprehensive Environmental Response Compensation And Liability Act (CERCLA).

If a spill of a substance exceeds it's reportable quantity (RQ) in CFR 302.3, Table 40 302.4 Appendix A & 302.4 Appendix B, the release must be reported to The National Response Center At (800) 424-8802, The State Emergency Response Commission (SERC), And community emergency coordinators likely to be affected.

**Components present that could require reporting under the statute are:**  
NONE KNOWN

Superfund Amendments And Reauthorization Act Of 1986 (SARA) Title III Requires emergency planning based on the Threshold Quantities (TPQ'S) and release reporting based on Reportable Quantities (RQ'S) In 40 CFR 355 Appendix A&B Extremely Hazardous Substances. The emergency planning and release requirements of 40 CFR 355 apply to any facility at which there is present any amount of any extremely hazardous substance (EHS) equal to or in excess of it's Threshold Planning Quantity (TPQ).

**Components present that could require reporting under the statute are:**

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NONE KNOWN

EPCRA 40 CFR 372(Section 313) Requires EPA and the States to annually collect data on releases of certain toxic materials from industrial facilities, and make the data available to the public in the Toxics Release Inventory(TRI). This information must be included in all MSDS'S that are copied and distributed or compiled for this material. Reporting Threshold: Standard: A facility must report if it manufactures (including imports) or processes 25,000 pounds or more or otherwise uses 10,000 pounds or more of a listed toxic chemical during the calendar year.

**Components present that could require reporting under the statute are:  
See Section II**

The components of this product are listed or excluded from listing on the US Toxic Substance Control Act (TSCA) chemical substance inventory. Mixtures shall be assumed to present the same health hazards as do the Components Which Comprise One Percent(By Weight Or Volume) or greater of the mixture, except that the mixture shall be assumed to present carcinogenic hazard if it has a component in concentrations of 0.1 percent or greater. The remaining percentage of unspecified ingredients, if any, are not contained in above DeMinimis concentrations and/or are believed to be non-hazardous under the OSHA Hazard Communication Standard (29 CFR 1910.1200), and may consist of pigments, fillers, defoamers, wetting agents, resins, dryers, anti-bacterial agents, water and/or solvents in varying concentrations.

**International Regulations:**

**Canadian WHMIS:**

This product is not listed in any division, class, or subdivision.

**Canadian Environmental Protection Act (CEPA):**

All of the components of this product are exempt or listed on the DSL. See Section II For Composition/Information on Ingredients

**EINECS:**

All of the components of this product are listed in the EINECS inventory or are exempt from notification requirements.

**State Regulations:**

**California:**

California Proposition 65: The following Statement is made in order to comply with The California Safe Drinking Water and Toxic Enforcement Act of 1986

"WARNING: This product contains the chemical(s) appearing below known to the State of California to:

**A: Cause Cancer**

NONE KNOWN

\*If tinted contains Carbon Black: CAS#1333-86-4 and may also contain trace amounts of Crystalline Silica: CAS#14808-60-7

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**B: Cause Birth Defects or other Reproductive Harm :**

NONE KNOWN

In addition to the above named chemical(s)(if any), this product may contain trace amounts of chemicals, known to the State of California, to cause Cancer or Birth Defects and other Reproductive Harm.

**Delaware:**

NONE KNOWN

**Florida:**

NONE KNOWN

**Massachusetts:**

CALCIUM CARBONATE, CAS#1317-65-3 SUBSTANCE CODES:4

**Michigan:**

NONE KNOWN

**Minnesota:**

THE FOLLOWING ARE LISTED IN THE MINNESOTA HAZARDOUS SUBSTANCES LIST

| CHEMICAL NAME     | CAS#      | CODES | HAZARDS | CARCINOGEN? |
|-------------------|-----------|-------|---------|-------------|
| CALCIUM CARBONATE | 1317-65-3 | A     | --      | NO          |

**New Jersey:**

NONE KNOWN

**New York:**

NONE KNOWN

**Pennsylvania:**

CALCIUM CARBONATE CAS#1317-65-3 CODE:E

Titanium Dioxide CAS#13463-67-7 CODE:--

**Washington:**

WASHINGTON AIR CONTAMINANT:

CALCIUM CARBONATE(RESPIRABLE) CAS#1317-65-3

|    |     |                |
|----|-----|----------------|
| WA | ppm | mg/Cubic Meter |
|----|-----|----------------|

|     |     |   |
|-----|-----|---|
| TWA | UNK | 5 |
|-----|-----|---|

|      |     |     |
|------|-----|-----|
| STEL | UNK | UNK |
|------|-----|-----|

|         |     |     |
|---------|-----|-----|
| CEILING | UNK | UNK |
|---------|-----|-----|

SKIN:UNK

~~~~ SECTION 16 ~~~~ OTHER INFORMATION ~~~~

HMIS® III

Health : 2

Flammability : 0

Physical Hazard : 0

*Following Health rating Indicates Chronic/Carcinogenic Effects

HMIS® III Personal Protection : I

This rating is for the product as it is packaged. This rating will need to be adjusted by the user based on conditions of use.

The information contained herein relates only to the specific material identified. United Coatings believes that such information is accurate and reliable as of the date of this material safety data sheet, but no representation, guarantee or warranty, expressed or

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implied, is made as to the accuracy, reliability, or completeness of the information. To assure proper use & disposal of these materials & the safety & health of employees & customers, United Coatings urges persons receiving this information to make their own determination as to the information's suitability and completeness for their particular application.



| | | | |
|-------------|-------------------|-----------|---------|
| Date: | 6/20/2008 | MSDS No.: | US-M291 |
| Trade Name: | Excalibur 7018 MR | | |
| Sizes: | All | | |
| Supersedes: | 6/1/07 | | |

MATERIAL SAFETY DATA SHEET

For Welding Consumables and Related Products

Conforms to Hazard Communication Standard 29CFR 1910.1200 Rev. October 1988

SECTION I - IDENTIFICATION

| | | | |
|----------------------------|--|-----------------|-------------------|
| Manufacturer/
Supplier: | The Lincoln Electric Company
22801 St. Clair Avenue
Cleveland, OH 44117-1199
(216) 481-8100 | Product Type: | Covered Electrode |
| | | Classification: | AWS E7018 H4R |

SECTION II - HAZARDOUS MATERIAL (1)

IMPORTANT!

This section covers the materials from which this product is manufactured. The fumes and gases produced during welding with the normal use of this product are covered by Section V; see it for industrial hygiene information.

CAS Number shown is representative for the ingredients listed. All ingredients listed may not be present in all sizes.

(1) The term "hazardous" in "Hazardous Materials" should be interpreted as a term required and defined in the Hazards Communication Standard and does not necessarily imply the existence of any hazard. All materials are listed on the TSCA inventory.

| Ingredients: | CAS No. | Wt. % | TLV
mg/m ³ | PEL
mg/m ³ |
|--|------------|-------|--------------------------|--------------------------|
| Iron | 7439-89-6 | 15 | 10* | 10* |
| Limestone and/or calcium carbonate | 1317-65-3 | 10 | 10 | 15 |
| Titanium dioxides | 13463-67-7 | < 5 | 10 | 15 |
| Fluorides (as F) | 7789-75-5 | < 5 | 2.5 | 2.5 |
| Silicates and other binders | 1344-09-8 | < 5 | 10* | 10* |
| Manganese and/or manganese alloys and compounds (as Mn)***** | 7439-96-5 | < 5 | 0.2 | 5 (c) |
| Mineral silicates | 1332-58-7 | < 5 | 5** | 5** |
| Silicon and/or silicon alloys and compounds (as Si) | 7440-21-3 | 1 | 10* | 10* |
| Zirconium alloys and compounds (as Zr) | 12004-83-0 | 0.5 | 5 | 5 |
| Lithium compounds (as Li) | 554-13-2 | < 0.5 | 10* | 10* |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| Carbon steel core wire | 7439-89-6 | 55 | 10* | 10* |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

Supplemental Information:

(*) Not listed. Nuisance value maximum is 10 milligrams per cubic meter. (c) PEL value for iron oxide is 10 milligrams per cubic meter. TLV value for iron oxide is 5 milligrams per cubic meter.

(**) As respirable dust.

(*****) Subject to the reporting requirements of Sections 311, 312, and 313 of the Emergency Planning and Community Right-to-Know Act of 1986 and of 40CFR 370 and 372.

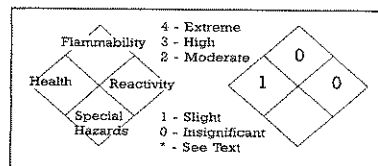
Value is for manganese fume. Present PEL is 5 milligrams per cubic meter (ceiling value). Values proposed by OSHA in 1989 were 1.0 milligrams per cubic meter TWA and 3.0 milligrams per cubic meter STEL (Short Term Exposure Limit).

SECTION III - HAZARD DATA

Non Flammable; Welding arc and sparks can ignite combustibles and flammable products. See Z49.1 referenced in Section VI. Product is inert, no special handling or spill procedures required. Not regulated by DOT.

Product: Excalibur 7018 MR

Date: 6/20/2008



SECTION IV - HEALTH HAZARD DATA

Threshold Limit Value: The ACGIH recommended general limit for Welding Fume NOS - (Not Otherwise Specified) is 5 mg/m³. ACGIH-1999 preface states that the TLV-TWA should be used as guides in the control of health hazards and should not be used as fine lines between safe and dangerous concentrations. See Section V for specific fume constituents which may modify this TLV. Threshold Limit Values are figures published by the American Conference of Government Industrial Hygienists. Units are milligrams per cubic meter of air.

Effects of Overexposure: Electric arc welding may create one or more of the following health hazards:

Fumes and Gases can be dangerous to your health. Common entry is by inhalation. Other possible routes are skin contact and ingestion.

Short-term (acute) overexposure to welding fumes may result in discomfort such as metal fume fever, dizziness, nausea, or dryness or irritation of nose, throat, or eyes. May aggravate pre-existing respiratory problems (e.g. asthma, emphysema). Exposure to extremely high levels of fluorides can cause abdominal pain, diarrhea, muscular weakness, and convulsions. In extreme cases it can cause loss of consciousness and death.

Long-term (chronic) overexposure to welding fumes can lead to siderosis (iron deposits in lung) and may affect pulmonary function. Manganese overexposure can affect the central nervous system, resulting in impaired speech and movement. Bronchitis and some lung fibrosis have been reported. Repeated exposure to fluorides may cause excessive calcification of the bone and calcification of ligaments of the ribs, pelvis and spinal column. May cause skin rash. **WARNING:** This product, when used for welding or cutting, produces fumes or gases which contain chemicals known to the State of California to cause birth defects and, in some cases, cancer. (California Health & Safety Code Section 25249.5 et seq.)

Arc Rays can injure eyes and burn skin. *Skin cancer has been reported.*

Electric Shock can kill. If welding must be performed in damp locations or with wet clothing, on metal structures or when in cramped positions such as sitting, kneeling or lying, or if there is a high risk of unavoidable or accidental contact with workpiece, use the following equipment: Semiautomatic DC Welder, DC Manual (Stick) Welder, or AC Welder with Reduced Voltage Control.

Emergency and First Aid Procedures: Call for medical aid. Employ first aid techniques recommended by the American Red Cross.

IF BREATHING IS DIFFICULT give oxygen. IF NOT BREATHING employ CPR (Cardiopulmonary Resuscitation) techniques.

IN CASE OF ELECTRICAL SHOCK, turn off power and follow recommended treatment. In all cases call a physician.

SECTION V - REACTIVITY DATA

Hazardous Decomposition Products: Welding fumes and gases cannot be classified simply. The composition and quantity of both are dependent upon the metal being welded, the process, procedure and electrodes used.

Other conditions which also influence the composition and quantity of the fumes and gases to which workers may be exposed include: coatings on the metal being welded (such as paint, plating, or galvanizing), the number of welders and the volume of the worker area, the quality and amount of ventilation, the position of the welder's head with respect to the fume plume, as well as the presence of contaminants in the atmosphere (such as chlorinated hydrocarbon vapors from cleaning and degreasing activities.)

When the electrode is consumed, the fume and gas decomposition products generated are different in percent and form from the ingredients listed in Section II. Decomposition products of normal operation include those originating from the volatilization, reaction, or oxidation of the materials shown in Section II, plus those from the base metal and coating, etc., as noted above.

Reasonably expected fume constituents of this product would include: Primarily iron oxide and fluorides; secondarily complex oxides of manganese, potassium, silicon and sodium.

Maximum fume exposure guideline for this product (based on manganese content) is 4.0 milligrams per cubic meter.

Gaseous reaction products may include carbon monoxide and carbon dioxide. Ozone and nitrogen oxides may be formed by the radiation from the arc.

Determine the composition and quantity of fumes and gases to which workers are exposed by taking an air sample from inside the welder's helmet if worn or in the worker's breathing zone. Improve ventilation if exposures are not below limits. See ANSI/AWS F1.1, F1.2, F1.3 and F1.5, available from the American Welding Society, 550 N.W. LeJeune Road, Miami, FL 33126.

SECTION VI AND VII

CONTROL MEASURES AND PRECAUTIONS FOR SAFE HANDLING AND USE

Read and understand the manufacturer's instruction and the precautionary label on the product. Request Lincoln Safety Publication E205. See American National Standard Z49.1, "Safety in Welding, Cutting and Allied Processes" published by the American Welding Society, 550 N.W. LeJeune Road, Miami, FL, 33126 (both available for free download at <http://www.lincolnelectric.com/community/safety/>) and OSHA Publication 2206 (29CFR1910), U.S. Government Printing Office, Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250-7954 for more details on many of the following:

Ventilation: Use enough ventilation, local exhaust at the arc, or both to keep the fumes and gases from the worker's breathing zone and the general area. Train the welder to keep his head out of the fumes. *Keep exposure as low as possible.*

Respiratory Protection: Use respirable fume respirator or air supplied respirator when welding in confined space or general work area when local exhaust or ventilation does not keep exposure below TLV.

Eye Protection: Wear helmet or use face shield with filter lens shade number 12 or darker. Shield others by providing screens and flash goggles.

Protective Clothing: Wear hand, head, and body protection which help to prevent injury from radiation, sparks and electrical shock. See Z49.1.

At a minimum this includes welder's gloves and a protective face shield, and may include arm protectors, aprons, hats, shoulder protection, as well as dark substantial clothing. Train the welder not to permit electrically live parts or electrodes to contact skin ... or clothing or gloves if they are wet. Insulate from work and ground.

Disposal Information: Discard any product, residue, disposable container, or liner as ordinary waste in an environmentally acceptable manner according to Federal, State and Local Regulations unless otherwise noted. No applicable ecological information available.



Date:
Supercedes:

25 September 2012
2 September 2010

MATERIAL SAFETY DATA SHEET

IN CASE OF EMERGENCY CALL CHEMTREC AT 1-800-424-9300

1. PRODUCT IDENTIFICATION AND COMPANY IDENTIFICATION:

Product Name: **GOJO® ORIGINAL FORMULA™ HAND CLEANER**

Company Name & Address: GOJO Industries, Inc.
One GOJO Plaza, Suite 500
Akron, OH 44311

Emergency Phone: **1-800-424-9300 CHEMTREC**

Non-Emergency Phone: (330) 255-6000

MSDS Request Phone: (330) 255-6000 x8804

2. INFORMATION ON INGREDIENTS:

| HAZARDOUS INGREDIENTS | CAS NUMBER | OSHA PEL | ACGIH TLV | % RANGE |
|-------------------------------|------------|----------|-----------|---------|
| Petroleum Distillates (vapor) | 64742-47-8 | --- | 200 mg/m3 | < 40% |
| Mineral Oil (mist) | 8042-47-5 | 5 mg/m3 | 5 mg/m3 | < 15% |
| Mineral Spirits | 8032-32-4 | 500 ppm | 100 ppm | < 5% |

| Other ingredient(s) with notification requirements: | CAS NUMBER | List |
|---|------------|------------------------|
| Petroleum Distillates | 64742-47-8 | MA 1; NJ 1; PA 1 |
| Mineral Oil (mist) | 8042-47-5 | MA; NJ; PA; CN |
| Mineral Spirits | 8032-32-4 | MA 1; NJ 1; PA 1; CN 1 |
| Propylene Glycol | 57-55-6 | PA 1: CN |
| Oleic Acid | 112-80-1 | PA: CN |

3. HAZARDS IDENTIFICATION:

EMERGENCY OVERVIEW

When used according to instructions, the product applicable to this MSDS is safe and presents no immediate or long-term health hazard. However, abnormal entry routes, such as gross ingestion, may require immediate medical attention.

Potential Health Effects:

HMIS: Health 1 Flammability 1 Reactivity 0 Personal Protection None

Eye Contact: May cause eye irritation.

Skin Contact: No irritation or reaction expected.

Inhalation: Not applicable.

Ingestion: May cause upset stomach, nausea (Abnormal entry route).

Carcinogenicity: Not listed as a carcinogen by NTP, IARC, OSHA or ACGIH.

4. FIRST AID MEASURES:

Eye Contact: Do not rub eyes. Flush eyes thoroughly with water for 15 minutes. If condition worsens or irritation persists, contact physician.

Skin Contact: Not applicable.

Inhalation: Not applicable.

Ingestion: Do not induce vomiting. Contact a physician or Poison Control Center.

5. FIRE FIGHTING MEASURES:NFPA: Health 1 Fire 1 Reactivity 0

Flashpoint °F/°C (PMCC method): >212°F/100°C

Unusual Fire and Explosion Hazards: None known.

Special Fire Fighting Procedures: None known.

Extinguishing Media: X Water Fog X Alcohol Foam X CO₂ X Dry Chemical Other**6. ACCIDENTAL RELEASE MEASURES:**

No special requirements. Water clean up and rinse. CAUTION – WILL CAUSE SLIPPERY SURFACES.

7. HANDLING AND STORAGE:

Store at normal room temperature away from reach of small children. Keep containers sealed. Use older containers first. Avoid freezing conditions.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION:

Eye Protection: None required under normal conditions.

Skin Protection: None required under normal conditions.

Respiratory Protection: None required under normal conditions.

Ventilation: None required under normal conditions.

Protective Equipment or Clothing: None required under normal conditions.

9. PHYSICAL AND CHEMICAL PROPERTIES:

Appearance and Odor White opaque gel, characteristic solvent odor

pH (undiluted): 9 typical

VOC, %: 7

10. STABILITY AND REACTIVITY:

Stable/Non reactive product.

11. TOXICOLOGICAL INFORMATION:

No acute or chronic toxic effects expected when used according to directions.

12. ECOLOGICAL CONSIDERATIONS:

No ecological or special considerations when used according to directions. Not considered environmentally harmful from normal dilution, expected usage and typical drainage to sewers, septic systems and treatment plants.

13. DISPOSAL CONSIDERATIONS:

No special considerations when disposed according to local, state and Federal regulations.

14. TRANSPORT INFORMATION:

Not classified as a hazardous material.

15. REGULATORY AND OTHER INFORMATION:

TSCA: All ingredients are listed or exempt per reference 15 USC 2602 (2)(B)(vi).

Complies with current FDA regulations for cosmetic and/or over-the-counter drug products.

WHMIS: Not controlled

Notice: The information herein is based on data considered to be accurate as of the date of preparation of this material safety data sheet. However, no warranty or representation, expressed or implied, is made as to the accuracy or completeness of the foregoing data and safety information. The user assumes all liability for any damage or injury resulting from abnormal use, from any failure to adhere to recommended practices or from any hazards inherent in the nature of the product.



MATERIAL SAFETY DATA SHEET

Resinoid Bonded Abrasives

MSDS #1/2

1. PRODUCT AND COMPANY IDENTIFICATION

Product Identity / Trade Name: Grinding and Cutting Wheels, Resinoid (Type 1, Type 27, Type 28, Type 29), Cup Wheels (Type 11) Cones and Plugs (Type 16, Type 17 and Type 18), Mounted Points, UA-MTX, UA-GFX, A36F, A54F.

Product Use: Abrasive materials used for cutting and grinding metals, concrete, masonry and building materials.

Manufacturer: Mailing Address

United Abrasives, Inc.
185 Boston Post Road
North Windham, CT 06256

Physical Address

United Abrasives, Inc.
185 Boston Post Road
North Windham, CT 06256

Internet: www.unitedabrasives.com

Information Phone: (860) 456-7131 **Emergency Phone:** (860) 456-7131

MSDS Date of Preparation: August 24, 2012

2. HAZARDS IDENTIFICATION

This product is a black, brown or reddish colored solid wheel with no odor.

EMERGENCY OVERVIEW

Dust may cause eye and respiratory irritation. Dust particles may cause abrasive injury to the eyes.

3. COMPOSITION/INFORMATION ON INGREDIENTS

| Hazardous Component | CAS # | % |
|-----------------------------|------------|------|
| Aluminum Oxide | 1344-28-1 | 0-95 |
| Silicon Carbide | 409-21-2 | 0-95 |
| Zirconium Oxide | 1314-23-4 | 0-80 |
| Cured Phenolic Resin | N/A | 1-30 |
| Nitrile Compounds | N/A | 1-20 |
| Fluoride Compounds | N/A | 1-20 |
| Iron Pyrite | 12068-85-8 | 0-20 |
| Woven Fiberglass | N/A | 0-15 |
| Calcium Compounds | N/A | 0-15 |
| Sulfur | 7704-34-9 | 0-15 |
| Calcium Oxide | 1305-78-8 | 1-10 |
| Cryolite | 15096-52-3 | 1-10 |
| Cured Epoxy Resin | N/A | 1-10 |
| Titanium Dioxide | 13463-67-7 | 0-5 |
| Calcium Carbonate | 1317-65-3 | 0-5 |
| Aluminum Potassium fluoride | 14484-69-6 | 0-5 |
| Iron Oxide | 1309-37-1 | 0-5 |
| Graphite | 7782-42-5 | 0-5 |
| Potassium Fluoroborate | 14075-53-7 | 0-5 |

4. FIRST AID MEASURES

Ingestion: If grinding dust is swallowed, seek medical attention.

Inhalation: If overexposed to grinding dust, remove victim to fresh air and get medical attention.

Eye Contact: Flush eyes thoroughly with water, holding open eyelids. Get medical attention if irritation persists.

Obtain immediate medical attention for foreign body in the eye.

Skin Contact: Wash dust from skin with soap and water. Launder contaminated clothing before reuse.

5. FIRE FIGHTING MEASURES

Extinguishing Media: Use any media that is appropriate for the surrounding fire.

Special Firefighting Procedures: None needed.

Unusual Fire and Explosion Hazards: This product is not combustible, however, consideration must be given to the potential fire/explosion hazards from the base material being processed. Many materials create flammable/explosive dusts or turnings when machined or ground.

Hazardous Combustion Products: None known.

6. ACCIDENTAL RELEASE MEASURES

Pick up, sweep up or vacuum and place in a container for disposal. Minimize generation of dust. Notify authorities as required by local, state and federal regulations.

7. HANDLING AND STORAGE

Recommended Work Practices: Use only with adequate ventilation. Avoid breathing dust. Wash thoroughly after handling and use, especially before eating, drinking or smoking. Refer to ANSI B7.1, Safety Requirements for the Use, Care and Protection of Abrasive Wheels for additional information. Consider potential exposure to components of the base materials or coatings being ground. Refer to OSHA's substance specific standards for additional work practice requirements where applicable.

Storage: Store in accordance with ANSI B7.1. Protect abrasive wheels from damage.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure Guidelines:

| Hazardous Component | OSHA PEL | ACGIH TLV |
|--|--|--|
| Aluminum Oxide | 5 mg/m ³ (Respirable fraction)
15 mg/m ³ (total dust) | 1 mg/m ³ (respirable) (as Al metal) |
| Silicon Carbide | None Established | 10 mg/m ³ (inhalable)
3 mg/m ³ (respirable) |
| Zirconium Oxide (as zirconium compounds) | 5 mg/m ³ | 5 mg/m ³
10 mg/m ³ STEL |
| Cured Phenolic Resin | None Established | None Established |
| Nitrile Compounds | None Established | None Established |
| Fluoride Compounds | 2.5 mg/m ³ | 2.5 mg/m ³ |
| Iron Pyrite | None Established | None Established |
| Woven Fiberglass | 5 mg/m ³ (Respirable fraction)
15 mg/m ³ (total dust) | 5 mg/m ³ (Inhalable)
1 f/cc |
| Calcium Compounds | None Established | None Established |
| Sulfur | None Established | None Established |
| Calcium Oxide | 5 mg/m ³ | 2 mg/m ³ |
| Cryolite (as fluorides) | 2.5 mg/m ³ | 2.5 mg/m ³ |

United Abrasives MSDS #1/2
Resinoid Bonded Abrasives (08/12)

| | | |
|--|--|----------------------------------|
| Cured epoxy resin | None Established | None Established |
| Titanium Dioxide | 15 mg/m ³ (total dust) | 10 mg/m ³ |
| Calcium Carbonate | 5 mg/m ³ (Respirable fraction)
15 mg/m ³ (total dust) | None Established |
| Aluminum Potassium Fluoride (as Al metal) | 5 mg/m ³ (Respirable fraction)
15 mg/m ³ (total dust) | 1 mg/m ³ (respirable) |
| Aluminum Potassium Fluoride (as fluorides) | 2.5 mg/m ³ | 2.5 mg/m ³ |
| Iron Oxide | 10 mg/m ³ (fume) | 5 mg/m ³ (respirable) |
| Graphite | 15 mppcf | 2 mg/m ³ (respirable) |
| Potassium Fluoroborate (as fluorides) | 2.5 mg/m ³ | 2.5 mg/m ³ |

Note: Consider also components of base materials and coatings being ground.

Ventilation: Use local exhaust or general ventilation as required to minimize exposure to dust and maintain the concentration of contaminants below the TLVs.

Respiratory Protection: Use NIOSH approved respirator if exposure limits are exceeded or where dust exposures are excessive. Consider the potential for exposure to components of the coatings or base material being ground in selecting proper respiratory protection. Refer to OSHA's specific standards for lead, cadmium, etc. where appropriate. Selection of respiratory protection depends on the contaminant type, form and concentration. Select and use respirators in accordance with OSHA 1910.134 and good industrial hygiene practice.

Gloves: Cloth or leather gloves recommended.

Eye Protection: Safety goggles or face shield over safety glasses with side shields.

Other: Protective clothing as needed to prevent contamination of personal clothing. Hearing protection may be required.

9. PHYSICAL AND CHEMICAL PROPERTIES

Boiling Point: Not Applicable

Solubility in Water: Insoluble

Specific Gravity: Not Applicable

Melting Point: Not Applicable

Flammable Limits: LEL: Not Applicable UEL: Not Applicable

Appearance and Odor: Black, brown or reddish colored solid wheel with no odor.

Vapor Pressure: (mm Hg) Not Applicable

Vapor Density: (Air = 1) Not Applicable

Evaporation Rate: Not Applicable

Flash Point: Non-Combustible

10. STABILITY AND REACTIVITY

Stability: Stable

Incompatibility: None known.

Hazardous Decomposition Products: Dust from grinding could contain ingredients listed in Section 3 and other, potentially more hazardous components of the base material being ground or coatings applied to the base material.

Hazardous Polymerization: Will not occur.

11. TOXICOLOGICAL INFORMATION

HEALTH HAZARDS:

Ingestion: None expected under normal use conditions. Swallowing large pieces may cause obstruction of the gastrointestinal tract.

Inhalation: Dust may cause respiratory irritation.

Eye: Dust may cause eye irritation. Dust particles may cause abrasive injury to the eyes.

Skin: None expected under normal use conditions. Rubbing product across the skin may cause mechanical irritation or abrasions.

Sensitization: This material is not known to cause sensitization.

Chronic: Long-term overexposure to respirable dust may cause lung damage (fibrosis) with symptoms of coughing, shortness of breath and diminished breathing capacity. Chronic effects may be aggravated by smoking. Prolonged overexposure to fluorides may cause a bone condition, fluorosis. Prolonged exposure to elevated noise levels during operations may affect hearing. A greater hazard, in most cases, is the exposure to the dust/fumes from the material or paint/coatings being ground. Most of the dust generated during grinding is from the base material being ground and the potential hazard from this exposure must be evaluated.

Carcinogenicity: Titanium Dioxide is listed by IARC as a group 2B Carcinogen (suspected human carcinogen). None of the other components is listed as a carcinogen or potential carcinogen by OSHA, NTP or IARC.

Medical Conditions Aggravated by Exposure: Employees with pre-existing respiratory disease may be at risk from exposure.

Acute Toxicity Values:

This product and its components are not acutely toxic. The only acute toxicity data available for the components are listed below.

Aluminum Oxide: Oral rat LD50 >5,000 mg/kg

Cryolite: Oral rat LD50 >5,000 mg/kg

12. ECOLOGICAL INFORMATION

No ecological data is available for this product. No hazards to the environment are expected from this product. However, consideration must be given to potential environment effects of the base material being processed.

13. DISPOSAL CONSIDERATIONS

Dispose in accordance with all applicable local, state/provincial and federal regulations. Local regulations may be more stringent than regional and national requirements. It is the responsibility of the waste generator to determine the toxicity and physical characteristics of the material to determine the proper waste identification and disposal in compliance with applicable regulations.

14. TRANSPORT INFORMATION

DOT Hazardous Materials Description:

Proper Shipping Name: Not Regulated

UN Number: None

Hazard Class/Packing Group: None

Labels Required: None

15. REGULATORY INFORMATION

SARA Section 311/312 Hazard Categories: Not Applicable (manufactured articles)

SARA Section 313: Some products contain the following toxic chemicals subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372 (Toxic Chemical Release Reporting): None

California Proposition 65: WARNING You create dust when you cut, sand, drill or grind materials such as wood, paint, cement, masonry or metal. This dust often contains chemicals known to cause cancer, birth defects or other reproductive harm.

Canadian WHMIS Classification: Not a controlled product. This product meets the definition of a "manufactured article" under the WHMIS regulations.

This product has been classified under the CPR and this MSDS discloses information elements required by the CPR.

| |
|------------------------------|
| 16. OTHER INFORMATION |
|------------------------------|

NFPA Hazard Rating: Health: 1
Fire: 0
Reactivity: 0

Date Previous Revision: 12/1/09

Date This Revision: 8/24/12

Revision Summary: Section 3 Updated Composition, Section 8 Updated exposure limits, Section 11 Updated Acute toxicity values.

Prepared By: IH&SC Inc., Shelton, CT 06484

The preceding information is believed to be correct and current as of the date of preparation of this Material Safety Data Sheet. Since the use of this information and the conditions of use of this product are not within the control of United Abrasives, Inc., it is the user's obligation to assure safe use of this product.

MATERIAL SAFETY DATA SHEET

Product Trade Name: IDP-214

Revision Date: 04-Jan-2011

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

Statement of Hazardous Nature Non-Hazardous according to the criteria of NOHSC, Non-Dangerous Goods according to the criteria of ADG.

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
53-55 Bannister Road
Canning Vale
WA 6155
Australia

ACN Number: 009 000 775
Telephone Number: 61 (08) 9455 8300
Fax Number: 61 (08) 9455 5300

Product Emergency Telephone

Australia: 08-64244950
Papua New Guinea: 05 1 281 575 5000
NewZealand: 06-7559274

Fire, Police & Ambulance - Emergency Telephone

Australia: 000
Papua New Guinea: 000
New Zealand: 111

Identification of Substances or Preparation

Product Trade Name: IDP-214
Synonyms: None
Chemical Family: Organic hydrocarbon
UN Number: None
Dangerous Goods Class: None
Subsidiary Risk: None
Hazchem Code: None
Poisons Schedule: None
Application: Lubricant

Prepared By Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| Substances | CAS Number | PERCENT | Australia NOHSC | ACGIH TLV-TWA |
|---------------------|------------|-----------|-----------------------|---------------------|
| Lubricating greases | 74869-21-9 | 60 - 100% | Not applicable | Not applicable |
| Muscovite | 1318-94-1 | 8-10% | Not applicable | Not applicable |
| Talc | 14807-96-6 | 2-10% | 2.5 mg/m ³ | 2 mg/m ³ |

2. COMPOSITION/INFORMATION ON INGREDIENTS

| | | | | |
|---------------------|-----------|--------|----------------|----------------|
| Butene, homopolymer | 9003-29-6 | 1 - 5% | Not applicable | Not applicable |
|---------------------|-----------|--------|----------------|----------------|

Total to 100%

3. HAZARDS IDENTIFICATION

Hazard Overview May cause eye irritation. May be harmful if swallowed.

Hazard Ratings

| | |
|---------------|---|
| Flammability: | 0 |
| Toxicity: | 1 |
| Body Contact: | 1 |
| Reactivity: | 0 |
| Chronic: | 2 |

Scale: Min/Nil=0 Low=1 Moderate=2 High=3 Extreme=4

4. FIRST AID MEASURES

| | |
|---------------------------|---|
| Inhalation | If inhaled, remove to fresh air. If not breathing give artificial respiration, preferably mouth-to-mouth. If breathing is difficult give oxygen. Get medical attention. |
| Skin | Wash with soap and water. Get medical attention if irritation persists. Remove contaminated clothing and launder before reuse. |
| Eyes | In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists. |
| Ingestion | Get medical attention! If vomiting occurs, keep head lower than hips to prevent aspiration. |
| Notes to Physician | Not Applicable |

5. FIRE FIGHTING MEASURES

| | |
|--|--|
| Suitable Extinguishing Media | All standard fire fighting media |
| Extinguishing media which must not be used for safety reasons | None known. |
| Special Exposure Hazards | Use water spray to cool fire exposed surfaces. Decomposition in fire may produce toxic gases. |
| Special Protective Equipment for Fire-Fighters | Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel. |

6. ACCIDENTAL RELEASE MEASURES

| | |
|---|--|
| Personal Precautionary Measures | Use appropriate protective equipment. Wear self-contained breathing apparatus in enclosed areas. |
| Environmental Precautionary Measures | Prevent from entering sewers, waterways, or low areas. |
| Procedure for Cleaning / Absorption | Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove. |

7. HANDLING AND STORAGE

| | |
|-----------------------------|---|
| Handling Precautions | Avoid contact with eyes, skin, or clothing. Launder contaminated clothing before reuse. Wash hands after use. |
| Storage Information | Store away from oxidizers. Keep from excessive heat. Keep container closed when not in use. Store in a cool well ventilated area. |

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

| | |
|-------------------------------|--|
| Engineering Controls | Use in a well ventilated area. |
| Respiratory Protection | <p>If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional.</p> <p>Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Organic vapor respirator.</p> |
| Hand Protection | Oil-resistant gloves. |
| Skin Protection | Normal work coveralls. |
| Eye Protection | Safety glasses. |
| Other Precautions | Eyewash fountains and safety showers must be easily accessible. |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|--|----------------|
| Physical State: | Semi-Solid |
| Color: | Beige |
| Odor: | Hydrocarbon |
| pH: | 7 |
| Specific Gravity @ 20 C (Water=1): | 1.0 |
| Density @ 20 C (kg/l): | 1 |
| Bulk Density @ 20 C (kg/m³): | Not Determined |
| Boiling Point/Range (C): | < 316 |
| Freezing Point/Range (C): | 260 |
| Pour Point/Range (C): | Not Determined |
| Flash Point/Range (C): | 221 |
| Flash Point Method: | PMCC |
| Autoignition Temperature (C): | > 260 |
| Flammability Limits in Air - Lower (g/m³): | Not Determined |
| Flammability Limits in Air - Lower (%): | 0.7 |
| Flammability Limits in Air - Upper (g/m³): | Not Determined |
| Flammability Limits in Air - Upper (%): | 9 |
| Vapor Pressure @ 20 C (mmHg): | < 0.08 |
| Vapor Density (Air=1): | > 5 |
| Percent Volatiles: | 0 |
| Evaporation Rate (Butyl Acetate=1): | < 0.01 |
| Solubility in Water (g/100ml): | Insoluble |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (g/l): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|--------------------------------|----------------|
| Molecular Weight (g/mole): | Not Determined |
| Decomposition Temperature (C): | Not Determined |

10. STABILITY AND REACTIVITY

| | |
|--------------------------------------|---|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | Keep away from heat, sparks and flame. |
| Incompatibility (Materials to Avoid) | Strong oxidizers. |
| Hazardous Decomposition Products | Oxides of sulfur. Carbon monoxide and carbon dioxide. Oxides of nitrogen. |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|--|--|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | Not a likely route of exposure. Massive inhalation may be harmful. |
| Skin Contact | Prolonged or repeated contact may cause skin irritation. |
| Eye Contact | May cause eye irritation. |
| Ingestion | Large doses may cause nausea, vomiting and diarrhea. May be harmful if swallowed. |
| Aggravated Medical Conditions | None known. |
| Chronic Effects/Carcinogenicity | The full refining history is known and it can be shown that the production substance is not carcinogen, therefore the classification as a carcinogen need not apply. |
| Other Information | None known. |
| Toxicity Tests | |
| Oral Toxicity: | LD50: > 2000 mg/kg (Rat) |
| Dermal Toxicity: | Not determined |
| Inhalation Toxicity: | Not determined |
| Primary Irritation Effect: | Not determined |
| Carcinogenicity | Not determined |
| Genotoxicity: | Not determined |
| Reproductive / Developmental Toxicity: | Not determined |

12. ECOLOGICAL INFORMATION

| | |
|---------------------------|----------------|
| Mobility (Water/Soil/Air) | Not determined |
| Persistence/Degradability | Not determined |

Bio-accumulation Not determined

Ecotoxicological Information

Acute Fish Toxicity: Not determined

Acute Crustaceans Toxicity: Not determined

Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined

Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Disposal should be made in accordance with federal, state, and local regulations.

Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

ADR

Not restricted

Air Transportation

ICAO/IATA

Not restricted

Sea Transportation

IMDG

Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

Chemical Inventories

Australian AICS Inventory

All components listed.

US TSCA Inventory

Product contains one or more components not listed on inventory.

EINECS Inventory

This product, and all its components, complies with EINECS

Classification

None.

Risk Phrases

Safety Phrases

S28 After contact with skin, wash immediately with plenty of S61 Avoid release to the environment. Refer to special instructions/Safety data sheets.

S20/21 Do not eat, drink or smoke when using.

S36/37/39 Wear suitable protective clothing, gloves and eye/face protection.

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Contact

Australian Poisons Information Centre

24 Hour Service: - 13 11 26

Police or Fire Brigade: - 000 (exchange): - 1100

New Zealand National Poisons Centre

0800 764 766

Additional Information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

END OF MSDS

MATERIAL SAFETY DATA SHEET

Product Trade Name: IDP-585

Revision Date: 07-Jul-2011

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: IDP-585
Synonyms: None
Chemical Family: Blend
Application: Lubricant

Manufacturer/Supplier Baroid Industrial Drilling Products
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4613 or 1-877-379-7412
Emergency Telephone: (281) 575-5000

Prepared By Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| Substances | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|-------------|------------|----------|----------------|----------------------|
| Soybean oil | 8001-22-7 | 30 - 60% | Not applicable | 15 mg/m ³ |

3. HAZARDS IDENTIFICATION

Hazard Overview May cause eye irritation.

4. FIRST AID MEASURES

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin Wash with soap and water. Get medical attention if irritation persists. Remove contaminated clothing and discard.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

| | |
|---|----------------|
| Flash Point/Range (F): | > 370 |
| Flash Point/Range (C): | > 187.8 |
| Flash Point Method: | PMCC |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media Carbon Dioxide, Dry Chemicals, Foam.

Special Exposure Hazards Decomposition in fire may produce toxic gases.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 0, Flammability 1, Reactivity 0

HMIS Ratings: Health 0, Flammability 1, Physical Hazard 0 , PPE: A

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment.

Environmental Precautionary Measures None known.

Procedure for Cleaning / Absorption Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing.

Storage Information Store away from oxidizers.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area.

Respiratory Protection Not normally necessary.

Hand Protection Normal work gloves.

Skin Protection Normal work coveralls.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|------------------------------------|----------------|
| Physical State: | Liquid |
| Color: | Yellow |
| Odor: | Slight |
| pH: | Not Determined |
| Specific Gravity @ 20 C (Water=1): | .935 |
| Density @ 20 C (lbs./gallon): | 7.79 |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|--|----------------|
| Bulk Density @ 20 C (lbs/ft3): | Not Determined |
| Boiling Point/Range (F): | > 375 |
| Boiling Point/Range (C): | > 190.6 |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Insoluble |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | Not Determined |

10. STABILITY AND REACTIVITY

| | |
|--------------------------------------|-------------------------------------|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None known. |
| Incompatibility (Materials to Avoid) | Strong oxidizers. |
| Hazardous Decomposition Products | Carbon monoxide and carbon dioxide. |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|---------------------------------|--|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | None known. |
| Skin Contact | Prolonged or repeated contact may cause skin irritation. |
| Eye Contact | May cause slight eye irritation. |
| Ingestion | None known |
| Aggravated Medical Conditions | None known. |
| Chronic Effects/Carcinogenicity | No data available to indicate product or components present at greater than 1% are chronic health hazards. |
| Other Information | None known. |
| Toxicity Tests | |
| Oral Toxicity: | LD50: > 15000 mg/kg (Rat) |
| Dermal Toxicity: | Not determined |
| Inhalation Toxicity: | Not determined |
| Primary Irritation Effect: | Not determined |

| | |
|---|----------------|
| Carcinogenicity | Not determined |
| Genotoxicity: | Not determined |
| Reproductive /
Developmental Toxicity: | Not determined |

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined

Persistence/Degradability Biodegradable

Bio-accumulation Not determined

Ecotoxicological Information

Acute Fish Toxicity: Not determined

Acute Crustaceans Toxicity: Not determined

Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined

Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Disposal should be made in accordance with federal, state, and local regulations.

Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR
Not restricted

Air Transportation

ICAO/IATA
Not restricted

Sea Transportation

IMDG
Not restricted

Other Transportation Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|---|--|
| US TSCA Inventory | All components listed on inventory or are exempt. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | None |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | All components listed do not apply to the California Proposition 65 Regulation. |
| MA Right-to-Know Law | Does not apply. |
| NJ Right-to-Know Law | Does not apply. |
| PA Right-to-Know Law | One or more components listed. |

Canadian Regulations

| | |
|------------------------|---|
| Canadian DSL Inventory | All components listed on inventory or are exempt. |
| WHMIS Hazard Class | Un-Controlled |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

| | |
|------------------------|--|
| Additional Information | For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335. |
|------------------------|--|

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

END OF MSDS



Material Safety Data Sheet

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

John Deere Hy-Gard™ Transmission/Hydraulic Oil

Product Use: Transmission Fluid, Hydraulic Oil

Product Number(s): CPS240216, CPS240230

Synonyms: John Deere Hy-Gard™ Low Vis Transmission/Hydraulic, John Deere Hy-Gard™ Transmission/Hydraulic Oil

Company Identification

ChevronTexaco Global Lubricants
6001 Bollinger Canyon Rd
San Ramon, CA 94583
United States of America
chevron-lubricants

Transportation Emergency Response

CHEMTREC: (800) 424-9300 or (703) 527-3887

Health Emergency

ChevronTexaco Emergency Information Center: Located in the USA. International collect calls accepted.
(800) 231-0623 or (510) 231-0623

Product Information

email : lubemsds@chevrontexaco.com

SECTION 2 COMPOSITION/ INFORMATION ON INGREDIENTS

| COMPONENTS | CAS NUMBER | AMOUNT |
|--|------------|------------------|
| Highly refined mineral oil (C15 - C50) | Mixture | 80 - 100 %weight |
| Zinc alkyl dithiophosphate | 68649-42-3 | 1 - 5 %weight |

SECTION 3 HAZARDS IDENTIFICATION

IMMEDIATE HEALTH EFFECTS

Eye: Not expected to cause prolonged or significant eye irritation.

Skin: Contact with the skin is not expected to cause prolonged or significant irritation. Not expected to be harmful to internal organs if absorbed through the skin. High-Pressure Equipment Information: Accidental high-velocity injection under the skin of materials of this type may result in serious injury. Seek medical attention at once should an accident like this occur. The initial wound at the injection site may not appear to be serious at first; but, if left untreated, could result in disfigurement or amputation of the affected part.

Ingestion: Not expected to be harmful if swallowed.

Inhalation: Not expected to be harmful if inhaled. Contains a petroleum-based mineral oil. May cause respiratory irritation or other pulmonary effects following prolonged or repeated inhalation of oil mist at airborne levels above the recommended mineral oil mist exposure limit. Symptoms of respiratory irritation

may include coughing and difficulty breathing.

SECTION 4 FIRST AID MEASURES

Eye: No specific first aid measures are required. As a precaution, remove contact lenses, if worn, and flush eyes with water.

Skin: No specific first aid measures are required. As a precaution, remove clothing and shoes if contaminated. To remove the material from skin, use soap and water. Discard contaminated clothing and shoes or thoroughly clean before reuse.

Ingestion: No specific first aid measures are required. Do not induce vomiting. As a precaution, get medical advice.

Inhalation: No specific first aid measures are required. If exposed to excessive levels of material in the air, move the exposed person to fresh air. Get medical attention if coughing or respiratory discomfort occurs.

Note to Physicians: In an accident involving high-pressure equipment, this product may be injected under the skin. Such an accident may result in a small, sometimes bloodless, puncture wound. However, because of its driving force, material injected into a fingertip can be deposited into the palm of the hand. Within 24 hours, there is usually a great deal of swelling, discoloration, and intense throbbing pain. Immediate treatment at a surgical emergency center is recommended.

SECTION 5 FIRE FIGHTING MEASURES

Leaks/ruptures in high pressure system using materials of this type can create a fire hazard when in the vicinity of ignition sources (eg. open flame, pilot lights, sparks, or electric arcs).

FIRE CLASSIFICATION:

OSHA Classification (29 CFR 1910.1200): Not classified by OSHA as flammable or combustible.

NFPA RATINGS: Health: 0 Flammability: 1 Reactivity: 0

FLAMMABLE PROPERTIES:

Flashpoint: (Cleveland Open Cup) 150 °C (302 °F) (Min)

Autoignition: No Data Available

Flammability (Explosive) Limits (% by volume in air): Lower: Not Applicable Upper: Not Applicable

EXTINGUISHING MEDIA: Use water fog, foam, dry chemical or carbon dioxide (CO₂) to extinguish flames.

PROTECTION OF FIRE FIGHTERS:

Fire Fighting Instructions: This material will burn although it is not easily ignited. For fires involving this material, do not enter any enclosed or confined fire space without proper protective equipment, including self-contained breathing apparatus.

Combustion Products: Highly dependent on combustion conditions. A complex mixture of airborne solids, liquids, and gases including carbon monoxide, carbon dioxide, and unidentified organic compounds will be evolved when this material undergoes combustion.

SECTION 6 ACCIDENTAL RELEASE MEASURES

Protective Measures: Eliminate all sources of ignition in vicinity of spilled material.

Spill Management: Stop the source of the release if you can do it without risk. Contain release to prevent further contamination of soil, surface water or groundwater. Clean up spill as soon as possible,

observing precautions in Exposure Controls/Personal Protection. Use appropriate techniques such as applying non-combustible absorbent materials or pumping. Where feasible and appropriate, remove contaminated soil. Place contaminated materials in disposable containers and dispose of in a manner consistent with applicable regulations.

Reporting: Report spills to local authorities and/or the U.S. Coast Guard's National Response Center at (800) 424-8802 as appropriate or required.

SECTION 7 HANDLING AND STORAGE

Precautionary Measures: DO NOT USE IN HIGH PRESSURE SYSTEMS in the vicinity of flames, sparks and hot surfaces. Use only in well ventilated areas. Keep container closed. Keep out of the reach of children.

General Handling Information: Avoid contaminating soil or releasing this material into sewage and drainage systems and bodies of water.

Static Hazard: Electrostatic charge may accumulate and create a hazardous condition when handling this material. To minimize this hazard, bonding and grounding may be necessary but may not, by themselves, be sufficient. Review all operations which have the potential of generating and accumulating an electrostatic charge and/or a flammable atmosphere (including tank and container filling, splash filling, tank cleaning, sampling, gauging, switch loading, filtering, mixing, agitation, and vacuum truck operations) and use appropriate mitigating procedures. For more information, refer to OSHA Standard 29 CFR 1910.106, 'Flammable and Combustible Liquids', National Fire Protection Association (NFPA 77, 'Recommended Practice on Static Electricity', and/or the American Petroleum Institute (API) Recommended Practice 2003, 'Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents'.

Container Warnings: Container is not designed to contain pressure. Do not use pressure to empty container or it may rupture with explosive force. Empty containers retain product residue (solid, liquid, and/or vapor) and can be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, static electricity, or other sources of ignition. They may explode and cause injury or death. Empty containers should be completely drained, properly closed, and promptly returned to a drum reconditioner or disposed of properly.

SECTION 8 EXPOSURE CONTROLS/PERSONAL PROTECTION

GENERAL CONSIDERATIONS:

Consider the potential hazards of this material (see Section 3), applicable exposure limits, job activities, and other substances in the work place when designing engineering controls and selecting personal protective equipment. If engineering controls or work practices are not adequate to prevent exposure to harmful levels of this material, the personal protective equipment listed below is recommended. The user should read and understand all instructions and limitations supplied with the equipment since protection is usually provided for a limited time or under certain circumstances.

ENGINEERING CONTROLS:

Use in a well-ventilated area.

PERSONAL PROTECTIVE EQUIPMENT

Eye/Face Protection: No special eye protection is normally required. Where splashing is possible, wear safety glasses with side shields as a good safety practice.

Skin Protection: No special protective clothing is normally required. Where splashing is possible, select protective clothing depending on operations conducted, physical requirements and other substances in the workplace. Suggested materials for protective gloves include: Nitrile Rubber, Silver Shield, Viton.

Respiratory Protection: No respiratory protection is normally required.

If user operations generate an oil mist, determine if airborne concentrations are below the occupational exposure limit for mineral oil mist. If not, wear an approved respirator that provides adequate protection

from the measured concentrations of this material. For air-purifying respirators use a particulate cartridge.

Use a positive pressure air-supplying respirator in circumstances where air-purifying respirators may not provide adequate protection.

Occupational Exposure Limits:

| Component | Agency | TWA | STEL | Ceiling | Notation |
|--|----------|---------|----------|---------|----------|
| Highly refined mineral oil (C15 - C50) | ACGIH | 5 mg/m3 | 10 mg/m3 | -- | -- |
| Highly refined mineral oil (C15 - C50) | OSHA Z-1 | 5 mg/m3 | -- | -- | -- |

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Attention: the data below are typical values and do not constitute a specification.

Color: Colorless to yellow

Physical State: Liquid

Odor: Petroleum odor

pH: Not Applicable

Vapor Pressure: <0.01 mmHg @ 37.8 °C (100 °F)

Vapor Density (Air = 1): >1

Boiling Point: >260°C (500°F)

Solubility: Soluble in hydrocarbons; insoluble in water

Freezing Point: Not Applicable

Specific Gravity: 0.87 - 0.88 @ 15.6°C (60.1°F) / 15.6°C (60.1°F)

Viscosity: 7 cSt @ 100°C (212°F) (Min)

SECTION 10 STABILITY AND REACTIVITY

Chemical Stability: This material is considered stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.

Incompatibility With Other Materials: May react with strong acids or strong oxidizing agents, such as chlorates, nitrates, peroxides, etc.

Hazardous Decomposition Products: None known (None expected)

Hazardous Polymerization: Hazardous polymerization will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

IMMEDIATE HEALTH EFFECTS

Eye Irritation: The eye irritation hazard is based on evaluation of data for similar materials or product components.

Skin Irritation: The skin irritation hazard is based on evaluation of data for similar materials or product components.

Skin Sensitization: No product toxicology data available.

Acute Dermal Toxicity: The acute dermal toxicity hazard is based on evaluation of data for similar materials or product components.

Acute Oral Toxicity: The acute oral toxicity hazard is based on evaluation of data for similar materials or product components.

Acute Inhalation Toxicity: The acute inhalation toxicity hazard is based on evaluation of data for similar materials or product components.

ADDITIONAL TOXICOLOGY INFORMATION:

This product contains petroleum base oils which may be refined by various processes including severe solvent extraction, severe hydrocracking, or severe hydrotreating. None of the oils requires a cancer warning under the OSHA Hazard Communication Standard (29 CFR 1910.1200). These oils have not been listed in the National Toxicology Program (NTP) Annual Report nor have they been classified by the International Agency for Research on Cancer (IARC) as; carcinogenic to humans (Group 1), probably carcinogenic to humans (Group 2A), or possibly carcinogenic to humans (Group 2B). These oils have not been classified by the American Conference of Governmental Industrial Hygienists (ACGIH) as: confirmed human carcinogen (A1), suspected human carcinogen (A2), or confirmed animal carcinogen with unknown relevance to humans (A3).

SECTION 12 ECOLOGICAL INFORMATION**ECOTOXICITY**

The toxicity of this material to aquatic organisms has not been evaluated. Consequently, this material should be kept out of sewage and drainage systems and all bodies of water.

ENVIRONMENTAL FATE

This material is not expected to be readily biodegradable.

SECTION 13 DISPOSAL CONSIDERATIONS

Use material for its intended purpose or recycle if possible. Oil collection services are available for used oil recycling or disposal. Place contaminated materials in containers and dispose of in a manner consistent with applicable regulations. Contact your sales representative or local environmental or health authorities for approved disposal or recycling methods.

SECTION 14 TRANSPORT INFORMATION

The description shown may not apply to all shipping situations. Consult 49CFR, or appropriate Dangerous Goods Regulations, for additional description requirements (e.g., technical name) and mode-specific or quantity-specific shipping requirements.

DOT Shipping Description: PETROLEUM LUBRICATING OIL, NOT REGULATED AS A HAZARDOUS MATERIAL FOR TRANSPORTATION UNDER 49 CFR

Additional Information: NOT HAZARDOUS BY U.S. DOT. ADR/RID HAZARD CLASS NOT APPLICABLE.

IMO/IMDG Shipping Description: PETROLEUM LUBRICATING OIL; NOT REGULATED AS DANGEROUS GOODS FOR TRANSPORT UNDER THE IMDG CODE

ICAO/IATA Shipping Description: PETROLEUM LUBRICATING OIL; NOT REGULATED AS DANGEROUS GOODS FOR TRANSPORT UNDER ICAO

SECTION 15 REGULATORY INFORMATION**EPCRA 311/312 CATEGORIES:**

- | | |
|---------------------------------------|----|
| 1. Immediate (Acute) Health Effects: | NO |
| 2. Delayed (Chronic) Health Effects: | NO |
| 3. Fire Hazard: | NO |
| 4. Sudden Release of Pressure Hazard: | NO |
| 5. Reactivity Hazard: | NO |

REGULATORY LISTS SEARCHED:

01-1=IARC Group 1
01-2A=IARC Group 2A
01-2B=IARC Group 2B
02=NTP Carcinogen
03=EPCRA 313
04=CA Proposition 65
05=MA RTK
06=NJ RTK
07=PA RTK

The following components of this material are found on the regulatory lists indicated.

Zinc alkyl dithiophosphate 03, 06

CHEMICAL INVENTORIES:

All components comply with the following chemical inventory requirements: AICS (Australia), DSL (Canada), EINECS (European Union), ENCS (Japan), KECI (Korea), TSCA (United States).

One or more components does not comply with the following chemical inventory requirements: IECSC (China), PICCS (Philippines).

NEW JERSEY RTK CLASSIFICATION:

Under the New Jersey Right-to-Know Act L. 1983 Chapter 315 N.J.S.A. 34:5A-1 et. seq., the product is to be identified as follows: PETROLEUM OIL (Automatic transmission fluid)

WHMIS CLASSIFICATION:

This product is not considered a controlled product according to the criteria of the Canadian Controlled Products Regulations.

SECTION 16 OTHER INFORMATION

NFPA RATINGS: Health: 0 Flammability: 1 Reactivity: 0

HMIS RATINGS: Health: 1 Flammability: 1 Reactivity: 0
(0-Least, 1-Slight, 2-Moderate, 3-High, 4-Extreme, PPE:- Personal Protection Equipment Index recommendation, *- Chronic Effect Indicator). These values are obtained using the guidelines or published evaluations prepared by the National Fire Protection Association (NFPA) or the National Paint and Coating Association (for HMIS ratings).

LABEL RECOMMENDATION:

Label Category : INDUSTRIAL OIL 1

REVISION STATEMENT: This revision updates the following sections of this Material Safety Data Sheet: 1-16

Revision Date: 07/26/2005

ABBREVIATIONS THAT MAY HAVE BEEN USED IN THIS DOCUMENT:

| | |
|---|---|
| TLV - Threshold Limit Value | TWA - Time Weighted Average |
| STEL - Short-term Exposure Limit | PEL - Permissible Exposure Limit |
| | CAS - Chemical Abstract Service Number |
| ACGIH - American Conference of Government | IMO/IMDG - International Maritime Dangerous Goods |

| | |
|--|--|
| Industrial Hygienists | Code |
| API - American Petroleum Institute | MSDS - Material Safety Data Sheet |
| CVX - ChevronTexaco | NFPA - National Fire Protection Association (USA) |
| DOT - Department of Transportation (USA) | NTP - National Toxicology Program (USA) |
| IARC - International Agency for Research on Cancer | OSHA - Occupational Safety and Health Administration |

Prepared according to the OSHA Hazard Communication Standard (29 CFR 1910.1200) and the ANSI MSDS Standard (Z400.1) by the ChevronTexaco Energy Research & Technology Company, 100 Chevron Way, Richmond, California 94802.

The above information is based on the data of which we are aware and is believed to be correct as of the date hereof. Since this information may be applied under conditions beyond our control and with which we may be unfamiliar and since data made available subsequent to the date hereof may suggest modifications of the information, we do not assume any responsibility for the results of its use. This information is furnished upon condition that the person receiving it shall make his own determination of the suitability of the material for his particular purpose.

MATERIAL SAFETY DATA SHEET

Date Issued: 12/24/02

American Tool Companies, Inc.
Wilmington Division
92 Grant Street
Wilmington, Ohio 45177

Technical Contact: Jeff Curry
(937) 382-3811 (8:00-5:00 EST)

1. SUBSTANCE IDENTIFICATION

| | |
|-----------------|---|
| Substance Name: | Strait-Line® Marking Chalk (Blue) |
| Description: | Powdered Chalk |
| General Use: | Refill for self-chalking chalk line reels |

2. COMPOSITION/INGREDIENT INFORMATION

| Component | CAS No. | % by weight | Exposure Limit 8-Hour TWA (mg/m ³) | | |
|--|--------------------------|-------------|--|--------------------------------|--------------------------------|
| | | | OSHA PEL | ACGIH TLV | NIOSH REL |
| Calcium Carbonate (Limestone) | 471-34-1;
(1317-65-3) | 75-85 | 15 ¹ 5 ² | 10 ¹ | 10 ¹ 5 ² |
| Sodium Alumino Sulphosilicate | 57455-37-5 | 10-20 | 15 ¹ 5 ² | 10 ¹ 3 ² | |
| Magnesite | 546-93-0 | 4-6 | 15 ¹ 5 ² | 10 ¹ | 15 ¹ 5 ² |
| Silica-Crystalline Quartz ³ | 14808-60-7 | 0.01-3.0 | 2.0 ^{2,4} | 0.05 ² | 0.05 ² |

¹ Total dust.

² Respirable dust.

³ Calcium carbonate may contain crystalline silica at levels between 0.01 and 4.0 % and varies naturally.

⁴ Using the OSHA quartz formula, this PEL was calculated assuming a crystalline silica content of 3.0% in this ingredient.

TWA = Time-weighted average.

3. HAZARDS IDENTIFICATION

Hazardous Material Identification System (HMIS):

Health 1*, Flammability 0, Reactivity 0.

*chronic effects

EMERGENCY OVERVIEW: Non-combustible blue solid powder with no odor. Mildly irritating to eyes, skin, and respiratory system. Exposure to large quantities of this material may cause acute irritation of eyes and difficulty breathing.

POTENTIAL HEALTH EFFECTS: Exposure to Strait-Line® Marking Chalk is primarily through contact with dust from this material created during handling and use of the chalk. Acute health effects include minor irritation of the eyes, skin, and respiratory tract.

Substance Name: Strait-Line® Marking Chalk (Blue)

Date Issued: 12/24/02

INHALATION: Acute exposure to dust levels above exposure limits (Section 2) may cause irritation of the respiratory system with sneezing and coughing.

EYE CONTACT: Contact with dust or powder may cause mechanical irritation and pain, watering of eyes, and eyelid inflammation.

SKIN CONTACT: When the product is used as intended, it is not considered to cause discomfort. Prolonged skin contact may produce moderate irritation.

INGESTION: Considered an unlikely route of entry in commercial/industrial environments. Small amounts of low dose rates are regarded as practically non-harmful. This material acts as a mild laxative. In excessive quantity, may cause stomach distension with pain.

CHRONIC: Repeated and prolonged inhalation exposure to crystalline silica dust above exposure limits may cause delayed, chronic lung injury (silicosis). When the product is used as intended, dust levels should not exceed exposure limits. See Sections 2 and 11.

4. FIRST AID MEASURES

INHALATION: Remove exposed person to fresh air; restore and/or support his or her breathing as needed. Encourage the victim to cough, spit out, and blow nose to remove dust. Seek medical attention if irritation or discomfort persist.

EYE CONTACT: Rubbing eyes may cause abrasions. Gently lift the eyelids and flush immediately and continuously with copious amounts of water for at least 15 minutes. If irritation continues, seek medical attention.

SKIN CONTACT: Wet clothing first to minimize dust generation, then remove contaminated clothing. Do not shake or blow dust off clothing or body. Wash affected skin with soap and water. Launder contaminated clothing before wearing again. Seek medical attention in event of irritation.

INGESTION: Never give anything by mouth to an unconscious person. Rinse mouth out with plenty of water. If ingested, have that conscious person drink 2 to 3 glasses of water, do not induce vomiting. Consult with a physician or medically trained personnel at a poison control center.

5. FIRE-FIGHTING MEASURES

FLASHPOINT: None identified.

FLAMMABLE LIMITS: None identified.

AUTOIGNITION TEMPERATURE: None identified.

Substance Name: Strait-Line® Marking Chalk (Blue)

Date Issued: 12/24/02

HAZARDOUS COMBUSTION PRODUCTS: In fires sustained by other combustible material, this product may undergo chemical change with the release of heat, and toxic, irritating sulfur dioxide gas.

EXTINGUISHING MEDIA: This material is noncombustible. Use extinguishing agents that will put out the surrounding fire.

FIRE-FIGHTING INSTRUCTIONS: Suitable breathing apparatus should be worn by fire-fighters.

6. ACCIDENTAL-RELEASE MEASURES

Notify safety and environmental personnel of spills or leaks. For large spills (e.g. more than 8 ounces), cleanup personnel need protection against eye contact and dust inhalation. Prevent spillage from entering sewers, or storm sewers, which includes sinks, toilets, and floor drains. Recover the product whenever possible. Avoid creating dust during cleanup. Shovel the material or use high-efficiency particulate air (H.E.P.A.) filtered vacuum, wet sweeping compound or water for cleanup so that airborne dust does not exceed exposure limits. **Do not dry sweep. Do not blow with air, which could cause a dusting problem.** Follow applicable OSHA regulations (29 CFR 1910.120).

7. HANDLING AND STORAGE

HANDLING: Store this material in a closed container and handle so as to minimize dusting or any material leaks. Do not mix with acids. Practice good personal hygiene after using this material. Keep containers closed when not in use.

STORAGE: Do not store near acids. Do not store in areas where there is a risk of fire.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS: Use sufficient general area ventilation. Local exhaust ventilation should be used if airborne levels of dust exceed the exposure limits cited in Section 2.

RESPIRATORY PROTECTION: When engineering controls are not sufficient to reduce exposure, seek professional advice prior to respirator selection and use. Wear NIOSH-approved respirator selected per OSHA 29 CFR 1910.134 to reduce concentrations inside the respirator below exposure limits cited in Section 2.

SKIN PROTECTION: No special equipment needed when handling small quantities, e.g. refilling chalk-line reel.

EYE PROTECTION: Wear protective eyeglasses or chemical safety goggles in windy conditions or where eye contact is possible, as required by OSHA regulations (29 CFR 1910.133).

Substance Name: Strait-Line® Marking Chalk (Blue)

Date Issued: 12/24/02

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|--|---|
| Appearance: | Blue |
| Physical State: | Powder |
| Odor: | None |
| pH: (at 10% solids) | 8.5-9.5 |
| Boiling Point: | Not applicable |
| Melting Point: | Decomposes at 1517°F (825°C) (Releases sulfur above 752°F, 400°C) |
| Vapor Pressure (at 20°C): | Not applicable |
| Percent Volatile: | 0 |
| Vapor Density (Air=1): | Not applicable |
| Solubility in Water: | <0.0002 (Trace) |
| Octanol/Water Partition Coefficient: | Not applicable |
| Specific Gravity (H ₂ O=1): | 2.5-2.7 |
| Volatile organic compound (VOC) content: | 0 percent |

10. STABILITY AND REACTIVITY

GENERAL: This product is stable under normal storage and handling conditions.

CONDITIONS TO AVOID: Avoid contact with acids.

CHEMICAL INCOMPATIBILITIES: Ignites on contact with fluorine. Reacts with acids to liberate carbon dioxide and sulfur dioxide.

HAZARDOUS DECOMPOSITION PRODUCTS: Sulfur dioxide and carbon dioxide.

HAZARDOUS POLYMERIZATION: Does not occur.

11. TOXICOLOGICAL INFORMATION

Note: Toxicologic effects described in this section are those that would be expected based on data for the components of the product.

EYE: (Calcium Carbonate)

Rabbit: 0.750 mg administered for 24 hours produces severe irritation.

SKIN: (Calcium Carbonate)

Rabbit: 500 mg administered for 24 hours produces moderate skin irritation.

INGESTION: (Calcium Carbonate) Rat: LD₅₀: 6450 mg/kg.

(Sodium Alumino Sulphosilicate) Rat: LD₅₀: > 10,000 mg/kg.

INHALATION: (Silica, Crystalline-Quartz)

Human: LC_{Lo}: 300 µg/m³ intermittent exposure over a 10 year period produced pulmonary system effects.

Substance Name: Strait-Line® Marking Chalk (Blue)

Date Issued: 12/24/02

TARGET ORGANS: Eyes, respiratory tract, and skin.

CHRONIC/CARCINOGENICITY: The International Agency for Research on Cancer (IARC) has designated Silica, Crystalline-Quartz: Group 1A, carcinogenic to humans; National Toxicology Program (NTP), Group K, known to be a human carcinogen.

TERATOLOGY: No data.

REPRODUCTION: No data.

MUTAGENICITY: No data.

12. ECOLOGICAL INFORMATION

Limestone and other ingredients are not classified as a "toxic pollutant" or a "hazardous substance" under Section 307 and 311 of the Clean Water Act. The pigment in this product is extremely stable, except under acidic conditions, where it will decompose to white siliceous material with the evolution of hydrogen sulfide.

13. DISPOSAL CONSIDERATIONS

RCRA Hazardous Waste (40 CFR 261): This materials in this product are not listed wastes. Review Federal, state and local government requirements prior to disposal. Do not dispose of the product in storm sewer or sanitary sewer, which includes sinks, toilets, and floor drains. Disposal by landfill may be acceptable.

Consult an expert on the disposal of recovered material. Ensure conformity with Federal, state, and local disposal regulations.

14. TRANSPORT INFORMATION (NOT MEANT TO BE ALL INCLUSIVE) (49 CFR 172.101-2)

Department of Transportation (DOT) hazard class: Non-regulated material.
International Air Transport Association (IATA) hazard class: Non-regulated material.

15. REGULATORY INFORMATION

U.S. FEDERAL REGULATIONS

OSHA: Ingredients are listed as air contaminants (29 CFR 1910.1000). Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

TSCA (Toxic Substance Control Act): All components of this product are listed on the TSCA inventory.

Substance Name: Strait-Line® Marking Chalk (Blue)

Date Issued: 12/24/02

CERCLA: Hazardous Substance, (40 CFR 302.4): Not Listed

Extremely Hazardous Substance (40 CFR 355): Not Listed

SARA Hazard Category: This product has been reviewed according to the EPA "Hazard Categories" promulgated under Sections 311 and 312 of the Superfund Amendment and Reauthorization Act of 1986 (SARA Title III) and is considered, under applicable definitions, to meet the following category: "An immediate (acute) and chronic health hazard."

Chemicals subject to the reporting requirements of Section 313 or Title III of SARA and 40 CFR Part 372: None.

STATE REGULATIONS: California's "Safe Drinking Water and Toxic Enforcement Act of 1986" (Proposition 65).

This product contains the following Proposition 65 regulated materials known to the State of California to cause cancer or reproductive harm. The listed typical amounts are a result of their natural presence in the raw materials from which this product is produced.

| | |
|---------------------------|------------------------------------|
| arsenic | less than 2 part per million (ppm) |
| chromium | 3 ppm |
| mercury | less than 0.2 ppm |
| lead | less than 4 ppm |
| nickel | less than 15 ppm |
| silica-crystalline quartz | less than 3.0 percent |

16. OTHER INFORMATION

MSDS Status: This MSDS replaces the version dated 12/20/99. Sections 2, 3, 4, 6, 7, 8, 11, 15, and 16 have been revised.

To the best of our knowledge, the information contained herein is accurate. However, neither American Tool Companies, Inc. nor any of its subsidiaries or contractors assume any liability whatsoever for the accuracy or completeness of this information. The information relates to this specific material. It may not be valid for this material if used in combination with other materials or in any process. The user is responsible for the suitability and completeness of this information for his/her own particular use.

Prepared by: Larry Verdier, CIH, CSP, Shaw Environmental, Inc.
for the American Tool Companies, Inc.



Mystik® JT-6® Multi-Purpose Grease, No. 2

Material Safety Data Sheet

CITGO Petroleum Corporation
P.O. Box 3758
Tulsa, OK 74102-3758

MSDS No. 665006002

Revision Date 04/15/2003

IMPORTANT: Read this MSDS before handling or disposing of this product and pass this information on to employees, customers and users of this product.

Emergency Overview

Physical State Semi-solid to solid (Smooth and adhesive)
Color Amber. **Odor** Mild petroleum odor

WARNING:

Injection under the skin can cause severe injury.
Most damage occurs in the first few hours.
Initial symptoms may be minimal.
Hot grease will cause thermal burns upon contact.
Spills may create a slipping hazard.

Hazard Rankings

| | HMIS | NFPA |
|---------------|------|------|
| Health Hazard | 1 | 0 |
| Fire Hazard | 1 | 1 |
| Reactivity | 0 | 0 |

* = Chronic Health Hazard

Protective Equipment

Minimum Recommended
See Section 8 for Details



SECTION 1: IDENTIFICATION

| | | | |
|-----------------------|---|--|----------------|
| Trade Name | Mystik® JT-6® Multi-Purpose Grease, No. 2 | Technical Contact | (800) 248-4684 |
| Product Number | 665006002 | Medical Emergency | (918) 495-4700 |
| CAS Number | Mixture. | CHEMTREC Emergency (United States Only) | (800) 424-9300 |
| Product Family | Lubricating grease | | |
| Synonyms | Lubricating grease;
CITGO Material Code No.: 665006002, 665995002, 663996002 | | |

SECTION 2: COMPOSITION

| Component Name(s) | CAS Registry No. | Concentration (%) |
|---|---------------------|-------------------|
| Distillates, petroleum, hydrotreated light naphthenic | 64742-53-6 | 0 - 90 |
| Distillates, petroleum, hydrotreated heavy naphthenic | 64742-52-5 | 0 - 90 |
| Calcium, 12-hydroxy Stearate | 3159-62-4 | 1 - 15 |
| Proprietary Ingredients | Proprietary Mixture | 0 - 5 |
| Antimony and antimony compounds | Proprietary | 0 - 1 |

SECTION 3: HAZARDS IDENTIFICATION

Also see Emergency Overview and Hazard Ratings on the top of Page 1 of this MSDS.

Major Route(s) of Entry Skin contact.

Signs and Symptoms of Acute Exposure

999-10532-0204

Mystik® JT-6® Multi-Purpose Grease, No. 2

| | |
|--|--|
| Inhalation | No significant adverse health effects are expected to occur upon short-term exposure at ambient temperatures. At elevated temperatures, product vapor may cause respiratory tract irritation. Repeated or prolonged overexposure to product mists can result in respiratory tract inflammation and an increased risk of infection. |
| Eye Contact | This material can cause mild eye irritation from contact with product or product mists. |
| Skin Contact | This material can cause mild skin irritation from prolonged or repeated skin contact. Injection under the skin can cause inflammation and swelling. Injection of pressurized hydrocarbons can cause severe, permanent tissue damage. Initial symptoms may be minor. Injection of petroleum hydrocarbons requires immediate medical attention. Skin contact with hot material may result in severe burns. |
| Ingestion | This material can cause a laxative effect. If swallowed in large quantities, this material can obstruct the intestine. |
| Chronic Health Effects Summary | Contains a petroleum-based mineral oil. Prolonged or repeated skin contact can cause mild irritation and inflammation characterized by drying, cracking, (dermatitis) or oil acne. Repeated or prolonged inhalation of petroleum-based mineral oil mists at concentrations above applicable workplace exposure levels can cause respiratory irritation or other pulmonary effects. |
| Conditions Aggravated by Exposure | Medical conditions aggravated by exposure to this material may include pre-existing skin disorders. |
| Target Organs | This material may cause damage to the following organs: skin. |
| Carcinogenic Potential | This product does not contain any components at concentrations above 0.1% which are considered carcinogenic by OSHA, IARC or NTP. |

OSHA Hazard Classification is indicated by an "X" in the box adjacent to the hazard title. If no "X" is present, the product does not exhibit the hazard as defined in the OSHA Hazard Communication Standard (29 CFR 1910.1200).

| OSHA Health Hazard Classification | | | | OSHA Physical Hazard Classification | | | | | |
|-----------------------------------|--------------------------|--------------|--------------------------|-------------------------------------|--------------------------|------------------|--------------------------|----------------|--------------------------|
| Irritant | ☐ | Toxic | ☐ | Combustible | ☐ | Explosive | ☐ | Pyrophoric | ☐ |
| Sensitizer | ☐ | Highly Toxic | ☐ | Flammable | ☐ | Oxidizer | ☐ | Water-reactive | ☐ |
| Corrosive | ☐ | Carcinogenic | ☐ | Compressed Gas | ☐ | Organic Peroxide | ☐ | Unstable | ☐ |

SECTION 4: FIRST AID MEASURES

Take proper precautions to ensure your own health and safety before attempting rescue or providing first aid. For more specific information, refer to Exposure Controls and Personal Protection in Section 8 of this MSDS.

| | |
|---------------------------|--|
| Inhalation | Vaporization is not expected at ambient temperatures. This material is not expected to cause inhalation-related disorders under anticipated conditions of use. In case of overexposure, move the person to fresh air. |
| Eye Contact | Check for and remove contact lenses. Flush eyes with cool, clean, low-pressure water while occasionally lifting and lowering eyelids. Seek medical attention if excessive tearing, redness, or pain persists. |
| Skin Contact | If burned by hot material, cool skin by quenching with large amounts of cool water. For contact with product at ambient temperatures, remove contaminated shoes and clothing. Wipe off excess material. Wash exposed skin with mild soap and water. Seek medical attention if tissue appears damaged or if pain or irritation persists. Thoroughly clean contaminated clothing before reuse. Discard contaminated leather goods. If material is injected under the skin, seek medical attention immediately. |
| Ingestion | Do not induce vomiting unless directed to by a physician. Rinse out mouth with water. Never give anything by mouth to a person who is not fully conscious. Allow small quantities to pass through the digestive system. If large amounts are swallowed or irritation or discomfort occurs, seek medical attention immediately. |
| Notes to Physician | In the event of injection in underlying tissue, immediate treatment should include extensive incision, debridement and saline irrigation. Inadequate treatment can result in ischemia and gangrene. Early symptoms may be minimal. |

SECTION 5: FIRE FIGHTING MEASURES

| | | | |
|---|---|------------------------------|----------|
| NFPA Flammability Classification | NFPA Class-IIIB combustible material. | | |
| Flash Point Method | Open cup: >150°C (>302°F) (Estimated.). | | |
| Lower Flammable Limit | No data. | Upper Flammable Limit | No data. |
| Autoignition Temperature | Not available. | | |
| Hazardous Combustion Products | Carbon dioxide, carbon monoxide, smoke, fumes, unburned hydrocarbons and trace oxides of sulfur, antimony, phosphorus and/or nitrogen. | | |
| Special Properties | Fight the fire from a safe distance in a protected location. Open any masses with a water stream to prevent reignition due to smoldering. Cool surface with water fog. Molten material can form flaming droplets if ignited. Water or foam can cause frothing. Use of water on product above 100° C (212° F) can cause product to expand with explosive force. Do not allow liquid runoff to enter sewers or public waters. | | |
| Extinguishing Media | Use dry chemical, foam, Carbon Dioxide or water fog. | | |
| Protection of Fire Fighters | Firefighters must use full bunker gear including NIOSH-approved positive pressure self-contained breathing apparatus to protect against potential hazardous combustion or decomposition products and oxygen deficiencies. | | |

SECTION 6: ACCIDENTAL RELEASE MEASURES

Take proper precautions to ensure your own health and safety before attempting spill control or clean-up. For more specific information, refer to the Emergency Overview on Page 1, Exposure Controls and Personal Protection in Section 8 and Disposal Considerations in Section 13 of this MSDS.

Do not touch damaged containers or spilled material unless wearing appropriate protective equipment. Slipping hazard; do not walk through spilled material. Stop leak if you can do so without risk. For small spills, absorb or cover with dry earth, sand, or other inert non-combustible absorbent material and place into waste containers for later disposal. Contain large spills to maximize product recovery or disposal. Prevent entry into waterways or sewers. In urban area, cleanup spill as soon as possible. In natural environments, seek cleanup advice from specialists to minimize physical habitat damage. This material will float on water. Absorbent pads and similar materials can be used. Comply with all laws and regulation

SECTION 7: HANDLING AND STORAGE

| | |
|-----------------|--|
| Handling | If this product is stored or applied in high-pressure systems such as grease guns or hydraulic lines, there is the potential for accidental injection into the skin and underlying tissues. Hydrocarbons injected into skin or underlying tissues are not readily removed by body fluids and can cause pain, swelling, chemical irritation, infection and tissue destruction. Early symptoms may be minimal. Workers must be aware of the significant hazards associated with a hydrocarbon injection injury. In the event of an injection injury, workers should seek medical treatment immediately. Avoid water contamination and elevated temperatures to minimize product degradation. Empty containers may contain product residues that can ignite with explosive force. Do not pressurize, cut, weld, braze solder, drill, grind or expose containers to flames, sparks, heat or other potential ignition sources. Consult appropriate federal, state and local authorities before reusing, reconditioning, reclaiming, recycling or disposing of empty containers and/or waste residues of this product. |
| Storage | Keep container closed. Do not store with strong oxidizing agents. Do not store at elevated temperatures. Avoid storing product in direct sunlight for extended periods of time. Consult appropriate federal, state and local authorities before reusing, reconditioning, reclaiming, recycling or disposing of empty containers or waste residues of this product. |

SECTION 8: EXPOSURE CONTROLS AND PERSONAL PROTECTION

Engineering Controls

Ventilation controls are not normally required under anticipated conditions of use. Provide exhaust ventilation or other engineering controls if airborne mists or vapors concentrations exceed recommended occupational exposure limits listed below. An eye wash station and safety shower should be located near the work-station.

Personal Protective Equipment

Personal protective equipment should be selected based upon the conditions under which this material is used. A hazard assessment of the work area for PPE requirements should be conducted by a qualified professional pursuant to OSHA regulations. The following pictograms represent the minimum requirements for personal protective equipment. For certain operations, additional PPE may be required.



Eye Protection

Safety glasses equipped with side shields are recommended as minimum protection in industrial settings. Wear goggles and/or face shield if splashing or spraying is anticipated. Wear goggles and face shield if material is heated above 125°F (51°C). Have suitable eye wash water available.

Hand Protection

Use gloves constructed of chemical resistant materials such as neoprene or heavy nitrile rubber if frequent or prolonged contact is expected. Use heat-protective gloves when handling product at elevated temperatures.

Body Protection

Use clean and impervious protective clothing (e.g., neoprene or Tyvek®) if splashing or spraying conditions are present. Protective clothing may include long-sleeve outer garment, apron, or lab coat. If significant contact occurs, remove oil-contaminated clothing as soon as possible and promptly shower. Launder contaminated before reuse or discard. Wear heat protective boots and protective clothing when handling material at elevated temperatures.

Respiratory Protection

Vaporization is not expected at ambient temperatures. Therefore, the need for respiratory protection is not anticipated under normal use conditions and with adequate ventilation. If elevated airborne concentrations above applicable workplace exposure levels are anticipated, a NIOSH-approved organic vapor respirator equipped with a dust/mist prefilter should be used. Protection factors vary depending upon the type of respirator used. Respirators should be used in accordance with OSHA requirements (29 CFR 1910.134).

General Comments

Use good personal hygiene practices. Wash hands and other exposed skin areas with plenty of mild soap and water before eating, drinking, smoking, use of toilet facilities, or leaving work. DO NOT use gasoline, kerosene, solvents or harsh abrasives as skin cleaners. Since specific exposure standards/control limits have not been established for this product, the "Oil Mist, Mineral" exposure limits shown below are suggested as minimum control guidelines.

Occupational Exposure Guidelines

Substance

Oil Mist, Mineral

Applicable Workplace Exposure Levels

ACGIH (United States).

TWA: 5 mg/m³

STEL: 10 mg/m³

OSHA (United States).

TWA: 5 mg/m³

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES (TYPICAL)

| | | | | | |
|-------------------------|---|--------------|-----------------|-------------------------------|---------------------|
| Physical State | Semi-solid to solid (Smooth and adhesive) | Color | Amber. | Odor | Mild petroleum odor |
| Specific Gravity | Not available. | pH | Not Applicable. | Vapor Density | >10 (Air = 1) |
| Boiling Range | Not applicable. | | | Melting/Freezing Point | Not available. |

Mystik® JT-6® Multi-Purpose Grease, No. 2

Vapor Pressure <0.001 kPa (<0.01 mmHg) (at 20°C)

Viscosity (cSt @ 40°C) 1080

Solubility in Water Insoluble in cold water.

Volatile Characteristics Negligible volatility

Additional Properties NLGI Grade: 2
Thickener: Calcium
Texture: Adhesive

SECTION 10: STABILITY AND REACTIVITY

Chemical Stability Stable.

Hazardous Polymerization Not expected to occur.

Conditions to Avoid Keep away from extreme heat, sparks, open flame, and strongly oxidizing conditions.

Materials Incompatibility Strong oxidizers.

Hazardous Decomposition Products No additional hazardous decomposition products were identified other than the combustion products identified in Section 5 of this MSDS.

SECTION 11: TOXICOLOGICAL INFORMATION

For other health-related information, refer to the Emergency Overview on Page 1 and the Hazards Identification in Section 3 of this MSDS.

Toxicity Data

Distillates, petroleum, hydrotreated light naphthenic:

ORAL (LD50): Acute: >5000 mg/kg [Rat].
DERMAL (LD50): Acute: >2000 mg/kg [Rabbit].

INHALATION (LC50) Acute: 9.6 mg/L (Female Rat).
INHALATION (LC50) Acute: 10.5 mg/L (Male Rat).
DRAIZE EYE Acute: Non-irritating (Rabbit).
DRAIZE DERMAL Acute: Mild skin irritant (Rabbit).
BUEHLER DERMAL Acute: Non-sensitizing (Guinea Pig).
28-Day DERMAL Sub-Chronic: Mild to moderate skin irritant (Rabbit & Rat).

A life-time dermal application of severely hydrotreated light naphthenic oils produced skin masses on mice which correlated with the skin irritation response levels of the test animals. Additional studies attribute these masses to a weak promotional activity. These studies indicate that light naphthenic oils are not mutagenic, tumor initiators nor complete chemical carcinogens. These materials have not been determined to be carcinogenic by IARC, NTP or OSHA.

Distillates, petroleum, hydrotreated heavy naphthenic:

ORAL (LD50): Acute: >5000 mg/kg [Rat].
DERMAL (LD50): Acute: >2000 mg/kg [Rabbit].

Mineral oil mists derived from highly refined oils are reported to have low acute and sub-acute toxicities in animals. Effects from single and short-term repeated exposures to high concentrations of mineral oil mists well above applicable workplace exposure levels include lung inflammatory reaction, lipoid granuloma formation and lipoid pneumonia. In acute and sub-acute studies involving exposures to lower concentrations of mineral oil mists at or near current work place exposure levels produced no significant toxicological effects.

Grease:

Injection of pressurized hydrocarbons under the skin, in muscle or into the blood stream can cause irritation, inflammation, swelling, fever and mild central nervous system depression. Injection of pressurized hydrocarbons can cause severe, permanent tissue damage.

SECTION 12: ECOLOGICAL INFORMATION

| | |
|---------------------------|--|
| Ecotoxicity | Ecotoxicity data are not available for this product. |
| Environmental Fate | An environmental fate analysis has not been conducted on this specific product. Plants and animals may experience harmful or fatal effects when coated with petroleum-based products. Petroleum-based (mineral) lube oils will normally float on water. In stagnant or slow-flowing waterways, an oil layer can cover a large surface area. As a result, this oil layer might limit or eliminate natural atmospheric oxygen transport into the water. With time, if not removed, oxygen depletion in the waterway can result in a loss of marine life or create an anaerobic environment. This material contains phosphorus which is a controlled element for disposal in effluent waters in most sections of North America. Phosphorus is known to enhance the formation of algae. Severe algae growth can reduce oxygen content in the water possibly below levels necessary to support marine life. |

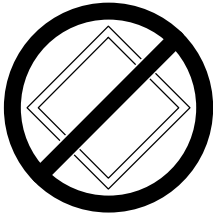
SECTION 13: DISPOSAL CONSIDERATIONS

Hazard characteristic and regulatory waste stream classification can change with product use. Accordingly, it is the responsibility of the user to determine the proper storage, transportation, treatment and/or disposal methodologies for spent materials and residues at the time of disposition.

Conditions of use may cause this material to become a "hazardous waste", as defined by federal or state regulations. It is the responsibility of the user to determine if the material is a "hazardous waste" at the time of disposal. Transportation, treatment, storage, and disposal of waste material must be conducted in accordance with RCRA regulations (see 40 CFR 260 through 40 CFR 271). State and/or local regulations may be more restrictive. Contact the RCRA/Superfund Hotline at (800) 424-9346 or your regional US EPA office for guidance concerning case specific disposal issues. Empty drums and pails retain residue. DO NOT pressurize, cut, weld, braze, solder, drill, grind, or expose this product's empty container to heat, flame, or other ignition sources. DO NOT attempt to clean it. Empty drums and pails should be drained completely, properly bunged or sealed, and promptly sent to a reconditioner.

SECTION 14: TRANSPORT INFORMATION

The shipping description below may not represent requirements for all modes of transportation, shipping methods or locations outside of the United States.

| | | | |
|-----------------------------|---|-------------------------------------|--|
| US DOT Status | Not regulated by the U.S. Department of Transportation as a hazardous material. | | |
| Proper Shipping Name | Not regulated. | | |
| Hazard Class | Not regulated. | Packing Group(s) | Not applicable. |
| | | UN/NA ID | Not regulated. |
| Reportable Quantity | A Reportable Quantity (RQ) has not been established for this material. | | |
| Placards |  | Emergency Response Guide No. | Not applicable. |
| | | HAZMAT STCC No. | Not available |
| | | MARPOL III Status | Not a DOT "Marine Pollutant" per 49 CFR 171.8. |
| | | | |

SECTION 15: REGULATORY INFORMATION

| | |
|---------------------------------------|--|
| TSCA Inventory | This product and/or its components are listed on the Toxic Substances Control Act (TSCA) inventory. |
| SARA 302/304 | The Superfund Amendments and Reauthorization Act of 1986 (SARA) Title III requires facilities subject to Subparts 302 and 304 to submit emergency planning and notification information based on Threshold Planning Quantities (TPQs) and Reportable Quantities (RQs) for "Extremely Hazardous Substances" listed in 40 CFR 302.4 and 40 CFR 355. No components were identified. |
| SARA 311/312 | The Superfund Amendments and Reauthorization Act of 1986 (SARA) Title III requires facilities subject to this subpart to submit aggregate information on chemicals by "Hazard Category" as defined in 40 CFR 370.2. This material would be classified under the following hazard categories:
No SARA 311/312 hazard categories identified. |
| SARA 313 | This product contains the following components in concentrations above de minimis levels that are listed as toxic chemicals in 40 CFR Part 372 pursuant to the requirements of Section 313 of SARA: No components were identified. |
| CERCLA | The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) requires notification of the National Response Center concerning release of quantities of "hazardous substances" equal to or greater than the reportable quantities (RQ's) listed in 40 CFR 302.4. As defined by CERCLA, the term "hazardous substance" does not include petroleum, including crude oil or any fraction thereof which is not otherwise specifically designated in 40 CFR 302.4. Chemical substances present in this product or refinery stream that may be subject to this statute are:
Antimony and Antimony Compounds, Concentration: 0 - 1% |
| CWA | This material is classified as an oil under Section 311 of the Clean Water Act (CWA) and the Oil Pollution Act of 1990 (OPA). Discharges or spills which produce a visible sheen on waters of the United States, their adjoining shorelines, or into conduits leading to surface waters must be reported to the EPA's National Response Center at (800) 424-8802. |
| California Proposition 65 | This product is not known to contain the any components for which the State of California has found to cause cancer, birth defects or other reproductive harm. |
| New Jersey Right-to-Know Label | Petroleum Oil |
| Additional Regulatory Remarks | No additional regulatory remarks. |

SECTION 16: OTHER INFORMATION

Refer to the top of Page 1 for the HMIS and NFPA Hazard Ratings for this product.

REVISION INFORMATION

| | |
|-----------------------|------------------------|
| Version Number | 2.2 |
| Revision Date | 04/15/2003 |
| Print Date | Printed on 04/15/2003. |

ABBREVIATIONS

| | | | | | | |
|--|---|-----------------|--------------|--------------------|-------------|---------------------|
| AP: Approximately | EQ: Equal | >: Greater Than | <: Less Than | NA: Not Applicable | ND: No Data | NE: Not Established |
| ACGIH: American Conference of Governmental Industrial Hygienists | AIHA: American Industrial Hygiene Association | | | | | |
| IARC: International Agency for Research on Cancer | NTP: National Toxicology Program | | | | | |
| NIOSH: National Institute of Occupational Safety and Health | OSHA: Occupational Safety and Health Administration | | | | | |
| NPCA: National Paint and Coating Manufacturers Association | HMIS: Hazardous Materials Information System | | | | | |
| NFPA: National Fire Protection Association | EPA: US Environmental Protection Agency | | | | | |

DISCLAIMER OF LIABILITY

Mystik® JT-6® Multi-Purpose Grease, No. 2

THE INFORMATION IN THIS MSDS WAS OBTAINED FROM SOURCES WHICH WE BELIEVE ARE RELIABLE. HOWEVER, THE INFORMATION IS PROVIDED WITHOUT ANY WARRANTY, EXPRESSED OR IMPLIED REGARDING ITS CORRECTNESS. SOME INFORMATION PRESENTED AND CONCLUSIONS DRAWN HEREIN ARE FROM SOURCES OTHER THAN DIRECT TEST DATA ON THE SUBSTANCE ITSELF. THIS MSDS WAS PREPARED AND IS TO BE USED ONLY FOR THIS PRODUCT. IF THE PRODUCT IS USED AS A COMPONENT IN ANOTHER PRODUCT, THIS MSDS INFORMATION MAY NOT BE APPLICABLE. USERS SHOULD MAKE THEIR OWN INVESTIGATIONS TO DETERMINE THE SUITABILITY OF THE INFORMATION OR PRODUCTS FOR THEIR PARTICULAR PURPOSE.

THE CONDITIONS OR METHODS OF HANDLING, STORAGE, USE, AND DISPOSAL OF THE PRODUCT ARE BEYOND OUR CONTROL AND MAY BE BEYOND OUR KNOWLEDGE. FOR THIS AND OTHER REASONS, WE DO NOT ASSUME RESPONSIBILITY AND EXPRESSLY DISCLAIM LIABILITY FOR LOSS, DAMAGE OR EXPENSE ARISING OUT OF OR IN ANY WAY CONNECTED WITH HANDLING, STORAGE, USE OR DISPOSAL OF THE PRODUCT.

***** END OF MSDS *****

MATERIAL SAFETY DATA SHEET

No. 2 DIESEL FUEL (ULSD)

EMERGENCY PHONE NUMBERS:

CHEMTREC: 1-800-424-9300 (for fire, spill and emergency response information)

CHEMTREC CUSTOMER NUMBER: CCN14937

GREAT FALLS POISON CONTROL CENTER: 1-800-525-5042 (for poisoning)

SPOKANE POISON CONTROL CENTER: 1-800-732-6985 (for poisoning)

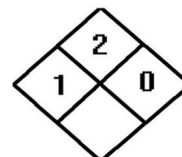
SECTION 1 - PRODUCT IDENTIFICATION

PRODUCT NAME: No. 2 DIESEL FUEL

CAS NUMBER: 68476-34-6

FORMULA: C₁₀H₂₂-C₁₆H₃₄

CHEMICAL FAMILY: Petroleum hydrocarbon



NFPA 704 SYMBOL

SYNONYMS: No.2 Ultra Low Sulfur Diesel, No. 2 Diesel Fuel - dyed, No.2 Diesel fuel oil, No.2 off road diesel - dyed, No. 2 Distillate, UN 1202

SECTION 2 - HAZARDOUS INGREDIENTS

| HAZARDOUS COMPONENTS | CAS NO. | RETEC# | VOL% | TLV(8 Hr TWA) | PEL(8 Hr TWA) | STEL | IDLH |
|----------------------|------------|-----------|------|---------------------------|---------------|------------------------|------------------------|
| No.2 Diesel fuel | 68476-34-6 | -- | >99 | 100 mg/m ³ (s) | -- | -- | -- |
| Ethyl Benzene | 100-41-4 | DA0700000 | <1 | 100 ppm ⁽²⁾ | 100 ppm | 125 ppm ⁽²⁾ | 800 ppm ⁽³⁾ |
| Naphthalene | 91-20-3 | QJ0525000 | <1 | 10 ppm ⁽²⁾ | 10 ppm | 15 ppm ⁽²⁾ | 250 ppm ⁽³⁾ |

(2)= ACGIH (3)= NIOSH (s)= skin notation

OTHER INGREDIENT INFORMATION: Sulfur content is less than 15 ppm by weight.

SECTION 3 - PHYSICAL DATA

| | |
|-----------------------------|--|
| BOILING POINT: | 315-650°F |
| VAPOR PRESSURE: | 0.40mm Hg |
| VAPOR DENSITY (AIR=1): | >3 |
| SOLUBILITY IN WATER: | <0.1% |
| ODOR THRESHOLD: | N.A. |
| APPEARANCE: | Clear to yellow liquid may be dyed red |
| ODOR: | Petroleum |
| SPECIFIC GRAVITY (WATER=1): | 0.8 - 0.88 |
| AUTOIGNITION TEMP: | 490-546°F |
| Physical Hazard: | Combustible liquid
(may accumulate static charge) |

No. 2 DIESEL FUEL(ULSD)

SECTION 4 - FIRE AND EXPLOSION HAZARD DATA

CLASSIFICATION: COMBUSTIBLE LIQUID

FLASH POINT: 140°F (PMCC)

FLAMMABLE LIMITS: LEL = 0.4% UEL = 8.0%

EXTINGUISHING MEDIA: Foam, dry chemical, carbon dioxide, Halon

SPECIAL FIRE FIGHTING PROCEDURES: Move container from fire area if possible. Use water to keep fire exposed containers cool. Use foam for spill control.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Evacuate a radius of 1500 feet for uncontrolled fires. Vapors are heavier than air and may travel great distances and flash back. Extinguish only if flow can be stopped.

NFPA FIRE = 2 (moderate)

SECTION 5 - REACTIVITY DATA

STABILITY: Stable

HAZARDOUS POLYMERIZATION: Will not occur

CONDITIONS TO AVOID/INCOMPATIBILITY: Strong oxidizers, all possible sources of ignition.

HAZARDOUS DECOMPOSITION PRODUCTS: Carbon monoxide, carbon dioxide and sulfur oxides.

Exhaust from diesel engines have been classified as probably carcinogenic to humans.

NFPA REACTIVITY = 0 (minimal)

SECTION 6 - HEALTH HAZARD DATA

ROUTES OF ENTRY: Inhalation, ingestion, contact.

TARGET ORGANS: Eyes, skin, respiratory system, central nervous system, liver, kidneys.

HEALTH HAZARDS: Irritant\Narcotic. May cause depression of central nervous system ranging from headaches to death. Kidney and liver damage is possible. Aspiration into lungs can cause severe lung damage leading to pulmonary edema and bronchial pneumonia. Exposure to petroleum solvents/petroleum hydrocarbons by skin contact may aggravate an existing dermatitis. Petroleum middle distillates have been shown to produce skin tumors in mice following repeated skin exposure without washing or removal. Also prolonged or repeated inhalation exposure to high concentrations has caused liver tumors in mice and adverse kidney effects in male rats. This product is judged to have an acute oral LD50 (rat) greater than 5 g/kg of body weight, and an acute dermal LD50 (rabbit) greater than 3.16 g/kg of body weight.

CARCINOGENICITY: There is inadequate evidence as a human carcinogen. There is limited evidence as an animal carcinogen. Not listed by NTP, or OSHA. Diesel, light distillate is listed by IARC in group 3 under unclassifiable as to Carcinogenicity to humans. Exhaust from diesel engines have shown in recent studies to be potentially carcinogenic and is listed by IARC in group 2A as probably carcinogenic to humans. Naphthalene is listed by the IARC as possibly carcinogenic to humans under group 2B.

SIGNS AND SYMPTOMS OF EXPOSURE: Respiratory tract irritation and may cause nausea, cramping, headaches, coughing or gagging and depression of the central nervous system. High vapor contact or liquid concentration can irritate eyes. Prolonged or repeated contact with skin can cause defatting, irritation, and dermatitis.

No. 2 DIESEL FUEL(ULSD)

SECTION 6 - HEALTH HAZARD DATA (cont.)

EMERGENCY AND FIRST AID PROCEDURES:

INGESTION: Toxic if swallowed. DO NOT INDUCE VOMITING. Immediately seek medical attention.

Symptoms may include nausea, irritation, vomiting, diarrhea and depression

INHALATION: Maintain respirations, assist with artificial respiration if needed and give oxygen if available and trained to do so. Seek medical attention. If liquid is in lungs (aspirated) seek medical care.

EYES: Flush eyes with water for at least 15 minutes. Seek medical attention.

SKIN: Remove diesel soaked clothing as soon as possible launder before reuse. Wash skin thoroughly with soap and water. If irritation persists seek medical attention.

NFPA HEALTH = 1 (slight)

SECTION 7 - PRECAUTIONS FOR SAFE HANDLING AND USE

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Eliminate all sources of ignition. Contain spill. Use water fog to suppress vapor cloud. Use SCBA to avoid breathing vapors. Absorb liquid with dry earth, sand, clay or other noncombustible material. Do not touch or walk through spilled material.

WASTE DISPOSAL: Dispose in accordance with RCRA regulations. Do not put in sewers or any water course.

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE: All equipment and storage containers should be properly grounded. This material is subject to OSHA and DOT regulations. Portable metal containers should be bonded to the storage container before transferring liquid.

OTHER PRECAUTIONS: Avoid breathing vapors. Vapors may be explosive. Do not weld on containers unless properly cleaned and purged using safe work procedures. Trace amounts of hydrogen sulfide may be present in the product. Accumulation of hydrogen sulfide may occur in vapor spaces of confined spaces where this product is handled, stored or used.

SECTION 8 - ENVIRONMENTAL AND SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION: Use NIOSH\MSHA approved respiratory protection in areas exceeding exposure limits, the type to be determined by the degree of exposure.

VENTILATION: Use in well ventilated area or provide ventilation to limit exposure to acceptable levels.

EYE/SKIN PROTECTION: Rubber gloves, face shields, goggles or safety glasses with side shields, coveralls.

WORK/HYGIENIC PRACTICES: Remove contaminated clothing as soon as possible launder before reuse. Always wash exposed area thoroughly with soap and water.

NOTICE: This product contains a toxic chemical or chemicals subject to the reporting Requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372, as listed below:

| CAS-NUMBER | CHEMICAL | WEIGHT % |
|------------|---------------|----------|
| 100-41-4 | Ethyl Benzene | <1 |
| 91-20-3 | Naphthalene | <1 |

This notice should be included in all copies or redistribution of this Material Safety Data Sheet.

SECTION 8 - ENVIRONMENTAL AND SPECIAL PROTECTION INFORMATION (cont.)

This product contains the following components which are considered hazardous if spilled in navigable waters.

| Component | Reportable Quantity |
|-----------------------|---|
| Petroleum Hydrocarbon | Film or sheen upon the water surface or discoloration of the water or adjoining shoreline |

REFER TO DEPARTMENT OF TRANSPORTATION (DOT) EMERGENCY RESPONSE GUIDEBOOK GUIDE 128 FOR ADDITIONAL EMERGENCY INFORMATION.

SECTION 9 - SHIPPING DATA**DOT**

Identification #: NA 1993
 Shipping name: Diesel fuel
 Hazard class/division: 3
 Packing group: III
 Label: not required (49CFR173.150(f)(2))
 Placard required: FLAMMABLE/1993

Labels are not required for non- bulk packages (≤119 gal) (49CFR173.150(f)(2))
 Placards are required for bulk packages (>119 gal)

IATA

Identification #: UN 1202
 Shipping name: Diesel fuel
 Hazard class/division: 3
 Packing group: III
 Non-bulk package Marking: Diesel fuel, UN 1202
 Label name: FLAMMABLE

Arrows are required on two opposite sides of the package for all non bulk packages for liquids except drums (IATA 7.1.6.1)(49 CFR 173.312)

Arrows required on two opposite sides of packages.

This information is believed to be accurate and as reliable as information available to us. We make no warranty or guarantee as to its accuracy and assume no liability from its use. Users should determine the suitability of the information for their particular purposes.

Section 1. Chemical product and company identification

| | |
|-------------------------------------|---|
| Product name | : Oxygen |
| Supplier | : AIRGAS INC., on behalf of its subsidiaries
259 North Radnor-Chester Road
Suite 100
Radnor, PA 19087-5283
1-610-687-5253 |
| Product use | : Synthetic/Analytical chemistry. |
| Synonym | : Molecular oxygen; Oxygen molecule; Pure oxygen; O ₂ ; Liquid-oxygen-; UN 1072; UN 1073; Dioxygen; Oxygen USP, Aviator's Breathing Oxygen (ABO) |
| MSDS # | : 001043 |
| Date of Preparation/Revision | : 6/16/2011. |
| In case of emergency | : 1-866-734-3438 |

Section 2. Hazards identification

| | |
|---|---|
| Physical state | : Gas. |
| Emergency overview | : DANGER!
GAS:
OXIDIZER.
CONTACT WITH COMBUSTIBLE MATERIAL MAY CAUSE FIRE.
CONTENTS UNDER PRESURE.
Do not puncture or incinerate container.
May cause severe frostbite.
LIQUID:
OXIDIZER.
CONTACT WITH COMBUSTIBLE MATERIAL MAY CAUSE FIRE.
Extremely cold liquid and gas under pressure.
May cause severe frostbite.

Do not puncture or incinerate container. Store in tightly-closed container. Avoid contact with combustible materials.
Contact with rapidly expanding gases or liquids can cause frostbite. |
| Routes of entry | : Inhalation |
| Potential acute health effects | |
| Eyes | : May cause eye irritation. Contact with rapidly expanding gas may cause burns or frostbite. Contact with cryogenic liquid can cause frostbite and cryogenic burns. |
| Skin | : May cause skin irritation. Contact with rapidly expanding gas may cause burns or frostbite. Contact with cryogenic liquid can cause frostbite and cryogenic burns. |
| Inhalation | : Respiratory system irritation after overexposure to high oxygen concentrations. |
| Ingestion | : Ingestion is not a normal route of exposure for gases. Contact with cryogenic liquid can cause frostbite and cryogenic burns. |
| Medical conditions aggravated by over-exposure | : Acute or chronic respiratory conditions may be aggravated by overexposure to this gas. |
| See toxicological information (Section 11) | |

Section 3. Composition, Information on Ingredients

| <u>Name</u> | <u>CAS number</u> | <u>% Volume</u> | <u>Exposure limits</u> |
|-------------|-------------------|-----------------|------------------------|
| Oxygen | 7782-44-7 | 100 | |

Section 4. First aid measures

No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

- Eye contact** : Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.
- Skin contact** : None expected.
- Frostbite** : Try to warm up the frozen tissues and seek medical attention.
- Inhalation** : If inhaled, remove to fresh air. If not breathing, give artificial respiration. Get medical attention.
- Ingestion** : As this product is a gas, refer to the inhalation section.

Section 5. Fire-fighting measures

- Flammability of the product** : Non-flammable.
- Products of combustion** : No specific data.
- Fire hazards in the presence of various substances** : Extremely flammable in the presence of the following materials or conditions: reducing materials, combustible materials and organic materials.
- Fire-fighting media and instructions** : Use an extinguishing agent suitable for the surrounding fire.

Apply water from a safe distance to cool container and protect surrounding area. If involved in fire, shut off flow immediately if it can be done without risk.

Contains gas under pressure. Contact with combustible material may cause fire. This material increases the risk of fire and may aid combustion. In a fire or if heated, a pressure increase will occur and the container may burst or explode.

- Special protective equipment for fire-fighters** : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

- Personal precautions** : Immediately contact emergency personnel. Keep unnecessary personnel away. Use suitable protective equipment (section 8). Eliminate all ignition sources if safe to do so. Do not touch or walk through spilled material. Shut off gas supply if this can be done safely. Isolate area until gas has dispersed.
- Environmental precautions** : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.
- Methods for cleaning up** : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see section 1 for emergency contact information and section 13 for waste disposal.

Section 7. Handling and storage

- Handling** : High pressure gas. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Store in tightly-closed container. Avoid contact with combustible materials. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.
Never allow any unprotected part of the body to touch uninsulated pipes or vessels that contain cryogenic liquids. Prevent entrapment of liquid in closed systems or piping without pressure relief devices. Some materials may become brittle at low temperatures and will easily fracture.

Oxygen

- Storage** : Keep container tightly closed. Keep container in a cool, well-ventilated area. Separate from acids, alkalies, reducing agents and combustibles. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F). For additional information concerning storage and handling refer to Compressed Gas Association pamphlets P-1 Safe Handling of Compressed Gases in Containers and P-12 Safe Handling of Cryogenic Liquids available from the Compressed Gas Association, Inc.

Section 8. Exposure controls/personal protection

- Engineering controls** : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

Personal protection

- Eyes** : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.

When working with cryogenic liquids, wear a full face shield.

- Skin** : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

- Respiratory** : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

The applicable standards are (US) 29 CFR 1910.134 and (Canada) Z94.4-93

- Hands** : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.

Insulated gloves suitable for low temperatures

- Personal protection in case of a large spill** : Self-contained breathing apparatus (SCBA) should be used to avoid inhalation of the product.

Product name

Oxygen

Consult local authorities for acceptable exposure limits.

Section 9. Physical and chemical properties

- Molecular weight** : 32 g/mole
- Molecular formula** : O₂
- Boiling/condensation point** : -183°C (-297.4°F)
- Melting/freezing point** : -218.4°C (-361.1°F)
- Critical temperature** : -118.6°C (-181.5°F)
- Vapor density** : 1.105 (Air = 1) Liquid Density@BP: 71.23 lb/ft³ (1141 kg/m³)
- Specific Volume (ft³/lb)** : 12.0482
- Gas Density (lb/ft³)** : 0.083

Section 10. Stability and reactivity

- Stability and reactivity** : The product is stable.
- Incompatibility with various substances** : Extremely reactive or incompatible with the following materials: oxidizing materials, reducing materials and combustible materials.
- Hazardous decomposition products** : Under normal conditions of storage and use, hazardous decomposition products should not be produced.
- Hazardous polymerization** : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Toxicity data

Other toxic effects on humans : No specific information is available in our database regarding the other toxic effects of this material to humans.

Specific effects

Carcinogenic effects : No known significant effects or critical hazards.

Mutagenic effects : No known significant effects or critical hazards.

Reproduction toxicity : No known significant effects or critical hazards.

Section 12. Ecological information

Aquatic ecotoxicity

Not available.

Environmental fate : Not available.

Environmental hazards : This product shows a low bioaccumulation potential.

Toxicity to the environment : Not available.

Section 13. Disposal considerations

Product removed from the cylinder must be disposed of in accordance with appropriate Federal, State, local regulation. Return cylinders with residual product to Airgas, Inc. Do not dispose of locally.

Section 14. Transport information

| Regulatory information | UN number | Proper shipping name | Class | Packing group | Label | Additional information |
|---------------------------|-----------|-----------------------------|-------|-----------------------|---|---|
| DOT Classification | UN1072 | OXYGEN, COMPRESSED | 2.2 | Not applicable (gas). |  | Limited quantity
Yes. |
| | UN1073 | Oxygen, refrigerated liquid | | |  | Packaging instruction
Passenger aircraft
Quantity limitation:
75 kg

Cargo aircraft
Quantity limitation:
150 kg

Special provisions
A52 |
| TDG Classification | UN1072 | OXYGEN, COMPRESSED | 2.2 | Not applicable (gas). |  | Explosive Limit and Limited Quantity Index
0.125 |
| | UN1073 | Oxygen, refrigerated liquid | | |  | ERAP Index
3000

Passenger Carrying Ship |

Oxygen

| | | | | | | |
|------------------------------|----------------------|---|-----|-----------------------|--|--|
| | | | | | | Index
50

<u>Passenger Carrying Road or Rail Index</u>
75

<u>Special provisions</u>
42 |
| Mexico Classification | UN1072

UN1073 | OXYGEN, COMPRESSED

Oxygen, refrigerated liquid | 2.2 | Not applicable (gas). | 
 | - |

“Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product.”

Section 15. Regulatory information

United States

U.S. Federal regulations : TSCA 8(a) IUR: Partial exemption
United States inventory (TSCA 8b): This material is listed or exempted.
SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: Oxygen
SARA 311/312 MSDS distribution - chemical inventory - hazard identification:
Oxygen: Fire hazard, Sudden release of pressure, Delayed (chronic) health hazard

State regulations

: **Connecticut Carcinogen Reporting**: This material is not listed.
Connecticut Hazardous Material Survey: This material is not listed.
Florida substances: This material is not listed.
Illinois Chemical Safety Act: This material is not listed.
Illinois Toxic Substances Disclosure to Employee Act: This material is not listed.
Louisiana Reporting: This material is not listed.
Louisiana Spill: This material is not listed.
Massachusetts Spill: This material is not listed.
Massachusetts Substances: This material is listed.
Michigan Critical Material: This material is not listed.
Minnesota Hazardous Substances: This material is not listed.
New Jersey Hazardous Substances: This material is listed.
New Jersey Spill: This material is not listed.
New Jersey Toxic Catastrophe Prevention Act: This material is not listed.
New York Acutely Hazardous Substances: This material is not listed.
New York Toxic Chemical Release Reporting: This material is not listed.
Pennsylvania RTK Hazardous Substances: This material is listed.
Rhode Island Hazardous Substances: This material is not listed.

Canada

WHMIS (Canada) : Class A: Compressed gas.
Class C: Oxidizing material.

Oxygen

CEPA Toxic substances: This material is not listed.
Canadian ARET: This material is not listed.
Canadian NPRI: This material is not listed.
Alberta Designated Substances: This material is not listed.
Ontario Designated Substances: This material is not listed.
Quebec Designated Substances: This material is not listed.

Section 16. Other information

United States

Label requirements : GAS:
OXIDIZER.
CONTACT WITH COMBUSTIBLE MATERIAL MAY CAUSE FIRE.
CONTENTS UNDER PRESURE.
Do not puncture or incinerate container.
May cause severe frostbite.
LIQUID:
OXIDIZER.
CONTACT WITH COMBUSTIBLE MATERIAL MAY CAUSE FIRE.
Extremely cold liquid and gas under pressure.
May cause severe frostbite.

Canada

Label requirements : Class A: Compressed gas.
Class C: Oxidizing material.

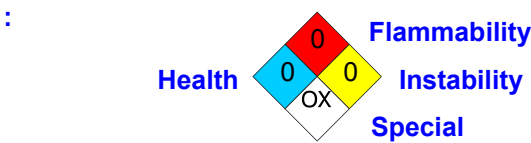
Hazardous Material
Information System (U.S.A.)

| | |
|------------------|---|
| Health | 0 |
| Flammability | 0 |
| Physical hazards | 0 |
| | |

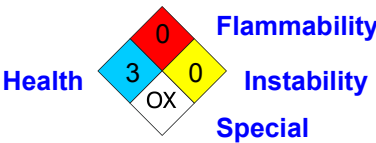
liquid:

| | |
|---------------------|---|
| Health | 3 |
| Fire hazard | 0 |
| Reactivity | 0 |
| Personal protection | |

National Fire Protection
Association (U.S.A.)



liquid:



Notice to reader

| |
|---------------|
| Oxygen |
|---------------|

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.

Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Material Safety Data Sheet



SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

Texaco Havoline® DEX-COOL® Extended Life Prediluted 50/50 Anti-Freeze/Coolant

Product Use: Antifreeze/Coolant

Product Number(s): CPS227995

Company Identification

Chevron Products Company
a division of Chevron U.S.A. Inc.
6001 Bollinger Canyon Road
San Ramon, CA 94583
United States of America
www.chevronlubricants.com

Transportation Emergency Response

CHEMTREC: (800) 424-9300 or (703) 527-3887

Health Emergency

Chevron Emergency Information Center: Located in the USA. International collect calls accepted. (800) 231-0623 or (510) 231-0623

Product Information

email : lubemsds@chevron.com
Product Information: 800-LUBE-TEK
MSDS Requests: 800-414-6737

SECTION 2 COMPOSITION/ INFORMATION ON INGREDIENTS

| COMPONENTS | CAS NUMBER | AMOUNT |
|----------------------------|------------|-----------------|
| Ethylene Glycol | 107-21-1 | 40 - 55 %weight |
| Diethylene glycol | 111-46-6 | 1 - 5 %weight |
| Potassium 2-ethylhexanoate | 3164-85-0 | 1 - 5 %weight |

SECTION 3 HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

- HARMFUL OR FATAL IF SWALLOWED
- CONTAINS MATERIAL THAT MAY CAUSE ADVERSE REPRODUCTIVE EFFECTS BASED ON ANIMAL DATA
- POSSIBLE BIRTH DEFECT HAZARD - CONTAINS MATERIAL THAT MAY CAUSE BIRTH DEFECTS BASED ON ANIMAL DATA

- CAUSES DAMAGE TO:
- KIDNEY

IMMEDIATE HEALTH EFFECTS

Eye: Not expected to cause prolonged or significant eye irritation.

Skin: Contact with the skin is not expected to cause prolonged or significant irritation. Not expected to be harmful to internal organs if absorbed through the skin.

Ingestion: Toxic; may be harmful or fatal if swallowed.

Inhalation: The vapor or fumes from this material may cause respiratory irritation. Symptoms of respiratory irritation may include coughing and difficulty breathing. Breathing this material at concentrations above the recommended exposure limits may cause central nervous system effects. Central nervous system effects may include headache, dizziness, nausea, vomiting, weakness, loss of coordination, blurred vision, drowsiness, confusion, or disorientation. At extreme exposures, central nervous system effects may include respiratory depression, tremors or convulsions, loss of consciousness, coma or death.

DELAYED OR OTHER HEALTH EFFECTS:

Reproduction and Birth Defects: Contains material that may cause adverse reproductive effects if swallowed based on animal data. Contains material that may cause birth defects based on animal data.

Target Organs: Contains material that causes damage to the following organ(s) if swallowed: Kidney
See Section 11 for additional information. Risk depends on duration and level of exposure.

SECTION 4 FIRST AID MEASURES

Eye: No specific first aid measures are required. As a precaution, remove contact lenses, if worn, and flush eyes with water.

Skin: To remove the material from skin, use soap and water. Discard contaminated clothing and shoes or thoroughly clean before reuse.

Ingestion: If swallowed, get immediate medical attention. Do not induce vomiting. Never give anything by mouth to an unconscious person.

Inhalation: Move the exposed person to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if breathing difficulties continue.

SECTION 5 FIRE FIGHTING MEASURES

FIRE CLASSIFICATION:

OSHA Classification (29 CFR 1910.1200): Not classified by OSHA as flammable or combustible.

NFPA RATINGS: Health: 2 Flammability: 0 Reactivity: 0

FLAMMABLE PROPERTIES:

Flashpoint: Not Applicable

Autoignition: No Data Available

Flammability (Explosive) Limits (% by volume in air): Lower: Not Applicable Upper: Not Applicable

EXTINGUISHING MEDIA: Dry Chemical, CO2, AFFF Foam or alcohol resistant foam.

PROTECTION OF FIRE FIGHTERS:

Fire Fighting Instructions: This material will not burn.

SECTION 6 ACCIDENTAL RELEASE MEASURES

Spill Management: Stop the source of the release if you can do it without risk. Contain release to prevent further contamination of soil, surface water or groundwater. Clean up spill as soon as possible, observing precautions in Exposure Controls/Personal Protection. Use appropriate techniques such as applying non-combustible absorbent materials or pumping. Where feasible and appropriate, remove contaminated soil. Place contaminated materials in disposable containers and dispose of in a manner consistent with applicable regulations.

Reporting: Report spills to local authorities and/or the U.S. Coast Guard's National Response Center at (800) 424-8802 as appropriate or required.

SECTION 7 HANDLING AND STORAGE

Precautionary Measures: Do not get in eyes, on skin, or on clothing. Do not breathe vapor or fumes. Wash thoroughly after handling.

General Handling Information: Do not taste or swallow antifreeze or solution. Keep out of the reach of children and animals.

General Storage Information: Do not store in open or unlabeled containers.

Container Warnings: Container is not designed to contain pressure. Do not use pressure to empty container or it may rupture with explosive force. Empty containers retain product residue (solid, liquid, and/or vapor) and can be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, static electricity, or other sources of ignition. They may explode and cause injury or death. Empty containers should be completely drained, properly closed, and promptly returned to a drum reconditioner or disposed of properly.

SECTION 8 EXPOSURE CONTROLS/PERSONAL PROTECTION

GENERAL CONSIDERATIONS:

Consider the potential hazards of this material (see Section 3), applicable exposure limits, job activities, and other substances in the work place when designing engineering controls and selecting personal protective equipment. If engineering controls or work practices are not adequate to prevent exposure to harmful levels of this material, the personal protective equipment listed below is recommended. The user should read and understand all instructions and limitations supplied with the equipment since protection is usually provided for a limited time or under certain circumstances.

ENGINEERING CONTROLS:

Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below the recommended exposure limits.

PERSONAL PROTECTIVE EQUIPMENT

Eye/Face Protection: No special eye protection is normally required. Where splashing is possible, wear safety glasses with side shields as a good safety practice.

Skin Protection: No special protective clothing is normally required. Where splashing is possible, select protective clothing depending on operations conducted, physical requirements and other substances in the workplace. Suggested materials for protective gloves include: Natural rubber, Neoprene, Nitrile Rubber, Polyvinyl Chloride (PVC or Vinyl).

Respiratory Protection: Determine if airborne concentrations are below the recommended occupational exposure limits for jurisdiction of use. If airborne concentrations are above the acceptable limits, wear an

approved respirator that provides adequate protection from this material, such as: Air-Purifying Respirator for Organic Vapors, Dusts and Mists.

Use a positive pressure air-supplying respirator in circumstances where air-purifying respirators may not provide adequate protection.

Occupational Exposure Limits:

| Component | Agency | TWA | STEL | Ceiling | Notation |
|-----------------|--------|-----|------|--------------|----------|
| Ethylene Glycol | ACGIH | -- | -- | 100
mg/m3 | -- |

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Attention: the data below are typical values and do not constitute a specification.

Color: Orange

Physical State: Liquid

Odor: Faint or Mild

pH: 8 - 8.6

Vapor Pressure: <0.01 mmHg @ 20 °C (68 °F)

Vapor Density (Air = 1): 2.1

Boiling Point: 107.8°C (226°F) (Typical)

Solubility: Miscible

Freezing Point: -36.7°C (-34°F) (Typical)

Specific Gravity: 1.06 - 1.09 @ 15.6°C (60.1°F) / 15.6°C (60.1°F)

Viscosity: No data available

SECTION 10 STABILITY AND REACTIVITY

Chemical Stability: This material is considered stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.

Hazardous Decomposition Products: Aldehydes (Elevated temperatures), Ketones (Elevated temperatures)

Hazardous Polymerization: Hazardous polymerization will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

IMMEDIATE HEALTH EFFECTS

Eye Irritation: The eye irritation hazard is based on evaluation of data for similar materials or product components.

Skin Irritation: The skin irritation hazard is based on evaluation of data for similar materials or product components.

Skin Sensitization: No product toxicology data available.

Acute Dermal Toxicity: The acute dermal toxicity hazard is based on evaluation of data for similar materials or product components.

Acute Oral Toxicity: The acute oral toxicity hazard is based on evaluation of data for similar materials or product components.

Acute Inhalation Toxicity: The acute inhalation toxicity hazard is based on evaluation of data for similar materials or product components.

ADDITIONAL TOXICOLOGY INFORMATION:

This product contains diethylene glycol (DEG). The estimated oral lethal dose is about 50 cc (1.6 oz) for an adult human. DEG has caused the following effects in laboratory animals: liver abnormalities, kidney damage and blood abnormalities. It has been suggested as a cause of the following effects in humans: liver abnormalities, kidney damage, lung damage and central nervous system damage.

This product contains ethylene glycol (EG). The toxicity of EG via inhalation or skin contact is expected to be slight at room temperature. The estimated oral lethal dose is about 100 cc (3.3 oz.) for an adult human. Ethylene glycol is oxidized to oxalic acid which results in the deposition of calcium oxalate crystals mainly in the brain and kidneys. Early signs and symptoms of EG poisoning may resemble those of alcohol intoxication. Later, the victim may experience nausea, vomiting, weakness, abdominal and muscle pain, difficulty in breathing and decreased urine output. When EG was heated above the boiling point of water, vapors formed which reportedly caused unconsciousness, increased lymphocyte count, and a rapid, jerky movement of the eyes in persons chronically exposed. When EG was administered orally to pregnant rats and mice, there was an increase in fetal deaths and birth defects. Some of these effects occurred at doses that had no toxic effects on the mothers. We are not aware of any reports that EG causes reproductive toxicity in human beings.

2-Ethylhexanoic acid (2-EXA) caused an increase in liver size and enzyme levels when repeatedly administered to rats via the diet. When administered to pregnant rats by gavage or in drinking water, 2-EXA caused teratogenicity (birth defects) and delayed postnatal development of the pups. Additionally, 2-EXA impaired female fertility in rats. Birth defects were seen in the offspring of mice who were administered sodium 2-ethylhexanoate via intraperitoneal injection during pregnancy.

SECTION 12 ECOLOGICAL INFORMATION

ECOTOXICITY

The toxicity of this material to aquatic organisms has not been evaluated. Consequently, this material should be kept out of sewage and drainage systems and all bodies of water.

ENVIRONMENTAL FATE

This material is expected to be readily biodegradable.

SECTION 13 DISPOSAL CONSIDERATIONS

Use material for its intended purpose or recycle if possible. Oil collection services are available for used oil recycling or disposal. Place contaminated materials in containers and dispose of in a manner consistent with applicable regulations. Contact your sales representative or local environmental or health authorities for approved disposal or recycling methods.

SECTION 14 TRANSPORT INFORMATION

The description shown may not apply to all shipping situations. Consult 49CFR, or appropriate Dangerous Goods Regulations, for additional description requirements (e.g., technical name) and mode-specific or quantity-specific shipping requirements.

DOT Shipping Description: Anti-freeze Preparations, Proprietary

Additional Information: Bulk shipments with a reportable quantity (5000 pounds) of ethylene glycol are a hazardous material. The Proper Shipping Name is: Environmentally Hazardous Substance, Liquid, N.O.S. (ethylene glycol), 9, UN3082, III, RQ (ethylene glycol).

IMO/IMDG Shipping Description: NOT REGULATED AS DANGEROUS GOODS FOR TRANSPORTATION UNDER THE IMDG CODE

ICAO/IATA Shipping Description: Anti-freeze Preparations, Proprietary; NOT REGULATED AS DANGEROUS GOODS FOR TRANSPORT UNDER ICAO

SECTION 15 REGULATORY INFORMATION

| | | |
|----------------------------------|---------------------------------------|-----|
| EPCRA 311/312 CATEGORIES: | 1. Immediate (Acute) Health Effects: | YES |
| | 2. Delayed (Chronic) Health Effects: | YES |
| | 3. Fire Hazard: | NO |
| | 4. Sudden Release of Pressure Hazard: | NO |
| | 5. Reactivity Hazard: | NO |

REGULATORY LISTS SEARCHED:

| | |
|---------------------|----------------------|
| 01-1=IARC Group 1 | 03=EPCRA 313 |
| 01-2A=IARC Group 2A | 04=CA Proposition 65 |
| 01-2B=IARC Group 2B | 05=MA RTK |
| 02=NTP Carcinogen | 06=NJ RTK |
| | 07=PA RTK |

The following components of this material are found on the regulatory lists indicated.

| | |
|-------------------|----------------|
| Diethylene glycol | 07 |
| Ethylene Glycol | 03, 05, 06, 07 |

CHEMICAL INVENTORIES:

All components comply with the following chemical inventory requirements: AICS (Australia), DSL (Canada), EINECS (European Union), IECSC (China), PICCS (Philippines), TSCA (United States).

One or more components does not comply with the following chemical inventory requirements: ENCS (Japan), KECI (Korea).

NEW JERSEY RTK CLASSIFICATION:

Refer to components listed in Section 2.

WHMIS CLASSIFICATION:

Class D, Division 1, Subdivision B: Toxic Material -
Acute Lethality
Class D, Division 2, Subdivision A: Very Toxic Material -
Teratogenicity and Embryotoxicity
Reproductive Toxicity

SECTION 16 OTHER INFORMATION

NFPA RATINGS: Health: 2 Flammability: 0 Reactivity: 0

HMIS RATINGS: Health: 2* Flammability: 0 Reactivity: 0
(0-Least, 1-Slight, 2-Moderate, 3-High, 4-Extreme, PPE:- Personal Protection Equipment Index)

recommendation, *- Chronic Effect Indicator). These values are obtained using the guidelines or published evaluations prepared by the National Fire Protection Association (NFPA) or the National Paint and Coating Association (for HMIS ratings).

LABEL RECOMMENDATION:

Label Category : ANTIFREEZE/COOLANT 3 - AFC3

REVISION STATEMENT: This revision updates the following sections of this Material Safety Data Sheet:
15

Revision Date: August 22, 2007

ABBREVIATIONS THAT MAY HAVE BEEN USED IN THIS DOCUMENT:

| | |
|---|--|
| TLV - Threshold Limit Value | TWA - Time Weighted Average |
| STEL - Short-term Exposure Limit | PEL - Permissible Exposure Limit |
| | CAS - Chemical Abstract Service Number |
| ACGIH - American Conference of Government Industrial Hygienists | IMO/IMDG - International Maritime Dangerous Goods Code |
| API - American Petroleum Institute | MSDS - Material Safety Data Sheet |
| CVX - Chevron | NFPA - National Fire Protection Association (USA) |
| DOT - Department of Transportation (USA) | NTP - National Toxicology Program (USA) |
| IARC - International Agency for Research on Cancer | OSHA - Occupational Safety and Health Administration |

Prepared according to the OSHA Hazard Communication Standard (29 CFR 1910.1200) and the ANSI MSDS Standard (Z400.1) by the Chevron Energy Technology Company, 100 Chevron Way, Richmond, California 94802.

The above information is based on the data of which we are aware and is believed to be correct as of the date hereof. Since this information may be applied under conditions beyond our control and with which we may be unfamiliar and since data made available subsequent to the date hereof may suggest modifications of the information, we do not assume any responsibility for the results of its use. This information is furnished upon condition that the person receiving it shall make his own determination of the suitability of the material for his particular purpose.



USA and WORLDWIDE

March 31, 1994

Material Safety Data Sheet

[TROPARTIC® MOTOR OIL (All Grades)]

PHILLIPS 66 COMPANY
A Division of Phillips Petroleum Company
Bartlesville, Oklahoma 74004

PHONE NUMBERS
Emergency: (918) 661-8118
Technical Service: (800) 766-0050
For Additional MSDSs: (918) 661-5974

A. Product Identification

Synonyms: Racing 20W-50, Turbo 10W-30, All Season 10W-40 and
5W-30, Single Grade 10W, 20W-20, 30, 40,
Fuel Economy 10W-30

Chemical Name: Mixture
Chemical Family: Hydrocarbon
Chemical Formula: Mixture
CAS Reg. No.: Mixture

Product No.: 1012590(42770); 1012598(42960); 1012592(42860)
1012580(42720); 1012575(42520); 1012587(42750)
1012777(67170); 1012781(67270); 1012782(67370)
1012786(67470)

Product and/or Components Entered on EPA's TSCA Inventory: YES

This product is in U.S. commerce, and is listed in the Toxic Substances Control Act (TSCA) Inventory of Chemicals; hence, it may be subject to applicable TSCA provisions and restrictions.

B. Components

| Ingredients | CAS
Number | %
By Wt. | OSHA
PEL | ACGIH
TLV |
|-------------|---------------|-------------|-------------|--------------|
|-------------|---------------|-------------|-------------|--------------|

This product does not meet the definition of a hazardous material given in 29 CFR Part 1910.1200(OSHA). Information on this form is furnished as a customer service.

NA - Not Applicable NE - Not Established

C. Personal Protection Information

Ventilation: Use adequate ventilation to control exposure below recommended levels.

Respiratory Protection: Not generally required. For concentrations exceeding the recommended exposure level, use NIOSH/MSHA approved air purifying respirator.

Eye Protection: Use safety glasses with side shields. For splash protection use chemical goggles and face shield.

Skin Protection: Use protective garments to prevent skin contact.

NOTE: Personal protection information shown in Section C is based upon general information as to normal uses and conditions. Where special or unusual uses or conditions exist, it is suggested that the expert assistance of an industrial hygienist or other qualified professional be sought.

D. Handling and Storage Precautions

Avoid contact with eyes, skin or clothing. Avoid breathing vapors, mist, fume or dust. Use with adequate ventilation. Wear protective equipment and/or garments described in Section C if exposure conditions warrant. Wash thoroughly after handling. Launder contaminated clothing before reuse. If pressure injected under the skin, can cause gangrene if not treated.

Store in closed containers. Store in well-ventilated area.

E. Reactivity Data

Stability: Stable

Conditions to Avoid: Not Applicable

Incompatibility (Materials to Avoid): Oxygen and strong oxidizing agents.

Hazardous Polymerization: Will Not Occur

Conditions to Avoid: Not Applicable

Hazardous Decomposition Products: Carbon oxides and various hydrocarbons formed when burned.

F. Health Hazard Data

Recommended Exposure Limits:

OSHA PEL and ACGIH TLV for oil mists is 5 mg/m³.

Acute Effects of Overexposure:

Eye: Mild irritation.

Skin: Practically non-toxic by skin absorption. Mild irritation with prolonged or repeated contact.

Inhalation: None expected.

Ingestion: Practically non-toxic.

Subchronic and Chronic Effects of Overexposure:

No known applicable information.

Other Health Effects:

Pressurized injection of product under the skin can lead to seriously inflamed tissue. If left untreated injury can be gangrenous.

Prolonged and repeated exposure to oil mist poses a risk of pulmonary disease such as lung inflammation. This condition usually causes no symptoms.

Continuous skin contact with used motor oils has caused skin cancer in laboratory animals. Avoid prolonged skin contact with used motor oil.

Health Hazard Categories:

| | Animal | Human | | Animal | Human |
|---------------------|--------|-------|-------------------------------|--------|-------|
| Known Carcinogen | — | — | Toxic | — | — |
| Suspect Carcinogen | — | — | Corrosive | — | — |
| Mutagen | — | — | Irritant | — | — |
| Teratogen | — | — | Target Organ Toxin | — | — |
| Allergic Sensitizer | — | — | Specify - No known applicable | — | — |
| Highly Toxic | — | — | information. | | |

First Aid and Emergency Procedures:

Eye: Flush eyes with running water. If irritation or adverse symptoms develop, seek medical attention.

Skin: Wash skin with soap and water. If irritation or adverse symptoms develop, seek medical attention.

Inhalation: Remove from exposure. If illness or adverse symptoms develop, seek medical attention.

Ingestion: If illness or adverse symptoms develop, seek medical attention.

Note to Physician: For injection injuries, immediate medical treatment is required. Physicians may call the emergency number (918) 661-8118.

G. Physical Data

Appearance: Colorless to dark liquid
 Odor: Mild
 Boiling Point: > 600F (> 316C)
 Vapor Pressure: <1 mm Hg @ 68F (20C)
 Vapor Density (Air = 1): > 1 g/ml
 Solubility in Water: Negligible
 Specific Gravity (H2O = 1): 0.86 - 0.87 @ 60F (16C)
 Percent Volatile by Volume: Negligible
 Evaporation Rate (= 1): Negligible
 Viscosity: 39.4 - 189 cSt @ 104F (40C)

H. Fire and Explosion Data

Flash Point (Method Used): > 383F (> 195)(COC, ASTM D92)
Flammable Limits (% by Volume in Air): LEL - Not Established
UEL - Not Established

Fire Extinguishing Media: Dry chemical, foam or carbon dioxide (CO2)

Special Fire Fighting Procedures: Evacuate area of all unnecessary personnel. Shut off source, if possible. Use NIOSH/MSHA approved self-contained breathing apparatus and other protective equipment and/or garments described in Section C if conditions warrant. Water fog or spray may be used to cool exposed containers and equipment.

Fire and Explosion Hazards: Carbon oxides and various hydrocarbons formed when burned.

I. Spill, Leak and Disposal Procedures

Precautions Required if Material is Released or Spilled:

Wear protective equipment and/or garments described in Section C if exposure conditions warrant. Shut off source, if possible and contain spill. Keep out of water sources and sewers. Absorb in dry, inert material. Transfer to disposal drums.

Waste Disposal (Insure Conformity with all Applicable Disposal Regulations):
Incinerate or otherwise manage at a permitted waste management facility.

J. DOT Transportation

Shipping Name: Not Regulated
Hazard Class: Not Regulated
ID Number: Not Regulated
Packing Group: Not Regulated
Marking: Not Regulated
Label: Not Regulated
Placard: Not Regulated
Hazardous Substance/RQ: Not Regulated
Shipping Description: Not Regulated
Packaging References: Not Regulated

K. RCRA Classification - Unadulterated Product as a Waste

Prior to disposal, consult your Environmental contact to determine if TCLP (Toxicity Characteristic Leaching Procedure, EPA Test Method 1311) is required. Reference 40 CFR Part 261.

L. Protection Required for Work on Contaminated Equipment

Contact immediate supervisor for specific instructions before work is initiated. Wear protective equipment and/or garments described in Section C if exposure conditions warrant.

M. Hazard Classification

— This product meets the following hazard definition(s) as defined by the Occupational Safety and Health Hazard Communication Standard (29 CFR Section 1910.1200):

| | | |
|----------------------|-----------------------------|------------------|
| — Combustible Liquid | — Flammable Aerosol | — Oxidizer |
| — Compressed Gas | — Explosive | — Pyrophoric |
| — Flammable Gas | — Health Hazard (Section F) | — Unstable |
| — Flammable Liquid | — Organic Peroxide | — Water Reactive |
| — Flammable Solid | | |

—X— Based on information presently available, this product does not meet any of the hazard definitions of 29 CFR Section 1910.1200.

N. Additional Comments

SARA 313

As of the preparation date, this product did not contain a chemical or chemicals subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

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UNLEADED GASOLINE (ALL GRADES)

MATERIAL SAFETY DATA SHEET

Petrocom Energy Group, LLC
1330 Post Oak Blvd., Suite 2350
Houston, Texas 77056
Phone: 713-418-3000
Fax: 713-418-3001

Revision Date: 03/05/2008

Section 1: Product Identification

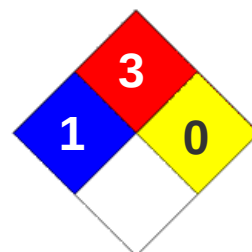
Name: Unleaded Gasoline
Synonyms: Regular/Midgrade/Premium Gasoline, Motor Fuel, Reformulated Gasoline, RFG, Conventional Gasoline.
CAS No.: 86290-81-5
MSDS No.: PEG-UNL
Use: Motor fuel

Section 2: Product Composition

| Component | CAS Number | Amount (%) |
|------------------------------------|-------------------|-------------------|
| Gasoline | 86290-81-5 | 0 – 100 |
| Benzene | 71-43-2 | 0 – 5 |
| Toluene | 108-88-3 | 0 – 30 |
| Xylene (all isomers) | 1330-20-7 | 0 – 25 |
| Hexane (other isomers) | Mixture | 5 – 25 |
| n-Hexane | 110-54-3 | 0 – 3 |
| Cyclohexane | 110-82-7 | 0 – 3 |
| Octanes (all isomers) | Mixture | 0 – 20 |
| Heptane (all isomers) | 142-82-5 | 0 – 15 |
| Ethanol | 64-17-5 | 0 – 10 |
| Pentanes (all isomers) | Mixture | 0 – 20 |
| Trimethylbenzenes (all isomers) | 95-63-6 | 0 – 5 |
| Ethylbenzene | 100-41-4 | 0 – 5 |
| Cumene | 98-82-8 | 0 – 5 |
| Methyl Tertiary Butyl Ether (MTBE) | 1634-04-4 | 0 – 16 |
| Tertiary Amyl Methyl Ether (TAME) | 994-05-8 | 0 – 6 |

Section 3: Hazards Identification**Emergency Overview****DANGER!**

Extremely Flammable liquid and vapor
Harmful if swallowed
Skin Irritant
May cause eye and respiratory irritation
Cancer Hazard – Contains material which can cause cancer

Hazard Rankings**NFPA**

Physical form: Liquid
Appearance: Clear to amber
Odor: Strong, Gasoline

Potential Health Effects

Eyes: Contact with eyes may cause irritation, redness, tearing, stinging, watering and blurred vision.

Skin: Contact with skin may cause irritation, itching, redness and skin damage. Prolonged or repeated contact may cause drying and cracking of the skin, and may also cause dermatitis and inflammation. (See also section 11).

Inhalation: Breathing high concentration can be harmful. Throat and lung irritation may occur. Central nervous system effects including nausea, euphoria, dizziness, headache, fatigue, drowsiness or unconsciousness may occur due to long term or high concentration exposure to vapors.

Ingestion: Toxic if swallowed. This product may cause nausea, vomiting, dizziness, drowsiness, diarrhea if swallowed. Central nervous system effects may be caused. Swallowing this product can result in severe lung damage and/or death.

Signs / Symptoms: When overexposed to this product effects such as nausea, vomiting, blurred vision, respiratory failure, central nervous system depression, unconsciousness, tremor, death may occur.

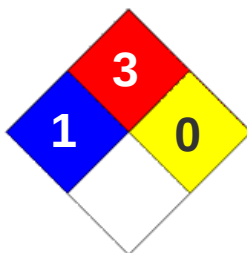
See toxicological Information (section 11)

Section 4: First Aid Measures

| | |
|--------------------------------|--|
| Eye contact: | Flush eyes immediately with fresh, cool water for at least 15 minutes. If irritation or redness or any symptoms persist, seek medical attention. |
| Skin contact: | Remove contaminated clothes and shoes. Flush affected area with large amounts of water. If skin surface is damaged, apply a clean dressing and seek medical attention. If skin surface is not damaged, wash affected area thoroughly with soap and water. If irritation or redness develops, seek medical attention. |
| Inhalation (Breathing): | If inhaled, immediately move person to fresh air. If there is difficulty breathing, give oxygen. If not breathing, immediately give artificial respiration. Seek medical attention. |
| Ingestion (Swallowing): | This product may be harmful or fatal if swallowed. This product may cause nausea, vomiting, diarrhea and restlessness. Do not induce vomiting. Do not give anything by mouth because this material can enter the lungs and cause severe lung damage. If victim is unconscious or drowsy, place on the left side with the head down. Seek immediate medical attention. |
| Notes to Physician: | <p>This material sensitizes the heart to the effects of sympathomimetic amines. Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in individuals exposed to this material.</p> <p>Inhalation overexposure can produce toxic effects. Monitor respiratory distress. If difficulty in breathing evaluate upper respiratory tract inflammation, bronchitis and pneumonitis. Administer supplemental oxygen as required.</p> <p>If ingested, this material presents a significant aspiration and chemical pneumonitis hazard. Consider activated charcoal and/or gastric lavage. If patient is obtunded, protect the airway by cuffed endotracheal intubation or by placement of the body in a Trendelenburg and left lateral decubitus position.</p> |

Section 5: Fire Fighting Measures

NFPA Hazard Class: Health = 1 ; Flammability = 3 ; Instability = 0
(0 – Minimal ; 1 – Slight ; 2 – Moderate ; 3 – Serious ; 4 – Severe)



Auto – ignition temperature : >260 °C (500 °F)

Flash point : Closed cup: -43 °C (-45 °F)

Flammable limits : Lower: approximately 1.4%
Upper: approximately 7.6%

Products of combustion : Carbon monoxide, carbon dioxide, nitrogen and sulfur oxides, smoke, fumes, unburned hydrocarbons and other products of incomplete combustion.

Special properties : Flammable liquid! This material can be ignited by heat, sparks, flames or other sources of ignition. Vapors may travel long distances to a source where they can ignite and flash back, or explode. A mixture of vapor and air can create an explosion hazard in confined spaces. If container is not properly cooled, it can rupture in the heat of a fire.

Extinguishing media : Use of dry chemical, carbon dioxide, or foam is recommended to extinguish fire. Water spray is recommended to cool or protect exposed materials or structures. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces. Water may not extinguish the fire, unless it is used by experienced fire fighters and under favorable conditions.

Protective Equipment for Fire Fighters : Fire fighters should wear appropriate protective equipment and self contained breathing apparatus (SCBA) with a full face piece operated in positive pressure mode.

Section 6: Accidental Release Measures

| | |
|-----------------------------------|--|
| Personal precautions: | This material is extremely flammable. Eliminate all ignition sources. Keep all hot metal surfaces away from spill/release. All equipment used when handling this material must be grounded. |
| Spill precautions: | Stay upwind and away from spill. Notify persons down wind of the spill, isolate spill area and keep unauthorized personnel out. If it can be done with minimal risk, try to stop spill. Always wear protective equipment, including respiratory protection. Contact emergency personnel. |
| Environmental precautions: | Prevent spilled material from entering sewers, drains, soil, and natural waterways. Use foam or spills to minimize vapors (section 5). Spilled material may be absorbed into an appropriate absorbent material. |
| Methods for cleaning up: | Notify fire authorities and appropriate federal, state and local agencies. Immediate cleanup is recommended. |

Section 7: Handling and Storage

| | |
|------------------|---|
| Handling: | <p>Flammable liquid and vapor. To be used only as a motor fuel. Avoid inhalation of vapors and contact with skin. Wash hands thoroughly after handling this material. Use in a well ventilated area away from all ignition sources. Use product with caution around heat, sparks, static electricity and open flames. Static electricity may ignite vapors and cause fire.</p> <p>Empty containers retain residue and may be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks or other ignition sources. The may explode and cause injury and/or death. Empty drums should be completely drained, properly bunged, and returned promptly to a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations.</p> |
| Storage: | Store in approved containers only. Keep in tightly closed containers in cool, dry, well ventilated areas. Keep isolated away from heat, sources of ignition and hot metal surfaces. |

Section 8: Exposure Controls / Personal Protection

Engineering controls: Provide ventilation or other engineering controls to keep the airborne concentrations of vapor or mists below their occupational exposure limits. Eyewash stations and safety showers should be located near the work-station.

Personal Protection

Eye Protection: Keep away from eyes. Safety glasses complying with approved standards should be worn. Chemical type goggles should be worn.

Skin Protection: Keep away from skin. Skin protection should be worn. Chemical resistant, impervious gloves should be worn. Always follow good personal hygiene practices after handling the material.

Respiratory Protection: Approved respiratory equipment must be used if a risk assessment indicates it is necessary. If workplace exposure limits for product or components are exceeded, NIOSH approved equipment should be worn.

General Protection: Use this material in well ventilated areas. Ventilation equipment should be explosion proof also.

| Component | Applicable Workplace Exposure Limits |
|------------------------------------|---|
| Gasoline | ACGIH – TWA: 300 ppm (8 hours)
STEL: 500 ppm (15 minutes) |
| Benzene | ACGIH – TWA: 0.5 ppm (8 hours)
STEL: 2.5 ppm (15 minutes)

OSHA – TWA: 1 ppm (8 hours)
STEL: 5 ppm (15 minutes) |
| Toluene | ACGIH – TWA: 20 ppm (8 hours)

OSHA – TWA: 200 ppm (8 hours)
CEIL: 300 ppm
PEAK: 500 ppm (10 minutes) |
| Xylene (all isomers) | ACGIH – TWA: 100 ppm (8 hours)
STEL: 150 ppm (15 minutes)

OSHA – TWA: 100 ppm (8 hours) |
| Hexane (other isomers) | ACGIH – TWA: 500 ppm (8 hours)
STEL: 1000 ppm (15 minutes) |
| n-Hexane | ACGIH – TWA: 50 ppm (8 hours)

OSHA – TWA: 500 ppm (8 hours) |
| Cyclohexane | ACGIH – TWA: 100 ppm (8 hours)

OSHA – TWA: 300 ppm (8 hours) |
| Octanes (all isomers) | ACGIH – TWA: 300 ppm (8 hours)

OSHA – TWA: 500 ppm (8 hours) |
| Heptane (all isomers) | ACGIH – TWA: 400 ppm (8 hours)
STEL: 5000 ppm (15 minutes)

OSHA – TWA: 500 ppm (8 hours) |
| Ethanol | ACGIH – TWA: 1000 ppm (8 hours)

OSHA – TWA: 1000 ppm (8 hours) |
| Pentanes (all isomers) | ACGIH – TWA: 600 ppm (8 hours)

OSHA – TWA: 1000 ppm (8 hours) |
| Trimethylbenzenes (all isomers) | ACGIH – TWA: 25 ppm (8 hours) |
| Ethylbenzene | ACGIH – TWA: 100 ppm (8 hours)
STEL: 125 ppm (15 minutes)

OSHA – TWA: 100 ppm (8 hours) |
| Cumene | ACGIH – TWA: 50 ppm (8 hours)

OSHA – TWA: 50 ppm (8 hours) |
| Methyl Tertiary Butyl Ether (MTBE) | ACGIH – TWA: 50 ppm (8 hours) |
| Tertiary Amyl Methyl Ether (TAME) | ACGIH – TWA: 20 ppm (8 hours) |

Section 9: Physical and Chemical Properties

| | |
|------------------------------|---|
| Physical State: | Liquid. |
| Color: | Transparent, clear to amber liquid. |
| Odor: | Strong. Characteristic gasoline odor. |
| pH: | Not applicable |
| Boiling Point: | >26 °C (>78 °F) |
| Melting Point: | Not applicable. |
| Specific gravity: | 0.66 to 0.75 (Water = 1) |
| Vapor density: | 3 to 4 (Air = 1) |
| Vapor pressure: | 220-450 mm Hg at 20°C (68°F) / 6-15 Reid-psia at 37.8°C (100°F) |
| Volatility: | 720 – 770 g/l VOC (w/v) |
| Viscosity (at 40 °C): | < 1 |
| Flash Point: | < -45 °F / < 43°C |
| Bulk Density: | 6.0 – 6.4 lbs/gal |
| Solubility in water: | Negligible |

Section 10: Stability and Reactivity

Stability: Stable. Extremely flammable liquid and vapor. Vapor can cause fire.

Conditions to avoid: Keep away from heat, flame and all other possible sources of ignition.

Materials to avoid: Keep away from strong oxidizing agents such as acids, chlorine, hydrogen peroxide and oxygen.

Hazardous decomposition products: Please refer to the combustion products identified in Section 5 of this MSDS.

Hazardous Polymerization: Not expected to occur.

Section 11: Toxicological Information

Toxicology Information

Oral toxicity: Almost non-toxic. LD 50: > 2000 mg/kg (species: rats)
Dermal toxicity: Almost non-toxic. LD 50: > 2000 mg/kg (species: rabbits)
Inhalation toxicity: Almost non-toxic. LD 50: > 5 mg/l (species: rats)
Eye irritation: Almost non-irritating. Draize score: > 6 and < 15 (species: rabbits)
Skin irritation: Irritant. Primary irritation index: > 3 and < 5 (species: rabbits)

Other data: Inhalation of high concentrations of vapors or mists may cause respiratory system irritation and damage. It may also result in the damage and depression of the central nervous system and may cause death. Prolonged contact with the material may cause severe skin irritation.

Subchronic toxicity: Dermal studies resulted in significant irritation but not systematic toxicity (species: rabbits). Inhalation exposures (90 day, approximately 1500 ppm vapor) produced light hydrocarbon nephropathy but no significant systemic toxicity (species: rats).

Neurotoxicity: Repeated and prolonged exposures to high concentrations of vapor has been reported to result in central nervous system damage and eventually, death. In a study in which ten human volunteers were exposed for 30 minutes to approximately 200, 500 or 1000 ppm concentrations of gasoline vapor, irritation of the eyes was the only significant effect observed, based on both subjective and objective assessments. However, no persistent neurotoxic effects were observed in subchronic inhalation studies of gasoline.

Reproductive toxicity: An inhalation study with rats exposed to 0, 400 and 1600 ppm of wholly vaporized unleaded gasoline, 6 hours per day on day 6 through 16 of gestation, showed no teratogenic effects nor indication of toxicity to either the mother or the fetus. Another inhalation study in rats exposed to 3000, 6000, or 9000 ppm of gasoline vapor, 6 hours per day on day 6 through 20 of gestation, also showed no teratogenic effects nor indications of toxicity to either the mother or the fetus.

Chronic toxicity: A lifetime mouse skin painting study of unleaded gasoline applied at 50 microliters, three time weekly, resulted in some severe skin irritation and changes, but no statistically significant increase in skin cancer or cancer to any other organ. Lifetime inhalation of wholly vaporized unleaded gasoline over 2000 ppm has caused increased liver tumors in female mice and increased kidney tumors in male rats. The EPA has concluded that mechanism by which wholly vaporized unleaded gasoline causes kidney damage is unique to the male rat. The effects in that species (kidney damage and cancer) should not be used in human risk assessment.

| | |
|--------------------------------------|--|
| Other toxic effects on humans | Extremely hazardous in case of ingestion.
Very hazardous in case of eye contact.
Hazardous in case of skin contact.
Slightly hazardous in case of inhalation. |
| Carcinogenic effects: | Contains material that may cause cancer depending on the level and duration of exposure. |
| Target organs: | Contains material that may cause damage to humans organs such as (but not limited to) blood, kidneys, lungs, liver, eye, skin, nervous system and upper respiratory tract. |

Section 12: Ecological Information

| | |
|----------------------------|---|
| Ecotoxicity: | This material may be toxic to aquatic organisms such as algae and daphnia. It has also shown to be toxic to fish. |
| Environmental fate: | The material is expected to be readily biodegradable. When released into the environment, some of the constituents of gasoline will volatilize and be photo degraded in the atmosphere. Following spillage, the more volatile components of gasoline will be rapidly lost, with concurrent dissolution of these and other constituents into the water. Factors such as local environmental conditions, photo-oxidation, biodegradation and adsorption onto suspended sediments, can contribute to the weathering of spilled gasoline. |

Section 13: Disposal Considerations

| | |
|------------------------|---|
| Waste disposal: | Avoid disposal of spilled material and runoff and contact with soil, waterways, drains and sewers. Disposal of this product and any of its by products should always comply with the requirements of environmental protection and waste disposal legislation and any local authority requirements.
This material would likely be identified as a federally regulated RCRA hazardous waste. See sections 7 and 8 for further information on handling, storage and personal protection. See section 9 for the material's physical and chemical properties. |
|------------------------|---|

Section 14: Transportation Information

This material is U.S Department of Transportation (DOT) regulated material.

Shipping name: Gasoline, 3, UN 1203, PG II
Gasohol, 3, NA 1203, PG II (for gasoline blended with less than 20% ethanol).

Hazard class: 3 DOT Class: Flammable liquid

Packing Group: II

UN / NA Number: UN1203 / NA1203

Emergency Response Code: 128

Label:

**Section 15: Regulatory Information**

TSCA Inventory: This product and/or its components are listed on the Toxic Substances Control Act (TSCA)

**SARA 302 / 304:
Emergency planning and notification** The Superfund Amendments and Reauthorization Act of 1986 (SARA) Title III requires facilities subject to Subparts 302 and 304 to submit emergency planning and notification information based on Threshold Planning Quantities (TPQs) and Reportable Quantities (RQs) for "Extremely Hazardous Substances" listed in 40 CFR 302.4 and CFR 355. No components were identified.

**SARA 311 / 312:
Hazard identification** SARA Title III requires facilities subject to this subpart to submit aggregate information on chemicals by "Hazard Category" as defined in 40 CFR 370.2. This material would be classified under: Fire, Acute (immediate) Health Hazard, Chronic (Delayed) Health Hazard.

**CERCLA / SARA 313:
Toxic and chemical
notification and release
reporting**

This material contains the following chemicals subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR 372

| Component | CAS Number | Amount (%) |
|------------------------------------|-------------------|-------------------|
| Benzene | 71-43-2 | 0 – 5 |
| Toluene | 108-88-3 | 0 – 30 |
| Xylene (o, m, p isomers) | 1330-20-7 | 0 – 25 |
| n-Hexane | 110-54-3 | 0 – 3 |
| Cyclohexane | 110-82-7 | 0 – 3 |
| 1, 2, 4 Trimethylbenzenes | 95-63-6 | 0 – 5 |
| Ethylbenzene | 100-41-4 | 0 – 5 |
| Cumene | 98-82-8 | 0 – 5 |
| Methyl Tertiary Butyl Ether (MTBE) | 1634-04-4 | 0 – 16 |

California Proposition 65: This material may contain detectable quantities of the following chemicals known to the State of California to cause cancer, birth defects or other reproductive harm, and which may be subject to the requirements of California Proposition 65 (CA Health & Safety Code Section 25249.5):

Benzene (CAS NO. 71-43-3)

Toluene (CAS No. 108-88-3)

Ethylbenzene (CAS No. 100-41-4)

Naphthalene (CAS No. 91-20-3)

Canadian Regulations:

WHMIS Hazard Class: B2 – Flammable Liquids
D2A – Very Toxic Material

Section 16: Other Information

Issue date: March 5, 2008
Previous issue date: No previous date
Version: 1
MSDS Code: PEG-UNL

Legend:

ACGIH = American Conference of Governmental Industrial Hygienists
CAS = Chemical Abstracts Service Registry
CEIL = Ceiling Limit
CERCLA = The Comprehensive Environmental Response, Compensation and Liability Act
EPA = Environmental Protection Agency
NFPA = National Fire Protection Association
OSHA = Occupational Safety and Health Administration
SARA = Superfund Amendments and Reauthorization Act
STEL = Short Term Exposure Limit (15 minutes)
TWA = Time Weighted Average (8 hours)
WHMIS = Worker Hazardous Materials Information System (Canada)

Disclaimer:

The information presented in this Material Safety Data Sheet (MSDS) is based on data believed to be accurate as of the issuance date of this MSDS. No warranty is expressed or implied for the accuracy or completeness of the above provided information. Petrocom Energy Group, LLC does not assume any liability for any damage or injury arising out of product use by others. The end user of the product has the responsibility for evaluating the accuracy of the data, and determining the safety, toxicity and suitability of the product under any conditions.



MATERIAL SAFETY DATA SHEET
Vitrified Grinding Wheels
MSDS #3

1. PRODUCT AND COMPANY IDENTIFICATION

Product Identity / Trade Name: Vitrified Grinding Wheels, Including Surface Grinding Wheels (Type 1) and Mounted Points.

Product Use: Abrasive materials used for cutting and grinding of metals, concrete, masonry and building materials.

Manufacturer: Mailing Address
United Abrasives, Inc.
P.O. Box 75
Willimantic, CT 06226

Physical Address
United Abrasives, Inc.
185 Boston Post Road
North Windham, CT 06256

Internet: www.unitedabrasives.com

Information Phone: (860) 456-7131 **Emergency Phone:** (860) 456-7131

MSDS Date of Preparation: May 23, 2012

2. HAZARDS IDENTIFICATION

This product is a black, brown, green or reddish colored solid wheel with no odor.

EMERGENCY OVERVIEW

Dust may cause eye and respiratory irritation. Dust particles may cause abrasive injury to the eyes.

3. COMPOSITION/INFORMATION ON INGREDIENTS

| Hazardous Component | CAS # | % |
|---------------------|-----------|-------|
| Aluminum Oxide | 1344-28-1 | 0-100 |
| and/or | | |
| Silicon Carbide | 409-21-2 | 0-100 |

4. FIRST AID MEASURES

Ingestion: If grinding dust is swallowed, seek medical attention.

Inhalation: If overexposed to grinding dust, remove victim to fresh air and get medical attention.

Eye Contact: Flush eyes thoroughly with water, holding open eyelids. Get medical attention if irritation persists. Obtain immediate medical attention for foreign body in the eye.

Skin Contact: Wash dust from skin with soap and water. Launder contaminated clothing before reuse.

5. FIRE FIGHTING MEASURES

Extinguishing Media: Use any media that is appropriate for the surrounding fire.

Special Firefighting Procedures: None needed.

Unusual Fire and Explosion Hazards: This product is not combustible, however, consideration must be given to the potential fire/explosion hazards from the base material being processed. Many materials create flammable/explosive dusts or turnings when machined or ground.

Hazardous Combustion Products: None known.

6. ACCIDENTAL RELEASE MEASURES

Pick up, sweep up or vacuum and place in a container for disposal. Minimize generation of dust. Notify authorities as required by local, state and federal regulations.

7. HANDLING AND STORAGE

Recommended Work Practices: Use only with adequate ventilation. Avoid breathing dust. Wash thoroughly after handling and use, especially before eating, drinking or smoking. Refer to ANSI B7.1, Safety Requirements for the Use, Care and Protection of Abrasive Wheels for additional information. Consider potential exposure to components of the base materials or coatings being ground. Refer to OSHA's substance specific standards for additional work practice requirements where applicable.

Storage: Store in accordance with ANSI B7.1. Protect abrasive wheels from damage.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure Guidelines:

| Hazardous Component | OSHA PEL | ACGIH TLV |
|---------------------|-----------------------------------|--|
| Aluminum Oxide | 15 mg/m ³ (total dust) | 1 mg/m ³ (respirable) (as Al metal) |
| Silicon Carbide | 15 mg/m ³ (total dust) | 10 mg/m ³ (Inhalable fraction) |

Note: Consider also components of base materials and coatings being ground.

Ventilation: Use local exhaust or general ventilation as required to minimize exposure to dust and maintain the concentration of contaminants below the TLVs.

Respiratory Protection: Use NIOSH approved respirator if exposure limits are exceeded or where dust exposures are excessive. Consider the potential for exposure to components of the coatings or base material being ground in selecting proper respiratory protection. Refer to OSHA's specific standards for lead, cadmium, etc. where appropriate. Selection of respiratory protection depends on the contaminant type, form and concentration. Select and use respirators in accordance with OSHA 1910.134 and good industrial hygiene practice.

Gloves: Cloth or leather gloves recommended.

Eye Protection: Safety goggles or face shield over safety glasses with side shields.

Other: Protective clothing as needed to prevent contamination of personal clothing. Hearing protection may be required.

9. PHYSICAL AND CHEMICAL PROPERTIES

Boiling Point: Not Applicable

Solubility in Water: Insoluble

Specific Gravity: Not Applicable

Melting Point: Not Applicable

Flammable Limits: LEL: Not Applicable

Vapor Pressure: (mm Hg) Not Applicable

Vapor Density: (Air = 1) Not Applicable

Evaporation Rate: Not Applicable

Flash Point: Non-Combustible

UEL: Not Applicable

Appearance and Odor: Black, gray, brown, green or reddish colored solid wheel, no odor.

10. STABILITY AND REACTIVITY

Stability: Stable

Incompatibility: None known.

Hazardous Decomposition Products: Dust from grinding could contain ingredients listed in Section 3 and other, potentially more hazardous components of the base material being ground or coatings applied to the base material.

Hazardous Polymerization: Will not occur.

11. TOXICOLOGICAL INFORMATION

HEALTH HAZARDS:

Ingestion: None expected under normal use conditions. Swallowing large pieces may cause obstruction of the gastrointestinal tract.

Inhalation: Dust may cause respiratory irritation.

Eye: Dust may cause eye irritation. Dust particles may cause abrasive injury to the eyes.

Skin: None expected under normal use conditions. Rubbing product across the skin may cause mechanical irritation or abrasions.

Sensitization: This material is not known to cause sensitization.

Chronic: Long-term overexposure to respirable dust may cause lung damage (fibrosis) with symptoms of coughing, shortness of breath and diminished breathing capacity. Chronic effects may be aggravated by smoking. Prolonged exposure to elevated noise levels during operations may affect hearing. A greater hazard, in most cases, is the exposure to the dust/fumes from the material or paint/coatings being ground. Most of the dust generated during grinding is from the base material being ground and the potential hazard from this exposure must be evaluated.

Carcinogenicity: None of the components is listed as a carcinogen or potential carcinogen by OSHA, NTP or IARC.

Medical Conditions Aggravated by Exposure: Employees with pre-existing respiratory disease may be at risk from exposure.

Acute Toxicity Values:

This product and its components are not acutely toxic. No specific toxicity data is available for this product or its components.

12. ECOLOGICAL INFORMATION

No ecological data is available for this product. No hazards to the environment are expected from this product. However, consideration must be given to potential environment effects of the base material being processed.

13. DISPOSAL CONSIDERATIONS

Dispose in accordance with all applicable local, state/provincial and federal regulations. Local regulations may be more stringent than regional and national requirements. It is the responsibility of the waste generator to determine the toxicity and physical characteristics of the material to determine the proper waste identification and disposal in compliance with applicable regulations.

14. TRANSPORT INFORMATION

DOT Hazardous Materials Description:

Proper Shipping Name: Not Regulated

UN Number: None

Hazard Class/Packing Group: None

Labels Required: None

15. REGULATORY INFORMATION

SARA Section 311/312 Hazard Categories: Not Applicable

SARA Section 313: This product contains the following toxic chemicals subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372 (Toxic Chemical Release Reporting):

None

California Proposition 65: WARNING You create dust when you cut, sand, drill or grind materials such as wood, paint, cement, masonry or metal. This dust often contains chemicals known to cause cancer, birth defects or other reproductive harm.

Canadian WHMIS Classification: Not a controlled product. This product meets the definition of a "manufactured article" under the WHMIS regulations.

This product has been classified under the CPR and this MSDS discloses information elements required by the CPR.

16. OTHER INFORMATION

NFPA Hazard Rating: Health: 1
Fire: 0
Reactivity: 0

Date Previous Revision: 12/1/2009

Date This Revision: 5/23/12

Revision Summary: Section 3 Components; Section 5 Removed Flammable Limits; Section 8 Exposure Limits; Comprehensive Review

Prepared By: Denese A. Deeds, CIH IH&SC Inc., Woodbridge, CT 06525

The preceding information is believed to be correct and current as of the date of preparation of this Material Safety Data Sheet. Since the use of this information and the conditions of use of this product are not within the control of United Abrasives, Inc., it is the user's obligation to assure safe use of this product.

APPENDIX F

SPILL RESPONSE PROCEDURES

HERMOSA DRILLING PROJECT PLAN OF OPERATIONS

APPENDIX F SPILL REPSONSE PROCEDURES

Prepared for:

**UNITED STATES DEPARTMENT
OF AGRICULTURE FOREST SERVICE**
Coronado National Forest
300 West Congress Street
Tucson, Arizona 85701

Prepared by:

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February 2013

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1. SPILL RESPONSE PROCEDURES

1.1. PURPOSE AND GOAL

The purpose of these procedures is to prevent or reduce discharge of materials that may be considered pollutants to the environment. These procedures will result in increased safety and awareness of personnel; elimination or reduction of the potential of releases (regardless of size); and assurance that mitigation, storage, reporting, and disposal procedures are adequate for environmental protection and regulatory compliance.

A copy of the Spill Response Procedures and of the Material Safety Data Sheets (MSDSs) are located at the Project Staging area on the Alta Claim owned by Arizona Minerals, Inc. (AMI). Copies of MSDSs are included in Appendix E. Employees and contractors are responsible for becoming familiar with the Spill Response Procedures and MSDSs, consistent with the Occupational Safety Health Administration (OSHA) Hazard Communication Standard.

Site contractors will provide temporary diesel fuel storage tank(s) located at the project staging area for the storage and handling of fuels (see Table F-1 and Table F-2) to be used during the Project. In addition, the tank(s) will include secondary containment with sufficient capacity to hold 110% of the tank volume. These precautions are expected to be sufficient to prevent spills to any waterways or to Coronado National Forest (CNF) lands.

1.1.1. Specific Tasks and Procedures for Spill Prevention and Control

Specific tasks and procedures will be implemented to prevent and control spills of pollutants. Listed below are tasks and procedures to be implemented as part of this plan:

- The storage area will be maintained in a clean and well-organized manner. The storage area will be properly equipped so maintenance and cleanup of leaks or spills of pollutants will occur in a proper and timely manner.
- Information on proper storage, cleanup procedures, and reporting protocols will be posted at a visible and accessible location at all times.
- The storage area will satisfy containment requirements such as double-walled tanks, secondary containment berms, and drum containment pans for containment and control of unforeseen leaks and spills of pollutants.
- Products and materials that are considered potential pollutants will be protected from rain.

1.1.2. Equipment Fueling

Fueling equipment will have an authorized shut-off nozzle to contain drips of fuel and to eliminate accidental overflow while fueling. The practice of “topping off” the fuel tank while filling will not be allowed. Hand-operated fuel dispensers are not subject to unattended overfilling. Operators will be trained

in proper fueling operations and procedures to make sure that they are alert to the task and will not overfill the fuel tank. On work areas on CNF land, plastic sheets and/or absorbent pads will be used under equipment to capture and contain any potential spillage of fuels.

1.1.3. Material Storage and Disposal

Good housekeeping practices are designed to minimize amounts of materials stored and the potential release of these products. Listed below are good housekeeping practices to be followed:

- The amount of product stored on individual characterization sites will be limited to that amount required for the job at hand.
- Materials will be stored in a neat and orderly manner in appropriate containers with approved lids or sealed and enclosed by water resistant covering, as needed.
- Products will be kept in original containers with the original manufacturer's label.
- Manufacturer's recommendations for proper storage, use, and disposal of each product will be followed.
- The authorized field representative or designee will inspect the characterization sites daily to ensure proper use and disposal of materials on-site. Inspection logs will be kept on-site and available. Inspection logs will document noticeable problems and outline a time frame for the correction of problems or issues identified.

1.1.4. Preventative Maintenance

Contractors will have preventative maintenance programs in place to ensure vehicles and equipment are utilized under optimum operating parameters and to ensure hoses and fittings are in good condition and leak-free. The operator, mechanic, tool pusher, or other designee will be responsible to execute the repairs or preventative maintenance tasks. Vehicle and equipment repair and maintenance will be documented through the use of maintenance logs. Vehicles and equipment in need of repair will not be put into service until repairs are fully completed.

1.1.5. Source Identification

Potential sources of pollutants include drill rigs, service vehicles, and other equipment. Potential pollutants include any of the substances listed in Table F-1 or Table F-2. These materials are not expected to come into contact with soils or surface waters. Nonetheless, BMPs will be employed to prevent release of pollutants to the environment.

1.1.6. Spill Contingency Plan

Materials and equipment necessary for spill cleanup will be kept in the fuel storage area on AMI property. Equipment and materials will include, but not be limited to, brooms, dust pans, rags, gloves, goggles, sorbent materials, and plastic/metal trash containers specifically for this purpose. Many of these materials will also be located on operational vehicles to mitigate releases or spills in the field during the characterization program.

Well-maintained equipment will be used to perform the work required during this project. When practicable, equipment maintenance will be performed off-site. In the event of oil, fuel, and lubricating grease leaks, cleanup will be conducted as soon as possible. If the leak is on compacted soil, an oil-absorbing product, such as Absorb®, may be applied. Once the cleanup product has absorbed the leak, the product will be swept up into watertight drums or bins, labeled, stored, and disposed of according to federal, state, or local regulations. If the leak occurs on uncompacted soil, soils will be “loosened,” and soil will be removed to the depth required to capture the contaminated soils and/or materials. The Los Reales Landfill in Tucson, Arizona will be used for disposal of contaminated soils impacted from spills.

In the case of a spill, procedures and BMPs will be adjusted to include measures that will mitigate reoccurrence and ensure that cleanup procedures are adequate. A description of the spill, cause, cleanup measures, and disposal method will be documented and reported as appropriate.

1.1.7. Spill Response

Spills will be treated as if hazardous. Employees will refer to the MSDS and implement the appropriate human health and safety measures and spill cleanup procedures. Regardless of size, spills will be reported to the appropriate AMI supervisor.

The following actions will be taken in the event of a hazardous spill:

- The AMI supervisor will be notified immediately. The supervisor will oversee the response and cleanup of hazardous materials releases.
- If a hazardous material spill is suspected to be dangerous, Emergency Notification procedures provided in Sections 1.1.7 and 1.1.8 will be implemented.
- Proper Personal Protective Equipment (PPE) will be utilized.
- As practicable the release of the material will be stopped or minimized.
- Employees will avoid contact with the spilled material including avoidance of gases, fumes, and smoke.
- A reputable, licensed company will be used to cleanup large spills and dispose of contaminated materials.
- Contaminated materials will be stored in appropriate and approved containers. Containers will be properly labeled following federal, state, and local requirements.

1.1.8. Spill Reporting

A spill report must be completed and forwarded to the AMI environmental official as quickly as possible. AMI will determine if any further notification is required to state or federal officials.

If there is a spill of any quantity of petroleum materials or a reportable quantity of a CERCLA hazardous substance off private land or into a wash, the following notifications will be completed:

| | |
|---|-------------------|
| ADEQ: | 800-234-5677 |
| National Response Center: | 800-424-8802 |
| Sierra Vista Ranger District Officer and Spill Coordinator,
Mr. Gil Gilbert, Libby Air Tanker Base | 520-559-3105 Cell |
| Tucson Forest Service Dispatch | 520-202-2710 |

Information to be provided to agencies/regulators includes:

- Name and telephone number of reporter;
- Name and location of the site;
- Date, time, and type of incident (e.g. release, fire);
- Name and estimated quantity of material(s) involved, to the extent known;
- Source of the discharge;
- Description of all affected media;
- Cause of the discharge;
- Extent of any damage or injuries caused by the discharge;
- Possible hazards to human health or the environment off-site; and
- Cleanup activities being conducted to contain and control the release.

1.1.9. Cleanup and Disposal

AMI has the following contractors on-site or available in order to respond to potential spills or discharges that occur during the drilling project:

DM Excavating of Patagonia, Arizona at (520) 604-6330 is AMI's earthmoving contractor. They have equipment on-site and the necessary training and expertise to clean up any spills.

Southwest Hazard Control is a licensed emergency response company in Tucson. Southwest Hazard Control will respond to any spill incidents that could occur at the site.

Southwest Hazard Control Inc.
Tucson, AZ 85745
Phone (520) 622-3607
Phone (800) 279 -5266
Fax (520) 622-3643

Collected spill material and any contaminated soil will be properly disposed of in accordance with federal, state and local requirements. The nearest licensed facility for disposal of petroleum contaminated or other materials is Tucson's Los Reales Landfill:

5300 E. Los Reales Road
Tucson, Arizona
Phone (520) 791-4183

APPENDIX F TABLES

Table F-1. Downhole Additives, Well Construction Materials

| Product | Use | Physical State | CERCLA/SARA Regulatory Information | | | | | | | Other | |
|---------------------|---------------------|----------------|---------------------------------------|----------------|------|----------|----------|-----------------|-----------------|---|---------------------|
| | | | §311/312: Title III Hazard Categories | | | | | §313 & 40CFR372 | RQ ¹ | Potential Hazards | Container Size |
| | | | Acute Health | Chronic Health | Fire | Pressure | Reactive | | | | |
| Bentonite Clay | Well Sealant | Powder | NA | NA | NA | NA | NA | None | NA | 100% Natural Mineral; Dust inhalation hazard | 50-lb bag |
| Quick-Gel Gold® | Viscosifier | Powder | Yes | Yes | No | No | No | None | NA | Dust may cause eye/respiratory irritation. | 40-lb bag |
| Quik-Trol® Gold LV | Fluid Loss Additive | Powder | NA | NA | NA | NA | NA | None | NA | Dust may cause eye and respiratory irritation | 40-lb bag |
| Soda Ash | Buffer | Powder | NA | NA | NA | NA | NA | None | NA | May cause serious eye irritation and/or damage | 1- to 3-gal bucket |
| Bullseye™ Pipe Dope | Thread Compound | Semisolid | NA | NA | NA | NA | NA | None | NA | May cause eye and skin irritation; Inhalation may block breathing passages | 5-gal bucket |
| Rod Ease® | Lubricant | Liquid | Yes | NA | NA | NA | NA | None | NA | May cause eye, skin, and respiratory irritation | 5-gal bucket |
| Diamond™ Seal | Additive | Liquid | Yes | No | NA | NA | NA | None | NA | May cause eye, skin, and respiratory irritation | 2- to 2½-gal bucket |
| EZ-MUD® PLUS | Additive | Liquid | Yes | NA | NA | NA | NA | None | NA | May cause eye, skin, and respiratory irritation | 5-gal bucket |
| EP Mudlube® | Lubricant | Liquid | Yes | No | Yes | NA | NA | None | NA | May cause eye, skin, and respiratory irritation; May cause headache, dizziness, and other central nervous system effects; May be harmful if swallowed | 5-gal bucket |
| Aqua-Clear® PFD | Surfactant | Liquid | NA | NA | NA | NA | NA | None | NA | May cause eye, skin, and respiratory irritation | 5-gal ail |
| Benseal® | Viscosifier | Liquid | Yes | Yes | Yes | NA | NA | None | NA | May cause eye, skin, and respiratory irritation | 30-lb bag |
| EZ-MUD® Gold | Additive | Liquid | NA | NA | NA | NA | NA | None | NA | May cause eye and skin irritation; Airborne dust may be explosive | 40-lb pail |
| N-Seal™ | Additive | Semisolid | NA | NA | NA | NA | NA | None | NA | May cause eye and skin irritation | 30-lb bag |
| Quik-Foam® | Additive | Liquid | NA | NA | NA | NA | NA | None | NA | NA | 5-gal pail |

Table F-1. Downhole Additives, Well Construction Materials

| Product | Use | Physical State | CERCLA/SARA Regulatory Information | | | | | | | Other | |
|--|-------------------|----------------|---------------------------------------|----------------|------|----------|----------|-----------------|-----------------|---|----------------|
| | | | §311/312: Title III Hazard Categories | | | | | §313 & 40CFR372 | RQ ¹ | Potential Hazards | Container Size |
| | | | Acute Health | Chronic Health | Fire | Pressure | Reactive | | | | |
| Quik-Gel® | Additive | Semisolid | NA | NA | NA | NA | NA | None | NA | May cause eye and respiratory irritation | 50-lb bag |
| Quik-Trol® LV | Additive | Solid | NA | NA | NA | NA | NA | None | NA | May cause eye and skin irritation; Airborne dust may be explosive | 40-lb case |
| Carbon and Alloy Steel | Pipe | Solid | NA | NA | NA | NA | NA | None | NA | NA | NA |
| PVC Pipe, Flush Thread Monitor Well Screens, and Casings | Pipe | Solid | NA | NA | NA | NA | NA | None | NA | NA | NA |
| Holeplug® 3/4 (Baroid) | Vicosifier | Solid | Yes | Yes | No | NA | NA | None | NA | May cause eye irritation, potential carcinogen | 50-lb bag |
| Portland Cement | Cement | Powder | Yes | No | No | NA | NA | None | NA | May cause eye and skin irritation | 47-lb bag |
| Quik-Grout® (Baroid) | Well Sealant | Powder | NA | NA | NA | NA | NA | None | NA | May cause eye and skin irritation | 50-lb bag |
| Grout-Well® DF | Well Sealant | Powder | NA | NA | NA | NA | NA | None | NA | May cause eye and skin irritation | 50-lb bag |
| Colorado Silica Sand | Filter Pack | Sand | Yes | Yes | No | NA | NA | None | NA | May cause eye, skin, and respiratory irritation | 50-lb bag |
| Bentonite Pellets ¼ | Well Sealant | Solid | Yes | Yes | No | NA | NA | None | NA | May cause eye irritation, potential carcinogen | 50-lb bag |
| PVC Plastic Pipe Cement | PVC Pipe Adhesive | Liquid | Yes | No | Yes | NA | NA | None | NA | May cause eye, skin, and respiratory irritation | ½ pt. – 1 qt. |

¹ Reportable Quantity (RQ) per CERCLA 40 CFR Parts 116–117

Table F-2. Hazardous Materials for Use in Project

| Product | Use | Physical State | NFPA ¹ | | | CERCLA/SARA Regulatory Information | | | | | | | Other | |
|---|-------------------------------|----------------|-------------------|---|---|---------------------------------------|----------------|------|----------|----------|--|------------------------|---|-------------------|
| | | | H | F | R | §311/312: Title III Hazard Categories | | | | | §313 & 40CFR372 | RQ ² | Potential Hazards | Container Size |
| | | | | | | Acute Health | Chronic Health | Fire | Pressure | Reactive | | | | |
| No. 2 Diesel | Motor Fuel Only | Liquid | 1 | 2 | 0 | Yes | Yes | Yes | No | No | Naphthalene | 75 gal in 24-hr period | Flammable; Marine Pollutant | 100-gal Slip tank |
| John Deere Hy-Gard® | Transmission/ Hydraulic Fluid | Liquid | 0 | 1 | 0 | NA | NA | NA | NA | NA | None | NA | Not Harmful | 1 or 5 gal |
| Unleaded Gasoline | Motor Fuel Only | Liquid | 1 | 3 | 0 | Yes | Yes | Yes | No | No | Toluene, Xylenes, Ethyl Benzene, Benzene, 1,2,4-Trimethyl Benzene, n-Hexane, and Cyclohexane | 25 gal in 24 hr period | Extremely flammable; May be fatal if swallowed; Causes skin irritation, drowsiness, cancer; Toxic to aquatic life | 5-gal can |
| TropArtic® Motor Oil | Automotive Engine Oil | Liquid | 0 | 1 | 0 | NA | NA | NA | NA | NA | Zinc Compound(s) | NA | May cause mild eye and skin irritation | 1 or 5 gal |
| Mystik® JT-6 Multipurpose Grease, No. 2 | Lubricant | Semisolid | 1 | 1 | 0 | NA | NA | NA | NA | NA | None | NA | May cause mild eye and skin irritation | 14-oz. tube |
| IDP-585 | Lubricant | Liquid | 0 | 1 | 0 | NA | NA | NA | NA | NA | None | NA | May cause eye irritation | 1 to 5 gal |
| IDP-214 | Lubricant | Semisolid | 1 | 1 | 0 | Yes | Yes | Yes | No | No | None | NA | May cause eye irritation; May be harmful if swallowed | 1 to 5 gal |
| Bestolife 3000® Joint Grease | Grease Mixture | Semisolid | 1 | 2 | 0 | Yes | Yes | Yes | No | No | None | NA | May cause skin irritation; May be absorbed through the skin; May cause eye irritation; Ingestion can result in both acute and chronic overexposure; If the grease base has been removed the remaining powders and particles can pose an inhalation hazard | 3-gal pail |

Table F-2. Hazardous Materials for Use in Project

| Product | Use | Physical State | NFPA ¹ | | | CERCLA/SARA Regulatory Information | | | | | | | Other | |
|-----------------------------|-----------|-------------------|-------------------|---|---|---------------------------------------|----------------|------|----------|----------|-----------------|-----------------|--|--------------------|
| | | | H | F | R | §311/312: Title III Hazard Categories | | | | | §313 & 40CFR372 | RQ ² | Potential Hazards | Container Size |
| | | | | | | Acute Health | Chronic Health | Fire | Pressure | Reactive | | | | |
| Excalibur® 7018 H4R | Welding | Solid | 1 | 0 | 0 | Yes | Yes | No | No | No | None | NA | Fumes may be dangerous to your health | 10-lb box |
| Acetylene | Welding | Gas | 1 | 4 | 2 | Yes | No | Yes | Yes | Yes | Ethyne | None | If inhaled can cause the symptoms similar to being intoxicated; Inhalation at higher concentrations can cause inadequate supply of oxygen to the lungs and cause unconsciousness | 140-cfm bottle |
| Oxygen | Welding | Gas | 3 | 0 | 0 | Yes | No | Yes | Yes | Yes | None | NA | Breathing high concentrations can lead to hyperoxia | 256-cfm bottle |
| Diamond Bits and Blades | Welding | Liquid | 1 | 0 | 0 | Yes | Yes | No | No | No | None | NA | These products in their manufactured state do not present an inhalation or contact hazard | NA |
| Grinding and Cutting Wheels | Welding | Solid | 1 | 0 | 0 | No | No | NA | NA | NA | None | NA | May cause eye irritation. If grinding dust is swallowed, seek medical attention. | 10-pc or 50-pc box |
| Vitrified Grinding Wheels | Welding | Solid | 1 | 0 | 0 | No | No | NA | NA | NA | None | NA | May cause irritation to the eyes, and lungs. | 10-pc or 50-pc box |
| Alconox® | Soap | Granulated Powder | 1 | 0 | 0 | Yes | No | No | No | No | None | NA | May cause eye and skin, irritation. Airborne particles are harmful to respiratory tract. | 4-lb carton |
| GoJo® Hand Cleaner | Hand Soap | Liquid | 1 | 1 | 0 | No | No | No | No | No | None | NA | May cause eye irritation and upset stomach if consumed. | 1-qt bottle |

Table F-2. Hazardous Materials for Use in Project

| Product | Use | Physical State | NFPA ¹ | | | CERCLA/SARA Regulatory Information | | | | | | | Other | |
|---|-------------------|----------------|-------------------|---|---|---------------------------------------|----------------|------|----------|----------|------------------|-----------------|---|------------------|
| | | | H | F | R | §311/312: Title III Hazard Categories | | | | | §313 & 40CFR372 | RQ ² | Potential Hazards | Container Size |
| | | | | | | Acute Health | Chronic Health | Fire | Pressure | Reactive | | | | |
| Chevron Hydraulic Oil AW ISO 32,46,68 | Hydraulic Oil | Liquid | 0 | 1 | 0 | No | No | No | No | No | None | NA | Not Harmful | 5-gal pail |
| Diathon® White-Fire Extinguisher | Fire Extinguisher | Powder | 1 | 0 | 0 | No | Yes | No | No | No | None | NA | Pneumoconiosis, or “dusty lung” disease, may result from chronic exposure to any dust | 2.5 lb and 10 lb |
| Marking Chalk- Blue | Mark-up | Solid | 0 | 0 | 0 | NA | NA | NA | NA | NA | None | NA | Not Harmful | NA |
| Chevron Delo® 400 | Engine Oil | Liquid | 0 | 1 | 0 | No | No | No | No | No | Zinc Compound(s) | NA | Not Harmful | 1 gal |
| Texaco Prediluted 50/50 Coolant/ Antifreeze | Engine Coolant | Liquid | 2 | 0 | 0 | No | Yes | No | No | No | Ethylene Glycol | 5,000 lbs | May cause eye irritation; toxic if swallowed; fumes or vapor may cause respiratory irritation | 1 gal |

¹ National Fire Protection Association (NFPA) Ratings; H=Health; F=Flammability; R=Reactivity² Reportable Quantity (RQ) per CERCLA 40 CFR Parts 116-117